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WOOD-CUTTING AND TYPE-FOUNDING.

[Virgin and Child · after Raffaelle.]

Richard de Bury, Bishop of Durham, who lived more than a century before the introduction of the art of printing, wrote a treatise, entitled 'Philobiblon, or, the Love of Books.' Describing the process by which manuscripts were multiplied, he uses the following words:—"Because everything that is serviceable to mortals suffers the waste of mortality through lapse of time, it is necessary for volumes corroded by age to be restored by renovated successors, that perpetuity, repugnant to the nature of the individual, may be conceded to the species. Hence it is that Ecclesiastes significantly says, in his 12th chapter, 'There is no end of making many books.'" The monks, who were principally engaged in these services, had probably began to weary in their laborious occupation in the time of the good bishop; for in another place he says, "the study of the monks now-a-days dispenses with emptying bowls, not amending books." The account he gives of the industry of their predecessors shows us, however, that the old religious transcribers must have been endued with singular patience and perseverance:—"Many wrote them out with their own hands in the intervals of the canonical hours, and gave up the time appointed for bodily rest to the fabrication of volumes; those sacred treasuries of whose labours, filled with cherubic letters, are at this day resplendent in most monasteries."

When we compare the multiplication of volumes in our own day with the slow productions of the transcribers described by Richard de Bury, we may say "there is no end of making many books." The copiers of manuscripts, indeed, were many, and their labours were incessant; but the whole life of the most industrious individual employed in this task would add only a few to the number of volumes in the world. With what ardour must the recluse have been inspired who resolved to set about the transcription of a bible or breviary, or

undertook the greater task even of adding one more to the number of copies of some ponderous treatise of scholastic divinity, then so much prized and cherished. Such a book Erasmus has described: "As for Thomas Aquinas's 'Secunda Secundæ,' no man can carry it about, much less get it into his head." The volume thus produced on fair parchment, after the labour of years, was covered with immensely thick lids of wood and leather, studded with large nails, and curiously clasped; and being deposited on the shelves of the monastic library, was kept sacred from all profane eyes. "Laymen," says Richard de Bury, "to whom it matters not whether they look at a book turned wrong side upwards or spread before them in its natural order, are altogether unworthy of any communion with books." The monks laboured for themselves alone, without any desire to diffuse the knowledge which they strove, and properly so, to preserve,

The "resplendent" volumes "filled with cherubic letters," which the author of 'Philobiblon' delights in, bore striking marks not only of the persevering industry but of the great ingenuity of the monks. Their initial letters,—that is, the letters at the beginning of each chapter or section,—were adorned with the most curious devices; and oftentimes a painting, called an illumination, was introduced, "resplendent" with gold and the brightest tints of crimson and azure. But the satisfaction to be afforded by these efforts of art was confined to a few. They were not, like the paintings with which churches were subsequently adorned, displayed before the people to exalt their devotion. They were unclasped only on days of solemnity, by the mitred abbot or the prior; and then conveyed, like precious jewels, to the obscurity of their worm-eaten and dusty cases.

Very early in the fifteenth century,—somewhere between 1400 and 1430,—an art was either discovered or introduced in Europe, which eventually conducted to the more important art of printing from moveable types. The invention to which we allude was that of taking impressions from lines cut in relief on blocks of wood. It is unnecessary for us here to enter into the details of a long controversy amongst antiquaries, as to whether engraving in wood was not practised in Italy a century earlier;—nor will it be more desirable for us to carry our readers through the multifarious evidence of the Asiatic origin of this art. It is enough for us to state, that it is established beyond doubt that, in the first quarter of the fifteenth century, engraving on wood was applied to the multiplication of copies of designs which were in demand amongst the people of Italy and Germany. This demand, which very soon called into existence a considerable number of workmen, was addressed to two objects of a very opposite character,—books of devotion, and playing-cards. The representations of saints and of scriptural histories, which the limners in the monasteries had for several centuries been painting in their missals and bibles, were copied in outline; and being divested of their brilliant colours and rich gilding, presented figures exceedingly rude in their want of proportion, and grotesque in their constrained and violent

attitudes. But they were nevertheless highly popular; and as the pictures were accompanied with a few sentences from Scripture, they probably supplied the first inducement to the laity to learn to read, and thus prepared the way for that diffusion of knowledge which was to accompany the invention of printing from moveable types. Again, for somewhat more than a century preceding the period of which we are speaking *, playing-cards had become the common amusement of the noble and wealthy. The cards, like the missals, called forth the art of the limner; and the king, the knight, and the knave (the characters of the early cards), were rich with crimson and purple, oftentimes painted on a golden ground. Gambling, like many other vices and follies, descends from the great to those below them in the social scale; and it is easy, therefore, to conceive that the followers of courts and of camps, and the artisans and dealers in the towns, seeing the amusement which their superiors derived from these painted bits of paper or parchment, would be anxious to possess the same means of excitement in their hours of idleness. The art of wood-engraving was ready to supply the extended demand for playing-cards. The outline of the figure was cut in relief upon a block; and the coloured parts were afterwards added by the pencil. In Mr. Singer's elaborate and interesting work, there are many fac-similes of the early cards. We subjoin a specimen of the *Knave of Bells*:—

[Knave of Bells.]

