PAPER

A non technical history and description of the more common types as used in Philately

by **JAMES H. OBRIG**

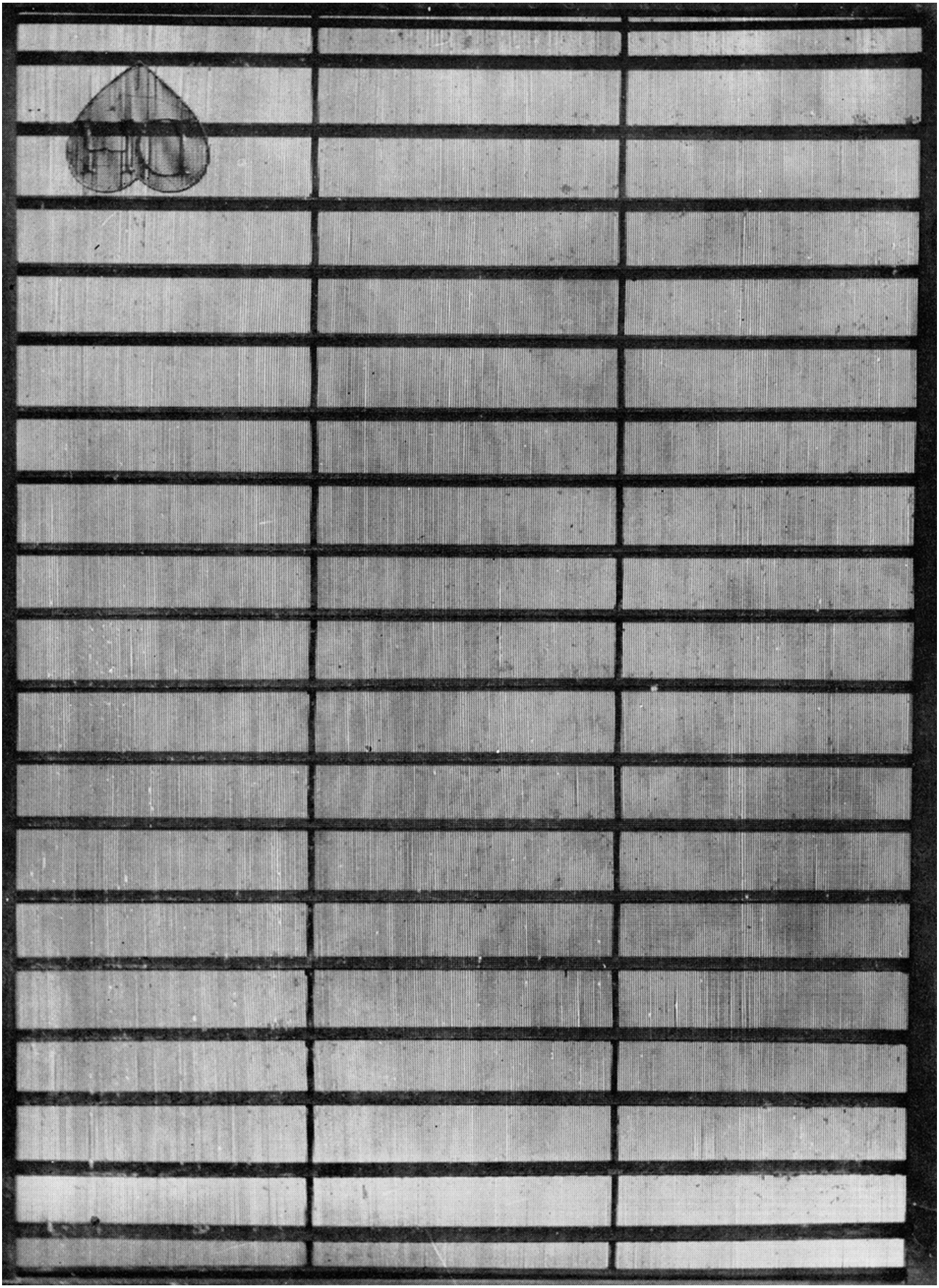
ONE of the little investigated side lines of philately is the study of paper and its relation to the various varieties as listed in the catalog. Because of the wide use of paper in our every day life this very necessary item is more or less taken for granted. A glance through the pages of your catalog will reveal that many types of paper are mentioned and in some cases the ability of the collector to recognize and identify the various types may save him many dollars in the purchase of a stamp.

The descriptions of the more common papers as found in the catalog are as complete and yet as simple as they can be made . . . but many times the collector is left wavering between two or more types.

In this article we will try to not only describe fully the more common types used for philatelic production but will show, where possible, by actual sheets, samples of each. Our sample group is not as complete as we wish it to be but due to conditions abroad it has been impossible to obtain some of the foreign papers.

On each sample page will also be found listed one or two reasonably priced stamps that are known to be printed on that particular type of paper. In this way the reader will be able to assemble a number of actual philatelic samples for use as reference material.

