of copper which are attracted and adhere to all the suspended model letters. When these letters have received a thick deposit of copper they are taken out of the battery and their thick coats or shells of copper are removed. The shells are then backed up or strengthened, and converted by the fitter-up into movable matrices. Matrices can be made by the electrotype process from engraved type-metal as readily as from punches.

Every character in the ordinary font of roman and italic has its own matrix, but all these matrices are adjusted to one mould. This mould must not only be true for its own work, so that every type cast from it will readily combine with its mates, but must be true in all points to the standard mould, and all other moulds for that body. A printer requires of the founder that types cast to-day shall be of exactly the same body as types cast twenty years ago, regardless of the wear of the mould during this long interval. If types were as uniform in width as they are in height, the task would not be so difficult; but letters vary irregularly in width from the i to the w, and the spaces vary regularly from the hair-space | to the three-em ▮ quadrat. It follows that the mould must be made adjustable, and that nearly every change of matrix will compel a readjustment of the mould.

All matrices are fitted to one mould.

The type-mould is of two pieces, apparently a right and a left counterpart. The matrix pro-

vided for the face is regarded as an attachment. Each piece consists of a number of firmly screwed bits of polished steel. When the two counterparts are properly brought together their interior sides are in exact parallel at a fixed and unalterable distance. The upper end of the mould is provided with a seat for the matrix; the lower end is open for the inflow of melted type-metal. Between these ends is the hollow to be filled with the melted metal that makes the type. Although the mould when joined is immovable in the direction that determines the body of the type, it has great liberty of motion and ease of adjustment in the direction that determines the thickness or the width of the type. The counterparts, when properly adjusted, slide to and fro on broad and solid bearings that prevent their getting out of square.[1]

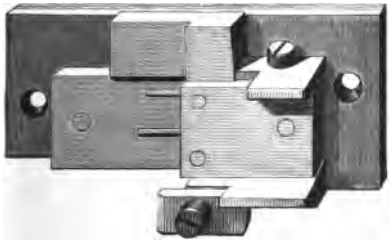
The construction of the type-mould

Moulds are now made to be attached to type-casting machines, for casting by hand exclusively has not been done in any American foundry since 1845. At the base of the machine is a small furnace, the heat of which keeps fluid the metal in the pot above. Suspended over this pot is a flat-faced

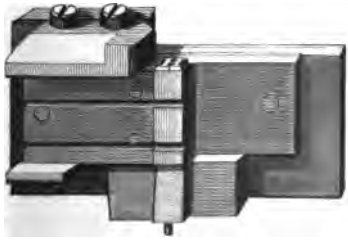
Construction of the type-casting machine

[1] The type-mould now in use does not materially differ from that shown by Fournier, in his "Manuel Typographique" of 1764, or by Moxon in his "Mechanick Exercises" of 1683, who does not write of it as a recent invention. Its more important features are as old as the invention of typography. Moxon's moulds were of iron; those of the early founders were of brass.

Type-mould without matrix, and with a type of the letter H in the mould.



One half of the mould.



