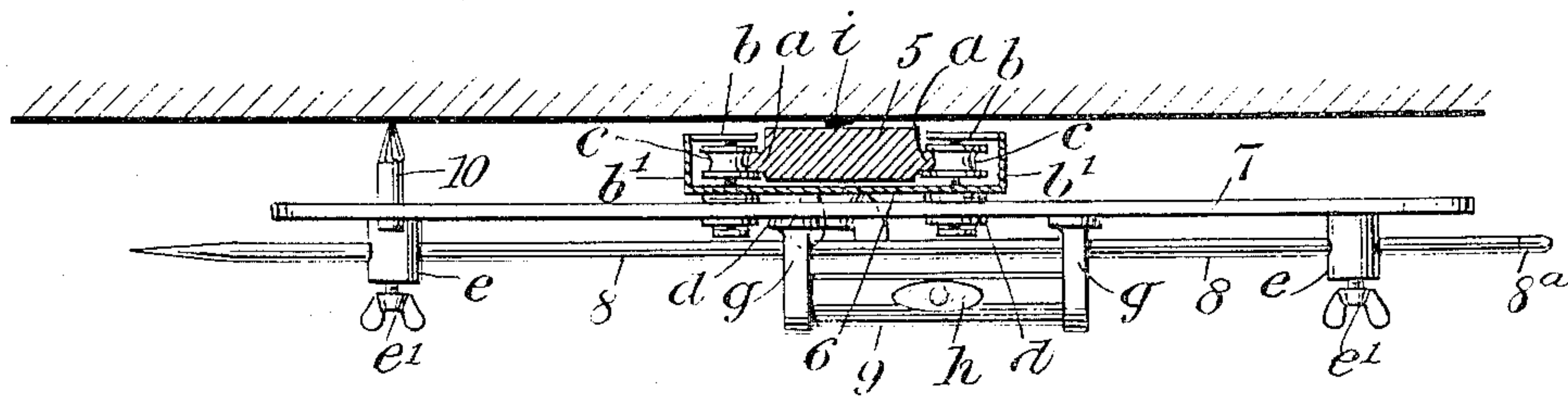
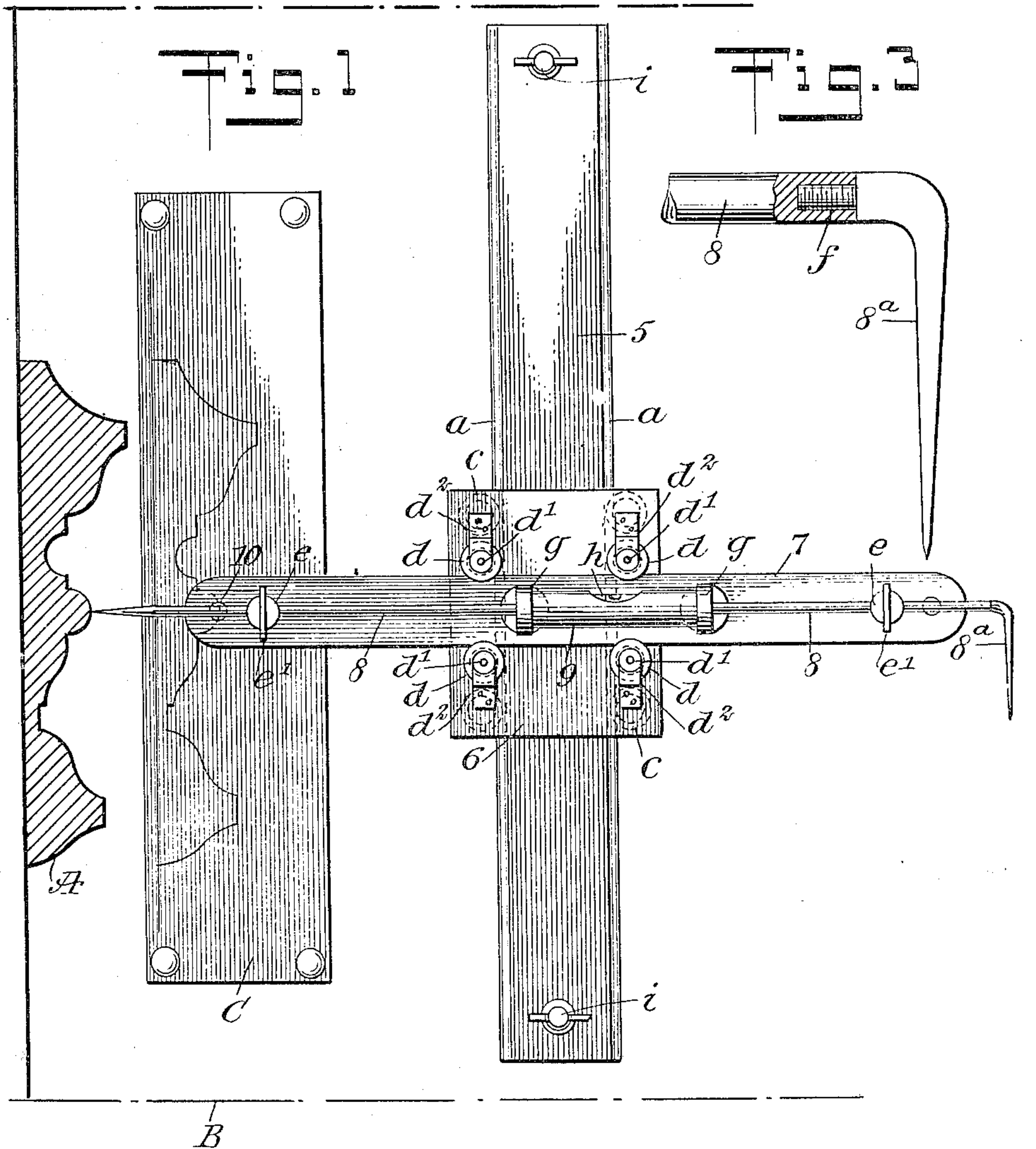


