SPONS' ENCYCLOPÆDIA

OF THE

INDUSTRIAL ARTS, MANUFACTURES,

AND

COMMERCIAL PRODUCTS.

DIVISION III.

EDITED BY

CHARLES G. WARNFORD LOCK.

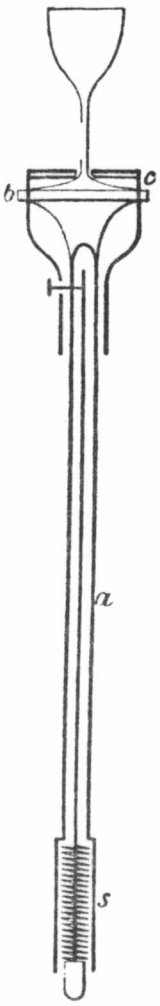
CONTENTS:

COTTON MANUFACTURES (*continued*), DISINFECTANTS, DRUGS, DYEING AND CALICO-PRINTING, DYESTUFFS, ELECTRO-METALLURGY, EXPLOSIVES, FEATHERS, FIBROUS SUBSTANCES, FLOOR-CLOTH, FOOD PRESERVATION, FRUIT, FUR, GAS [COAL], GEMS, GLASS, GRAPHITE, HAIR, HAIR MANUFACTURES, HATS, HONEY, HOPS, HORN, ICE, INDIA-RUBBER MANUFACTURES.

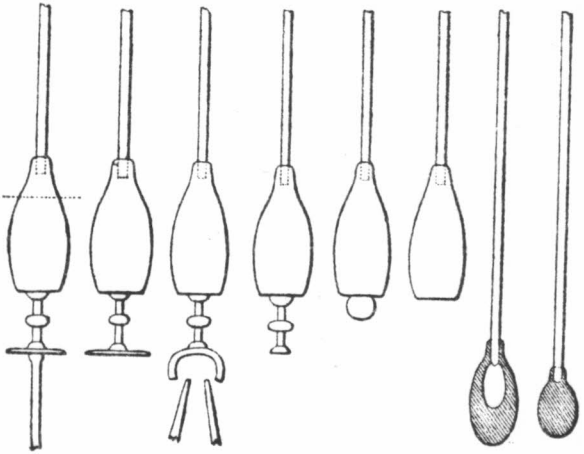
LONDON:
E. & F. N. SPON, 16, CHARING CROSS.
NEW YORK: 446, BROOME STREET.
1881.

is gathered at the end of a working-rod, and is rolled to an even thickness upon the marver. It is now lengthened by holding the rod with the glass downwards, and by pulling the free end with a pair of pincers. When the mass is sufficiently long, the free end is made to adhere to the side of the jug, and the other end is severed from the iron by the shears. The end which now remains free is seized by the pincers, bent round, and made to adhere to another point on the side of the jug,

776.



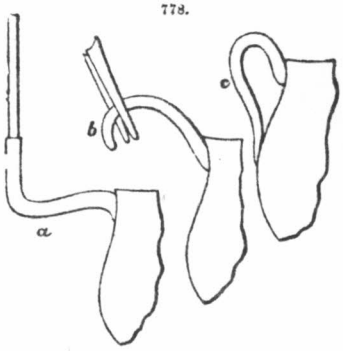
777.



below, but in the same line with, the first junction. If it be wished to form a compartment for ice, in the inside of the body of a jug or decanter, the body must be blown in the usual way, and, whilst it is still attached to the blow-pipe, a mass of molten glass must be dropped upon one side of it, and suction be applied to the mouth of the blow-pipe; by this means, the hot glass is drawn inwards, through the wall of the body of the decanter or jug, and the pressure of the external air forms the hot mass into an open bulb.

Fig. 779, *a b c d e f*, illustrates the formation of long flower-vases. A sufficient weight of glass is gathered and rolled. An indentation is made in order to form a knob, and the mass is expanded as shown at *c*. By swinging the bulb with the knob downwards, the bulb becomes greatly elongated. A working-rod is attached to the knob, and the other end is severed from the blow-pipe. The rough edge is sheared, and the open mouth is formed by rotation.

778.

