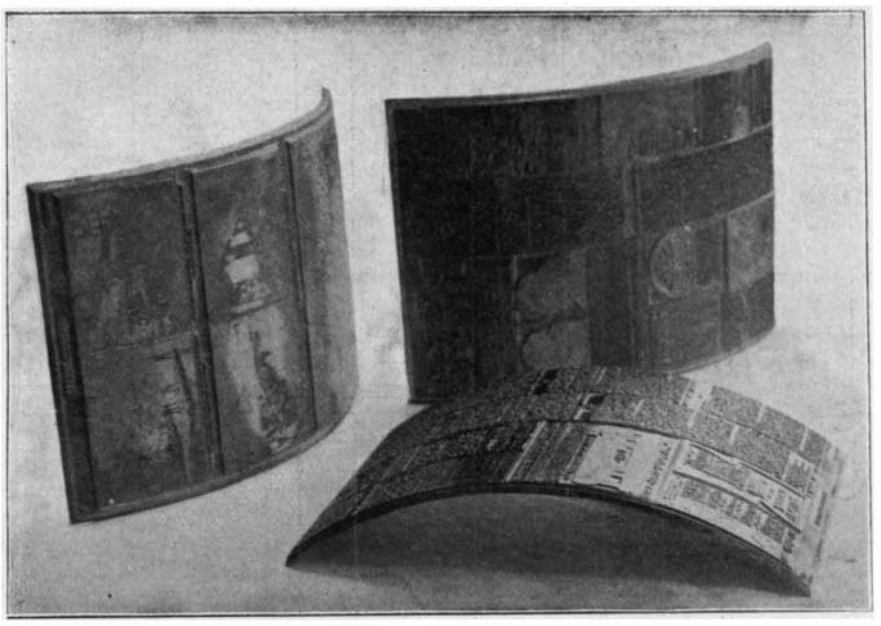


CURVED STEREOTYPE PLATES READY FOR THE PRESS.

THE MANUFACTURE OF PAPER AND PAPER PULP.

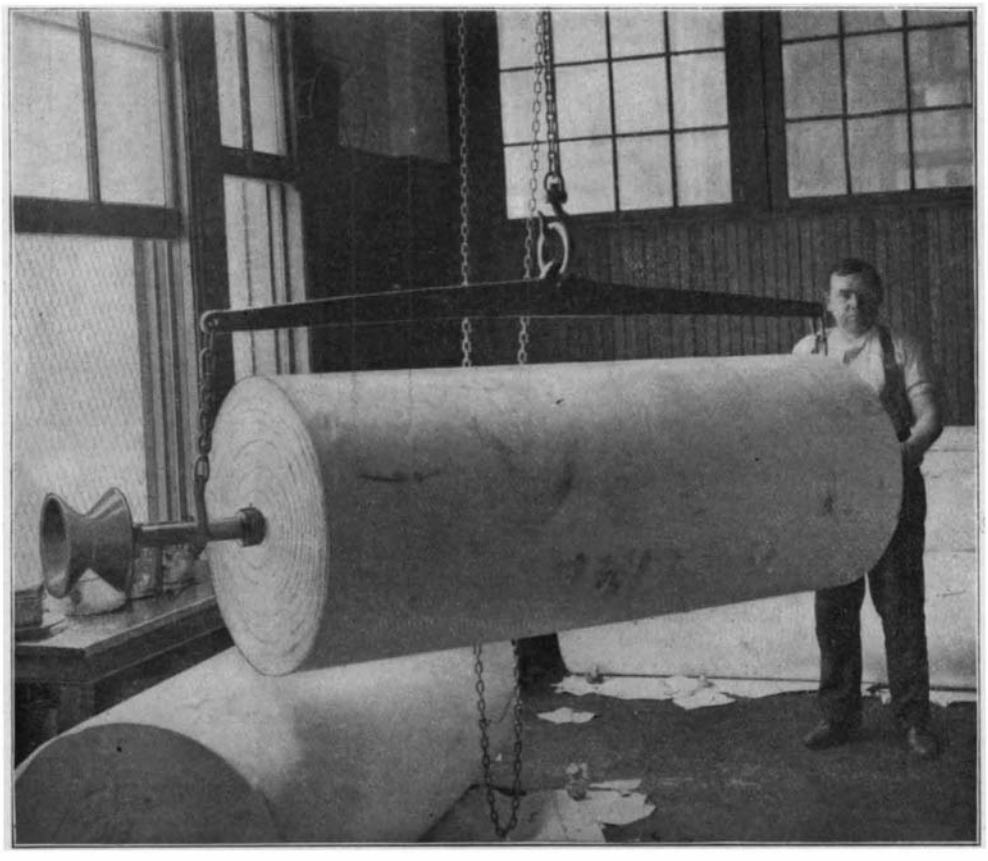
Improved methods in machinery and the great change in the character of materials used has had an important bearing upon the printing art. In the earliest mills established in this country, the raw fiber, after being prepared in the beating machine, was formed into a sheet in a mold or wire sieve which was dipped from the pulp vat by hand, the water drained off and the pulp left in a wet sheet in the mold. The sheets so made were turned out upon a felt press and then dried by exposing to the air in single sheets. Such mills were small and the output was limited. Strictly hand-made paper to-day is a rarity, although it exists. By the aid of the Fourdrinier machine the transformation of the fluid to stock or finished paper is made an automatic operation. The pulp is screened from the vat over an apron to a moving endless wire cloth made of closely woven fine brass wire, and supported by a series of small metal rolls set close together, yet without touching each other. In this way an even surface of the wire cloth is maintained; and by preserving an unvarying flow of the pulp and a constant forward motion of the wire cloth, the thickness of the layer of pulp deposited was kept uniform. By lateral motion of the supporting