It appears that the impressions of the engraved cards, as well as of most of the earlier block-prints, were taken off by friction. This is the mode by which, even at the present day, wood-engravers take off the specimen impressions of their works, called proofs. The Chinese produce their block-books in a similar manner, without the aid of a press.

In the collection of Earl Spenser there is a very curious print from a wood-block, representing St. Christopher carrying the infant Saviour. This print bears the date 1423. It is probably not the earliest specimen of the art; but it is the earliest undoubted document which determines with precision the period when wood-engraving was generally applied to objects of devotion. In a very few years from the date of this print, the art was carried onward, as we have mentioned, to a more important object,—that of producing a *book* of popular instruction. The Bible, as is well known, could only at this time be obtained in manuscript, at a very heavy cost; such as would purchase a considerable estate in those days. It was thought that a selection of subjects from the Bible, with appropriate texts, both engraved upon wood, might be acceptable to the common people. Such a book was produced somewhere between the year 1430 and 1450, and was called 'Biblia Pauperum,'—the Bible of the Poor. This very rare book consists of forty leaves of small folio, (about the size of the 'Penny Magazine,') each of which contains a cut in wood, with extracts from the Scriptures, and other illustrative sentences. It was followed by others of a similar character, the most remarkable of which is called 'Speculum Salutis,'—the Mirror of Salvation. In this performance the explanations of the text are much fuller than in the 'Biblia Pauperum;' and it is remarkable that, in one of the editions, part of the text is obviously printed from blocks, and part from moveable types. In addition to these works, wooden blocks were also used to print small manuals of grammar, called Donatuses, which were used in schools. We subjoin a fac-simile of a wood-cut from one of the early block-books.

[The Wise Men's Offering.]

In the course of this Number we shall see how the art of engraving on wood, and the production of block-books, gradually merged into the art of printing from moveable types. From that time wood-cuts became a secondary part of books, used, indeed, very often by the early printers, but by no means forming an indispensable branch of typography. Imitating the manuscript books, the first printers chiefly employed the wood-engraver upon initial letters; and sometimes the pages of their works were surrounded by borders, which contained white lines or sprigs of foliage upon a black ground. If a figure, or group of figures, was introduced, little more than the outline was first attempted, as will be seen in the fac-simile from the 'Historiæ Veteris et Novi Testamenti' just given. By

* This is much earlier than the date usually assigned to the introduction of Playing Cards; but there is abundant proof that they were used in Italy, Spain, and Germany, for at least a century preceding the reign of Charles VI. of France. See Singer's 'Researches into the History of Playing Cards.'

