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# THE OPERATION OF THE MODERN PRINTING PRESSES

By V. GILBERT SPRAGUE, '30

**T**HE first development of printing as an industry seems to have taken place in China several centuries ago. The Chinese method was to place ink on an engraved block, lay a sheet of paper on the block, and transfer the ink to the paper by softly brushing it. This method worked well at the time, because there was no particular demand for printing, and labor was cheap enough there so that the process was not expensive.

Years later, when the idea of printing had spread to the countries of Europe, it was found that the Chinese method was not rapid enough to accomplish the amount of work demanded. Experiment showed that the impression could be obtained by pressure as well as by brushing. Thus was developed the screw type of press, which was used in the early printing shops in England and America.

This press had many disadvantages. The type had to be inked by hand, and since it was almost impossible to obtain an even pressure over the type surface, the paper had to be printed wet. The pressure that could be applied was insufficient to print a large sheet, so that only half of a sheet could be printed at a time. The whole process was so slow that it was impossible to turn out a large number of papers in any reasonable length of time. Thus, it can readily be seen that this press left a great deal to be desired.

The evolution of the printing press has resulted in three modern types:

First, the platen type of press, in which the type is held in a flat form, and the paper on another flat surface, called the tympan, which come together to print the paper.

Second, the cylinder press, which also has the type on a flat form or bed, but which carries the paper on a cylinder.

Third, the rotary press, which carries the type on a cylinder, while the paper passes between this cylinder and another.

Many different types of platen presses have been developed, most of them for special purposes, such as embossing or engraving. In the United States, two presses are most popular, the Chandler & Price Gordon and the Colt's Armory press.

The Gordon holds the form, or chase, on a bed which swings back and forth with a rocking motion, being pivoted at the bottom of the press. A roller cam running in an eccentric groove

swings the platen from a position inclined at about 25° from the horizontal to one nearly vertical, bringing it into position for printing.

The Colt press has an action essentially different. The bed of the press is stationary, and the platen swings into a vertical position a short distance away from the type, and then travels up to it with the surfaces of the bed and platen parallel.

Another difference between the two presses lies in the method of ink distribution. The Gordon has a circular plate, made in two parts, one revolving inside the other in an opposite direction.

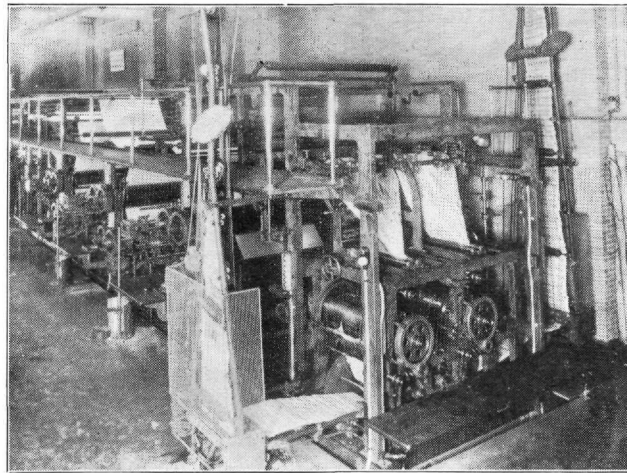
This aids in the quick, even distribution of the ink. When the press is closed the rollers travel over the plate, and then down over the form when the press opens. The Colt press has a large steel cylinder which collects ink from the fountain or trough, and passes it on to the form rollers. This system is somewhat similar to that used on cylinder presses, and gives better distribution than that on the Gordon. However, an improved type of Gordon, known as the Craftsman, has a vibratory system of rollers, which also gives an excellent distribution of ink.

The platen presses are chiefly adapted to printing small cardboard or paper jobs, and in general are quite efficient on forms up to about 14x22 inches. Above this size, the amount of pressure which must be applied and the difficulties of getting a good impression make the use of the cylinder press desirable.

Several automatic feeders have been developed for the platen presses, which on certain kinds of stock work very well. Their use greatly increases the output of the presses, as one man can run several of the automatic presses at the same time.

The principle of the cylinder press has been stated above. The form is placed on a flat bed, which travels from one end of the press to the other, passing under a cylinder which is rotating at a uniform speed.

The first cylinder presses were of the single revolution type, i. e., the cylinder made one revolution for each sheet which was printed. An inherent disadvantage of this press was the fact that the cylinder was abnormally large compared to the size of sheet printed. Because of the large diameter, the surface in contact with the type was greater, and excessive pressure was placed upon the bearings.



—Photo Courtesy Columbus Dispatch.  
A Rotary Press for Newspaper Work

The double revolution cylinder press was later perfected, and has almost entirely replaced the other type. The cylinder revolves once, carrying the paper, printing and discharging it, then revolves again empty, while the form is going back to its first position. On the second revolution the cylinder is raised so that it clears the type form, and if the feeder misses a sheet, he can keep the cylinder raised by simply stepping on the throw-off, thus allowing the press to run without printing on the tympan. This ease of operation was not possible with single revolution presses.

