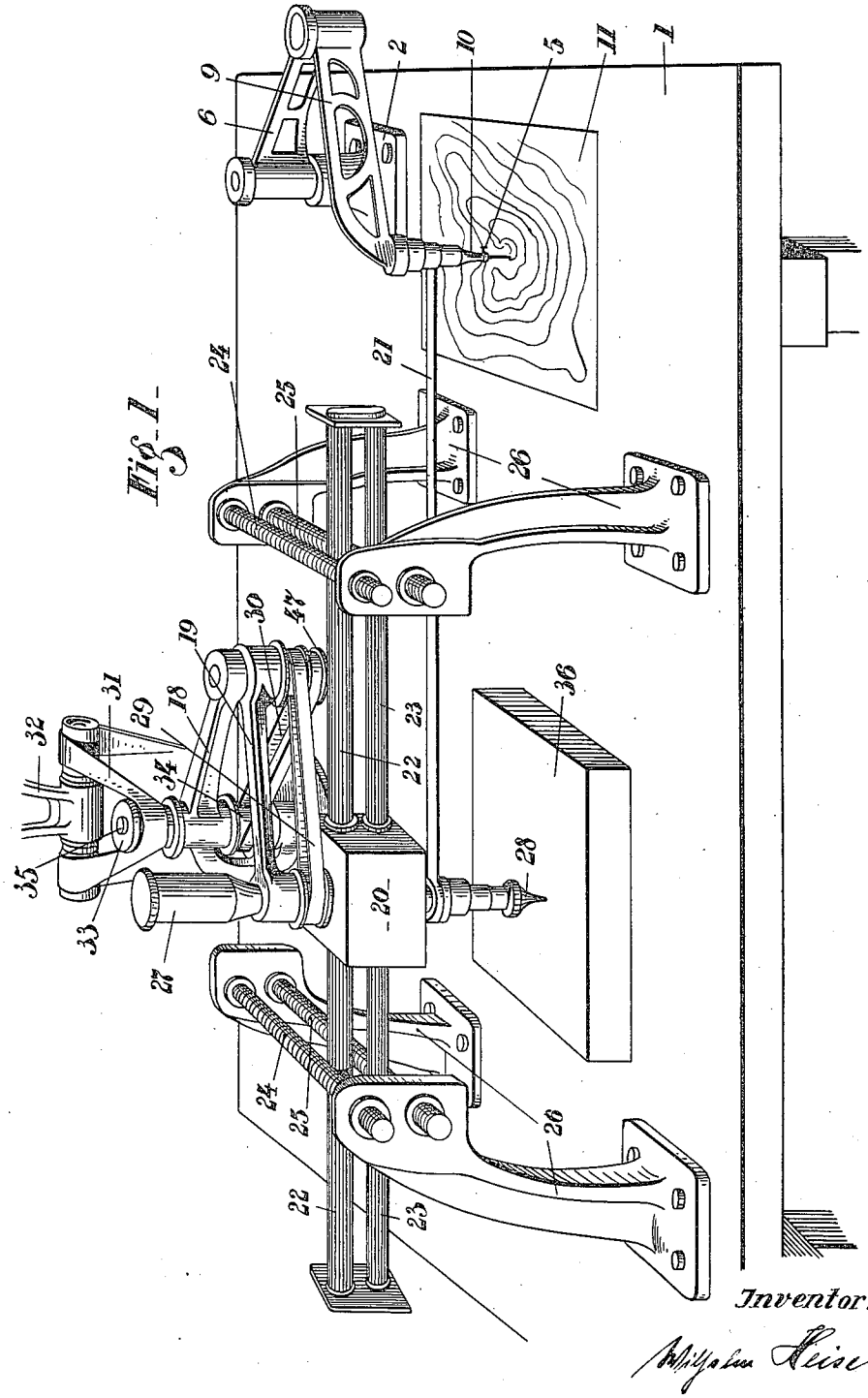
Jan. 30, 1923. 1,443,624.

W. HEISE.

PROCESS AND APPARATUS FOR THE PRODUCTION OF RELIEFS.