Paper, as we know of it today, was not produced until 100-150 AD when the Chinese discovered the first crude processes. The earliest example of any type of paper was the Egyptian process which produced Papyrus. The materials were gathered from an aquatic plant found growing in the Nile valley and the forming of the sheet resembled weaving. The outer tough stems of the plants were stripped off and after being crushed and bruised in water were woven together forming a mat which, after being soaked, was put under pressure to dry. After the crude ''sheet'' had dried sufficiently to allow handling it was rubbed with smooth shells or stones until the desired surface was obtained. These sheets were then joined together end to end and formed the Papyrus rolls as we know of them today. This ''paper'' was known as early as 2000 BC and we find records of its use as late as 1100 AD.



The Chinese process as we said, produced the first real paper from pulp fibres. The raw material they chose for their process was the bark of one of the Mulberry trees. After boiling the pieces in a strong solution of lye and washing, the resultant pulp was placed in a tub containing rice and a root called "oveni." This mixture was then thoroughly stirred until all of the materials were well blended. The actual sheet of paper was formed by dipping a hand mould (note Figure A) into the vat containing the pulpy mixture, the fibres of which formed on the screen in a thin even layer. As the mould was porous the water of the mixture drained off leaving the fibres in the form of a wet soggy "sheet." These were dropped from the moulds and laid one on top of the other with strips of reed between. Small piles were made and each was weighted with stones which remained until the paper had dried and seasoned.

This process remained a secret of the Chinese for centuries until the capture of Samarcand by the Arabs in 704 AD. The invaders learned the secret of the Chinese paper makers and carried the story back with them.

Western Europe learned the process during the early crusade and we find the first records of paper making in Spain about 1150 AD. The craft spread and France produced their first products in 1189 AD. The art flourished on the continent for years altho it was not until 1489 that we find any record of paper making in England. Research has produced evidence that the first attempts at watermarking were in Italy around 1280.

The process was first established in America in 1690 by William Rittinghuysen (now spelled Rittenhouse) who established his paper making plant in Roxborough, Penna. All of the production of paper in Europe and this country was by the use of hand moulds and the old crude stamping and pulping machinery. It was not until 1798-1804 that the mechanical marvel that we know today as the Fourdrinier Paper Machine was invented in France by one Nicholas Louis Roberts. The name as we know it was given to the invention in honor of the Fourdrinier Brothers who financed the inventor. Thus it is possible to find even our earliest stamps printed on "machine made paper."

A footnote found in a book from the writers library, published in 1876 states . . . "The Fourdrinier machine makes possible the completion of paper the day after the delivery of rags to the mill, where by the old process of hand manufacture, it often required as long as three months to complete paper for delivery. The difference in cost of paper production in 1806 was reported by the Fourdrinier Brothers as; Hand . . . 16 shillings per cwt. Machine . . . 3 shillings 6 pence per cwt."

The use of the Fourdrinier machine also brought to the industry many other improvements in the production of the pulp and led to the raising of its quality and purity. It is an interesting fact however, that the invention of Roberts remains basically the same today as it was back in 1800.

Having brought the history of paper up to date we now turn to the story of its manufacture and the various materials that are used. At one time or another practically every possible vegetable fibre has been tried with varying successes. The most common in use today are wood, flax and cotton fibres. Esparto (a grass) and straw are also used to produce certain types of paper.