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H. E. GREGORY.
COMBINED PROTRACTOR AND LEVEL.
APPLICATION FILED MAY 9, 1907.



WITNESSES
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Fig. 2

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HARVEY ELMORE GREGORY, OF FRUITVALE, CALIFORNIA.

COMBINED PROTRACTOR AND LEVEL.

No. 883,798.

Specification of Letters Patent.

Patented April 7, 1908.

Application filed May 9, 1907. Serial No. 372,791.

To all whom it may concern:

Be it known that I, HARVEY ELMORE GREGORY, a citizen of the United States, and a resident of Fruitvale, in the county of Alameda and State of California, have invented an Improved Combined Protractor and Level, of which the following is a full, clear, and exact description.

The purpose of this invention is to provide novel details of construction for a combined protractor and level, which are simple and practical, and very convenient in use, affording means for the speedy and exact duplication of the profile or contour of any object within its range of capacity, upon a flat surface of paper, wood or other suitable material, and thus enable the speedy and exact duplication in lineal delineation of the object thus copied.

A further object is to provide a novel instrument of the character indicated, which will facilitate the delineation or the counterpart of an object, such as a molding, carving, bas-relief or formation of a similar character, to serve as a guide for cutting out and forming from suitable material, an object of duplicate shape, to fit neatly upon the article copied, and thus expedite such mechanical construction, as in the ordinary way involves the expenditure of much time and difficult labor.

The invention consists in the novel construction and combination of parts as is hereinafter described and defined in the appended claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of the instrument, showing the duplication of a molding upon a paper sheet; Fig. 2 is a partly sectional plan view of the instrument in position for service; and Fig. 3 is an enlarged fragmentary and partly sectional view of an end of a guide rod that is a detail of the invention.