FILED NOV. 9, 1920. 2 SHEETS—SHEET 1.



Inventor:

William Heise

Jan. 30, 1923. 1,443,624.

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PROCESS AND APPARATUS FOR THE PRODUCTION OF RELIEFS.

FILED NOV. 9, 1920. 2 SHEETS—SHEET 2.

Fig. 3.

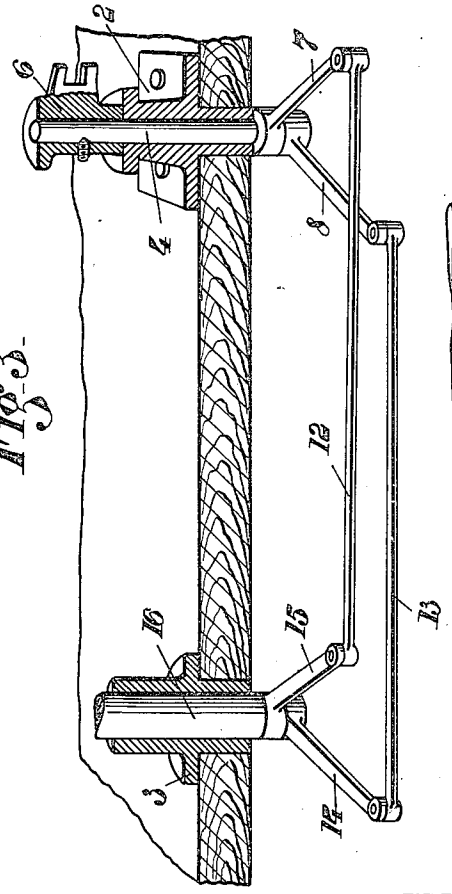


Fig. 4.

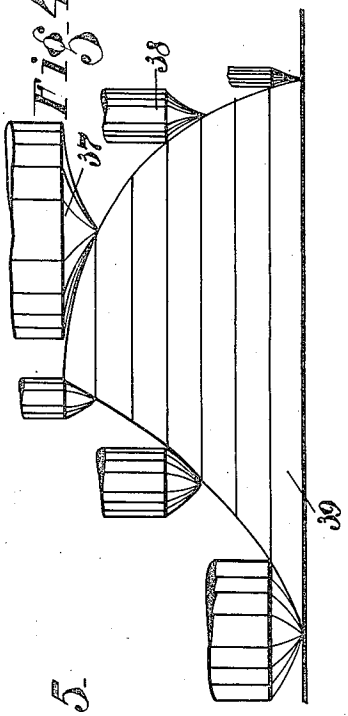


Fig. 2.

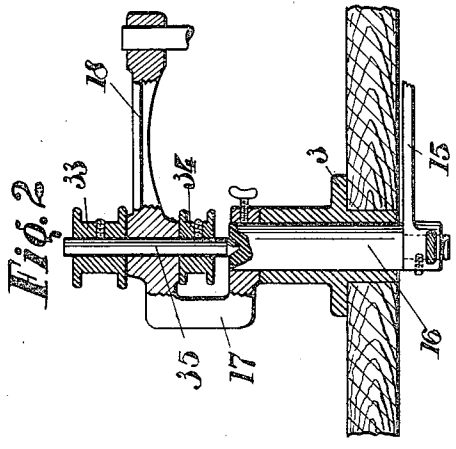
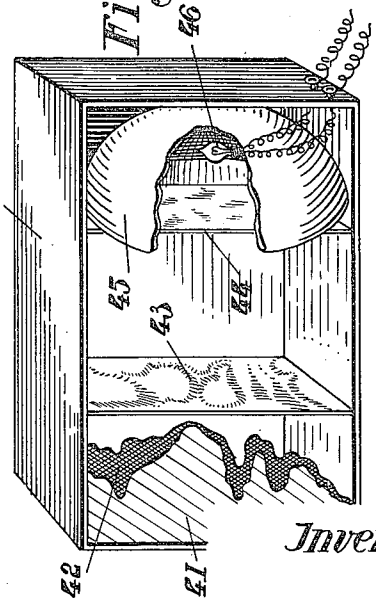


Fig. 5.