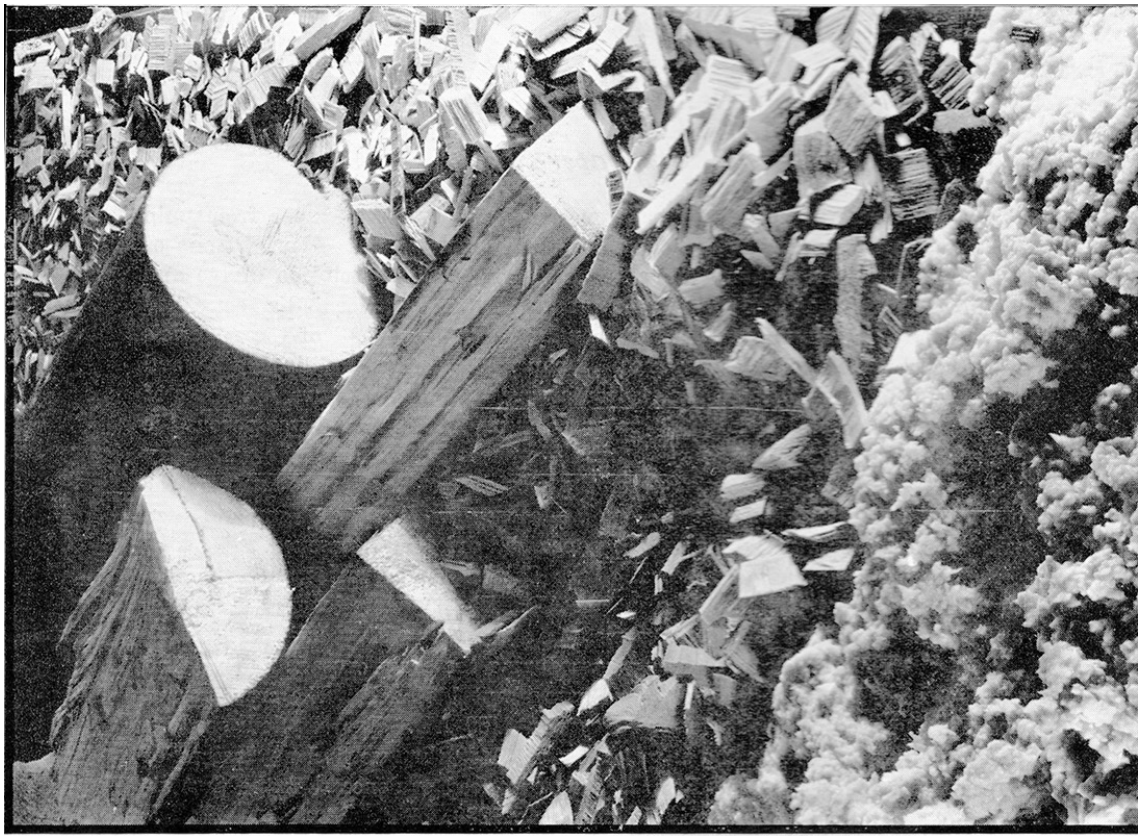


Fig. #1. WOOD PULP—THREE STAGES OF PRODUCTION. (1) Logs; (2) Wood Chips; (3) Bleached Pulp—Courtesy Oxford Paper Co.—Bourke-White Photo

Figure 1 graphically portrays the three stages of production used to prepare wood pulp. First we see the logs, then the sorted wood chips and finally the bleached pulp. Regardless of the type of fibre used, the manufacturing process remains basically the same. The only differences being in the chemicals, the amount of time needed and the various purifying processes.

Our description will deal with the production of wood pulp as that happens to be the type of paper in use at our own Bureau of Engraving and Printing. Wood pulp paper while strong and reasonably durable, has not the lasting power of a paper made from rags.

Strong paper requires that the fibres used in its manufacture be as long and as ragged as possible. In the production of wood pulp the woods of the evergreen family are used. Spruce, Pine and Hemlock being the most common. Most of the larger paper manufacturers own their own stands of timber and send timber cruisers through them at logging time to mark the trees for cutting. In almost every case these same manufacturers are providing for the future supply of logs by systematic planting and care of their timber stands. The old days of complete logging operations are happily in the past.

After being marked the trees are cut down, then cut into uniform lengths and sent to the pulp mills. After seasoning at the mill in huge piles (Figure 2) the logs, each about four or five feet long are sent to the ''barker'' which cleans the log down to the solid wood. The logs are then inspected and all large knots and burls are drilled out, they are then fed into the chippers which resemble a giant pencil sharpener and are turned into thousands of small chips.

