No. 676,326. Patented June 11, 1901.

K. KUTZBACH.

PROCESS OF REPRODUCING OBJECTS IN RELIEF OR INTAGLIO.

(Application filed July 9, 1900.)

(No Model.)

Fig. 3.

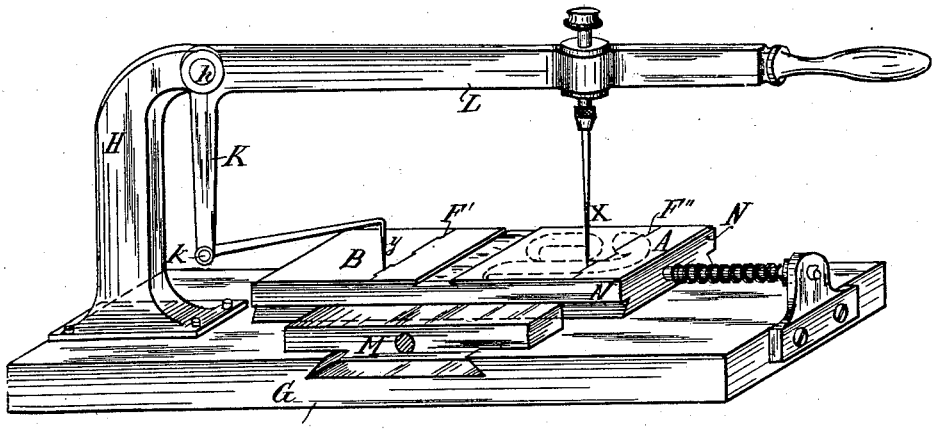


Fig. 1.

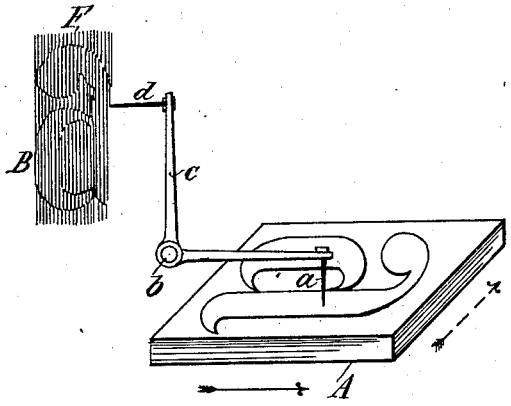
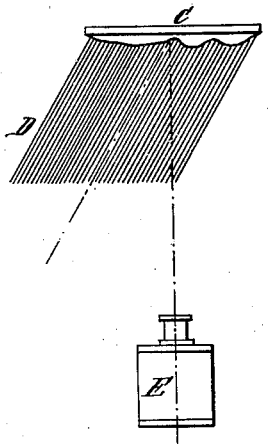


Fig. 2.



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UNITED STATES PATENT OFFICE.

KARL KUTZBACH, OF BERLIN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO ADOLPH KÜSTERMANN, OF SAME PLACE.

PROCESS OF REPRODUCING OBJECTS IN RELIEF OR INTAGLIO.

SPECIFICATION forming part of Letters Patent No. 676,326, dated June 11, 1901.

Application filed July 9, 1900. Serial No. 23,031. (No specimens.)

To all whom it may concern:

Be it known that I, KARL KUTZBACH, engineer, a subject of the German Emperor, residing at 10 Stromstrasse, in the city of Berlin, Germany, have invented new and useful Improvements in Processes of Reproducing Objects in Relief or Intaglio, of which the following is a specification.

My invention relates to improvements in processes for the reproduction or representation of objects or persons and the like in relief by the aid of photography.

The present process consists of two parts, the first relating to the taking of a photographic image of the object to be reproduced and the second to the preparation from this image of a plastic or other reproduction in relief of the original object. In this respect my process resembles those at present known and employed for similar purposes, but differs from them principally in this important respect, that in the case of the well-known processes it is necessary to take several photographic views, whereas with my process only one photographic picture is taken, the lines of which need only be passed over by a pointer of a mechanical device which automatically effects the reproduction.

In order to insure a thorough understanding of my invention, reference will be had to the accompanying drawings, in which is shown apparatus for carrying out my improved process and diagrams for illustrating the principle thereof.

Figure 1 is a diagrammatic perspective view illustrating the principle of a relief-machine. Fig. 2 is a diagram showing how the object may be photographed, and Fig. 3 is a perspective view of a machine by which the photographic reproduction may be transformed into a plastic one.