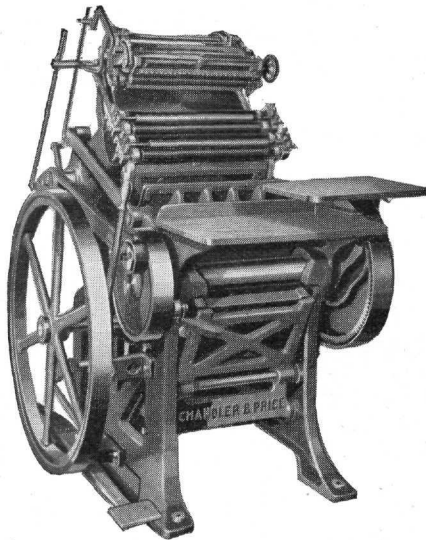
The cylinder is built to hold a certain thickness of packing or makeready. If too much or too little is put on, the circumference is increased or decreased, and the type will slur on the sheet.

All type and cuts placed in the form must be of a standard thickness. Cuts which are low are raised by underlays, and any spots on the form which are then printing too light or too heavy on the sheet are built up or cut out on the overlay, just under the top sheet of the tympan.

While the form is printing, the bed is moved in exact alignment with the cylinder by gears at the ends of the cylinder, engaging with racks on the sides of the bed. This helps to prevent slurring on the sheet.

The bed has a reciprocating motion, and is checked in speed at each end of the press by a dash pot. The same system of gears operates both the bed and the cylinder, to keep them running together perfectly.

The grippers, which are on the cylinder, close and grasp the edge of the sheet just as it passes by the guides on the feed board. The guides raise simultaneously, allowing the sheet to slip past. The cylinder continues around, printing the sheet; then the grippers release it as they come



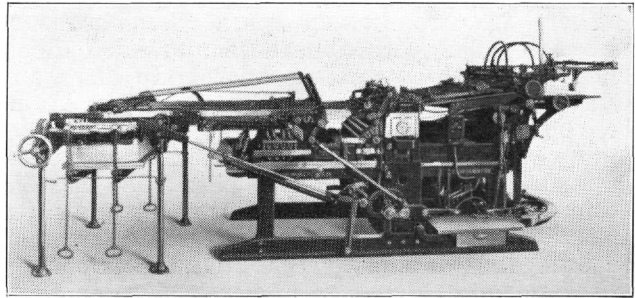
—Courtesy Chandler & Price Co.  
The Craftsman, a Small Job Press

to the top, allowing the sheet to pass onto the fly, which may be of such construction as to turn the sheet over or to deliver it printed side up on the pile.

The ink distribution system of the cylinder press consists of a fountain, or reservoir, which supplies ink to a group of vibrating composition rollers. These in turn deposit the ink on a plate which is a part of the bed of the press and moves

with it. The ink is carried to a second series of rollers close to the cylinder. This group of rollers spreads the ink uniformly over the type each time it passes under them. The fountain is operated by the press, and is adjusted to furnish the right amount of ink for each sheet printed.

In general, cylinder presses are used for practically all classes of commercial work larger than that handled by the platen presses, as well as for newspaper work in the smaller plants. The demand for two-color printing in commercial fields has led to the development of a variation of the cylinder press to enable this work to be done at



A Modern Press With Automatic Feeder Attachments

one operation. It is a two-color press, in effect two presses acting as one, with two cylinders and two separate ink distribution systems, and carrying two forms.

Smaller cylinder presses have been developed, doing a class of work usually done on the platen presses. As a rule these small cylinders are faster than the platens, thus combining larger output with higher quality of work. The two most striking examples of the small cylinder presses are the Kelly and the Miehle Vertical. The latter varies from the ordinary cylinder press in that the bed travels vertically rather than horizontally.

Automatic feeders have been developed for cylinder presses as well as the platens, and are quite efficient. These smaller cylinder presses are usually fed automatically.

Next we come to the rotary presses, such as are used by the large newspaper plants. Here the paper is fed in a continuous strip from a large roll; instead of type, we find curved stereotype plates used, mounted on a cylinder; and the paper is printed by passing between this and another cylinder carrying the tympan, which for newspaper work is usually of felt composition. Each type cylinder holds eight of the stereotype plates; that is, eight full-page forms. As a unit of the press consists of two type cylinders with their corresponding tympan cylinders, it is capable of turning out a sixteen-page paper or two eight-page papers at a time.

Two of these units working together are called a quadruple press; three units a sextuple; four units an octuple; and five units a decuple press.

Each section of these presses, consisting of four units and a folder, is driven by a pair of motors; one a 10 h. p. motor for starting and for running at slow speeds, and another of 100 h. p. for running at full speed. A system of controls is used on the press, so that full control may be had from practically any position. One button is used to flash the lights as a warning when the press is to be started. Another button, if pressed,

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prevents the press from starting, or from gaining speed when running slowly. Other buttons provide for steady increase or decrease of speed, and for turning the press part of a revolution at a time. Contacts are also provided which stop the press automatically if the paper tears.