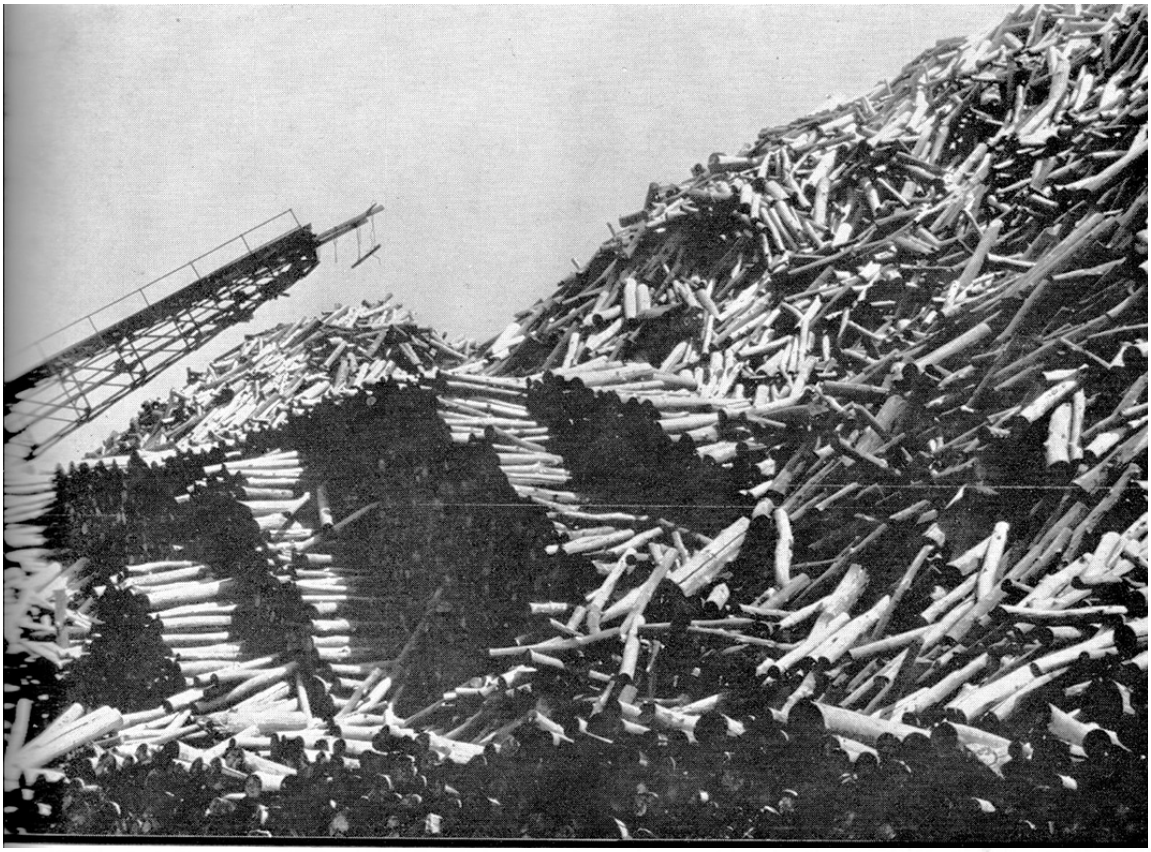


Fig. #2. LOGS FOR WOOD PULP—Courtesy Oxford Paper Co.—Bourke-White Photo

These chips are then screened and graded, large chips are sent back to the chipper and the balance sent into storage. When a run of pulp is to be made they are fed into the top of a large ''digester'' which is nothing more than pressure cooker. A strong liquid made of lime and sulphurous acid is added to free the impurities from the wood fibres and the entire mass cooked for a predetermined time. After the cooking is complete the liquid is drawn off and the pulp dumped. From the digesters the pulp goes to the bleaching vats and finally to the beaters (Figure 3). This machine closely resembles a race track in its shape with the pulp moving around much as the horses do. On one of the sides of the ''track'' a cylindrical drum is fitted extending the full width and depth. Each time the pulp is forced past it must go under the drum which presses it down and rubs the fibres against the bed plate on the bottom of the beater. The purpose of the beater being to roughen and fray the fibres so that they will cling to each other and produce a gelatinous substance that will aid in making the fibres adhere. It is also during this operation that the necessary fillers to bulk the paper are added. If the paper is to be colored the dyes are added at this point.

At this point in the manufacturing process the pulp has had so much water added to it that the percentage of solids runs about 2% to 98% water. From the beater the ''stuff'' is sent to storage tanks for any ageing and curing that may be necessary. As needed the ''stuff'' is drawn from storage and sent to the pond at the head of the paper making machine.

The modern Fourdrinier machine in use in this country today is over 300 feet long and is capable of converting pulp into paper at the rate of more than a city block a minute!

