clamped on the machine. If necessary the plate may be smoothed at the back by a specially-contrived planing machine. The plate is now ready for being placed on the printing machine. Each single operation can be performed with the utmost possible despatch. If the organization is sufficiently perfect, the time for making a plate, from the moment when the forme comes down from the machine-room to that wherein the perfect plate is set on the machine, need only be about eight minutes.

In newspaper establishments where stereotyping is thus adopted the pages are not all made up simultaneously : some are kept open till the last for the latest telegrams. The moment a page is com­pleted and locked up in its chase it is sent down to the foundry, and as many casts taken as there are printing machines to be set going. One page follows another with rapidity, the first being placed in position on the machine, while the later ones are in the foundry. When all the plates are finished and fixed in their places, six, eight, or ten machines may be simultaneously printing at the rate of nearly 12,000 per hour each. The enormous increase in the circulation of the great daily newspapers would have been impossible but for the extraordinary facilities for rapid production provided by stereotyping. This process is also of special utility to the newspaper printer in the case of telegrams arriving late. In machines which printed from the type, late telegrams could only be inserted by a “stop-press”; that is, the printing was inter­rupted while the alteration was being made. But, when the papier-mâché casts of the pages have been taken, the type itself is ;ed and sent back to the composing room, so that, if later news arrives while the machines are running, the foreman printer alters the page, a fresh cast of it is taken, and a machine started without interrupting the production for a moment. The London evening papers have usually five editions, and for every edition fresh casts are made of one or more of the pages.

Quite recently the substance called celluloid has been introduced instead of the metal referred to previously. A mould is made of yellow oxide of lead and glycerin formed into a semi-fluid paste, which is applied to the surface of the type. The matrix is placed on a powerful press and a heated sheet of celluloid about 3/16 of an inch thick is laid on it. When pressure is applied, a perfect facsimile is obtained, and it is ready to be printed from when mounted in the usual way. Whereas a good electrotype from a wood block averages six hours in its production, a cast in celluloid can be got in less than an hour. These blocks are very tough and many thousands more of impressions can be printed from them than from stereotypes with­out their showing signs of wear. For small stamps india-rubber is used as a stereotyping material, and afterwards vulcanized. These stamps, being flexible, print on rough surfaces which would not take an impression from ordinary stereotypes. With a flexible surface, too, much less pressure is required.

Machines have been invented to do away with the use of types altogether. The principle is to punch the characters successively on some substance which will act like the flong and become a mould from which stereo plates may be cast. In an apparatus recently introduced the flong is a prepared piece of millboard, which is placed in front of the steel punches. The latter are driven into the flong with lightning speed and great accuracy. By turn­ing a handle all the Roman punches are changed to Italic ; by another a set of sanserif or other founts comes into play. For set­ting time-tables and logarithms the apparatus is said to save ninety per cent. over the ordinary system of hand-setting. The obstacle to the more general use of it is the difficulty of correcting errors. In another machine the punches are driven into a block of teak wood. They are cast to thicknesses which are the multiple of a “point” ; hence by a simple calculation they may be spaced out to the exact number of points chosen for the length of the line, and every line leaves the machine justified. The block when com­plete is removed and a stereotype taken, which can be printed as in the ordinary method of typography.

For the reproduction of wood engravings electrotyping has nearly superseded stereotyping, as it produces much better copies. For obtaining plates of type matter it is also better than stereo­typing, as many thousands of impressions may be taken without reducing the sharpness of an electro, while ordinary stereotype would be almost worn out by printing a much smaller number. This arises from the superior hardness and toughness of copper, of which the surface of the electro is formed. Electrotyping, however, is costlier and slower.