degrees, however, endeavours were made to represent gradations of shadow; and a few light hatchings, or white dots, were employed. All cross-hatchings, such as characterize a line engraving upon metal, were carefully avoided by the early wood-cutters, on account of the difficulty in the process. Mr. Ottley, in his 'History of Engraving,' says that an engraver on wood, of the name of Wohlgemuth, (who flourished at Nuremburg about 1480,) "perceived that, though difficult, this was not impossible;" and, in the cuts of the 'Nuremburg Chronicle,' "a successful attempt was first made to imitate the bold hatchings of a pen-drawing." Albert Durer, an artist of extraordinary talent, became the pupil of Wohlgemuth; and by him, and afterwards by Holbein, wood-engraving was carried to a perfection which it subsequently lost till its revival in our own country, by Bewick. For more than a century and a half after the invention of printing in England, as well as in France, Holland and Germany, wood-cuts were profusely employed in the illustration of books. Those who have seen copies of the original editions of those very popular English works, 'Hollingshed's Chronicles' and 'Fox's Martyrs,' will perceive how attractive and really instructive wood-cuts were considered in the sixteenth and early in the seventeenth century. Wood-cuts are indeed essentially applicable to the general diffusion of knowledge; and the early printers were as much engaged in that great task as we of the present day, who are anxious to carry information into the dwellings of the peasant and the artisan, and to excite the curiosity of those who have been unaccustomed to think upon any subject connected with art and literature. The early printers had to seek for their most numerous class of customers among the laity, (persons not of the religious profession,) who, we have seen, were considered unworthy of the perusal of the monastic manuscripts. These, undoubtedly, were for a long time surrounded with every difficulty in the acquisition of knowledge. Many, even of the wealthier classes, were unable to read their own language; few understood the learned languages, in which the larger number of books were printed; and the greater part required some excitement to their curiosity before they seriously applied themselves to the perusal of a book, even if they possessed the ability. The liberal introduction of wood-cuts furnished a great attraction. After the first expenses of the drawing and engraving were incurred, there was no separate cost in taking off the impressions of the cuts;—they were executed by the typographical process, and thus formed an integral portion of the books. Gradually, however, as the original readers of books,—namely, the nobility and other possessors of property in land, and a few of the wealthier of the mercantile class,—desired a species of embellishment more costly than wood-cuts, though in many cases not superior, copper-plate prints began to be introduced into printed works. Impressions of these prints were obtained by a process totally different from the typographical art; so that they constituted, in every respect, an additional expense in the production of a book. Sir John Harrington's translation of 'Orlando Furioso' was the first English work in which copper-plates were used; this was printed in 1690. From this time till the latter part of the eighteenth century, the use of wood-cuts gradually declined in England. The rudest illustrations, as rude as those of the 'Biblia Pauperum,' were sometimes found in Primers and Spelling-books; but as a high branch of art wood-engraving was entirely lost till the appearance of Bewick, a most ingenious artist, who practised at Newcastle upon Tyne. His cuts of quadrupeds and birds are as remarkable for their force and delicacy of execution as engravings, as for the vigour and accuracy with which he drew them; and his humorous vignettes possess a truth of character which has been seldom equalled. The success of Bewick created several artists in wood, of considerable excellence; but, till within a very few years, the art was not applied to its legitimate purpose. It is essentially the art of design which is naturally associated with cheap and rapid printing. The wood-engravers who were contemporary with, or immediately succeeded, Bewick, were generally employed in the illustration of the most costly works; and the introduction of wood-cuts often rendered the printing of the other portions of the book so expensive, that a volume thus embellished was as costly as if the designs had been printed separately from metal plates. The reason was this:—from the mode in which these engravers worked, the most extraordinary care was required in printing their performances; and the wood-cuts being included in the same page and sheet with the text, if only a single wood-cut occurred in a sheet, the attention which that demanded from the pressman prevented the rapid working-off of the other pages. This we shall explain more fully when we come to treat of the press and printing-machine. It may be sufficient now to state that as, by the printing-machine, the ink is uniformly applied to wood-cuts as well as types, and as the cylindrical pressure of the machine is also uniform, no peculiar care of the superintendent can remedy defects or heighten beauties in the work of the engraver. He must, therefore, give his shadows the requisite force, and his lights the necessary clearness, when he completes his work. No subsequent care can alter its appearance. He, therefore, adapts his performance to the circumstances dependent upon rapid printing;—and it is not too much to say that these circumstances, principally exhibited and called forth by the great demand for the 'Penny Magazine,' have completely changed the character of the art of wood-engraving; and have rendered it peculiarly and essentially that branch of engraving which is applicable to cheap publications.

We may illustrate these remarks by referring to the cut at the head of this Number. It has been engraved as a specimen of his art, by Mr. Jackson,—one of the best wood-cutters of our day; who, in conjunction with Messrs. Sly and Wilson, has principally executed the cuts of the 'Penny Magazine.' This wood-cut is copied from one of the finest line-engravings of Raffaelle Morghen, and furnishes a true notion of the bold style of cross-hatching which that great artist adopted. It must be evident that these cross-lines are much more difficult to produce in wood than in copper or steel. In metal, the lines to be shown in the impression are cut away in the plate; in wood they are left standing, and the white between the lines is cut away. Of course it is much more laborious to cut away the minute white spaces formed by the intersections of the lines, than to follow with the graver the lines themselves. A writer in Brewster's 'Edinburgh Encyclopædia,' speaking of this peculiarity of the fine old wood-engravers, says, "In looking at the works of the old German artists, from the time of Albert Durer down to Christopher Jegher, we are surprised at the frequent occurrence and freedom of execution of the dark cross-hatchings,—an operation which, by the common process of cutting away the interstices, could not be done but with the greatest labour, and certainly without the freedom which these artists have displayed." The writer then goes on to suggest that these hatchings were not done by the tool, but corroded by some chemical process. Now, in the cut of the Madonna, no chemical process is used; and we think there is no want of freedom. The only secret in the matter is, that the artist is paid liberally for the great labour of the performance; and the means of paying him liberally are afforded by the circumstance that two hundred thousand purchasers co-operate to obtain a fine specimen of his art. By the adaptation of wood-engraving to the necessities of rapid printing, the impressions of a cut like this can be produced (and we think it will bear comparison with many

specimens of wood-engraving printed with the most expensive care) at the rate of eight hundred an hour or ten thousand a day; and thus a fine specimen of art can be placed within the reach of thousands, instead of being confined to the cabinets of a very few, as the print of Raffaelle Morghen is, from which it is copied.

It may be expected that we should add a short description of the process of engraving on wood.