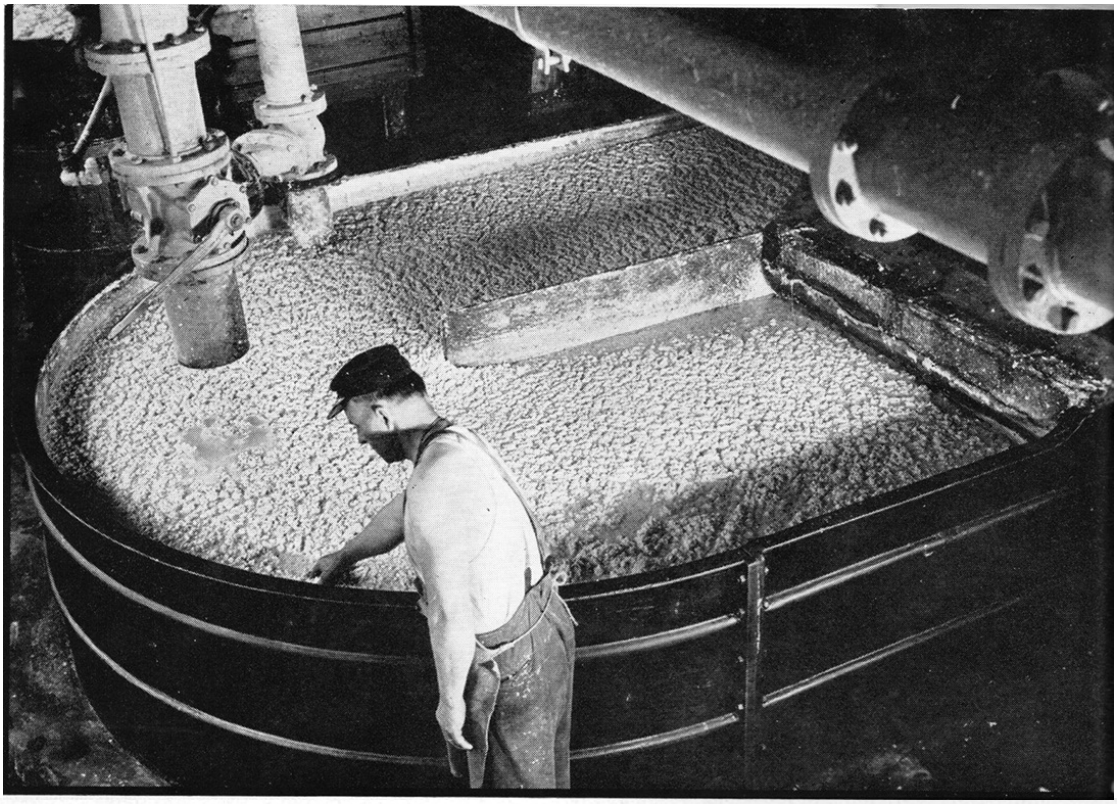


Fig #3. BEATER FILLED WITH WOOD PULP—Courtesy of the Oxford Paper Co.—Bourke-White Photo

Between the pond and the screen of the fourdrinier is a ''stuff box'' which corresponds to a control valve. The set of the stuff box determines the thickness of the finished paper and until recent years, had to be adjusted by hand. The paper maker in charge of the machine knew from experience just how to set the gate to run any weight of stock. Today in some mills this important control is mechanically set, but there are still plenty of ''modern'' machines where this is done by hand.

From the stuff box the watery pulp flows onto a continuous wire screen (Figure 4) which carries deckle straps at each side to hold the pulp in place. As the screen moves slowly forward it shakes from side to side to form and mat the pulp fibres into a strong sheet of paper. The water drains through the screen by gravity and numerous suction devices operate beneath the screen to make sure that all water is removed. It is at the end of the screen that the ''dandy roll'' is gently forced into the moist pulp to form the watermark design.

To digress for a moment in following the progress of the paper on the machine, we illustrate a dandy roll (Figure 5) which clearly shows the method of construction. The design to be formed in the paper is shaped of small wires soldered on a cylindrical wire screen. These wires, as they are forced into the wet pulp, slightly displace the fibres of the paper so that the mark is formed by thinner areas in the sheet. In the case of the old double line watermark illustrated (Figure 6) the letters were repeated all the way around the cylindrical form so every portion of the sheet received the marking. Naturally, as these designs are made by hand and soldered to the screen they are likely to differ from each other and in some cases have been known to show broken and distorted letters.