The forme to be electrotyped is placed upon a level plate, and surrounded with type-high clumps or metal furniture, and then floated with plaster of Paris, which prevents the mould of wax (to be afterwards made) from penetrating too far into the interstices of the spaces. The forme is next brushed with finely powdered blacklead or plumbago. The moulding composition is made of melted wax, with the addition of a little blacklead. This is poured into a shallow metal moulding tray, to which two pieces of stout wire are soldered, in order that it may be afterwards suspended in the depositing trough. After the composition is cooled and set its surface is brushed with blacklead, and it is then ready for moulding. The moulding press may be something like a letter-copying press, or, in a large establishment, may consist of a powerful hydraulic or other press capable of exercising a pressure of many tons. The forme is placed exactly under the centre of the platen, with the moulding tray containing the wax, slightly warm, upon it. An impression is then taken, and the mould afterwards separated from the forme. The mould has next to go through the process of *building,* that is, heated wax is dropped upon such portions as should be more deeply sunk in the finished electrotype plate, namely, the places where “whites” are to appear in the print. The mould, having been finished, has to be blackleaded, plumbago being a con­ductor of electricity, while wax is a non-conductor. The material is well brushed in, filling all the interstices of the forme ; and the entire surface of the mould must be properly covered, to ensure a perfect deposit of the copper. To facilitate this operation, a blackleading machine is used in large establishments. The forme is placed upon a carriage formed of transverse bars and is moved backwards and forwards by a handle and rounce to bring it under the blacklead brush. After the mould is blackleaded, the back of the moulding pan is coated with wax, to prevent the copper from being deposited upon it. The mould is now quickly immersed in one of the compartments of the battery. The process of depositing a copper solution upon the blackleaded surface of the mould is continued until a solid plate is formed, which, though it is scarcely thicker than a finger nail, being about 1/32 inch, forms, when pro­perly backed, the best and most enduring surface for letterpress printing that has been discovered.

The moulding tray containing the mould is hung on the brass rod of the depositing trough facing a plate of copper, and the con­nexion of the battery made : that is, the mould is attached to one pole of the battery and the plate of copper to the other. The copper, so to speak, is decomposed on the one hand and recomposed on the other : in other words, the current of electricity being com­plete, and the mould submerged in the sulphate of copper solution, the deposition of copper on the mould at once commences. Here it remains until the deposit is sufficient, the time usually occupied being from 8 to 12 hours, according to the state of the solution and the strength of the batteries. The dynamo-electro machine, which is now employed in large houses, very materially reduces this period ; otherwise Smee’s batteries are generally used. When the deposit, or, as it is called, the *shell,* formed on the wax mould is of proper thickness, it is disengaged from the wax,—the mould being placed with its back on an inclined board, and boiling water poured over the shell, which melts the surface of the wax, except a thin coating, the removal of which is effected by placing the mould and shell on a steam heating table. Thus the wax mould is destroyed, and it is not possible to obtain more than one shell from a mould, whereas the stereotype process enables almost any number of casts to be taken from the same matrix. The shell, being too thin and fragile to be printed from, is next backed, or filled up with metal of a somewhat softer kind than stereo metal. The shell, after being further cleaned, is lowered on to the top of a vessel of molten type metal ; and, when the solder previously used to unite the copper and the metal has fused, the latter is poured over it in a molten state until it is covered. The plate is washed, dried, and polished, the back roughly planed to a surface parallel to the front, the edges squared, and all imperfections made good. The thickness of a plate is usually a pica or ⅙th inch. It is mounted as an ordinary stereotype plate. Within the last few years the pro­cess has been greatly facilitated by the employment of specially contrived apparatus, and illustrations can be produced in three hours from the time the mould is made. Curved electros are pro­duced, as well as curved stereos, for use in rotary printing. Facing with nickel by the electroplating process is now largely adopted for hardening stereotypes and electrotypes and rendering them more durable. This process also prevents the deterioration of such plates by the action of the acids or other chemical reagents often present in printing inks, such as cyanide of potassium in red ink and nitric acid in some blue inks.

Polytyping is a method invented in France about the end of the 18th century, but now seldom practised in the United Kingdom. The apparatus somewhat resembles a pile-driver. It has two upright guides about six feet high, and a pulley at the top, which elevates by means of a rope a heavy plate, on which the matrix is placed in an inverted position. At the foot of the machine there is a sub­stantial iron bed, upon which the operator places some molten metal. He then pulls the rope until the matrix, with its weight attached, is elevated to the top of the machine, when it is suddenly allowed to fall. The result is similar to that made on a medal by means of a die,—a perfect reproduction of the matrix in relief, which is mounted on a metal stand to type height. The results are excellent, as the plastic metal is forced into the finest lines of the matrix. Duplicates of a block can be thus produced more rapidly than by the ordinary stereotype process ; and another ad­vantage is that the intaglio parts are much deeper,—a point of some importance in printing. The matrix may be made from the block by the electrotyping process.