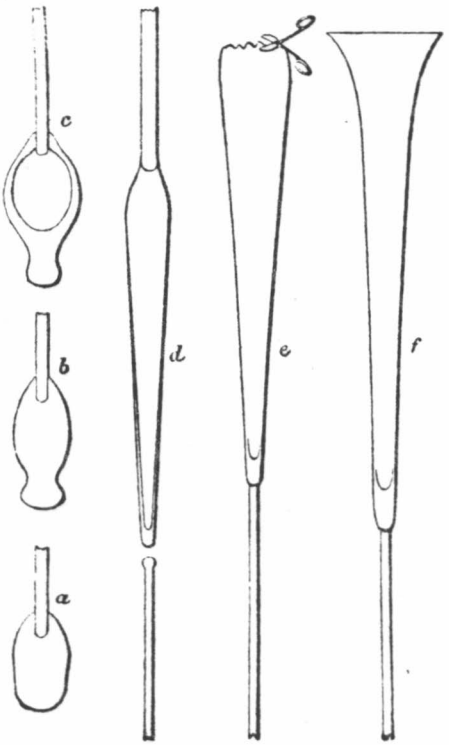


The manufacture of tubes and solid canes of glass depends upon the almost unlimited ductility of glass in the intermediate condition between liquidity and solidity. In making cane, a mass of glass is gathered, and rolled upon the marver. A flat disc of glass, adhering to a working-rod, is fixed to the end of the mass opposite to the attachment of the blow-pipe. The workman retains his blow-pipe in his hands, and an assistant holds the working-rod. The workman and assistant now separate, and recede from each other; the greater the distance is by which they are separated, the smaller will be the diameter, and the greater the length, of the glass which unites them. Tube is made in the same way as solid cane, with the difference that the mass of glass is blown into and expanded before it is extended. The stages of tube-drawing are illustrated in Figs. 780, 781: *a* is the solid mass of marvered glass; *b c*, the same expanded; *d*, the working-rod with disc of glass attached; *f g*, the process of drawing. The shape given to the mass of the glass, or to the hollow within the mass before extension, will be retained by the tube after extension. If the mass be flattened, a flat or oval tube will be formed; if moulded into a triangular form, the tube will be triangular; if the hollow mass be flattened, and then dipped into the crucible, and fresh glass gathered upon it, a round tube with a flattened bore will be produced. These facts are taken advantage of in making tubes for thermometers. A flattened bore makes the mercury more visible,

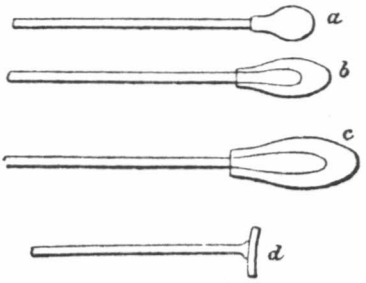
and an angle in front of the bore magnifies it. Thermometer-tube backed with enamel is thus formed:—A mass of glass is gathered, blown hollow, and flattened by pressure; upon one side of the flattened mass, a thin cake of hot enamel is carefully spread and fixed; the mass with the enamel attached is dipped into the crucible, and coated with glass; it is then marvered, moulded into any form, and finally drawn out in the same manner as ordinary tube.

Fig. 782 represents the process of making variegated cane or tube. A mass of molten glass attached to the blow-pipe is pressed into a circular open mould, around the inside of which, short

779.



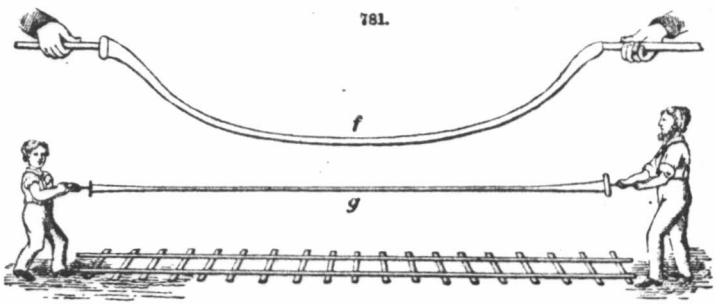
780.



lengths of coloured cane have been arranged. The mass is withdrawn with the canes adhering to its surface, and, after being rolled upon the marver to effect amalgamation, is drawn out in the usual manner. If short lengths of variegated cane be used in the above process, in the place of plain coloured cane, the section of the cane produced will bear some resemblance to a flower. Pretty effects may be obtained by incorporating minute sections of the "flower" cane in the bodies of decanters, or in the bowls of wine-glasses, and by surrounding them with engraved foliage.

The tube drawn for thermometers and barometers is cut into suitable lengths, and passed on to the lamp-worker, who inserts the mercury and seals the ends. The "lamp" is a combination of a gas-jet, an air-jet, and a foot-bellows, or of a gas-jet and a mouth blow-

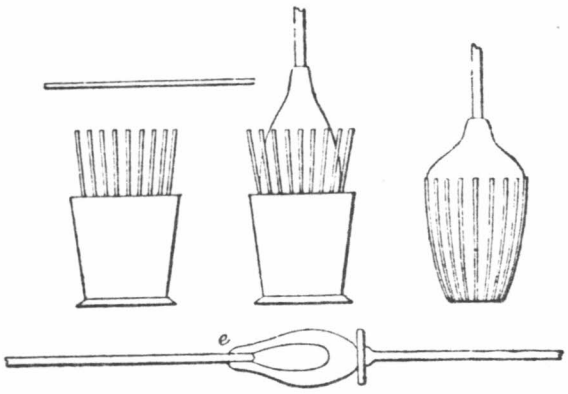
781.



