H. ARNOLD.

ALTIMETRIC DEVICE FOR USE IN THE PRODUCTION OF PLANS AND MAPS IN RELIEF.

APPLICATION FILED APR. 19, 1918.

1,344,162. **Patented June 22, 1920.**

Fig. 1

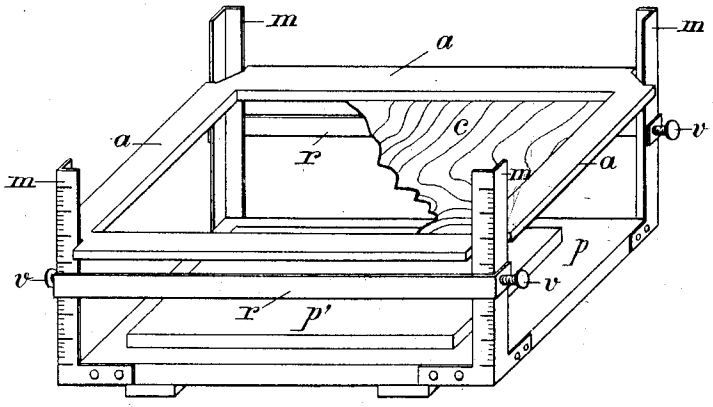


Fig. 2

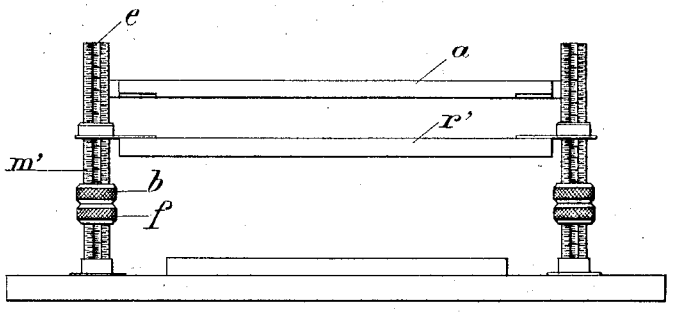
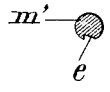


Fig. 3



INVENTOR:
HENRY ARNOLD
BY: Howard Hammond
ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY ARNOLD, OF PARIS, FRANCE, ASSIGNOR TO SOCIETE FRANCAISE D'EDITIONS PHOTO-CARTOGRAPHIQUES, OF PARIS, FRANCE, A CORPORATION OF FRANCE.

ALTIMETRIC DEVICE FOR USE IN THE PRODUCTION OF PLANS AND MAPS IN RELIEF.

1,344,162. Specification of Letters Patent. Patented June 22, 1920.

Application filed April 19, 1918. Serial No. 229,635.

To all whom it may concern:

Be it known that I, HENRY ARNOLD, citizen of Republic of France, and residing at Paris, Seine, France, 12 Avenue du Maine, have invented Improvements in Altimetric Devices for Use in the Production of Plans and Maps in Relief, of which the following is a specification.

The present invention has for its subject an altimetric device rendering it possible to produce very quickly and with the greatest possible exactitude plans and maps in relief to any desired scale, these plans or maps giving very exactly the reproduction in relief of a basic plan on which the levels are indicated by curves of contour. These reproductions in relief are particularly useful for the geographical services of war departments, although they are useful also for many other technical purposes.

The principle on which the altimetric device forming the subject of the present invention depends, consists essentially in effecting continuously the projections of a planimeter given on the successive altimetric planes corresponding to the levels of contour of the given basic plan, without any risk of relative displacement, these projections rendering it possible to translate the contours rapidly, easily and with great exactitude into relief surfaces corresponding with the indications on the plan.

The invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a perspective view of the device,

Fig. 2 shows a view in partial elevation illustrating a modified form of the device, and

Fig. 3 is a sectional detail view.

Referring first to Fig. 1, the apparatus there shown comprises three independent parts as follows:—

1st. A rectangular base p, p' of variable dimensions formed of a platform p on which is mounted in relief the plate p' whose dimensions are somewhat less than will correspond with the dimensions of the reproduction in relief to be effected. At each of its corners the platform p carries rigid pillars m, m which may be formed, for instance, of angle iron members and each of which is graduated on one of its faces in such a manner that these graduated faces correspond in pairs to the same plane in the apparatus. The pillars m, m serve as guides and supports for two longitudinal bars or rulers r, r, preferably formed of metal, which slide on the pillars and may be locked thereon at any desired height by any suitable clamping device such as screw clamps or set screws v.

2nd. A movable frame or rectangle a of wood, with its corners cut out so as to slide freely but with some friction between the pillars m of the platform p, this frame being adapted to rest on the transverse metal bars r, beyond which it projects a little, and to rest between the pillars which serve as guides for the frame.