In a 'Book of Trades,' published at Frankfort, in 1654, which was illustrated by a number of spirited wood-cuts from the designs of Jost Ammon, there is a representation of the *formschneider* or wood-cutter. He sits at a table holding the block in his left hand, upon which he is cutting with a small graver in his right. Another graver, and a sort of googe or chisel lies upon the table. If we enter the work-room of a wood-engraver of the present day, we shall find the instruments by which he is surrounded nearly as few and as simple. His block rests upon a flat circular leather cushion filled with sand; and this so completely answers the purpose of holding the block firmly, and yet allowing it to be moved in every direction, that it is expressively called the wood-cutter's third hand. His cutting instruments are of three sorts: the first, which is called a *graver*, is a lozenge-shaped tool, used for outlines and fine tints; the second, called a *scauper*, which presents a triangular point and edges, is used for deeper and bolder work; and the third, which is a *flat tool* or chisel, is employed in cutting away those parts of the block which are to be left entirely light. There are several varieties of size in these tools, but it is understood that the best artists employ the fewest tools. Upon the block, which presents a perfectly smooth surface, the design has previously been drawn, in most cases with a black-lead pencil, by a draughtsman, who is generally an artist distinct from the wood-engraver. It is the business of the cutter, as we have before mentioned, to leave all the lines upon the block which the draughtsman has traced with his pencil; and to do this, he of course cuts away all the parts which form the spaces between the various lines of the drawing. The lines thus stand up, as it is called, in relief; and when ink is applied to them by the printer, in the same way as he applies it to his metal types, they transfer the ink to the paper placed over them upon being subjected to an adequate pressure. We should mention that in this, as in every other species of engraving, the drawing upon the wood is a reverse of the object copied, in the same way as a mirror shows the reverse of the human countenance; when the impression is taken from the engraving, the object is correctly represented, in the same way as the reflection of any object in a second mirror placed opposite the first would also give it correctly. The process we have alluded to, by which the art of wood-engraving is adapted to the uniform printing effected by the revolving cylinder of a machine, consists in very much lowering the general surface of the wood wherever light tints are required to be produced. For example, the thigh of the infant in the wood-cut of the Madonna at the head of this paper, exhibits a number of faint lines, which are gradually lost in complete light. This is effected by scooping out the wood like a shelving trench from the edge of the shadow, and afterwards engraving the hatched lines upon the lowered surface. In a wood-cut executed ten years ago, the management of this effect would have been left to the printer; who, with great care and labour, would have contrived, by the adjustment of a number of small pieces of paper between the stretched parchment and blanket that covered the block during the impression from the common hand-press, to give a greater force to the bearing upon the shadows, while the lights were of course equally relieved from the pressure. By the mode of lowering the lights upon the block itself, the artist is sure that, with common care, every impression of his performance will be equally perfect. The process being a new one is, to a certain degree, imperfectly understood; but the great improvement which has progressively taken place in the appearance of the wood-cuts of the 'Penny Magazine,' is the best proof that a new principle has been introduced in wood-engraving, which, in time, will render a very high perfection perfectly compatible with that extreme cheapness of works in which wood-cuts are introduced, which is insured by the application of printing by machinery to the supply, with certainty and rapidity, of a large body of purchasers.

The wood which is used for the purpose of engraving is that of the box-tree. A considerable quantity of box is imported into this country, as the tree with us scarcely ever reaches a sufficient size. The best logs are shipped from Odessa, but very few are adapted for the purpose of the wood-engraver, and the inferior qualities are chiefly used for turnery. The blocks for engraving are cut directly across the grain, so that not many trees furnish pieces sufficiently large for the wood-cuts which we are in the habit of using, and in that case two or even three smaller pieces are fitted together with great exactness. The price of box for engravers has advanced considerably within the last year or two, owing, of course, to the increased demand. Some idea may be formed of this increase from the fact, that some twenty years since there were not more than about twelve working wood-engravers in London; there are now considerably more than a hundred. The encouragement afforded to this class of artists by works selling at a very cheap rate may be estimated, when we state that the wood-cuts of the 'Penny Magazine' cost about £2000 per annum. The impulse which the extension of the demand for reading has communicated to the business of wood-cutting in England has not yet been proportionately felt on the Continent. We ourselves supply metal casts to France, Germany, and Russia, not only to assist those countries in producing works similar to the 'Penny Magazine' at a cheap rate, but because, however excellent France and Germany may be in other branches of engraving, they have at present scarcely any wood-cutters amongst them. This is a singular contrast to the state of things in Germany soon after the invention of printing, when the wood-cutters, or *formschneiders*, were a body numerous enough to be incorporated distinct from the *briefmahlers*, or painters of cards and images.

