THE EVOLUTION OF HANDICRAFT.

The inventor has labored in all ages, but unfortunately he has not always left an enduring trace of his handiwork. In some of our museums attempts have been made to trace the history of tools from the time when the prehistoric denizens of caves waged war against the monsters of the glacial period; but such collections are almost invariably incomplete. Still, with the scant material that remains to us, we are enabled to form an excellent idea of the manners and customs of peoples whose race has entirely vanished.

One of the oldest implements, of which we have any record, is the stone celt, which is found in nearly all parts of the world where prehistoric remains have been discovered. The celt, Fig. 1, is an ax with a chisel edge, usually used without a handle. There are many varieties of celts, from the rough neolithic celt, simply pecked into shape, to magnificent examples beautifully shaped and highly polished, of a later time. Fig. 2 shows a mould for the casting of bronze implements. This remarkable mould was found in the third or burnt city of Troy by Dr. Schliemann, so that its date is problematical. The mould, which was made of mica-schist, resembles the moulding flask of to-day as regards economy of space. The metal was simply poured into the furrows and the mould was then covered with a flat stone to cool. The bronze hatchet, which we illustrate in Fig. 3, was in use among many of the peoples of antiquity, and is particularly interesting on account of the ear which was used to hold the head firmly on a projection of the handle, at right angles to the body of the handle, by means of cord. Fig. 4 is an Assyrian bronze knife. The design is copied from the old flint flake knives.

The transition from Assyria to Egypt is gradual, but once on Egyptian soil, we are in the presence of a hoary civilization which has been the wonder and the admiration of the world. In Figs. 5 and 6 we have representations of a cabinet maker and one of his tools. The grotesque little figure engaged in chair making is taken directly from a tomb painting, while an example of the bow drill is preserved in the British Museum. This handy tool was much used by the Egyptians and modern invention has not as yet superseded it for certain classes of work. In agricultural implements the advance is not as well marked, as shown by the hoe illustrated in Fig. 7, where the blades and handles are simply inserted the one into the other and bound together with a twisted rope. The fittings of the Egyptian houses were very remarkable. The doors consisted of either one or two valves, and turned on pins of bronze as illustrated in Fig. 10, which shows the lower pin of the door.

The Romans brought the same inventiveness and perfection of handicraft to bear upon the fabrication of the smaller objects of manufacture that they exhibited in their vast engineering works. The water works of the Romans are deservedly celebrated, and the system by which the water was conducted through the aqueduct into the fountains of the private houses showed the highest knowledge of hydraulic engineering, and a familiarity with plumbing that would reflect credit upon a metropolitan sanitary plumber. From the reservoirs the water was conducted to the houses by means of clay or lead pipes. Bronze pipes were used where the hydraulic pressure might have burst leaden pipes. The lead pipe was usually made by folding up a sheet of cast lead and soldering it. Fig. 13 shows a main, dug up in Rome, with two service branch pipes inscribed with the name of Severus (192 A. D.) The inscriptions on the pipes are a very valuable source of information, as various facts are recorded on them, as the name of the emperor, the owner of the house, the plumber, the capacity of the tubes, the date of the pipe, etc. Fig. 9 shows a bronze service cock beautifully finished.

In the matter of tools and household utensils the same perfection of finish obtains as in the plane, Fig. 11, the steelyard, Fig. 12, and the highly ornate brazier shown in Fig. 14, all in the museum of Naples, and as they came from Pompeii, of course date back to 79 A. D. The steelyard is proved for the year 77 A. D. by the regularly appointed sealer. The brazier is really an elegant piece of art metal work, and something modeled upon this pattern might well be introduced into those countries where chimneys and fireplaces are not in general use, instead of the cheerless charcoal brazier of the ordinary pattern. This brazier is 14 inches square, exclusive of the semicircular projection, which is made hollow to receive water. On the top of this water back are three eagles, intended probably to support some cooking utensil. Water is drawn off from the ornamental mask in the round tower, which has a movable lid.

The hydraulic organ shown in Fig. 15 is credited to Ctesibus, of Alexandria, 150 B. C., and betrays Greek influence. The windmill actuated the piston which took the place of the bellows. The keys simply uncovered the bottom of the tubes and permitted the air to reach the pipes.