The combination instrument briefly described, embodies a main beam 5, a flat coupling box 6, slidably mounted upon the main beam, a cross beam 7 slidable in or on the cross beam at right-angles to the main beam, a longitudinally adjustable guide rod 8, and a spirit level 9 also mounted upon the cross beam for aiding the operator to maintain the cross beam in or near a horizontal plane, and

thus insure the accurate operation of the instrument.

The main beam 5 may be of any preferred length, and be formed of any suitable material; for the sake of lightness and strength hard wood may be used with advantage. The body of the beam may be rectangular in cross section but as shown is preferably a flat strip of greater width than thickness, the parallel side edges thereof having opposite tongues *a, a*, formed thereon and rounded on their edges. The coupling box 6 is formed of plate metal or other available material and is rectangular in contour, the flat body portion thereof having at each corner an integral flange *b* disposed parallel with and spaced from the body 6 by an intervening web *b'*. The coupling box 6 may be loosely fitted upon the main beam 5 so as to be adapted for a free sliding movement thereon from one end to the other. As shown, to insure perfect freedom of longitudinal movement of the box 6 on the beam 5, four similar grooved pulleys *c*, are employed, each pulley being pivoted at a corner of the box between the body portion and a respective flange *b* as is clearly shown in Fig. 2. The space between the grooved peripheries of each pair of grooved pulleys *c*, at each end of the coupling box 6 is so proportioned, that the tongues *a, a*, on the beam 5 will enter freely therebetween, and with but slight resistance permit the coupling box to be moved readily in either direction from end to end of the main beam, but at the same time prevent any lateral movement of the box thereon.

The cross beam 7 that may be of metal or any other suitable material, is in the form of a straight flat bar, having parallel side edges, and a preferably less width than that of the main beam 5. The cross beam 7, may be loosely mounted on the flat side of the coupling box 6, by clip plates or the like, but preferably and as shown, grooved pulleys *d*, are pivoted on the coupling box, by means of pivot studs *d'* that have their ends firmly engaged with the body portion of the box, and with bracket arms *d''* that are secured upon said body portion and have members spaced from the body 6 for reception of the pulleys in said spaces. As shown in Fig. 1, the peripheries of the pulleys *d* are so spaced apart in pairs, that the cross beam 7 may be slidably passed between the two pairs of the pulleys, and hold the beam disposed at right angles with the main beam 5, but free to be

moved therebetween from end to end of said cross beam.

Two short posts *e, e*, are projected from the normally outer side of the cross beam 7 each near a respective end of said cross beam, the posts each having a lateral perforation, said perforations being disposed oppositely or in alinement, and loosely receive the body of a guide rod 8, that is thus supported in a plane parallel with the body of the cross beam 7 as is clearly shown in Fig. 2. In a threaded axial perforation in each post *e*, a set-screw *e'* is inserted, and may be adjusted to have binding contact with the guide rod 8, so that said rod may be slid endwise when released from the set screws and be projected or retracted at either end of the cross beam 7, as may be found necessary in operating the device, the rod being held by the set screws at any point of longitudinal adjustment therefor.

As shown in Figs. 1 and 3, a bent end 8^a is formed or secured on one end of the rod 8; preferably this end portion or leg 8^a is tapered, projects downwardly and is connected with the rod by forming a threaded perforation axially in the latter and providing a screw thread on the end of the leg, that connects therewith as appears at *f* in Fig. 3.

Upon the cross beam 7 near its center, two spaced posts *g, g* are erected, that are flattened sidewise and oppositely perforated in said flattened portions, producing jaws which receive the end portions of a cylindrical case 9, that is the incasement for a spirit level tube *h*, of usual construction. The posts *g, g* are perforated to permit the free passage of the guide rod 8, therethrough. The case 9 is loosely embraced by the jaws on the posts *g* and these are permitted to receive rotatable adjustment therein, which enables the exposure of the bubble in the spirit holding tube *h*, when the instrument is given different positions, as for example, when the main beam 5 is held horizontally and the cross beam above it, or when these beams are so disposed that the main beam is vertical and the cross beam horizontal, considered edgewise.