3rd. A metal rule which is completely independent of the other parts, and may be of any convenient thickness and length such that it will be supported firmly when resting on the lateral bars r.

In order to use the apparatus formed as above described, the operations are as follows: The basic plan c showing the contours which it is desired to transform into a relief map of the same scale, is applied by a suitable adhesive to the lower face or edges of the frame a, and then a pile or layer of suitable plastic material such as clay, a plastic paste or the like, is laid on the plate p', after which the transverse bars r are fixed at the graduation on the pillars m corresponding to the first altimetric level of the lowest contour shown on the plan; this graduation is of course arbitrary and of a greater or less height according as it is desired to accentuate to a greater or less extent the relief surface on the plan, as is generally required in practice when making profile reliefs. A scale ratio may in fact be adopted which is greater for heights than for lengths.

When this has been done the metal rule forming the third element above referred to, is laid on the two transverse bars r which serve as guides for the same, and is moved over these bars so as to smooth off the surface of the plastic or pasty mass laid on the plate p', in such a manner as to obtain a single plain surface at the desired level. Then the frame a is introduced between the pillars m so that it rests upon the transverse bars r, and the plan itself on the frame then contacts with the plastic surface. Next, the curve of contour corresponding to the height to which the bars r

are set is traced out on the plan by the point of a pencil or tool following this curve, thus reproducing on the plate the first layer of material traced out from the first contour curve. After this tracing operation the frame a with its plan is removed.

A second layer of the plastic material is now deposited on the first, within the borders of the contour first traced out, and this second layer is smoothed off to a height corresponding to the level of the second contour, which height is fixed by adjusting the transverse bars r to the height corresponding to the altitude of the second contour, the smoothing off being effected by the third element of the device as has been described already for the first layer of material and the first contour. The frame a with its plan is now replaced between the pillars m, and its second contour is traced out on the second layer of plastic material. When this has been done, and two curves at different planes have thus been obtained, the step or gap which separates the contours is filled in with plastic material to form an oblique surface representing the ground surface between the contours. After this, the frame is replaced between the pillars, where it is ready for use in the next tracing operation. As a result of the preceding operations there are traced out on the model thus obtained, all the planimetric indications which exist between the curves at two different altitudes; after this the same set of operations is repeated for each of the succeeding curves of contour throughout the whole plan.

In this way a complete relief model is obtained very easily, corresponding scale for scale with the plan, and if it is carefully made it will reproduce absolutely the indications given on the basic plan.

In the modification indicated in Fig. 2, the angle iron pillars m are replaced by screw-threaded cylindrical pillars m' which carry scales mounted in suitable depressions or grooves e, for example as indicated in section in Fig. 3. On the screw-threaded cylindrical pillars work micrometer nuts or screws b which when turned can be adjusted very accurately to different positions in height, and can be locked by lock nuts or screws f which will fix the nuts b accurately in position. On these nuts then rests a rectangular frame r' replacing the transverse bars r of the first construction, and serving like these latter to guide the rigid ruler which is employed to smooth off the plastic material at the different surface levels. The apparatus is completed by a movable frame a formed as above described and serving to carry the basic contour plan as already explained. This frame a may be guided in position on the frame r' either by means of inter-engaging ribs and grooves or by means of stops at each side of the frame.

The apparatus as above described and as shown by way of example in Figs. 1 and 2 of the drawings, renders it possible to trace out at each successive elevation the planimetric indications which will be met with in the region of the ground thus plotted, and in this way a projection on the horizontal surface is secured which corresponds rigorously with that of the basic plan, without any possible relative deplacements or deformations.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An altimetric device for reproducing plans and maps in relief with great accuracy to any scale, comprising a base with members adjustably mounted thereon and provided with scales for vertical adjustment, and a member for carrying the original contour plan and guiding it truly over the base, so that said plan may contact with a plastic material deposited on the base.

2. An altimetric device for reproducing maps and plans in relief, having in combination a rigid base or platform, vertical pillars thereon graduated on one face, transverse bars or frame members whose edges provide a guide track, means for clamping said frame members at any desired height on the pillars, said frame members providing a guide for a device adapted to be moved over the bars or frame members for smoothing off the layers of plastic material to the various contour levels, and a frame adapted to hold the contour map or plan, and to slide between the pillars, this frame being removable, and being used for tracing out the contours on the layers of plastic material from the contour lines on the plan, substantially as described.

3. The modified construction of the device set forth in claim 2, wherein screw threaded cylindrical pillars are used with micrometer nuts and lock nuts working upon them, and serving to support a rectangular frame which is adjusted to the various contour heights, this frame providing a guide for a smoothing rule, and a support for the frame carrying the contour plan, substantially as described.

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

HENRY ARNOLD.

Witnesses:
JULES FAYOLLET,
CHAS. P. PRESSLY.