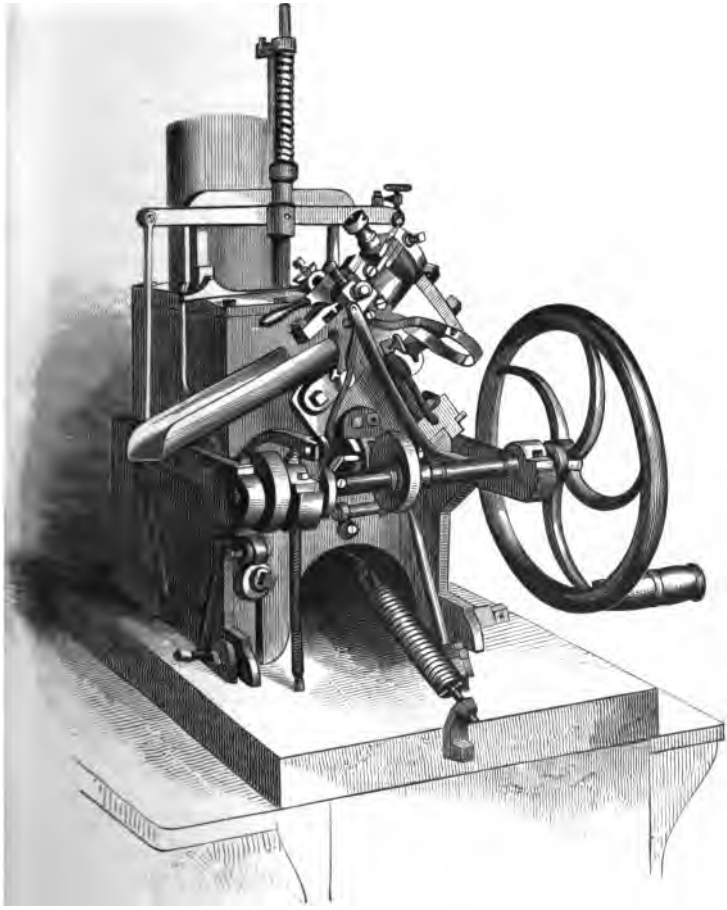
The other half of the mould.

piston, or plunger. Every revolution of the crank gives to this plunger a sudden thrust which injects through an unseen aperture enough of the melted metal to instantly fill the mould and the matrix, the matrix being held in place by a lever. As soon as the mould receives the metal it opens at an obtuse angle, as a door upon hinges. At the same instant the pressure on the lever that binds the matrix close to the mould is released, and then the matrix springs backward. The type is held in the upper half of the mould by a blunt pin, and when it raises, by the assistance of a rod which is connected with the apron, the stool hits the face end at the back and releases the type. As soon as the type is dislodged the mould closes automatically, and the plunger injects a new supply of metal, which is thrown out as before in the shape of a type.

Types rapidly made

Although types are cast singly they can be made rapidly; the rate of one hundred in a minute is not an uncommon production of the smaller sizes. The large types, which cool slowly, are cast slowly. The degree of heat required varies with the size of the body and the hardness of the metal. As a rule the smaller sizes are cast of harder metal and require greater heat.

Efforts have frequently been made to cast many types at one operation from a multiple mould. The most successful effort in this direction was made by Henri Didot of Paris, who in 1819 in-



The Bruce type-casting machine.

vented a "polymatype" mould for casting a font of extremely small type;[1] but this mould, although occasionally used by his successors for very small bodies, has not been adopted by other founders.

Imperfect as thrown from mould

The types thrown out of the mould are for the greater part perfect as to face, but unfinished as to body, for an unformed strip of metal called the jet, which cools outside of the mould, is attached to the lower end of each type. The bodies of the types have on their corners burs,[2] or sharp edges of metal. These and other imperfections have to be removed by the rubber and dresser, or finisher.[3] The jets are broken off, and the burs rubbed off on a grindstone, or dressing machine. Types with projections, like the f or j, are known as kerned letters, and are smoothed on the sides with a file, or by a machine in which a rapidly revolving wheel cuts away the superfluous metal without touching the projecting face. The types are then set up in a long row, and firmly fastened, face down, in a grooved channel

[1] British Patent No. 4826 to Louis John Pouchée. See the "Abridgement of Specifications relating to Printing," printed by order of the Commissioners of Patents, London, 1859, p. 165.

[2] The bur is produced by a slight and unavoidable leakage of metal at the angles of the mould. If the mould were set so tight that air could not escape from the corners, the types cast therefrom would be porous with air bubbles. Provision must be made for escape of air when the mould is suddenly filled with a spurt of hot metal.

