Dec. 29, 1931. C. W. HANSEL 1,838,394

CONSTRUCTION OF PHILOSOPHICAL APPARATUS AND MODELS

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Fig. 1.

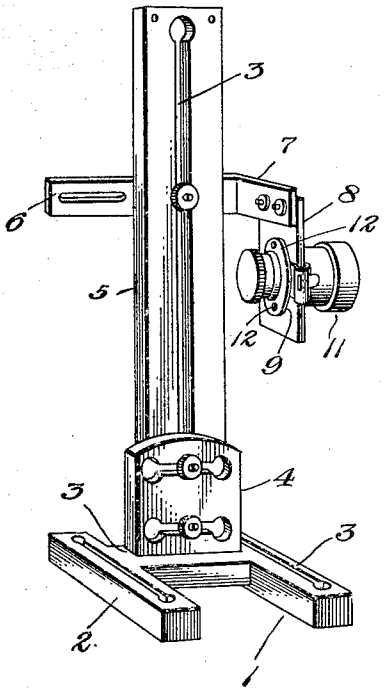
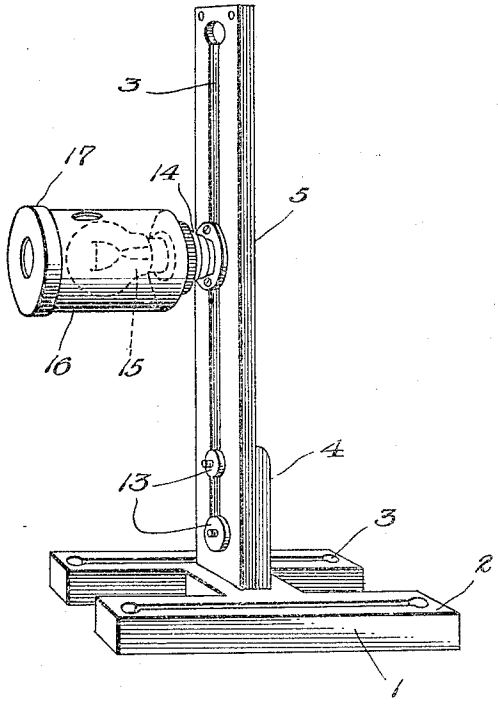


Fig. 2.



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Fig 4.

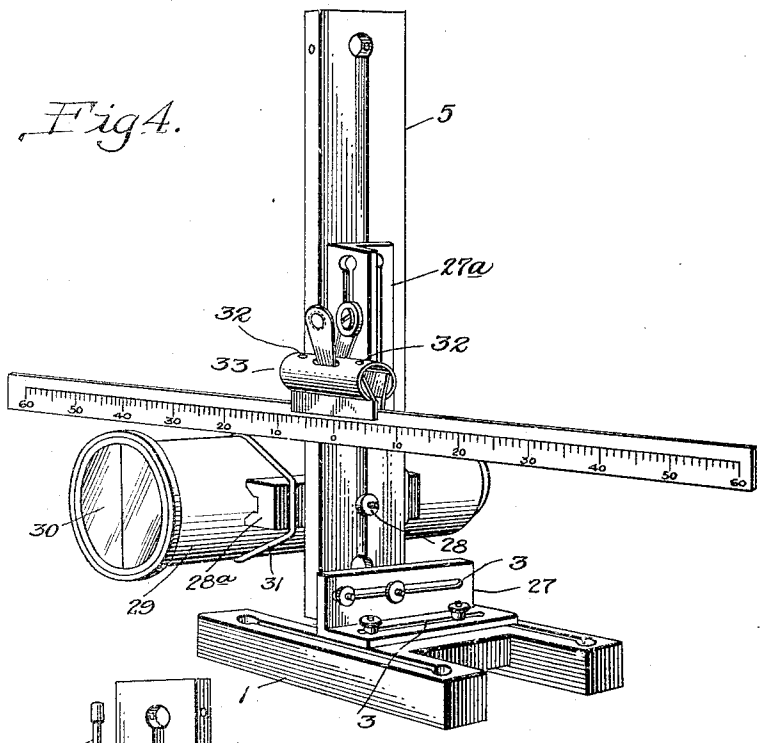
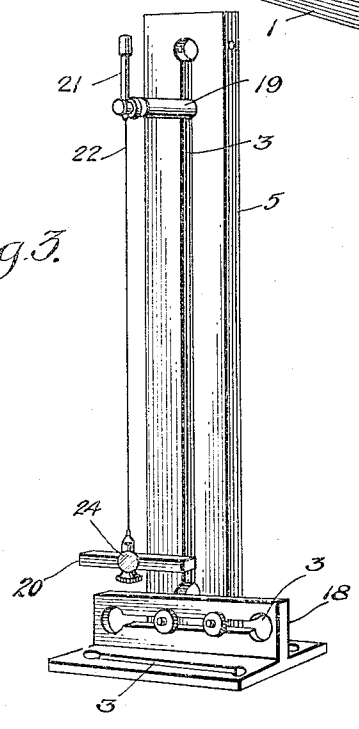


