its face, it is passed over a second cutter, which planes the second side absolutely parallel to the first. After this the type is carried in a line at right angles to its former course past a series of similar cutters, which plane out the foot, further smooth its surface, and plane each of the two dressed sides in succession ; this completes the dressing or finishing of the types, which, continuing on their course, pass upon a composing stick and are ready for the printer. The line of types presents the appearance of a solid bar of metal, so true, flat, and square are the surfaces of the several separate letters. This machine has been considerably improved by Mr P. Μ. Shanks. The new machine is of simpler construction and its parts are more compact. It does not produce better type, nor work quicker,—the speed in all type machines being regulated by the time required to cool the volume of metal, which, when on the machine, is assisted by having water percolating through the heated parts of the mould. The working of the new machine is more readily grasped by the manipulator, and there is considerable re­duction in its cost.

*Type-Setting or Composing.*

We may now describe the manipulation of the types in the print­ing office, and for the sake of conciseness reference must be made only to the operations connected with ordinary book-work. These differ in details from the methods in use in the other two depart­ments of the printing business,—news-work and job-work.

The types, received from the foundry in the packages called pages, are placed in shallow trays called *cases.* These contain compartments or *boxes,* each of which is appropriated to some par­ticular *sort* or character. The cases when in use stand on *frames* or sloping desks. The case at the top is the *upper case,* and that below the *lower case.* The former contains ninety­eight equal-sized boxes, appropriated princi­pally to the capital and small capital letters ; the latter has fifty-three boxes of vari­ous sizes, appropri­ated to the lower-case sorts. The difference in the size of the boxes corresponds to the difference of quantity of letters in a fount, as already stated,—the lower-case e for instance having the largest box. The localization of the letters, &c., is a subject on which opinions differ, the object being to bring the letters most frequently required nearest to the hand of the compositor as he stands at work. As a man picks out from the boxes seldom less than 1500 letters per hour and distributes or replaces on the average about 5000 per hour, it is necessary that the most economical allocation of the boxes should be adopted. The system of allocating the various types is called the *lay* of the case ; fig. 7 illustrates the plan used in the principal English book offices ; but there are many deviations.

The types when taken from the cases are arranged in lines or “composed” in an instrument called a *composing stick,* made of iron, brass, or gun metal. The slide in the middle is movable so as to accommodate varying lengths of lines. In the composing room the frames are arranged in rows, supporting the cases. The compositor fixes the “copy,” or document which he is to repeat in type, in a convenient place before his eye, and on some part of the case that is seldom used. In his left hand he holds the com­posing stick, and with the thumb and first finger of the right hand lifts the letters from the boxes, and arranges them in the com­posing stick, every letter, point, or sign being picked out separately. In this operation he is much assisted by the use of a *setting-rule,* a thin brass or steel plate which, being removed as successive lines are completed, keeps the type in place. When so many words and parts of words as will nearly fill the line have been composed, it is made the exact length required by inserting or diminishing the space between the several words. This is called *justifying* the line and is effected by means of the spaces already mentioned. If the work is not “ solid ”—that is, if the lines are not close together— the strips of metal called *leads* are used. They vary in thickness, but always form aliquot parts of pica body. A good compositor must possess intelligence and a reasonable amount of general know­ledge : he must be able to read his copy with readiness, and to understand its meaning, in order to punctuate it properly. He should be able to spell correctly, as some copy is almost undecipher­able in regard to separate letters, while other copy is incorrectly spelt. When the composing stick is filled, the type is lifted on to a *galley,* a shallow tray of wood or metal, two or three sides of which are flanged, for the purpose of supporting the type, when the galley is slightly inclined. Stickful after stickful of type is placed on the galley until it is full. The matter is then fastened up, a proof taken at the proof press, and the work of the *reader* or cor­rector of the press—described below—begins. The proof, marked with the necessary corrections, is given back to the compositor, in order that he may make the required alterations in the type.

