

developing along the same lines as letterpress machines with a reciprocating carriage which carried the stone, a single stop-cylinder which carried the paper into contact with the stone, damping rollers which moistened the surface of the stone and inking rollers to provide the ink.

These machines were developed to print a sheet size up to 60 in. by 40 in., and although ponderous and massively constructed they achieved a great step forward in speed of production over hand methods.

**DIRECT ROTARY MACHINES.** In the last quarter of the nineteenth century efforts were made to construct rotary machines, it being obvious that much higher speeds would be possible if the reciprocating principle of the flat-bed machine could be eliminated. These early rotary machines were designed to use zinc plates, but the treatment of the metal proved a stumbling block and little success was achieved. Attempts were actually made to use cylinders made of lithographic stone and, although this proved practicable, the high cost and the frequency with which the cylinders cracked placed it out of count commercially.

About 1900 the Aluminium Plate Co. of New York developed an aluminium printing plate which proved a complete success. It was used in conjunction with a direct rotary machine which became known as the "Aluminium Plate Rotary". This was introduced into England where it met with great approval, but one difficulty with this process was that aluminium plates were costly and had to be imported from America. Improved techniques in the use of zinc rapidly followed, however, and the lithographic trade took another step forward, the speed of impression rising to about 2,000 per hour. The almost universal use of zinc plates in this country may be credited to this early objection to cost and, notwithstanding the fact that at present aluminium is the cheaper metal, the bias remains. This is unfortunate because aluminium is undoubtedly vastly superior for certain classes of work, notably security and white paper work.

Although the direct rotary method of printing was revolutionary as far as speed was concerned, the fact remained that impressions obtained from the grained surface of zinc plates were inferior to those obtained from the smooth surface of lithographic stone. The process was seen at its best where large masses of colour or much broad detail were required. The rolling system was very effective and results were obtained mainly by weight of colour, although this made it

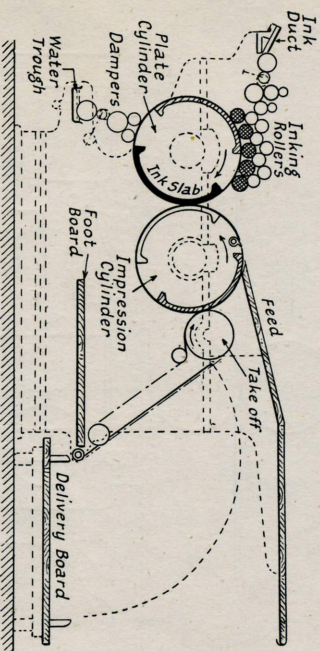


FIG. 5. DIRECT ROTARY MACHINE.

difficult—indeed, well-nigh impossible—to print fine chalk work. It is interesting to note that to this day direct rotary machines are in common use for the production of large poster work, mainly solids and heavy lettering. The heavy weight of ink used not only ensures great depth and brilliance of colour but also affords a measure of protection to the paper from the effects of the weather.

**FLAT-BED OFFSET MACHINES.** Whilst these interesting developments were taking place, probably the most important discovery since Senefelder passed almost unnoticed—the discovery of offset. This is credited to R. Barclay, a tin printer who took out patents for the process in 1875. He evolved a machine based on the existing flat-bed but with an additional cylinder (see Fig. 6). The original cylinder was