Fig 3.



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UNITED STATES PATENT OFFICE

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CONSTRUCTION OF PHILOSOPHICAL APPARATUS AND MODELS

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In carrying out experimental work it is desirable and in many cases essential, that the apparatus employed for this purpose should be capable of easy and effective adjustment. It is also necessary that parts of the apparatus shall be fixed or supported in definite positions, and for this purpose stands, clamps, brackets, and other appliances of a similar kind are used.

This invention relates to an improved method of and means for constructing apparatus and models, and the object of this invention is to provide instruments and models the members of which may be easily and quickly assembled and dismembered without injury or mutilation, such members being capable of universal application, adjustment, and rotation, in association with and connection to each other.

It is well known that metallic strips and stampings suitably perforated have been employed in the construction of toys and mechanical models. The application of such devices is limited to their use and assembly with one another, and models so constructed cannot in general be used in association with objects of ordinary construction and form and further such arrangements permit merely of the construction of artificial models and not of models of practical or scientific utility. It will also be apparent that metallic strips are not sufficiently substantial to provide suitable rigidity for apparatus except in structures where large numbers of strip elements are used leading to rigidity of the braced girder type. Further, such strips and stampings are, in general, quite incapable of supporting or accommodating objects of ordinary construction in the form of rods, tubes, plates, discs, and the like such as thermometers, burettes, mirrors, lenses, coils, magnets, etc. which will hereafter be referred to as ordinary objects. Such ordinary objects can only be used in association with apparatus composed of strips when framed or mounted in special carrier elements. On account of the variety of form and size of ordinary objects such carrier elements have heretofore been of a very miscellaneous kind and have not been standardized. Furthermore, objects so mounted have not in general been capable of universal adjustment either in the three dimensions of space or by rotation.

It is also well known that tubular members, rods, and bars, capable of mutual assembly, have been used for building up frames and stands, the adjustment of the carrier element in such cases being obtained by the sliding or screw motion of one cylindrical surface on another until the surfaces have been moved into a desired position in which they are clamped together by means of a set screw. Such arrangements are not usually capable of smooth and effective adjustment and are limited in their application.

In the embodiments of the invention illustrated in the accompanying drawings; Fig. 1 is a perspective view showing the invention in the form of a projection microscope; Fig. 2 is a similar view of another assembly for cooperation with the first, such assembly carrying the projection lamp; Figs. 3 and 4 are perspective views illustrative respectively of a mirror magnetometer and cooperating lamp and scale assembly.

According to my invention, I provide a system of shaped units provided with cuttings, usually in one or more of the flat surfaces of the units, such units being shaped and adapted where necessary with additional cuttings, grooves, recesses, notches, projections, and the like for mutual assembly and for association with ordinary objects. The units are so shaped and the cuttings are so arranged in spaced relation to each other on the various units, that all units may be interlocked or associated in suitable proximity to one another. The cuttings, grooves, projections, notches, recesses, etc. are spaced and shaped to admit of the association of the unit with ordinary objects of varying form and size and such as are likely to require mounting in fixed or adjustable position in the complete apparatus or model. The complete apparatus or model comprising units and components, admits of any desired flexibility of adjustment of any or all of the parts and also admits of rigid fixation of all units and components when in the desired position the

rigidity not being of the braced girder type. The apparatus may be dismantled after assembly without injury of any of the parts and, by variation of the association of the parts, other forms of apparatus may be constructed from the same parts or the same apparatus may be constructed in an alternative form.