Referring to Fig. 1, A represents a plate having a design in relief upon it, and *a* represents a pointer secured to a bell-crank lever *c*, pivoted at *b*. A marking-point *d* is similarly secured to the other arm of the lever *c*, and we will assume is at right angles to the plane of a sheet of paper B, over which it passes. Now if the plate A be moved in a horizontal plane and the sheet B moved to the same extent in a vertical plane any line traced by the pointer *a* will be reproduced by the marking-point *d* on the sheet B. Therefore if the plate A is so moved as to cause the pointer *a* to pass over the design upon it in a series of parallel lines the design will be produced upon the sheet B if that is moved to correspond with the movement of the plate A. Conversely, then, if it be assumed that B is a sheet of paper or other substance having a series of lines F across it and having a design covered by those lines, that *d* is a tracer, *a* a tool, such as a small cutter or the like, and that A is a plate of plastic or other material which may be easily cut, it will be readily seen that if the sheet B and plate A are moved as above described a line traced by the tracer *d* will produce a corresponding cut upon the surface of the plate A. Then by causing the tracer *d* to pass over the sheet B in a number of closely-located lines from a point without the outline of the design up to the outline thereof the cutter *a* would cut away the material from the plate A in corresponding lines or strips and leave standing in relief a reproduction of the object or design on the sheet B. The lines of travel of the cutting-tool of course may be made so close together that no material will be left standing between two successive cuts.

The first part of my invention therefore relates to the production of the image upon the sheet B, with the lines across it, and according to my process this is very simple. This operation may be carried out by throwing a series of shade or light lines D on the object C, Fig. 2, while the object is being photographed by the camera E. In this way a photographic view is secured which corresponds with the picture of the sheet B, Fig. 1. The parallel light or shade lines, however, may be produced in a variety of ways. Thus, for instance, a net or series of rods or wire may be interposed between the object and the source of light in such a manner that the parallel light or shade lines D are thrown on the object, producing thereon the lines F, or parallel rays of light may be made to pass through a fine slit and fall upon the object, which is otherwise in the dark, the light being made to pass intermittently and regularly over the object or to pass on continuously

while the shutter of the photographic apparatus is intermittently opened and closed. As a simple means for throwing the lines upon the plate a projecting apparatus may be used the plate-holder of which is provided with a kind of grating—*i. e.*, it may consist of a transparent plate provided with opaque parallel lines. When these lines are projected on the object, a kind of hatching or lining will be produced corresponding to that shown upon the Sheet B, Fig. 1. When the lines have thus been taken upon the plate, the whole object may then be photographed.

It is an essential principle of my process that all of the photographic views of one side of an object shall be upon a single plate—that is, it necessitates the taking of but one picture. It is immaterial, however, of what shape the lines are which are thus projected upon the picture.

In order to follow the lines F on the picture with great accuracy, the lines may, if desired, be etched into the plate or into any other reproduction of the same, and in those cases in which it is preferable to follow with the tracer in a continuous line such a line—say a spiral or zigzag line—may be drawn on a glass plate and projected upon the object at the same time that the photograph is taken.

In order to facilitate the operation of following the lines when there a great number of them, such as would be the case with objects with strong reliefs, it is well to make, say, every fifth line a broken line. In this way the operator knows that every fifth line should be a broken line or else something is wrong.

The principle of the copying device shown in Fig. 1 may be readily applied to a construction of a practical form of apparatus. In fact, the principle is somewhat similar to that of an engraving-machine for the production of hatched relief-lines.

In Fig. 3 is shown a practical form of apparatus devised by me for carrying out my present invention. There G represents the base-plate of the machine, with a standard H supporting a bell-crank lever K L, pivoted at *h*. To the lever-arm K is pivotally connected at *k* the guiding-point *y*, while the cutter *x* is suitably arranged on the lever-arm L. The base-plate is so arranged as to form a guide for the slide M, which carries a second slide N, movable at right angles to the path of the slide M. If, now, the slide M is moved across the base-plate G while the lever L is so guided by means of the handle that the point *y* follows the line F′, the cutter will reproduce on the block or plate A a line F″ the equivalent of the line F′, but in intaglio and relief. After having finished the line the slide N is so displaced that the point *y* falls on the next line, when the slide M is again moved, and so on until all of the lines have been gone over, as described in connection with Fig. 1, the result being a design in relief, as described.

In case it is desired to enlarge or reduce the design it is best not to have the work movable, but to provide properly-movable levers, in which case by properly proportioning the lengths of the lever-arms the desired results in the way of enlarging or reducing may be accomplished.

Again, the herein-described process may be used for the production of whole or solid objects, such as busts or the like, in which case photographs are taken of the object from several sides and the several reliefs obtained from such views united to form the whole body.

Having thus fully described my said invention and the manner in which the same is to be performed, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A process for the reproduction of objects in relief or intaglio which consists in throwing a series of lines across the object to be reproduced, photographing the object having the lines so thrown across it, tracing the series of photographed lines and simultaneously cutting away portions of a separate mass corresponding to the lines so traced, substantially as described.

2. A process for the reproduction of objects in relief or intaglio which consists in throwing a series of lines across the object to be reproduced, photographing the object having the lines so thrown across it, intensifying said photographed lines by etching, tracing the lines so etched by a point whose course is guided by said etching, and simultaneously cutting away from a separate mass portions corresponding to the portions of said lines passed over by the tracer, substantially as described.

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

KARL KUTZBACH.

Witnesses:
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