

# **Universitäts- und Landesbibliothek Tirol**

## **A handbook of chemical manipulation**

**Williams, Charles Greville**

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Section XIII. Supports for Apparatus

## SECTION XIII.

## SUPPORTS FOR APPARATUS.

221. Almost all arrangements of apparatus involve the necessity of supports of some kind to keep the various parts in their proper places, or to prevent their disarrangement by slight concussions, or even the shaking unavoidable at times during experiments.

It frequently happens that the illustrations in chemical works either do not show the method of supporting the apparatus in the positions represented, or, which is more objectionable, give supports which appear intended merely to have a picturesque effect, and do not really afford a true idea of the practical methods adopted in laboratories to effect the required end.

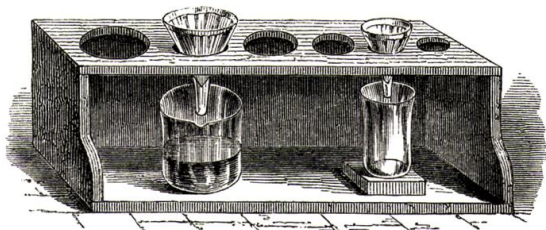
The various supports required differ more in size and appearance than in principle, and but little ingenuity has been expended by chemists upon them, yet there are few subjects that would better repay the time and trouble employed than the invention of some really good, cheap, and strong supports, adapted for the complicated and fragile systems of apparatus which are frequently unavoidable in the present state of chemistry, and will probably become still more in requisition until the science has become so improved as to enable us to procure combinations and decompositions by simple and direct methods.

222. Few things have a more beautiful appearance than a complex system of chemical apparatus well put together; and, moreover, success in very many instances is due to the skill with which this is effected. And when it is known that much depends upon a judicious selection of supports, it will be seen that any instructions calculated to guide the student or operator in his choice will not be an unprofitable subject to which to devote a few pages.

223. *Supports for filtration.*—These are of the simplest kind, such as the filtering-stand (fig. 123), which should find its place

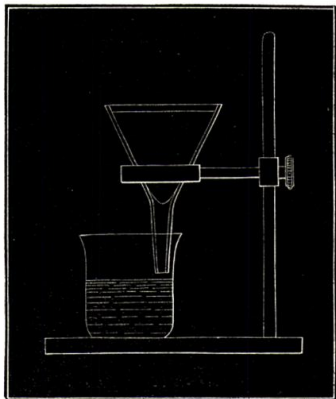
in every laboratory. Care must be taken in deciding upon the

Fig. 123.



proper place for this useful article. It should be in a spot free from dust, sufficiently near the operator's place for working, and yet not so close as to occupy otherwise valuable space. It should be strictly kept for the purpose intended, and ought never to be made use of as a depository for flasks and retorts, as its peculiar shape is liable to cause this to take place: those instruments must have a place specially appropriated to them. The mode of using the filtering-stand is evident from inspection of the figure, and need not therefore be described. A few blocks of wood of different thicknesses form a useful adjunct to it, and should therefore be provided.

Fig. 124.



224. Retort-stands are extremely useful for this purpose, but it is scarcely judicious to appropriate them to it, as they are required for so many other operations; but the small wooden filter-stands (fig. 124) made upon the same principle, are cheap, and should be provided in quantity; the laboratory should possess a considerable number of them.

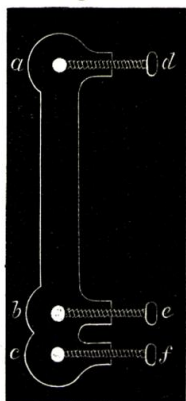
225. The porcelain and glass filter-holders (fig. 121) are some-

times extremely convenient, and when supported on the ring of a retort-stand, care should be taken that the point of the filter touches the edge of the glass or basin, in order to ensure the running of the fluid into them without splashing.

226. *Supports for pulverization.*—These are few, and consist chiefly of a large wooden block intended to support the iron mortar, and an equally large one of a different shape for the anvil.