pipe. Tube or cane is speedily rendered ductile by the intense heat of the blow-pipe flame, and can be readily manipulated. The lamp-worker prepares from tube some of the most delicate apparatus used in scientific research. A variety of goods for domestic and medical purposes, e. g. syringes, globule-bottles, vaccine-tubes, breast-glasses, &c., are made at the lamp from the same source. Cane is used in conjunction with tube in the manufacture of many useful and ornamental objects. Coloured canes are used to a considerable extent for imitating the decoration so common in Venetian vases. From cane, or in fact any solid glass, rendered ductile by the heat of the blow-pipe flame, a thread may be drawn out, which, if attached to a rapidly revolving wheel, may be indefinitely extended. In this way, spun glass is made. In order to render the thread more durable, it is annealed by heating the wheel upon which it is being wound. In Austria, spun glass has been pressed into

the service both of science and of decorative art; it is used in the laboratory for filtering acids, and appears in the drawing-room as a permanent substitute for silk and feathers. Some ornamental processes during manufacture are:—(1) Upon the surface of a vessel in course of manufacture, small drops or seals of molten coloured glass may be fixed, and may be pressed by moulds into the form of stars, gems, &c. (2) A small quantity of molten glass is gathered upon the end of a working-rod, and allowed to lengthen by the force of gravity; the free end is attached to some point on the body of a vessel in course of manufacture, and the vessel is rapidly rotated, thus a thread is evenly coiled around the vessel. A machine is now being used for causing the vessel attached to the blow-pipe to revolve more evenly and rapidly than can be effected by the unaided skill of the workman. (3) If, after the first gathering, the bulb of white glass be dipped into a crucible, containing coloured glass, a vessel may be formed with a coloured casing. In preparing coloured glasses for casing, great care must be taken that they shall neither be harder nor softer than the white metal, or the vessel formed is sure to crack. (4) If a bulb of molten glass be rolled upon variously coloured powdered glasses, flakes of mica, or leaves of gold, silver, or platinum, it will adhere to them, and, by continuous rolling, will amalgamate with them. Very beautiful effects of colour may be obtained in vessels made from glass prepared as described. (5) Iridescence, which is due to inequality of surface, may be produced by the action of an acid, or of the fumes of chloride of tin, upon the surface of glass. The glass, whilst hot, is subjected to the fumes of chloride of tin, during manufacture. Any acid process must take place after the glass is annealed and cold. To effect iridescence, weak solutions of hydrofluoric or hydrochloric acids may be used. In the latter case, the process takes place in heated air-tight vessels. (6) Glass vessels may be frosted by plunging them, whilst still red-hot, into cold water, and afterwards reheating them. (7) Etchings in gold-leaf may be introduced into the substance of a vessel in the following manner. The gold-leaf is floated on to a thin plate of glass, and etched. The plate of glass is heated, and a mass of molten glass is dropped upon the surface of the gold-leaf, and adheres to the thin plate of glass through the pores in the gold. The molten mass may be fashioned in the glass-house, or by the cutter.

782.



Cutting.—Annealed glass vessels may be subjected to a variety of processes after they have become cold. The mark of fracture left at the base of a blown-glass vessel by the working-iron, is removed by pressing it upon the edge of a swiftly-revolving stone wheel. After the inequality is removed, the roughness is polished away by substituting a wooden wheel for the stone one. Cutting and engraving are modified forms of the same process. The difference of effect lies in the greater depth of incision produced in cutting. In either process, lathes are used, in which the glass is pressed against the cutting-tools, instead of the cutting-tools being pressed against the glass. The cutting-tools are wheels revolving rapidly in a perpendicular plane. In cutting, the lathes are driven by steam, and the cutting-wheels are of considerable dimensions. The actual cutting is performed by iron wheels supplied from hoppers with sand and water. The incisions produced by iron wheels are smoothed by stone wheels supplied with water, and are polished by wooden wheels supplied with water and emery-powder, putty-powder, pumice, or rouge. For engraving, the lathes are usually worked by foot-treadles, and the wheels are of copper, and in some cases do not measure more than $\frac{1}{8}$ in. in diameter. In engraving, it is customary to leave the pattern rough, and the ground clear; this arrangement, however, may be reversed, by polishing the pattern with leaden wheels supplied with oil and rouge, and by previously roughening the ground. Specimens have lately appeared with polished patterns upon a clear ground, and the effect is decidedly pleasing.

Stoppering.—In stoppering a bottle, there are two processes: (1) The mouth of the bottle is opened to the required size by a steel cone revolving in a lathe; (2) the stopper is fixed in a wooden chuck, reduced to proper dimensions, and finally ground into the mouth of the bottle.

Roughening.—This may be produced by the recently invented sand-blast process, based upon the principle that if a stream of sand be made to fall through a vertical tube open to the air at the top, and the falling sand and air be received in a suitable closed vessel below, a jet or current of compressed air can be obtained. The entire surface of a vessel may thus be roughened, or, if parts are