Inventor:

Wilhelm Heise.

Patented Jan. 30, 1923. 1,443,624

UNITED STATES PATENT OFFICE.

WILHELM HEISE, OF MUNICH, GERMANY, ASSIGNOR TO ALBERT DEICHMANN, OF HILLEGERSBERG, NEAR ROTTERDAM, NETHERLANDS.

PROCESS AND APPARATUS FOR THE PRODUCTION OF RELIEFS.

Application filed November 9, 1920. Serial No. 422,947.

To all whom it may concern:

Be it known that I, WILHELM HEISE, a citizen of the German Realm, residing at No. 5 Rheinbergerstrasse, Munich, Germany, have invented certain new and useful Improvements in Processes and Apparatus for the Production of Reliefs, of which the following is a specification.

Reliefs, especially such as are used as contour maps, have been hitherto produced chiefly by cutting out the height contour lines from cardboard of suitable thickness. By sticking together the several cuttings, the well known step relief map was the result.

According to another process which has been recently much employed, the flat pattern itself has been rendered expansible by impregnation, and then the relief shape has been formed from it by modelling. The first process has the great drawback that the appearance of the natural relief shape is considerably spoilt by the step-like gradations.

The manufacture is also very expensive because only single copies can be made at a time. The rendering of such reliefs accessible to the general public is therefore made difficult, the more so because the step reliefs have to be subsequently trimmed and provided with the necessary inscriptions. Moreover these tedious and costly operations cannot be very accurate.

The second process above referred to may be employed satisfactorily in the case of medium and ordinary size scales. In cases however where it is a question of working to larger scales and of making super-elevated contour maps, it is scarcely possible to stretch the paper in such a manner that the relief map will have the same absolute accuracy as the flat map.

Older than the processes above referred to are the proposals to form a relief by transferring the contours from the flat map by means of a pantograph or the like and a pencil or graver, onto the relief copy, and working up the relief from the latter. The various proposals based on this principle have however not come into general use because, notwithstanding the costliness of the manufacture, the accuracy of the final product could generally not satisfy the requirements.

According to the present invention all those drawbacks are obviated by using a machine-driven vertically adjustable milling cutter and coupling it by means of a parallel motion to a guide or copying pin that is moved over the flat pattern. An apparatus of this kind combines at the same time all the advantages of the earlier processes. It enables absolutely accurate copies to be made in large numbers, because the milling cutter according to its vertical adjustment and in accordance with the movements of the copying pin, mills or cuts an absolutely faithful copy of the pattern in a block of plaster of Paris, wax, wood or the like. It is preferred for this purpose to employ milling cutters whose profiles are adapted to the slopes to be made in each case. The reliefs produced by this means are then multipled by the well known casting or stamping processes, and then the manifold copies in their turn come under the above described copying apparatus in order to be inscribed by means of a pencil which is inserted in the place of the milling cutter. The manifold copies may however also be produced by pressure by means of a matrix or die, or preferably by parallel projection of the picture, drawing, writing or inscriptions on to the copies. For the last purpose the copies are provided with a sensitized surface upon which by means of optical apparatus a beam of parallel light rays is thrown through a photographic negative of the pattern on to the relief body.

The drawings illustrate by way of example an embodiment of this invention.

Fig. 1 is a perspective view of the copying apparatus.

Figs. 2 and 3 show details of the pivotal connections.

Fig. 4 illustrates the employment of milling cutters having profiles adapted to the angles of the slopes.

Fig. 5 illustrates an optical apparatus adapted for producing by photography the inscriptions on the reliefs.

The improved apparatus is mounted on a table 1 and consists of two brackets 2 and 3. In the bracket 2 there is supported a shaft 4 which carries at its upper end a fixed arm 6 and at its lower end two fixed arms 7 and 8. The arm 6 is pivotally jointed to an arm 9 which carries by means of a screw 5 the guide-pin 10 in an adjustable manner. This pin is so adjusted as to allow the operator to follow exactly the contours of the flat pattern 11.