227. *Supports for thermometers.*—Most chemical thermometers have a ring formed at the top, intended to facilitate suspension in liquids, but they (the rings) are seldom used, it being more convenient in general to support them by means of a perforated cork fitting into one of the rings of a retort-stand. I am in the habit of using the apparatus, fig. 125, for supporting thermometers in baths or other situations where they may be required. I construct the screws with the aid of a screw-cutter\*; it consists of a wooden arm, *a b c*, intended to support two thermometers. The aperture at *a* serves to allow of the instrument being attached to a retort-stand, the screw, *d*, enabling the operator to fix it at any height. The apertures, *b* and *c*, contain perforated corks, through which pass the thermometers; they may be secured in any required position by means of the screws, *e* and *f*.

Fig. 125.



228. The wire triangle, fig. 126, is easily made, and is much used to support platinum and porcelain crucibles, it being generally laid on the ring of a retort-stand, or immediately on the chimney of the lamp.

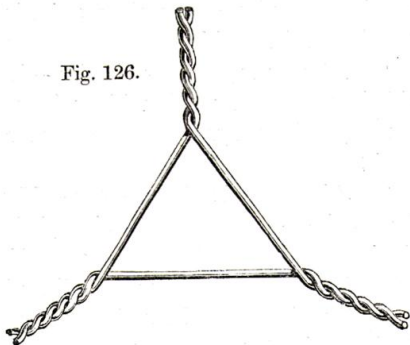
229. When it is wished to cool a platinum crucible rapidly, it is best effected by placing it upon the anvil or any other large clean iron surface (§§ 84 and 108); it need scarcely be said that

\* This instrument will be described in the section on Miscellaneous Operations.

hot porcelain or clay crucibles would be fractured by cooling them in the same manner. Clay crucibles may very conveniently be supported on the table, by interposing pieces of brick between them and the wood.

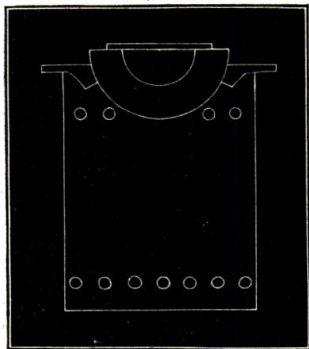
230. A retort-stand is also a convenient support for hot crucibles, or a piece of coarse wire trellis lying on the top of a glass or other convenient vessel may be used.

Fig. 126.



231. *Supports for evaporation.*—The appliances for this purpose are very similar to those used in distillation, &c., but vary in some cases. Few supports are more convenient than the sand- or water-bath during evaporation, and the methods of supporting these have already been described in treating of the instruments themselves. The tripod-stands, (§ 236) and especially the lamp-furnaces, figs. 28, 29 and 127, are greatly used in evaporations on the small scale.

Fig. 127.



232. *Supports for ebullition, distillation and sublimation.*—So many different kinds of supports are used in various ways during the performance of these operations, that the instruments themselves will be described, and the application of them must be left to the judgment of the operator.

The table-support, fig. 128, is an exceedingly valuable piece of apparatus, and is applicable in a very great number of operations: *a* is a flat table fixed on a rod, *b*; it slides up and down a hollow



support, *c*, and is capable of being arrested at any height by the screw, *d*. This portion of the apparatus is much used for supporting lamps at different heights during distillations, and many other processes. The part *f* is a support for flasks and dishes, which rest upon the three pegs; it is likewise fixable at any height in the tube, *c*, as is also the crook, *e*, which is of great service in supporting necks of retorts and long tubes in distillations and reduction operations, as in fig. 129. Sefström's holder is convenient in distillation, especially for heavy retorts, and to hold a Liebig's condenser, for which its considerable strength renders it particularly applicable. It is seen performing this office in fig. 130.

Fig. 128.