The type, being duly corrected, is made up into pages of the required length (unless the author has desired to see proof in *slip).* It is then *imposed,* that is, the pages are arranged in such a manner that, when printed and the sheet folded, they will fall in due numerical sequence. The impression from any arrangement of pages will be the reverse of that in which they are laid down. If an ordinary four-page newspaper supplement be opened and spread out with the first page uppermost, it will be found that on this side the order of pages is 4, 1 ; when turned the pages are 2, 3. The type pages must be ranged in the reverse way, as 1, 4 ; 3, 2. Thus the fourth page is placed alongside the first, because both must be printed together on the outside ; the third page is to the left, and the second to the right, because in books the odd page—the *verso—*is always to the right. For a quarto a sheet of paper is folded twice, that is once across its breadth and then once in a perpendicular direction down the middle. It contains four leaves, and if these are printed on both sides eight pages. The two sides of a sheet are called the outer and inner formes respectively. A sheet of octavo is folded three times, making 8 leaves or 16 pages. The size of a book depends, not only upon the number of times the sheet has been folded, and described accordingly as 4to, 8vo, 12mo, &c., but upon the size of the sheets. The dimensions of the papers commonly used in book-printing are :—imperial, 22 × 30 inches ; super royal, 20½ × 27½ ; royal, 20 × 25 ; medium, 19 × 24 ; demy, 17½ × 22½ ; double crown, 20 × 30 ; double foolscap, 17 × 27 ; post, 15¾ ×19½. Hence to say that a book is a quarto merely gives no precise indication of its dimensions, as a quarto of one size of paper may be smaller than an octavo of another ; it is also necessary to know the size of the sheets of which it is composed.

When a printed book is opened, it will be found that at the foot of certain pages there is usually a letter and at the foot of another a letter and a figure, as B, B 2 ; further on another letter and another letter and figure. On going through the book it will be seen that the letters are in regular alphabetical order, and occur at regular intervals of eight, twelve, sixteen, &c., pages. These designate the several sheets of which the book is composed and are called *signa­tures,* so that a sheet may be designated B, and the pages of which it consists are thereby sufficiently indicated. (Occasionally, as in the present work, numbers are used instead of letters.) These signatures assist the binder in folding, as they occupy a certain specified place in each sheet ; hence to ascertain if the sheet has been folded properly it is only necessary to examine the position of the signature. The binder also is thus assisted in *gathering* or collating together the sheets of a volume in proper order. Signa­ture A is omitted, because it would be on the title or first page, and would be both unnecessary and unsightly. By old custom J, V, and W are discarded, I and J, U and V being originally used indis­criminately by printers, while W was written UU or VV. When the alphabet is exhausted, a new one is commenced, distinguished by a figure precedent, as 2 B, 2 C, &c.

The pages of types are arranged in proper order on a flat table, covered with stone or metal, called the *imposing stone,* and are then ready to be made into a *forme,* that is, in such a state that they can be securely fastened up and moved about. The forme is en­closed in an iron frame or *chase,* subdivided by a cross bar. The portions of the type are separated by *furniture,* which may be of metal or wood or both. It is of the same height as the chase, but lower than the type, and therefore does not print, but forms the margin of the printed pages. At the sides of the two sections of the formes are pieces of furniture of a tapering shape, called *side­sticks,* and at the top and bottom corresponding pieces, called *foot­sticks.* Small wedges, called *quoins,* are inserted and driven forward by a mallet and a *shooting-stick,* so that they gradually exert in­creasing pressure upon the type. Other mechanical means for locking up are also occasionally adopted. When sufficiently locked up, the whole is quite as firm and portable, however many thousands of pieces of metal it may consist of, as if it were a single plate. In this rapid sketch we purposely omit mention of several opera­tions which, though important and indispensable, are only of interest to the workman.

For many years endeavours have been made to construct machines for type-setting which should obviate hand labour. Picking out the types separately from their boxes and arranging : them singly in the composing stick is an irksome and monotonous operation, and one which it might be thought comparatively easy to perform by automatic machinery. But of the many different composing machines that have been invented less than half a dozen have stood the test of practical experience. These have been con­fined to special classes of work, and it is open to doubt whether the nimble fingers of a good compositor, aided by the brains which no machinery can supply, do not favourably compare on the