The early history of wood-engraving, of which we have given a slight outline, clearly points out the successive steps in the perfection of the art of printing. The art of multiplying copies of drawings existed in Europe very early in the fifteenth century. It might have originated here, or it might have been copied from the Chinese; for Marco Polo, nearly a century earlier, had seen the paper-money of this people, on which "the principal officer, deputed by the cham, smears with cinnabar the seal consigned to him, and imprints it upon the money, so that the figure of the seal, coloured in cinnabar, remains impressed upon it*." However this may be, the use of carved blocks for the multiplication of copies of playing-cards and devotional pictures gave birth to a principle which has effected, and is still effecting, the most important changes in the world. These devotional pictures had short legends or texts attached to them; and when a text had to be printed, it was engraved in a solid piece as well as the picture. The first person who seized upon the idea that the text or legend might be composed of separate letters capable of re-arrangement after the impressions were taken off, so as to be applied, without new cutting, to other texts and legends, had secured the principle upon which the printing art was to depend. It was easy to extend the principle from a few lines to a whole page, and from one page to many, so as to form a book; but then

* 'Navigationi et Viaggi Raccolto da Ramusio.' Tome ii. fol. 29· quoted in Singer, page 85.

were seen the great labour and expense of cutting so many separate letters upon small pieces of wood or metal, and another step was required to be made before the principle was thoroughly worked out. This step consisted in the ready multiplication of the separate letters by casting metal in moulds. All these gradations were undoubtedly the result of long and patient experiments carried on by several individuals, who each saw the importance of the notion they were labouring to work out. It is this circumstance which has given rise to interminable controversies as to the inventors of printing, some claiming the honour for Coster of Haarlem, and some for Gutenburg of Mentz; and, as is usual in all such disputes, it was represented that the man to whom public opinion had assigned the credit of the invention had stolen it from another, who, as is also usual in these cases, thought of it in a dream, or received it by some other mysterious revelation. Those who desire to make themselves acquainted with the conflicting evidence on the origin of printing, will find ample accounts in 'Hansard's Typographia,' 'Singer on Playing Cards,' 'Bowyer's Origin of Printing,' 'Heinecken, Idée d'Estampes,' Ottley's 'History of Engraving,' and many other works; most of which in our opinion leave the matter quite as uncertain as many other subjects of antiquarian dispute, such as the birth-place of Homer, the site of Troy, the authenticity of Ossian, or the authorship of Junius. Our readers will probably be satisfied with the account of the invention given by an ancient German chronicler of the name of Trithemius, who appears to have personally known one of the three persons, who, as far as we may judge from the works which they produced, seem to have the best title to be called the inventors of printing:—

"At this time, in the city of Mentz on the Rhine in Germany, and not in Italy, as some have erroneously written, that wonderful and then unheard-of art of printing and characterizing books was invented and devised by John Gutenberger, a citizen of Mentz, who, having expended almost the whole of his property in the invention of this art, and on account of the difficulties which he experienced on all sides, was about to abandon it altogether; when, by the advice, and through the means, of John Faust, likewise a citizen of Mentz, he succeeded in bringing it to perfection. At first they formed (*i.e.*, engraved) the characters or letters in written order on blocks of wood, and in this manner they printed the vocabulary called a 'Catholicon.' But with these forms (or blocks) they could print nothing else, because the characters could not be transposed in these tablets, but were engraved thereon, as we have said. To this invention succeeded a more subtle one, for they found out the means of cutting the forms of all the letters of the alphabet, which they called matrices, from which again they cast characters of copper or tin of sufficient hardness to resist the necessary pressure, which they had before engraved by hand. And truly, as I learned thirty years since from Peter Opilio (Schoeffer) de Gernsheim, citizen of Mentz, who was the son-in-law of the first inventor of this art, great difficulties were experienced after the first invention of this art of printing, for in printing the Bible, before they had completed the third quaternion (or gathering of four sheets), 4000 florins were expended. This Peter Schoeffer, whom we have above mentioned, first servant and afterwards son-in-law to the first inventor, John Faust, as we have said, an ingenious and sagacious man, discovered the more easy method of casting the types, and thus the art was reduced to the complete state in which it now is. These three kept this method of printing secret for some time, until it was divulged by some of their workmen, without whose aid this art could not have been exercised; it was first developed at Strasbourg, and soon became known to other nations. And thus much of the admirable and subtle art of printing may suffice—the first inventors were citizens of Mentz. These three first inventors of printing (videlicet), John Gutenberger, John Fust, and Peter Schoeffer his son-in-law, lived at Mentz, in the house called Zum Jungen, which has ever since been called the Printing Office*."

The invention of Schoeffer, which, whatever might have been its first mechanical imperfections, undoubtedly completed the principle of printing, is more particularly described in an early document, which is given in several learned works on typography, as proceeding from a relation of Fust. It is as follows:—"Peter Schoeffer of Gernsheim, perceiving his master Fust's design, and being himself ardently desirous to improve the art, found out (by the good providence of God) the method of cutting (*incidendi*) the characters in a matrix, that the letters might each be singly cast, instead of being cut. He privately cut matrixes for the whole alphabet; and, when he showed his master the letters cut from these matrixes, Fust was so pleased with the contrivance, that he promised Peter to give him his only daughter Christina in marriage; a promise which he soon after performed. But there were as many difficulties at first with these letters, as there had been before with wooden ones; the metal being too soft to support the force of the impression: but this defect was soon remedied by mixing the metal with a substance which sufficiently hardened it†." John Schoeffer, the son of Peter, who was also a printer, confirms this account, adding, "Fust and Schoeffer concealed this new improvement by administering an oath of secrecy to all whom they intrusted, till the year 1462, when, by the dispersion of their servants into different countries, at the sacking of Mentz by the Archbishop Adolphus, the invention was publicly divulged."