FULL-PAGE PLATE OF A WEEKLY JOURNAL LOCKED UP IN A CHASE.

rolls the fibers are caused to interlace in various directions and give greater transverse strength to the texture. As the pulp is carried along on the wire cloth, much of the water drains through, leaving the fiber on the meshes. This first drying is usually hastened by various devices and the moist web is carried between rolls which are covered with woolen felt and then taken from the wire cloth on endless woolen felts which pass it between rolls and then to driers. These are large metal cylinders heated by steam. The paper has now acquired considerable strength. The water has been evaporated and the heated cylinders complete the drying process. The paper is then given a smooth surface by the calender rolls, which are smooth-faced heavy metal rollers. Finally the finished paper is reeled off in rolls and cut into sheets of the desired size. A large paper mill will make 250 tons of finished paper a day. The most modern machinery turns out a continuous web of finished paper at the rate of 500 feet a minute. The raw material of wood pulp is spruce, poplar, and in smaller quantities various other woods are employed. Wood pulp has to a great extent superseded the use of rags, and entirely so in the manufacture of news paper. The blocks of wood are pressed hydraulically against the edge of a rapidly revolving grindstone, and by attrition reduced to a mushy consistency.

There is also a chemical process of making wood pulp which is largely used. The merchantable shape of the fiber differs somewhat. Ground wood pulp is ordinarily sold in folded sheets only partially dry, and is, therefore, under common conditions, only suitable for use near the locality of its manufacture, its weight being so increased by the water as to preclude the profitable transportation of such a low-priced product. There are 763 paper-making plants in the United States and the total capital is $167,507,713, giving employment to 64,186 persons. The total cost of the materials used was $70,530,236, in 1900. The total value of the products was $127,326,162, and the total power required for running the plants was 764,847 horse power.

It has been estimated that nine novels had a total sale of 1,600,000 copies. This means 2,000,000 pounds of paper. We are assured by a manufacturer of paper that the average spruce tree yields a little less than half a cord of wood, which is equivalent to 500 pounds of paper. In other words, these nine novels swept away 4,000 trees. Is it any wonder that those interested in forestry look with anxiety upon the paper mill?