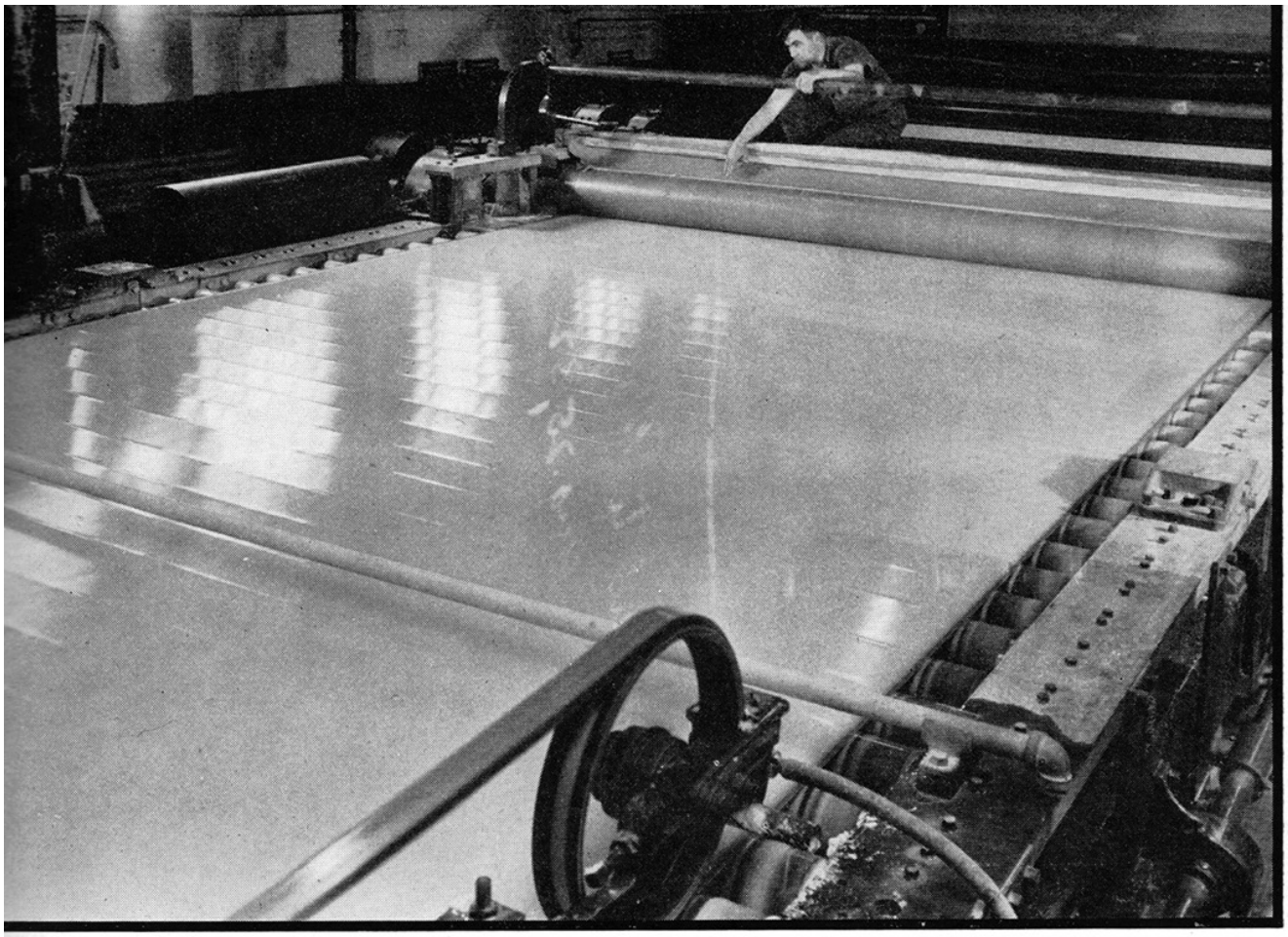
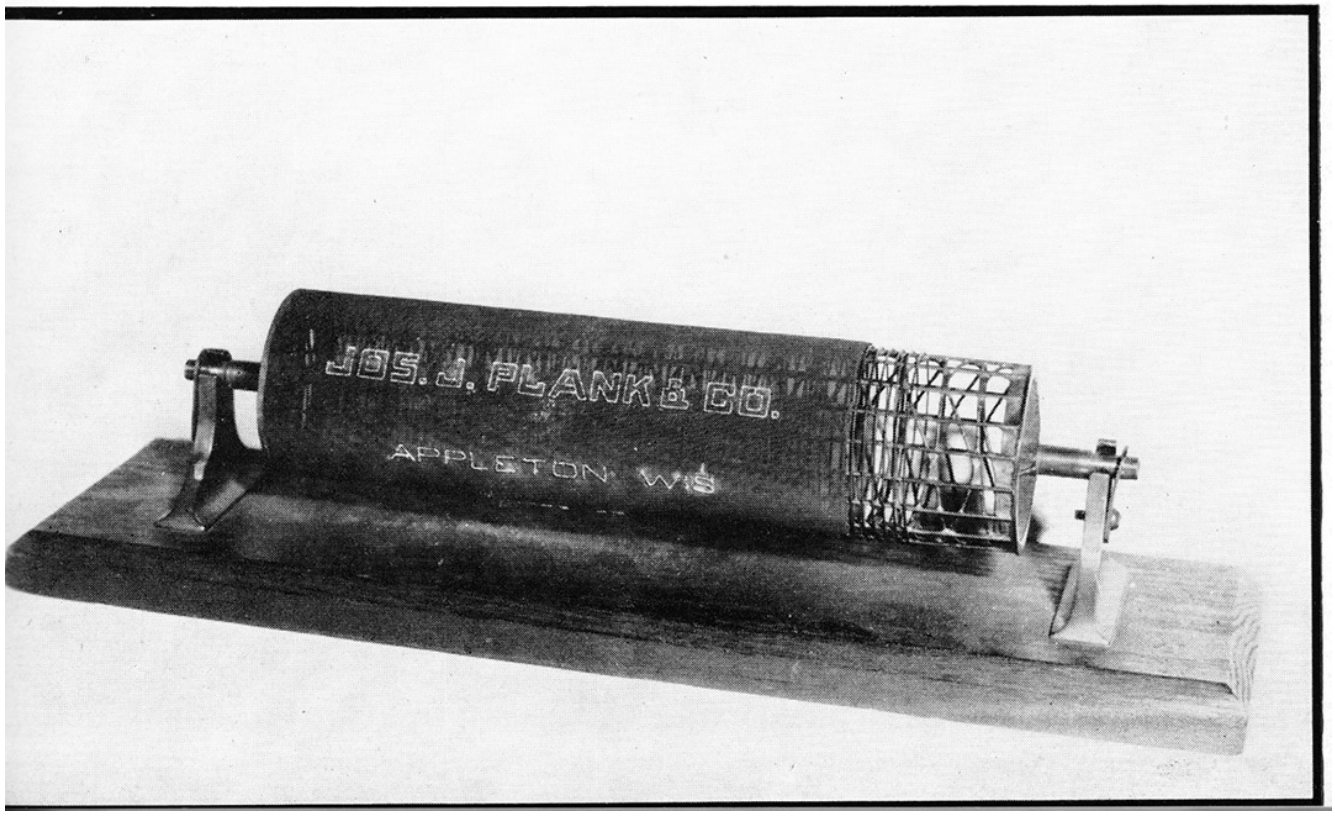