The original type was very similar to that which is still used most generally in German books. This is called the Gothic character, while the ordinary type which we employ is known as Roman. It derived that name from the first printers who used it, namely, Sweynheim and Pannartz, who, in 1467, executed in this type an edition of Cicero's 'Epistolæ Familiares,' at their office in Rome. The Italic type was the invention of Aldus Manutius, the first of a celebrated family of printers, who employed it not as we do very sparingly in quotations, but in the execution of a series of small classical works intended for general perusal. The object which he had in view was the saving of space, as the Italic letters, from their peculiarity of form, are thinner than the Roman or the Gothic. It is said, that in this character Aldus attempted an imitation of the hand-writing of the celebrated poet, Petrarch. His printing office was established at Venice, in 1490.

The original attempts to preserve the whole process of printing a secret, and which, no doubt, continued for a long time under that state of things when every trade was denominated a mystery, led to the union of the letter-founder and the printer. The division of labour (the progress of which principle is at all times slow) was little understood at that period, when the weaver manufactured his own loom, and the farmer constructed his own rude plough. Schoeffer, one of the first German printers, was also the first letter-founder; and he was, moreover, a book-binder. The general term printing originally included every process necessary for the production of a book, from cutting the punch by which the matrix is sunk, to stamping the leather which covered the ponderous wooden lids of the treasured folio.

The English printers, from Caxton to John Day, (who, in the year 1567, published a book of antiquities, in which he says that the Saxon characters were cut by himself,) were all letter-founders. The trades, however, after this began to be separated, for we find a decree of the Star Chamber, in 1637, by which it is ordered that

* 'Trithemii Annales Monasterii Hirsaugensis.' Translated in Singer.

† Bowyer's 'Origin of Printing,' p. 91.

there shall be four founders of letters for the kingdom, and no more. The provisions of this absurd and oppressive decree were recognized in an act of 14th Charles II., (1674,) which again restrained the number of master-founders to four; and, by the same act, the number of printers was limited to twenty. This, however, was only a provisional act, which appears to have been impossible of execution, like all other enactments which are directly opposed to the spirit of an age. The demand for knowledge had become so general that four founders and twenty printers were quite inadequate to the supply, whatever might be the opinion of Charles II. and his arbitrary court. The supply, therefore, went on. In a very curious book, written by Joseph Moxon, a mathematical-instrument maker, who also applied his mechanical knowledge to the art of letter-cutting, we are informed that, in 1686, "the number of founders and printers were grown very many, insomuch that, for the more easy management of typography, the operators had found it necessary to divide it into the several trades of the master-printer, the letter-cutter, the letter-caster, the letter-dresser, the compositor, the corrector, the pressman, the ink-maker, besides several other trades which they take into their assistance, as the smith, the joiner, &c." Such a division of labour indicates the natural progress of an art towards perfection, and is indeed in itself a cause of that perfection. Moxon says that letter-cutting was a handy-work at that time, kept so concealed among the artificers of it, that he could not learn any one had taught it any other. Moxon himself, however, laid down mathematical rules for the formation of letters, but he does not appear to have attempted any improvement in their shape. In the reign of Anne we imported most of our type from Holland, where the letter-founders had succeeded in producing much more beautiful characters. At length, however, in 1720, William Caslon, an engraver of gun-locks and barrels, having the credit of being a most ingenious artist, was employed by the 'Society for Promoting Christian Knowledge' to cut the punches for a fount of Arabic. His success led him to enter into the business of a letter-founder, in which undertaking he was assisted by Bowyer, the celebrated printer. In a very few years Caslon had rendered the English types superior to any in Europe; when the importation of foreign types ceased, and the founts of this ingenious founder became in demand on the Continent. The Caslon foundry is still continued by a descendant of the same name, with undiminished reputation.

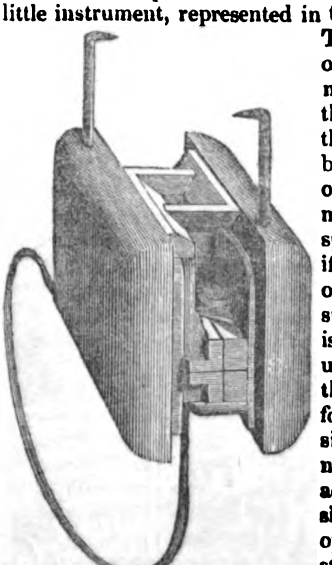
The different sizes of types which are cast in this country are very considerable, varying from the smallest called diamond, of which 205 lines are contained in a foot, to those large letters which we see employed in placards, of which some single letters are three or even four inches high. The type in which the 'Penny Magazine' is chiefly printed,—that is, the type which the reader is now perusing,—is called Long Primer, and this type stands mid-way between the largest and the smallest ever used in printing books. We give a list of the names of these letters, with a scale which expresses their proportions, in the number of lines which each occupies in a foot:—