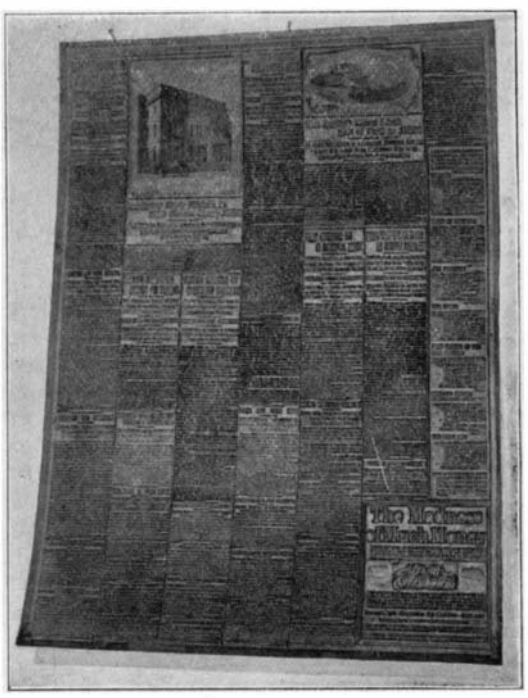
A ROLL OF PAPER 69 INCHES WIDE, READY FOR THE PRESS, OF ALL WEIGHTS FROM 700 TO 900 POUNDS. SUFFICIENT FOR 4,500 COPIES 24-PAGE PERIODICAL.

TYPE FOUNDING.

All early types were cast by hand one at a time, and the result was eminently satisfactory. Very large types are still cast in the same way. In 1822 a type-casting machine was introduced by David Bruce, and the changes in it were not very marked until the introduction of the Barth machine in 1888. A model for the punch cutter consists of a pencil sketch showing the letters 12 inches high. The drawing is reduced by a pantograph in the form of a model letter 3 inches high, with raised outline. An electrotype of this letter is then obtained and is fixed firmly upon the platform or table of the machine, beneath a tracing needle or index. To the head plate of this index are attached the four rods holding the cutting mechanism, which is at the top of the machine, and consists of a rapidly revolving borer, fixed in a stationary position and in a movable framework, in which is set the bar of steel or other metal which is to be cut. The leverage of the machine is capable of various adjustments, so that from the same model letter any body of type, from 2-point to 72-point, can be cut with equal facility and exactness.

The operator moves the index over the model letter on the platform, bearing down upon the lower parts and pressing against the sides of parts in high relief. The direction given to the index, at the will of the operator, upon the outlines of the model letter, is faithfully repeated by the tools cutting the punch. The cutting tools, of which two or three kinds are used in succession, are made with the utmost care. Being very highly tempered and being operated at very high speed, by steam power, they cut into the steel along the lines indicated by the movement of the guide over the model letter. The punches which are produced by this machine are finished in all points, requiring no hand work. Besides being produced more rapidly than those made by hand, these punches are more accurate, the counters are deeper, and the bevels are truer and always of uniform slope. This machine may be arranged to reproduce model letters in either direct or reverse order.

Where the punch is to be employed in making



MATRIX OF A PAGE OF A NEW YORK NEWSPAPER WAITING FOR THE AUTOPLATE TO STEREOTYPE IT.

matrices by the driving process, as is necessary for small characters, hard steel is used. The matrices for the larger characters are made from soft metal by the electrolytic process.

In the Barth type-casting machine, the half of the mold which carries the matrix is fixed immovably by a clamp in an upright position; the other half slides back and forth upon wide friction bearings, setting free the type that has just been cast and presenting again the mold mouthpiece to the nipple before the hot metal is injected for the next type. In order to prevent undue expansion of the mold, to get more accuracy in the type and to chill them quickly, a stream of cold water is carried in pipes through the fixed parts of the mold, and a current of air plays steadily on the matrix to keep it cool. The machine breaks off the gate, plows out the groove in the foot, removes the feather edges from the angles of each side, and delivers the types in serried rows upon sticks ready for the inspector.

At a meeting of the American Type Founders' Association in 1886, a committee was appointed to examine into and report upon the point system. There was some objection to the "pica" as a standard, but the majority of founders finally agreed to accept it as the basis of the point system. The twelfth part of a pica, called a point, was taken as a unit, and all bodies of type were placed on multiples of this