In order that objects of ordinary form and construction may be associated with a standard set of units in the construction of apparatus or models, it is necessary that some of the units, hereinafter called carrier units, shall be shaped or otherwise adapted for association with such objects. Carrier units may be simplified and their number reduced if standard sizes of ordinary objects are used whenever possible. Again, some slight modification of an ordinary object may often be made without interfering with its usefulness or increasing its cost of manufacture which enables it to be used more effectively with the standard units or leads to the elimination of auxiliary apparatus. For example, a thermionic valve with screwed valve legs could be mounted directly in adjustable position on a slotted panel without the use of a valve holder the valve cap serving as the carrier unit and the slotted panel as the basic unit. Alternatively, the valve cap could be provided with screwed or smooth sockets instead of projecting valve legs. With screwed sockets it could be fixed to a carrier unit with suitable cuttings, by means of screwed bolts or terminals. With smooth sockets it could be mounted on suitable projections on a carrier unit and the carrier unit could be provided with cuttings for association with other standard units.

In order to mount an object in fixed or adjustable position it becomes necessary to mount the carrier unit associated with it in a manner suited to give to the object the desired position or adjustment. For this purpose a stand or similar device consisting of units, hereinafter called basic units, must be provided, the cuttings in the basic units being of such a nature as to admit of the carrier unit being universally adjustable or capable of being fixed in any position. The same unit may sometimes be used alternatively as a basic unit or as a carrier unit according to the nature of the apparatus or model which it is desired to construct.

The assembly or association of basic and carrier units with ordinary objects into a complete apparatus or model is accomplished by means of simple connecting members such as bolts and nuts, terminals, spring clips, india-rubber bands, perforated strips of metal or other material, and the like. The shape of the units and the cuttings provided in them enables the assembly or dismemberment to be carried out rapidly with comparatively few connecting members and with connecting members of very simple type.

The accompanying drawings illustrate apparatus which may be built up using basic and carrier units of the kind described. It is evident that an extremely large number of other forms of apparatus could be constructed using the same units arranged in other ways. Further by the introduction of other shaped units having similar characteristics to the basic and carrier units and with their cuttings in spaced relation to those on units already described and also in spaced relation to one another, the number of forms of apparatus could be increased indefinitely.

Fig. 1 shows a projection microscope constructed by the assembly of the following parts:—1 is a metal unit of H-form recessed beneath the side and crossbars 2 and having in these said bars slots 3 in the cross slot of which is mounted the slotted plate 4 and fastened therein by screws from the recess on the under side. On one side of the slotted plate 4 is mounted the upright unit 5 in the slot of which is held in adjustable position the slotted L-shaped unit 6. It will be seen that by movement of the unit 6 up or down the slot 3 of unit 5 or by moving it upon the unit 5 along its own slot, the unit 6 may be adjusted at any desired position and/or at any angle with respect to unit 5 before fastening it in the desired position. Upon the arm 7 of unit 5 is mounted a stage 8 of a microscope carrying on one side the objective comprising the fitting 9 and a lens carrier 10, and on the other side the condenser 11, both of which are maintained in the required positions upon the stage by means of screws passing through holes in their respective fittings corresponding with holes provided in the stage and combining at the position 12. For the purpose of easy mounting and adjusting upon the stage the condenser tube is preferably provided on its inner side with a screw thread adapted to engage with a corresponding thread upon the condenser fitting. The fitting 9 and the lens carrier 10 are also screw threaded with regard to each other thereby enabling a suitable adjustment or focus to be made, while the fitting may be maintained at suitable distance from the stage 8 by means of screw washers or nuts.

Fig. 2 is an assembly of units similar to that shown in Fig. 1, but showing the other side of the unit 5 and its fixing upon the unit 4 by the nuts 13. In the slot 3 of unit 5 is mounted upon a suitable carrier unit 14, a projection lamp 15 encased in a tube 16 and adapted to be used for experimental purposes in conjunction with the projection microscope shown in Fig. 1. The lamp 15 is shown with a cap 17 having a circular opening, but various types of cap may be used

for producing sources of light of different form for other purposes.