In using the device, a lead pencil or metal scriber 10 is inserted through a perforation in the cross beam 7, near either end thereof, that is to be employed for transfer of the copy of a molding or the like upon a paper sheet or tablet of any suitable material. If the object to be duplicated is a fixture, such as a molding A shown for example in Fig. 1, the instrument may be supported in a horizontal plane upon a board B, that carries a paper sheet C or other material that is to be marked upon. The appropriate end of the guide rod 8 is now placed in contact with the molding at one side edge thereof, and the instrument is manipulated so as to slide the box 6 upon the beam 5 so that the end of the guide rod

will traverse the molding A, in a vertical plane toward and over the opposite edge of said molding. The operator while moving the coupling box 6 as explained, at the same time gently presses the point of the guide rod on the molding, which will insure the exact duplication in pencil marks of the configuration or profile of the molding on the paper sheet C, it being of course necessary that the pencil 10 be seated upon the paper. In some situations, the operation of the instrument may be better conducted by turning the instrument into such position as will dispose the main beam 5 vertically and the cross beam horizontally, and as it is essential for accuracy in conducting the operation that the beam 7 be level on its edges, the spirit level 9 affords means for maintaining the beam in such a position. It is to be understood that the pulleys *c* and *d* may be dispensed with, and the side walls of the coupling box be disposed close to the bars 5 and 7, so that said coupling box will hold the bars without objectionable looseness, but free to receive slidable adjustment.

It will be evident that the instrument will have a wide range of service, as by its use the fitting of one piece of material on other material having an intricate design on the surface will be rendered easy and accurate, saving time and labor in its execution. Furthermore, the instrument affords means for the quick and exact duplication of the profile of a column, bas-relief, statue, or any carving that may be approached near enough to permit the proper application of the device thereto.

In some situations the bent leg 8^a will be found convenient in service, enabling the application of the device upon surfaces that cannot be reached by the straight end of the guide rod 8.

In some cases it may be found desirable to hold the main beam 5 stationary on a table or the like, while the cross beam 7 and its attachments are moved for the execution of a duplicate drawing of an object; to this end two set-screws *i, i* are inserted through threaded perforations in the beam 5 near its ends, and these may be screwed into the table at a desired point so as to permit the free use of working details of the instrument carried by said main beam.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. The combination with a main beam, and a coupling box slidable longitudinally thereon, of a cross beam slidable on the coupling box at right-angles with the main beam, a guide rod longitudinally adjustable on the cross beam, and a tracing device carried by the cross beam near an end thereof.

2. The combination with a main beam having parallel side edges, a coupling box

mounted on said beam, and means carried by said box that loosely engage said side edges, of a cross beam slidable longitudinally on the coupling box at right angles with the main beam, a guide rod on the cross beam, and tracing means carried by said beam near ends thereof.

3. The combination with a main beam having parallel side edges, a coupling box mounted on said beam, and means carried within the box having grooves that loosely receive said side edges, of a cross beam disposed at right angles to the side edges on the main beam and adapted for longitudinal movement on the coupling-box, a guide rod longitudinally adjustable on the cross beam, and a leveling device mounted upon said cross beam.

4. The combination with a main beam having parallel side edges, a coupling box having grooved pulleys rotatable on said box and engaging the edges of the main beam, and set screws in the ends of the main beam, of a cross beam having parallel side edges,

grooved pulleys mounted rotatably on the coupling box, and engaging the edges of the cross beam which is thus adapted for longitudinal movement at right angles with the main beam, a guide rod longitudinally adjustable on the cross beam, a marking device carried by the guide rod and depending therefrom, and a leveling device mounted on the cross beam.

5. In a device of the character described, the combination with a suitable adjustable support, of a guide rod straight in the body, tapered at one end, having a threaded socket in the opposite end, and a leg having a threaded end that screws into the socket, and a depending member thereon that is pointed at its free end.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARVEY ELMORE GREGORY.

Witnesses:

G. O. WESTERMAN,
W. E. BROWN, Jr.