The large motor takes up the load of the press automatically when the speed passes a certain point, so that the smaller motor is not used at all when running at full speed. Other motors are used for running the conveyor when it is run separately from the press, and for operating the flying paster, by which a new roll of paper is brought into position and attached to the web running from the old roll without stopping the press.

A chain belt drive running lengthwise of the press transmits the power from the main motors to the drive shaft. This has been found much better than a direct drive, as it allows the motors a certain amount of slack when starting and stopping.

Instead of the usual ink fountain, these presses are so arranged that the ink is sprayed on by pressure. It is contained in two large tanks, each with a capacity of ten drums. The ink is forced through a strainer and through pipe lines to the various parts of the press at 40 lbs. pressure. At each unit of the press there is a small reservoir, where the ink is again strained, and from which it is distributed through small pipes to the drip roller. On the top of the reservoir are two sets of controls; master controls to cut off the ink supply from any or all of the four sections of the cylinder, and eight smaller controls for each section, giving perfect ink control for each column that is printed.

The distribution system consists of two large steel rollers in addition to the drip roller mentioned above, and a series of composition rollers, as well as two larger composition rollers running against the form, one six inches and the other seven inches in diameter. The steel roller running against these form rollers, as well as the composition rollers between the drip roller and first steel roller, are arranged to vibrate lengthwise slowly, spreading the ink as uniformly as possible.

Let us trace the course of the web of paper from the rolls to the completed newspaper. The rolls are carried from the stock room—which in a large plant holds about 40 carloads of paper—to the various units of the press, and are hoisted into place. The paper rolls may be 68 inches wide, for the full width of the press, or 51 or 34 inches for three-fourths or one-half width. Margins are regulated by moving the rolls from side to side on the reel shaft.

The web is carried up over rollers to the two sets of printing cylinders of each unit. Register between the units is maintained by changing the position of one of the rollers over which the paper passes, thus varying the length of the path over which the paper travels. After being printed on both sides, the web travels to the top of the press and toward the folder, along with the sheets which have been printed simultaneously by

the other units. The correct register relation between the sheets is maintained in the same way as mentioned for both sides of the same sheet. The web is cut in the center into two parts, each of which comes down over "V" shaped planes and between rollers, receiving a single lengthwise fold.

Now each cylinder in the press prints two pages (in length of paper) during each revolution. These pages can be the same or different. If they are the same, the paper is simply cut off and given a second fold, after which it goes into the conveyor. If the two pages are different, the first length cut goes into a collector cylinder which brings it alongside the second length, and the two sections receive their second fold together. This method is known as a collect run.

From the "V" folders the two strips can come into one collector-folder or into separate ones; that is, the press can print and fold two two-section papers or one four-section paper. When the collect run is used the output speed (in number of papers per folder) is cut down one-half. In case it is desired to run extra sheets down into the folder on one side of the web, one of the sheets can be cut and both sides brought out at the same side of the press by passing one side over parallel bars set at an angle of 45°.

The folders automatically count the papers, and kick out every twenty-fifth or every fiftieth paper at an angle when they are delivered to the conveyor. The conveyor carries the papers into the mailing room as fast as they are printed. Here they are tied into bundles and loaded on the waiting trucks. The newspaper press has an output of about 28,000 papers an hour from unit, or 14,000 when the collect run is used.

The Sunday comic sections and magazine sections in colors are printed on a special section arranged with three sets of cylinders, one above another, the top deck printing yellow, the next one red, and the lower one blue. A unit of the regular press prints the black forms. The tympan used on the color press requires more care in makeready, while the ink is distributed by a fountain such as is used on cylinder presses, rather than by pressure spray. Otherwise the color presses run in about the same manner as the others.

The manufacture and assembly of newspaper presses requires extreme skill and precision. Gears must be cut very accurately, so that all parts may run in perfect synchronism. Bearings must be accurately machined and aligned, roller and ball bearings being used on many of the parts, and adjustments being provided for taking up any wear. Circumferential speeds of the various rollers over which the paper passes must be made the same by correct gearing ratios.

This article by no means exhausts the subject of presses, for there are, in addition to the types described, the rotogravure and offset presses, each with different principles and intricacies of operation involved, and with different application of machine design. To cite an example, a firm in Germany recently built a four-color offset press for a newspaper in Australia. This press has a tympan cylinder six feet in diameter, and the four sections are arranged around it so that the four colors are all being printed as the paper travels around on the large cylinder.

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*Delicatessen*

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Given to Sorority  
Parties

*Barber Shop*

Why Not Have the  
Best of Barbering?

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*Ball Room*

A Place to Dance at  
Any Hour of the Day

*Candy Shop*

Your Favorite Box  
of Candy—  
Cynthia Sweets  
Page and Shaw  
Crane's

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*Pool Room*

Healthy Recreation  
after One of Those  
Heavy Classes

*"Opposite Museum at the Gate of the Campus"*