To the arms 7 and 8 are jointed two bars 12 and 13 which are jointed in their return to arms 14, 15 fixed on a shaft 16. By this means the shaft 16 receives exactly the same rotation as the shaft 4 receives in the motion of the guide-pin.

The shaft 16 is mounted in the bearing 3 and carries at its upper end by means of a clip 17, an arm 18 which is pivoted to an arm 19; the latter carries the milling cutter head 20. The milling head is connected to the copying pin 10 by means of a rod 21, so that the resulting parallel motion will cause the drilling head to make exactly the same movements as the guide-pin.

The milling head comprises two loose rotary racks 22, 23, mounted in racks 24, 25. The latter are carried by massive feet 26. The object of this construction is to prevent vibration or shaking of the milling head 20.

A milling cutter 28 is rotatably mounted in the milling head in a vertically adjustable manner by means of a micrometric screw 27 or the like. It is continuously driven by means of a belt drive 29, 30, 31 or the like from any suitable source of power. The belt 31 passes from the ceiling bearing 32 around the belt pulley 33 which is fixed on the shaft 35 mounted in the clip 17. The shaft 35 carries also a belt pulley 34 from which the belt drive is led over the belt pulley 47 to the milling cutter. It is to be understood that any other suitable drive may be employed instead of this belt drive. The cutters preferably employed are milling cutters having profiles conforming to the slopes of the angles of the reliefs to be produced, as is clearly shown in Fig. 4. 37, 38 are different milling cutters, and 39 is a cross section through the relief body.

The operation of the improved apparatus is as follows:—

After the milling cutter corresponding in shape to the respective slope of the ground or relief contour has been inserted, and the exact height has been determined by means of the micrometric screw 27, the guide-pin 10 is moved along the vertical contour lines by hand in recessed lines in the pattern. The milling cutter cuts the respective vertical contour line together with the angle of the slope determined by the next higher contour line. By inserting variously shaped milling cutters it is possible to cut out any desired shape of ground or relief contour true to nature from the corresponding material 39. In order to obtain a steady and certain working of the milling cutter and not to hinder its mobility too much, it is mounted in mutually crossing toothed racks or rollers or similar devices.

What I claim is:

1. A method of producing high and low reliefs by means of a milling cutter consisting in moving a guide pin along contour lines provided on a flat pattern, each of said lines corresponding to one definite height of the various parts of the relief to be produced, setting the cutter to the heights represented by the contour lines each time the cutting operation is started with respect to each contour line, and causing the cutter to follow the horizontal movements of the guide pin whilst the latter is moved over the contour lines, as set forth.

2. For the production of high and low reliefs, the combination with a flat pattern provided with contour lines each of which corresponds to one definite height of the various parts of the relief to be produced, of an apparatus comprising a guide pin intended to be moved along the contour lines of the said flat pattern in one and the same plane, a milling cutter capable of being adjusted in its height so as to correspond to the heights represented by the contour lines and a parallel motion mechanism connecting the said guide pin with the said milling cutter, whereby the milling cutter is caused to cut in different horizontal planes corresponding to the heights represented by the contour lines on the flat pattern whilst the guide pin always remains in one and the same horizontal plane.

3. For the production of high and low reliefs, the combination with a flat pattern provided with contour lines each of which corresponds to one definite height of the various parts of the relief to be produced, of an apparatus comprising a guide pin intended to be moved along the contour lines of the said flat pattern in one and the same plane, a milling cutter shaped to correspond to the transition surface between two contour lines and capable of being adjusted in its height so as to correspond to the heights represented by the contour lines, and a parallel motion mechanism connecting the said guide pin with the said milling cutter, whereby the milling cutter is caused to cut in different horizontal planes corresponding to the heights represented by the contour lines on the flat pattern whilst the guide pin always remains in one and the same horizontal plane.

In testimony whereof I have signed my name to this specification.

WILHELM HEISE.

Witnesses:
PAUL DREY,
ANNA NIEDERMAIER.