From this point we will jump to the middle ages and see what our more immediate forefathers were engaged in, and incidentally examine a couple of objects which show the tardy development of inventiveness, as in the modern plow of Castile, Fig. 8, and the African pole lathe, Fig. 16, still in use among the Kabyles of Africa. A reciprocating motion is imparted to the spindle by the cord; when the bowl or other article is rotated toward the operator the cutting tool is applied; the tool is then removed, the foot is raised and the elasticity of the sapling rotates the spindle in the opposite direction, and the operation is repeated until the object is turned. Lathes of this kind are in use in various parts of the world, and in our own country they were a feature of the backwoods until a few years ago, and even now some isolated examples might be found in some of the rural districts.

In the Catalan forge or furnace we have some of the methods of modern metallurgy foreshadowed. The process is now practically obsolete, though forges of this type are still to be seen in the Pyrenees, where the ore is rich and fuel plenty. The blast for reducing the ore is produced by a stream of water, which carries the air down with it into a chamber where the air and water separate, the water running out of the cistern while the air rushes through the sheet copper tweer on the metal and fuel in the bottom of the furnace, which is formed of refractory stone. The fall of water is usually twenty-five feet, and no chimney is needed. The blast is continuous, but the air is saturated with moisture. This arrangement is called a trompe.

Fig. 18 shows the development in apparatus for putting out fires, which is only a modification of the "squirt" or syringe which was used in the times of the Romans. This interesting apparatus dates from 1568, and is taken from Besson's "Theater." The water was poured into the funnel by means of pails. When the body of the syringe was full the valve was closed, cutting off the funnel; the crank was then turned and a barrel of water was projected through the nozzle with considerable force. The time required to fill the body of the syringe was not excessive, as the water could be poured in while the piston was being run back. The method of adjustment was extremely crude, the half circle with holes for bolts being used. When a lateral change was necessary, the whole apparatus had to be moved. Although the invention now appears to us to be a very poor affair, the efficiency of such a fire apparatus must have been great at a time when nearly all buildings were semi-fire-proof. Fig. 19 shows a medieval "ladye" at her loom, and is from Erasmus' book, the "Praise of Folly." The arrangement could not well be more primitive. Figs. 20 and 21 show artisans plying the trades of carpentry and lantern making. The period of the lantern maker is 1568, while the carpenter group is fifty years older. This illustration shows the tools in ordinary use in carpenter work at that period.

Figs. 22, 23, 24, illustrating the allied trades in 1564, are reproduced in fac-simile from a rare German work, usually called Jost Amman's Book of Trades, but the correct title is Hans Sachs' "Correct Description of All Arts, Ranks and Trades." Hans Sachs was the famous cobbler-poet immortalized by Wagner in his opera, "Der Meistersinger von Nurnberg." We owe a great deal of our information in regard to the arts of the middle ages to the quaint old cuts in this charming work. Paper making is of course the first step to book making, and in Fig. 22 we are introduced into a paper mill of considerable size, to judge by the water wheels which set in motion primitive pulp beaters. The paper maker is just dipping out the pulp to form into sheets; the powerful screw press in the background finished the paper and corresponds to our calendering rolls. In Fig. 23 we have an interior view of a printing office at the same period. In the alcove near the window, where the light was good, two compositors are shown working from the cases.

In the foreground is seen a powerful screw press; one of the men is inking the form, another taking off the printed page. In the Plantin-Moretus Museum, in Antwerp, we have a veritable printer's paradise, for the old presses are left in the same position that they occupied two hundred years ago. In Fig. 24 we have the bookbindery in which the books, printed in the printing office shown in the preceding cut, are bound. In the foreground is the forwarder, with leather apron, trimming the edges of the book with a plow. The remainder of the tools are disposed in various parts of the room; the rolls particularly have not changed, except as regards the pattern engraved on them, and even now the best finishing tools are patterned after the old. Bookbinding is one of the few arts which has made little, if any, progress in the last two hundred and fifty years. The sewing frame in the rear is almost the same as may be found in use to-day.