Fig. 3 is an assembly of units providing a mirror magnetometer for use with a device as shown in Fig. 4 which is an assembly of units providing a lamp and scale. In Fig. 3 the base of the magnetometer is formed by unit 18 which is of T-section provided with slots 3 and with holes (not shown) for accommodating levelling screws or for other purposes. Mounted on unit 18 is an upright unit 5 in the slot 3 of which is supported the special fitting 19 for the magnet 20. The fitting 19 consists of a circular unit having at one end a screw threaded extension which passes through the slot 3 and is held therein by a nut, and at the other end a cylindrical hole suitably threaded and adapted to have fastened to it by means of a screw any desired unit such as a split chuck, terminal, or a clip for holding a rod, tube, or plate. In this figure the fitting 19 is shown carrying a rod 21 provided with cuttings at its lower end forming a split chuck and adapted to form the carrier for suspension 22. At the other end of the suspension 22 is mounted the magnet 20 referred to and in the centre of which is the mirror 24.

In Fig. 4 the unit 1 and unit 5 are coupled by means of an L-shaped unit 27, the slots 3 of which enable it to be attached thereto. Clamped to unit 5 by means of the fastening 28 is a unit 28*a* of the form shown and carrying a lamp and tube as shown in 15 and 16 in Fig. 2, but which in this case is fitted with an outer telescope tube 29 fitted with the lens and crosswire 30 which is substituted for the cap 17. The tube is preferably attached to the unit 28*a* by means of a strip or band of suitable material 31. At any suitable position on unit 5 may be arranged another unit 27*a* so that the slot in the portion at right angles to the unit 5 may be made to accommodate a special large clip 33 of the well known "bull-dog" type but which is provided with jaws exactly alike and with holes 32 in the body thereof, which clip is made to carry a scale. By this means it is made possible to obtain adjustment of the scale either by movement of the unit 27*a* within the slot of unit 5 and/or by the movement of the scale within the jaws of the clip 33.

The desired experiments having been completed the assembled units may now be disconnected and applied to similar use in connection with other experiments and demonstrations.

Although only a few illustrations have been given of the type of apparatus which can be constructed and the type of unit used in the construction of it, it must be distinctly understood that any piece of apparatus or model may be constructed by the association of suitable base and carrier units together with ordinary objects. The basic and carrier units may take other forms than those illustrated for example they may be in the form of a box, frame, sheet, and the like, but in every case they are adapted for universal assembly with one another and with ordinary objects by means of simple connecting members and the cuttings provided in one or more of their flat surfaces are in spaced relation to the cuttings in other units.

What I claim and desire to obtain by Letters Patent is:—

1. Apparatus of the character disclosed, comprising a rigid base unit of angular form and having a plurality of slots in the different angularly related portions of the same, a stand unit similarly slotted, fastenings engaged in the slots of said units and adjustably and detachably securing the same together and an object carrier detachably and adjustably mounted on the stand unit through the medium of a slot therein.

2. As a new article of manufacture, a basic unit for philosophical and demonstration apparatus, comprising a rigid base having angularly related horizontally and vertically projecting flanges with vertically extensive slots in the horizontal flanges and horizontally extensive slots in the vertical flanges, said vertically and horizontally extensive slots having enlargements therein, enabling direct passage of fastenings therethrough for the quick mounting of various kinds of stands and object holders in various angular relations.

3. As a new article of manufacture, a basic unit for philosophical and demonstration apparatus, comprising a rigid base unit of H-form with long slots in the sides of the H and an angularly projecting flange on the bar which connects the slotted sides of the H, said angularly projecting flange also being slotted, enabling the use of fastenings in various relations for mounting stand and object holding units in different angular positions on the H base.

4. A basic unit for philosophical and demonstration apparatus, comprising a rigid base unit having a horizontal flat portion and an angularly upstanding intermediate vertical flange, said flange and the horizontal portions of said base units all being longitudinally slotted for fastenings to support stand and object holding units in various angular relations thereon.

5. A basic unit for philosophical and demonstration apparatus, comprising a rigid base unit of L-shaped cross-section having angularly related vertical and horizontal portions both slotted longitudinally for the passage of fastenings to support stand and article holder units in various angular positions thereon.

In testimony whereof I hereto affix my signature.

CARL WILLIAM HANSEL.