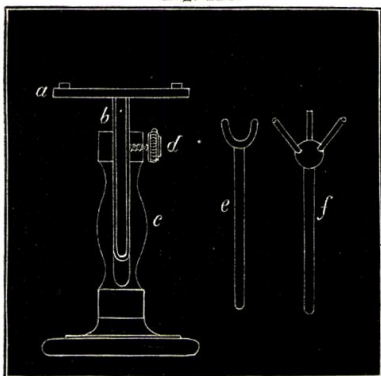
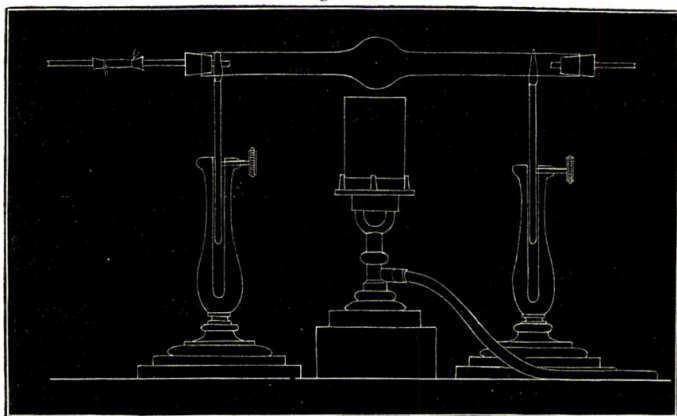


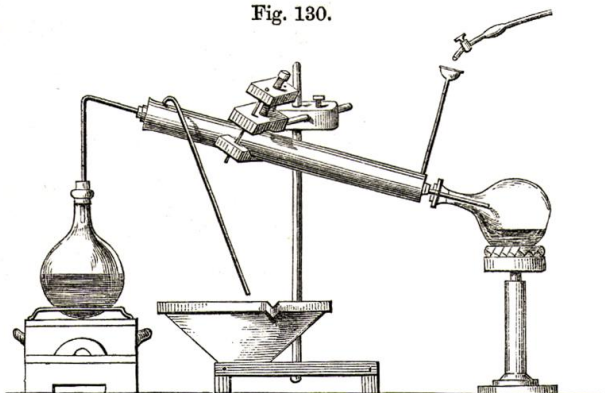
Fig. 129.



It will be unnecessary to dwell upon the method of its con-

struction, as it is rather troublesome to make, and can be easily procured from the dealers in chemical instruments.

Fig. 130.



233. A still more generally useful instrument is the wooden  
Fig. 131.



vice, fig. 131: *a* is a rod turned to fit the hole, *k*, of the block, *i*, fig. 132, which moves up and down the rod, *f*, and is fixable at any point by means of the screw, *g*. The vice is jointed at *b*, and is opened or shut by the motion of the screw, *c*, which, strictly, is only capable of shutting it; but a spring, *e*, forces it open when the screw is turned in the proper direction. The part *d* is made slightly arched, to enable the vice to grip round substances, as the necks of retorts, test-tubes, &c.

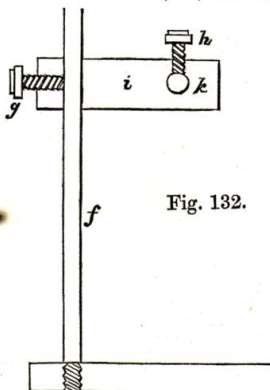


Fig. 132.

The instrument is particularly applicable to the support of small retorts during distillations, and in fact is constantly useful where vessels have to be supported at varying heights.

234. A retort-stand fit for many purposes is easily made out of a few pieces of wood and wire. The common form, however, is that shown in fig. 133. The rod, *d*, should be tolerably stout, and fit into a heavy loaded foot, *f*.

Fig. 133.

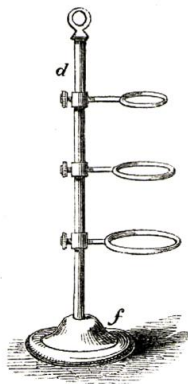
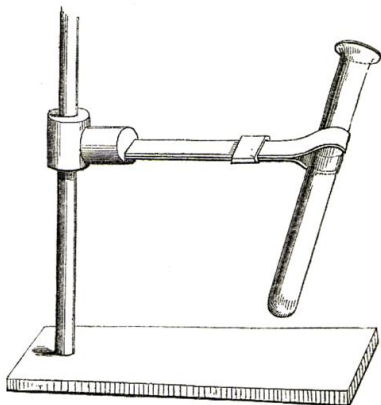


Fig. 134.