Double Pica	41¼	Bourgeois	102½
Paragon	44½	Brevier	112½
Great Primer	51½	Minion	128
English	64	Nonpareil	143
Pica	71½	Pearl	178
Small Pica	83	Diamond	205
Long Primer	89		

It is considered that the early printers and type-founders were very imperfectly acquainted with the proper composition of metal to be used. Lead, as being the most flexible metal, was principally employed; but then it was too soft for durability, and a portion of iron was consequently added. Regulus of antimony is now added to the lead, instead of iron. The smallest-sized types requiring the hardest metal, the alloy for these is twenty-five parts of the regulus of antimony to seventy-five parts of lead; the proportions are varied for the larger sizes, so that in some only fifteen parts of antimony are used to eighty-five of lead.

We have stated that the early printers were their own letter-founders. In their case they united the two trades, because the division of labour was imperfect. When an art becomes very much advanced, so as to allow one individual to employ his capital upon the largest scale, we sometimes find several distinct branches of trade carried on under the same roof. Thus in some large cotton factories we have the spinning and weaving processes united in the same establishment. It is not that the division of labour is not perfect in each department, but that there are commercial advantages which result from uniting two or more branches of one business. In this way, we find the business of type-founding carried on at the present day in one of the largest printing establishments in London,—that of Mr. Clowes, in Duke Street, Stamford Street,—the office where the 'Penny Magazine' and 'Cyclopædia' are printed. As we shall have to describe the subsequent processes of printing as practised in this office, it may be convenient to describe the practice of type-founding as it may be here seen.

Upon entering the Foundry, the superintendent, or overseer, will exhibit to the visitor a Punch and a Matrix. The punch is of hardened steel, and exhibits upon its face a single letter, formed by hammering down the hollows, and filing up the edges, when the metal was in a softened state. With this tool, an impression is struck into a piece of copper, about one inch and a quarter long, one-eighth of an inch deep, and wide in proportion to the size of the type to be cast. This is the matrix; which, after the die is sunk, is filed up to ensure the cast taken from it to be of the requisite depth, which process is called justifying. It will be desirable that the visitor should also inspect the Mould. This is a most ingenious little instrument, represented in the following wood-cut:



The mould is composed of two parts. The external surface is of wood; the internal of steel. At the top, as will be seen by the cut, is a shelving orifice, into which the metal is poured. The space within is as true as if it had been hollowed out of a single piece of steel; but nevertheless it is formed by the intimate union of the two parts of the mould, each part forming two of the four sides of the letter. It is not a matter of difficult adjustment to bring these sides together; it is the operation only of an instant. At the bottom of the mould, immediately under the orifice, is the matrix. This is held in its place by a metal spring, represented at the lower part of the cut; and every letter that is cast can only be loosened from the matrix by removing the pressure of the spring. In the larger cut at the end of this article, there is a representation of three furnaces. At the first, which is unoccupied, may be seen the little table at which the founder works, and the pot out of which he dips the heated metal with a very small ladle. At the second furnace the workman is shown at the moment after he has poured the metal into the mould. And at the third, the other workman is represented in the act of separating the two parts of the mould, and picking out the letter from the lower half, with the hook shown at the top edge of the other half.

Having made himself acquainted with the construction of the mould, and the mode by which the matrix is adjusted, the visitor proceeds into the foundry. His attention is naturally drawn to the extraordinary movement with which the founder performs the operation of casting. Having poured in the metal with his right hand, and returned the ladle to the melting-pot, he throws up his left hand, which holds the mould, above his head, with a sudden jerk, supporting it with his right hand. It is this movement which forces the metal into all the interstices of the matrix; and without the movement the metal, especially in the smaller types, would not reach the bottom of the mould, for it could not force out the air by its specific gravity alone. But the observer will be equally astonished by the precision, as well as the rapidity of the whole operation, of pouring in the metal, throwing up the mould, unclosing it, and removing the pressure of the spring, picking out the cast letter, closing the mould again, and re-applying the spring to be ready for repeating the whole act. All these operations do not occupy the eighth of a minute, for the average number of letters cast in an hour is five hundred. We should observe, that a considerable piece of metal remains attached to the end of the type when it is turned out of the mould; also, that the mould is so constructed that it forms what is called a nick, or nicks, on the lower edge of the letter, by which the printer at once sees the right way to place it without looking at the face.