Fig #4. WIRE SCREEN WITH DANDY ROLL FOR IMPRESSING WATERMARK DESIGN AT THE END—Courtesy Oxford Paper Co.—Bourke-White Photo

Fig. #5. DANDY ROLL SHOWING CONSTRUCTION—Courtesy Dard Hunter M. I. T. Paper Museum



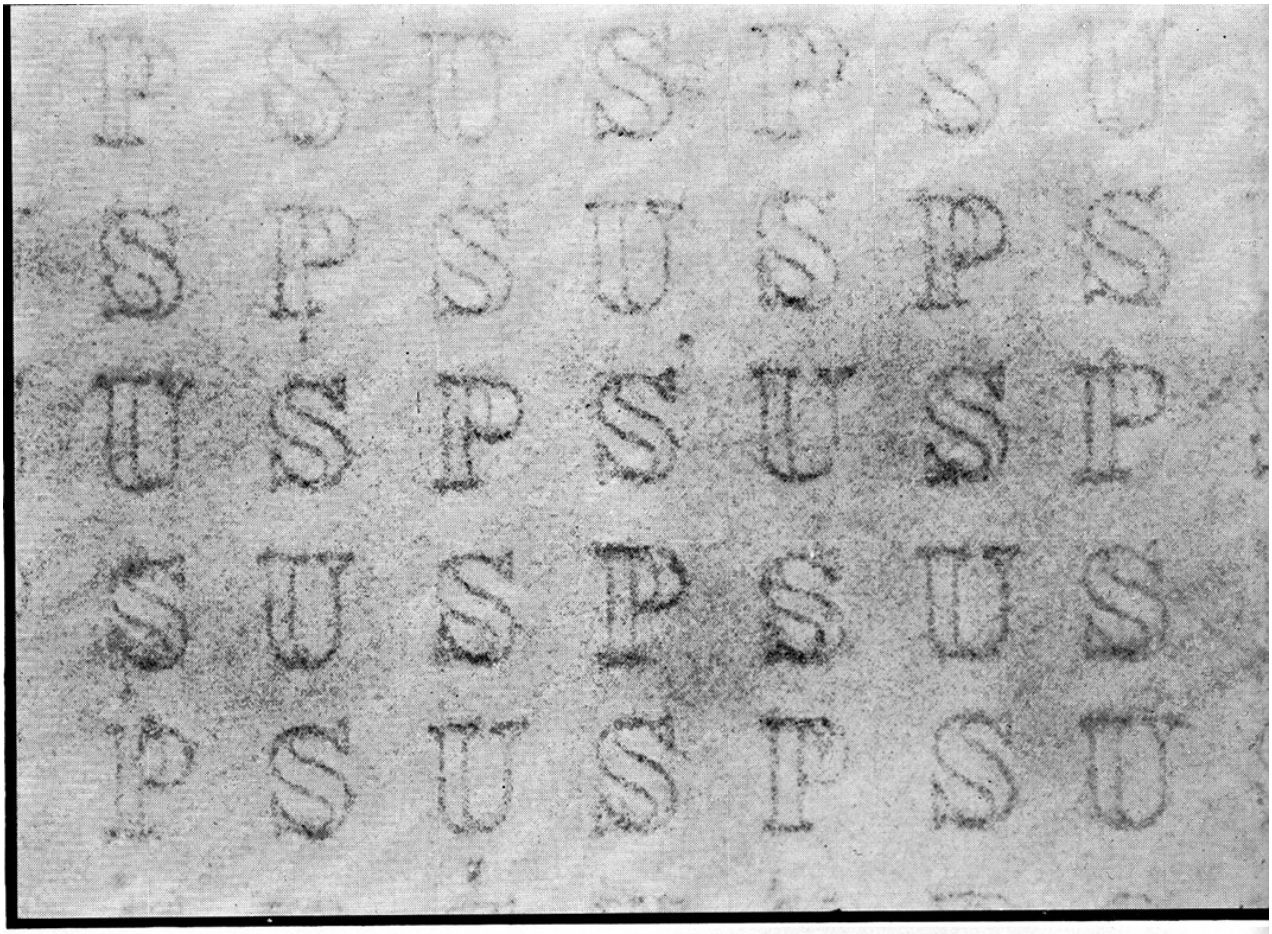
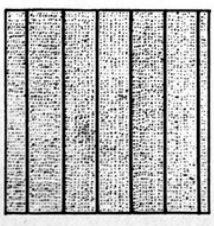


Fig. #6. UNITED STATES DOUBLE LINE WATERMARK.

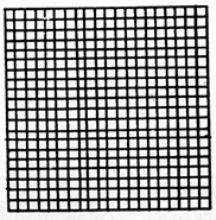
The designs of laid, batonne and quadrille papers are also formed at this point in the manufacturing process. In the old days of paper making the markings were formed by the way in which the wire screen was woven. The design in the paper as seen in a watermark detector is illustrated. In modern paper making the markings of laid, batonné, quadrille etc. are formed in the sheet by dandy rolls and are identical to watermarks. The normal wire screen of a dandy roll is closely woven with horizontal and vertical wires the same weight, in laid papers the horizontal wires are spaced about a sixteenth of an inch apart with strong vertical lines spaced a half inch apart running through them. Batonné paper has strong horizontal lines across the sheet spaced about a half inch apart while quadrille paper has wires of equal weight crossing to form squares. The size of the squares may vary from one eighth of an inch to as large as three quarters of an inch.