Distillatory apparatus, constructed of test-tubes, may very conveniently be supported by means of the tin test-tube holder, fig. 134. There it is seen that steadiness is obtained by means of the friction of a perforated cork enclosed in a tin cylinder, and sliding upon the rod; while the support for the tube is made to grip by slipping the piece of tin along the clasp. This is a cheap and useful piece of apparatus, and may be constructed with ease out of pieces of tin and a few corks.

235. A superior kind of retort-stand is often used, the rings of which are moveable and capable of being fixed by dropping into square sockets in the parts which slide upon the rod; it is advisable to have several pieces of apparatus so made as to be capable of dropping into the sockets, such as a screw clamp (fig. 131), a Plantamour's ebullition funnel, and a crucible jacket.

236. Flasks are conveniently supported, while fluids are boiled in them, by means of a tripod, as in fig. 135.

237. Mr. Griffin, to whom the chemical public is indebted



for the introduction, from the Continent, of an immense number of instruments, until then almost unknown in England, has described a vertical clamp well adapted for the support of small tube retorts, and several other pieces of apparatus.

238. I have often made vertical supports of the form of fig. 136, with the aid of the tools described in the section upon Miscellaneous Operations. Two slips of wood, preferably of a hard and springy kind, are screwed to a small block, *c*, which keeps them apart, and thus forms the spring. A screw, *d e*, is made upon a rod (by means of a screw-cutter); it is fixed at *d* by means of a pin, and passes loosely through the other slip. A female screw is cut in a block of wood, *e*, which has two projecting pieces to assist in turning it. On screwing up the block, *e*, against the slip, *b*, the two are brought into contact. The instrument to be supported is held between two pieces of cork glued on at *a* and *b*. The whole is then cemented into a mortise in the foot, *f*, which is loaded with lead.

Lamp-furnaces are also very convenient for supporting retorts, &c. in small distillations: they have already been described (§§ 42 and 231).

239. *Supports for burettes.*—These valuable instruments are supported in a vertical position, by means of a socket made in a block of wood. Binks' alkalimeter, which is far better and less

Fig. 135.

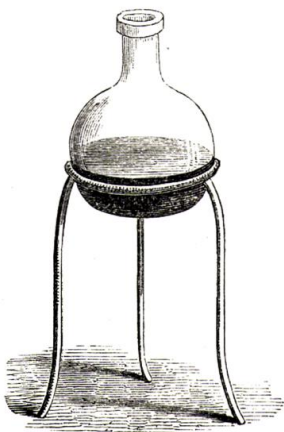
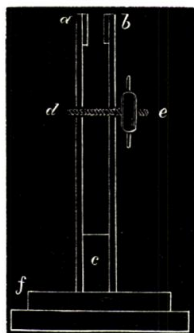


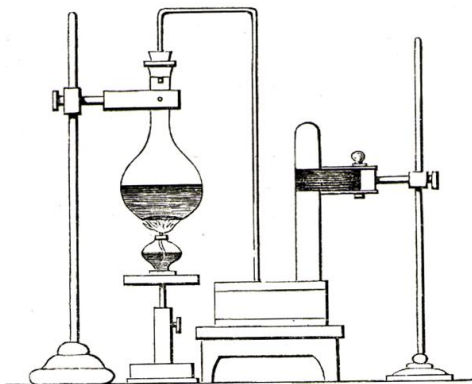
Fig. 136.



fragile than Guy-Lussac's, is, from its simple form, capable of being supported by a circular tube of wood with a foot.