Whatever elation we may have in looking back at the primitive condition of the arts or manufactures of past ages, the pride that we feel in the great wisdom and achievements of our own time should be tempered, perhaps, by the remembrance of the large number of so-called "lost arts." The fire engine and the loom and organ seem to us to be distinctly modern, but here we find that they have been known for centuries. In spite of all the knowledge of modern science and with the benefit of the wisdom of past ages to aid us, how many are the lost arts that modern invention has been unable to rehabilitate.

Kamela.

Kamela, or kamala, as it is written in the British Pharmacopœia, is at one and the same time a drug and a dye, and in the latter capacity it has never had practical justice done to its merits, although many writers have praised the shade and durability of the colors it gives on silk. The dyestuff is a powder, lying as a bloom on the outside of the fruits of the Mallotus Philippinensis, known also as the Rottlera tinctoria. This is a small evergreen tree, found throughout tropical India, and known to the Anglo-Indian as the monkey-faced tree. It is said also that the roots of the plant yield a red dye, but this seems to be rarely used nowadays. It is thought that the introduction of annatto displaced kamela, for, although inferior to kamela in many respects, annatto is a simpler and cheaper dye. Still there is no doubt that kamela has been neglected in every way. A demand for it would insure a constant supply, and if hitherto the price has been high, it is because of the improvident methods of gathering the crop practiced by the natives, and also because outside the districts in which it is grown there is an inadequate inquiry for it. The tree is wild, and apparently nowhere cultivated; the powder is obtainable in any local bazar, and within easy reach of the chief seaports. If a demand were to arise, the supply might be almost indefinitely increased, without, for many years to come, necessitating cultivation. It is quite customary to find, in sub-tropical forests, miles of country with here and there trees each bearing a mass of over-ripe powdery capsules, the kamela from which is simply being allowed to run to waste.

The powder seems to vary greatly in price in the various districts of India. Lisboa remarks: "If the berries be plucked too early, this dust is mixed with another sort, of a greenish tint, which destroys the value of the article, and, if not plucked at the right time, the dust will all disappear, being blown away by the wind, leaving the berries of a greenish-brown color and of no value. The article kamela finds a ready market, and is now worth 1s. 6d. a pound."

Kamela powder was first examined by the late Professor Anderson, of Glasgow University, and subsequently by E. G. Leube, Jr. The opinions originally published by these chemists have been reproduced in all subsequent medical works which have appeared in Europe, America, and India, without apparently any additional information being brought to light. The powder is said to be aromatic, is but slowly wetted by water, and yields but little color even to boiling water, coloring it pale yellow. In the presence of alkaline carbonates and caustic alkalies, especially the latter, it forms deep red solutions. The extract prepared with soda imparts to silk a fine and durable fiery orange color without further addition or the use of mordants; with cotton, on the other hand, it does not produce a good color. The natural dyestuff contains 3·49 per cent water, 78·19 resinous coloring matters, 7·34 albuminous substances, 7·14 cellulose, and 3·84 ash, besides small quantities of volatile oil and a volatile coloring matter. The liquid distilled from the alcoholic extract has a yellow color and the odor of the original substance. The concentrated ethereal extract of the coloring matter deposits a yellow crystalline substance called rottlerin. The extract, prepared with boiling alcohol, deposits, on cooling, non-crystalline flecks of a substance having the composition of $C_{20}H_{34}O_4$. It may be obtained nearly colorless, by repeated solution and separation; it is sparingly soluble in ether and in cold alcohol, insoluble in water; not precipitated by lead or silver salts. The alcoholic solution separated from these flecks leaves a dark red resin, $C_{30}H_{30}O_7$, soluble in all proportions in alcohol and ether, insoluble in water, melting at 100°, and forming with acetate of lead a deep orange colored precipitate of variable composition.

The brief account of the chemistry of this substance given above, which we derive from the Dyer and Calico Printer, expresses the rationale of its use as a dye. The ripe fruits are collected by the people, placed in a cloth or sack, and beaten until the glandular pubescence is removed from the exterior of the fruits. The powder thus obtained is then sifted to free it from the fruits and broken pieces, and in this condition it is ready for the market. McCann says: "The powder is only very sparingly soluble in either hot or cold water, but is completely dissolved in alkaline liquids, forming a dark red solution. The resinous yellow coloring matter may be separated from this red solution either by neutralizing with an acid or else by mere exposure to the air. In Bengal the red powder is dissolved by the addition of a solution of various alkaline ashes obtained by burning plants, and the development of the yellow coloring principle is in no case brought about by the addition of acids, but merely by allowing the cloth steeped in the red liquid to dry by exposure to the air. It is said not to require a mordant, but frequently alum is added for that purpose. The color is sometimes heightened by the addition of turmeric."