[3] In 1838 and 1868 two patents were granted to David Bruce, Jr., for mechanisms which automatically broke the jet and removed the bur, but they were not adopted by type-founders.

called the dressing rod, so that a plane, working in carefully adjusted side bearings, can cut away the irregular fracture made by the broken jet. This operation leaves the types with a shallow groove between the feet, which allows each body to rest on its feet, thereby securing uniformity as to height. The dresser then reverses the position of the row, bringing the faces upward, and scrapes or files the front and back of the types, deftly changing them from one rod to another, so that front and back may be exposed in succession. This operation ends the smoothing of the types; their sides having been rubbed before they were set in the dressing rod. The line or rod of types is then critically examined under a magnifying glass, and every type that shows an imperfection is thrown out and destroyed. This inspection completes the work. The perfect types are then packed in paper convenient for handling.

Dressing or finishing of types

This method of making types has been the method of all type-founders before the year 1850. Since 1890 new machines have been invented which do some of the work automatically. It is mainly in the department of casting the type that the greatest improvement has been developed.

The earliest method of hand-casting

All types were formerly cast by hand. The caster took in his left hand the mould, which was imbedded in wood and shielded to protect him from being burned with hot metal. Then, taking a

spoon in his right hand, he poured the fluid metal into the mouthpiece of the mould.[1] At the same instant, with a sudden and violent jerk, he threw up his left hand to aid the melted metal in making a forcible splash against the matrix. If the mould was not thrown upward quickly, the metal would not penetrate the matrix. Hand-casting was hard and slow work: Fournier says that the production of a French hand-caster was from two to three thousand types a day; Moxon says the English caster cast four thousand.

Type-founding in some of its processes is but one of the many forms of printing. The counter-punch impresses the punch; the punch impresses the matrix; the matrix impresses the fluid metal.

[1] In 1811, Archibald Binny of Philadelphia devised the first improvement in hand-casting. He attached a spring lever to the mould, giving it a quick return movement, which enabled the type-caster to double the old production. In 1828, William Johnson of Long Island invented a type-casting machine which received the active support of Elihu White of New York; but the types made by it were too porous, and the mechanism, after fair trial, was abandoned. About 1834, David Bruce, Jr., of New York invented a hand force-pump attachment to the mould, for the purpose of obtaining a more perfect face to ornamental type than was possible with the regular mould. This attachment was known as the squirt machine. Large ornamental types owe their popularity to this simple contrivance. In 1838, the same founder invented a type-casting machine, which was successfully used for many years in New York, Boston, and Philadelphia. In 1843 he added other improvements of recognized value. Most of the type-casting machines in Europe and America are modifications and adaptations of Mr. Bruce's invention.

For more than forty years the Bruce type-casting machine or some modification of it maintained its popularity, and furnished nearly all the type made during this period. Improvements of real value were gradually added to it in different foundries, but the changes did not materially increase its productiveness. Yet it has never been regarded as a perfect machine. Its great defect is its inability to make the types perfect. To break the jet off, to rub down the feather-edges, and to plough out the feet, manual labor has to be employed, as in the days of hand-casting. At different times Johnson & Atkinson of England, Foucher Frères of France, Hepburn of England, and Küstermann of Germany, invented new forms of type-casting machines that were intended to produce perfect types, but these machines have not been found entirely satisfactory by the type-founders of the United States. They have been most efficient in making spaces and quadrats.

The nearest approach to success has been made by Henry Barth, who was granted a patent January 24, 1888, for a complete type-casting machine. He claims that this machine produces one half more than the older machines; that it does its work with more accuracy, and that it permits the use of a harder quality of metal. Its construction and its processes differ radically from those of the Bruce machine. One half of the mould and the matrix

The complete machine of Henry Barth

THE PRACTICE OF

TYPOGRAPHY

A TREATISE ON THE
PROCESSES OF TYPE-MAKING
THE POINT SYSTEM, THE NAMES, SIZES
STYLES AND PRICES OF

PLAIN PRINTING TYPES

BY
THEODORE LOW DE VINNE

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