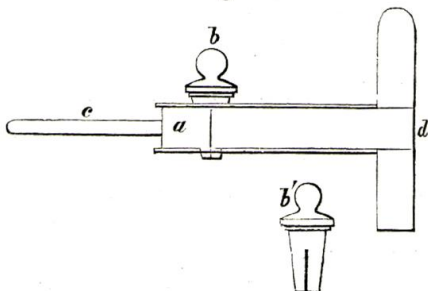
240. *Supports for gas apparatus.*—The apparatus used in manipulations connected with gases, is generally somewhat more complex than the other kinds; and not unfrequently several supports of different kinds are required in one arrangement, as in fig. 137, in which the operation of collecting a gas over mercury

Fig. 137.



is represented, and where, from the weight of metal, it is necessary to have the supports of considerable strength. The gas jar

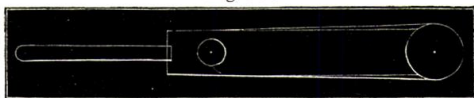
Fig. 138.



is held by one of Gahn's cylinder-holders, an excellent contrivance, the structure of which is seen by reference to fig. 138.

A block of wood, *a*, having a rod, *c*, to enable it to slide in a hole formed in a block, as at *k*, fig. 132, has a slit cut in it to enable a broad silk ribbon, *d*, to pass through, which is then fastened by one end to a slit in the conical plug, *b*, which is represented again at *b'*, to show the position of the slit; the other end of the ribbon passes round the end of the block, and is fastened to the other side. The manner in which this is done is observable from fig. 139, where it is seen from above. By twist-

Fig. 139.



ing the plug, the ribbon is tightened round the cylinder, and the conical form of the plug enables it to be fixed by a slight pressure downwards after the ribbon is tightened.

241. The flask in fig. 137 is secured by a clip, and the lamp is seen to be supported by the table, fig. 128.

The rod on which the Gahn's holder is fixed, is sometimes clamped to the edge of the mercurial or pneumatic trough.

242. In gas experiments, as in many others, wooden blocks are often of great service for raising and lowering apparatus to different heights; they should be about 4 or 5 inches square, and may vary from half an inch to 2 inches in thickness.

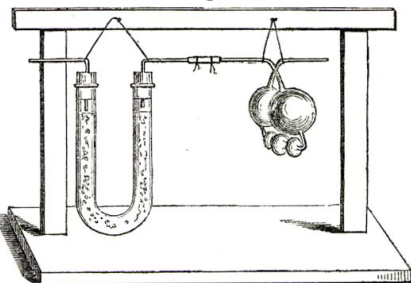
243. U-shaped chloride-of-calcium tubes are generally tied by string to a wooden support, but preferable methods will be found in the Appendix.

244. The U-shaped desiccating tubes, with a conducting tube at bottom, much used lately for drying gases, by passing them over fragments of pumice moistened with sulphuric acid, are conveniently supported against a board by means of wires passing through the wood and round the tube, a piece of vulcanized caoutchouc intervening.

245. The apparatus used in experiments on the solution of bodies requires no special supports, the appliances already mentioned being capable of meeting all ordinary cases.

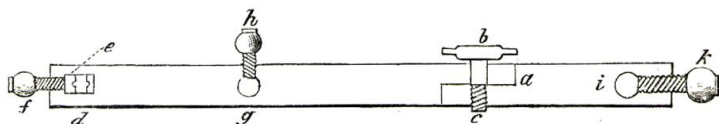
246. An exceedingly useful support for U-tubes, and many other kinds of apparatus, is represented in fig. 140. It merely consists of a frame-work of wood, to which the U-tubes are suspended by strings attached to nails or pegs.

Fig. 140.



247. *Support for thermometer and vapour-flask.*—In taking the densities of vapours, I have sometimes constructed the arm for supporting the thermometer and vapour-flask (see § 131) of the form of fig. 141. No difficulty will be found in making it. It is represented turned sideways, to show the position of the screws, &c. It is jointed at *a*, to allow of its being raised or depressed

Fig. 141.



to any angle, and may be fixed tight in its position by the screw, *b c*, which passes smoothly through at the upper side, and has the screw cut upon its lower portion. A square hole is mortised at *d*, containing two pieces of cork, one of which, *e*, is moveable, and serves, by turning the screw, *f*, to fix the thermometer. The rod supporting the cage which holds the vapour-flask passes through the aperture, *g*, and is held in the desired position by means of the screw, *h*. The hole, *i*, enables the arm to slide upon a retort-stand, and it may be arrested by the screw, *k*, at the proper height.