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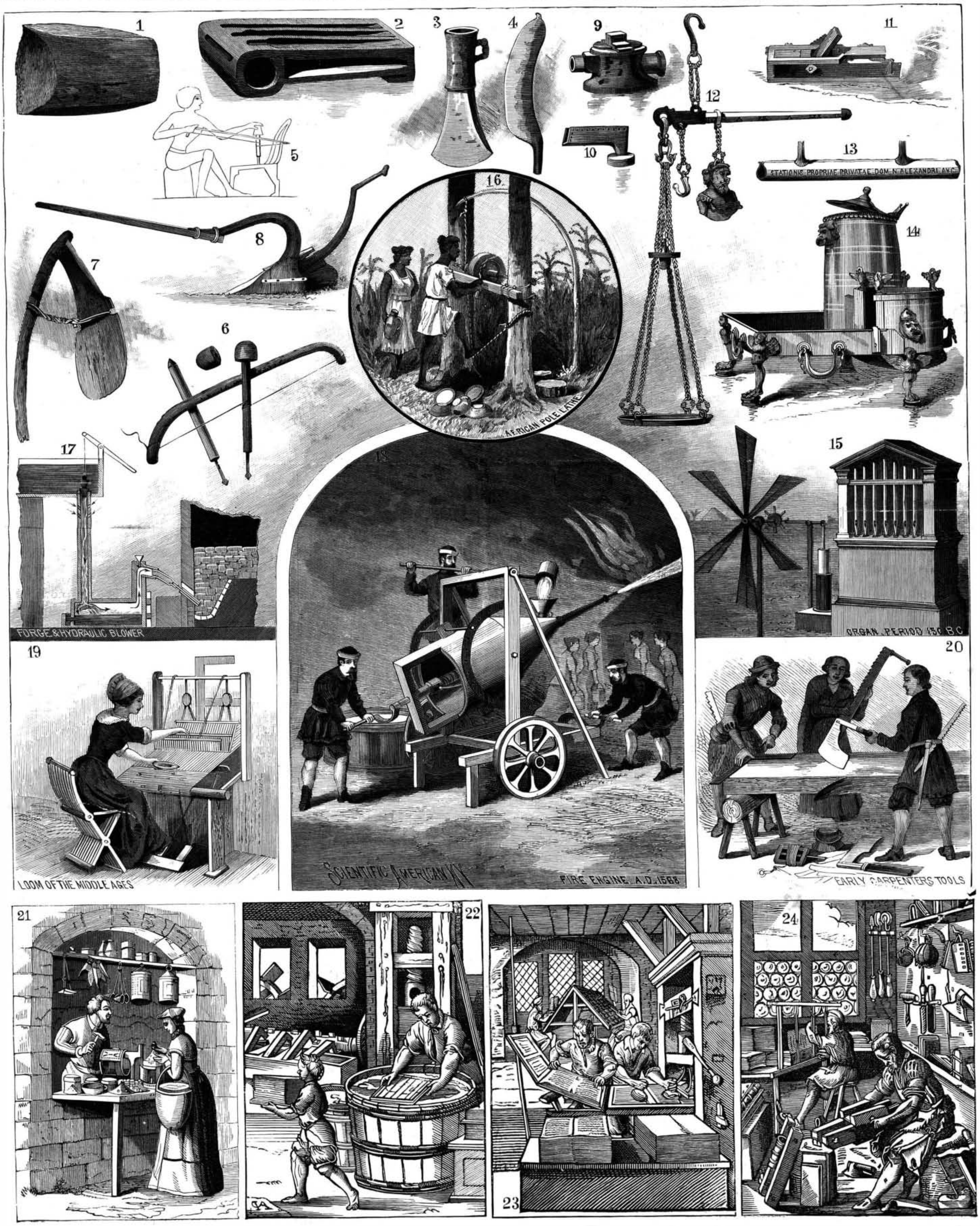

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