Now to return to the progress of the paper on the machine. From the wire the pulp web is passed to a series of endless felts that carry the formed paper through various drying and surfacing processes to compress and form the finished sheet. In the production of our stamp paper the sheet is also sized on

LAID



BATONNÉ



QUADRILLE

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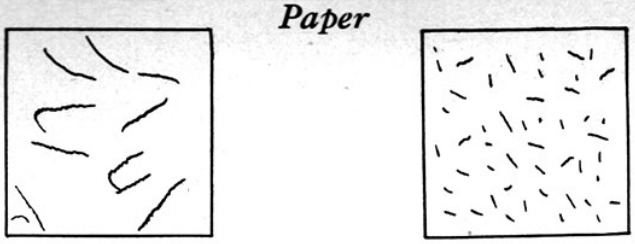

SILK THREAD **GRANITE**

the machine to give it the proper printing surface. If the paper is left as it comes from the paper machine it is known as antique finish. The sample shown being a good example. Note the rather dull, unpolished surface. To achieve the polished surface as shown by the sample of Government stamp paper the web is fed into a series of heated iron rolls, these rub against the surface of the paper and "iron" it flat giving it a polish at the same time. This process is called Calendering and helps to make the paper more receptive to fine steel engravings as are used in the production of our stamps. The rotary presses at the Bureau use a web of paper approximately 60 feet in length and either 10⅞" wide for coil stamps or 18½" wide for sheet stamps. The thickness of the paper as received from the paper mill before printing is supposed to be not more than .0032".

In order to produce chalk paper or colored paper as used in stamp production, the web is taken from the machine and, in the case of colored papers, is brushed with a coloring dye. To make chalk finish paper the web is sent through special machines that spray the coating on the surface and brush it

Fig. 7. COATING MACHINE—Courtesy Oxford Paper Co.—Bourke-White Photo

smooth (Figure 7). The chalk paper process as developed by Warren De La Rue used zinc white and glue to form the coating. After being applied to the base stock the surface was sent through the calendars for polishing. The theory behind the use of chalk paper for stamp printing was that the design being printed on the chalky surface would wash off if any attempt was made to eliminate the cancellation. So . . . collectors beware . . . don't "dunk" stamps that appear to be printed on this type of paper. The writer has successfully "floated" stamps of this type from paper, but the job is a tricky one at the best.

Pelure paper is best described as being a thin, exceptionally strong paper. In many ways it corresponds to our common rag content second sheets or air mail papers, except for the lack of crispness that is due to the use of extra sizing in pelure papers.

Granite and silk papers are similar in manufacturing, the granite paper is made by adding short colored fibres to the beater mixture which are spread throughout the pulp and impart a slight tone of color to the sheet and show the short colored fibres throughout. Silk paper is made by adding various colored short fibres to the pulp web as it is on the wire, these blend into the sheet but do not change its color.

India paper is a soft thin sheet of paper used for the proving of plates, either the single engravers dies or the full plate of subjects as prepared for printing. An impression on india paper is generally very sharp and clear. It is of course too fragile to be used for regular stamp production.

Under each of the sample sheets which follow we have listed stamps which have been printed on that particular type of paper. We urge that these be acquired and placed in the spaces provided so that the collector will have actual sample stamps to work with as well as the large sheet. We have also checked through the current issue of Scott's Catalog and have noted the various types of papers listed, where possible a stamp is given for each type so that the reader may form an additional reference collection.

Type of Paper	*Country*	*Scott Number*
White wove	United States	158 (any stamp from 1922 on)
Silk Paper	United States Revenue	R 15
Laid Paper	Afaganistan	267
	Brazil	420
Laid Batonné	Afaganistan	109
Wove Batonné	Afaganistan	125

Paper

Chalk Paper	Hong-Kong	75
	Russia	382
Thick Chalk Paper	India—Kishengarh	38
Granite Paper	Austria	51
	Japan	127
Pelure Paper	Bulgaria	39
	Latvia	10
Silk Thread Paper	Bavaria	2
Thin Paper (Pelure type)	Bolivia	40
	Rhodesia	1
Quadrille Paper	Honduras	7
Glazed Paper	India	9
	India—Barwani	8
Hand Made Wove Paper	Nepal	10

James H. Obrig, the author of this article is Production Manager of Walden-Mott Publications and Vice President of the Bureau Issues Association. Through his numerous contributions to STAMPS, The Stamp Specialist and other publications he is well known to philatelists. Through long association with the paper industry he has become one of the outstanding paper experts.

[This article was followed by 14 pages of paper samples. JFD.]