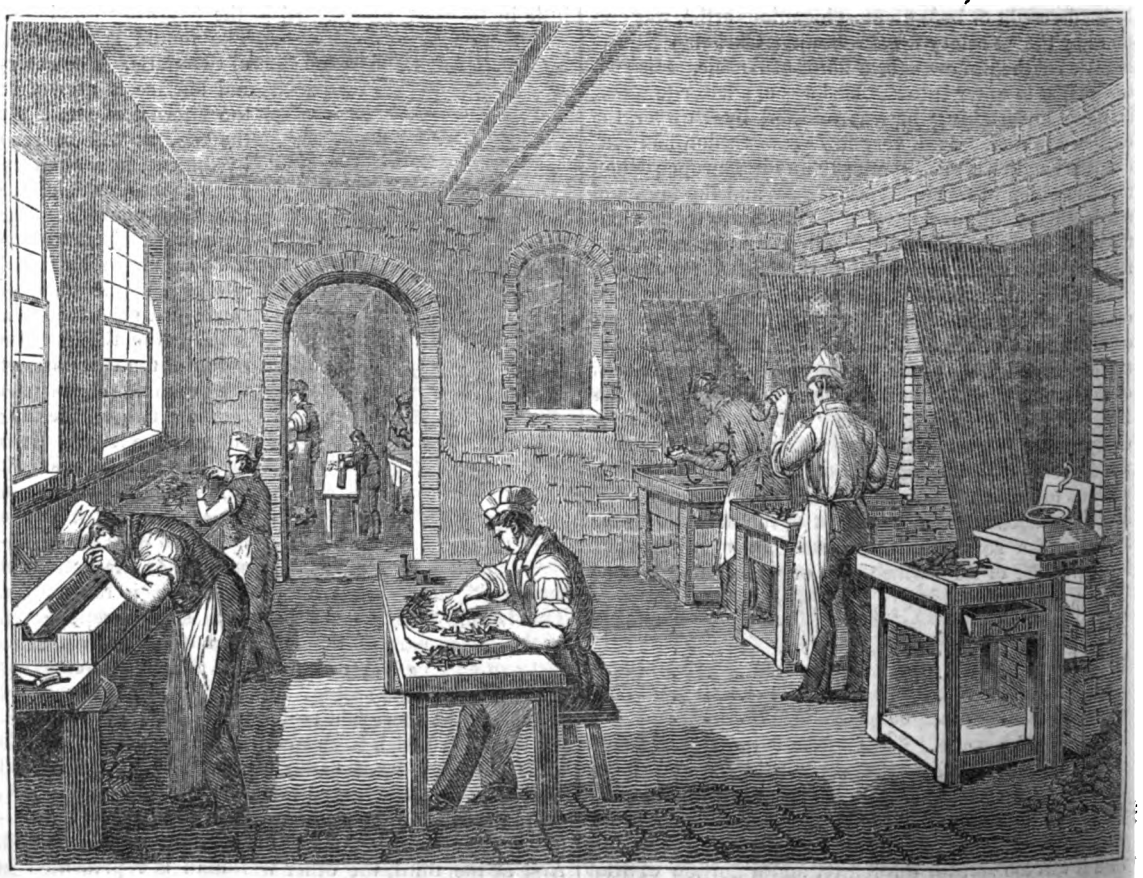
From the table of the caster the heap of types cast is from time to time removed by a boy to another table. It is his business to break off the superfluous metal; and this he does with such rapidity that the mode in which he operates can scarcely be followed by the eye. Some boys have been known to break off 5000 in an hour; the average number is 2000. This rapidity is the more remarkable, as the boy must seize the type, not upon the flat surface, but upon its edges, or he would otherwise break or bend it.

From the *breaking-off boy* the types are removed to the *rubber*. In the wood-cut this workman is represented seated in the centre. A round grit-stone is before him, upon which is a heap of types. The fore and middle fingers of his right hand are armed with a piece of tarred leather; and he passes each side (not the edges) of the type smartly over the stone, turning it, of course, in the movement. This, again, is an example of wonderful rapidity; 2000 types are thus rubbed in an hour.

From the rubber the heap is conveyed to a boy whose business is to set up the types in lines, in a long shallow frame. The face of each must be uppermost, and the nicks outward. The rate at which this boy works is the same as the rubber.

When the types are once set up in lines, they are never again deranged till they are given out to be used by the printer. The long frame, filled with a single line of type, is removed to the *dresser*. By the application of other frames, he is enabled to dress, or polish them, on each edge; and, turning them with the face downwards, to channel-cut with a plane a groove in the bottom, so that they will stand steadily. It will be at once understood how necessary it is that every letter should be perfectly square and true, when it is considered that if they were not of uniform height the impression could not be even; and that if there were the least deviation from a regular form, it would be quite impossible that, when 200,000 single letters are combined, as in one side of the 'Times' newspaper, they should hold together as they do, when wedged up, as securely as if that side were composed of one solid piece of metal.

Each letter being tied up in lines of convenient length, the proportionate numbers of each variety, small letters, points, capitals, small capitals, and figures, are selected; and the fount is ready for delivery to the printer.



[View of the Type-Foundry.]

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's-Inn Fields.
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