H. HUNDRIESER.

SCULPTOR'S COPYING MACHINE.

APPLICATION FILED DEC. 29, 1911.

1,039,406.

Patented Sept. 24, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

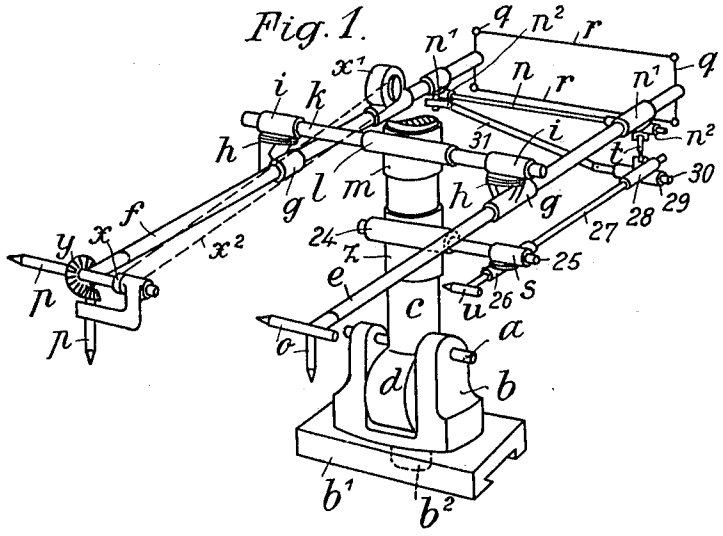


Fig. 5.

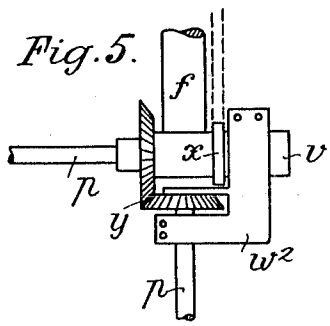


Fig. 4.

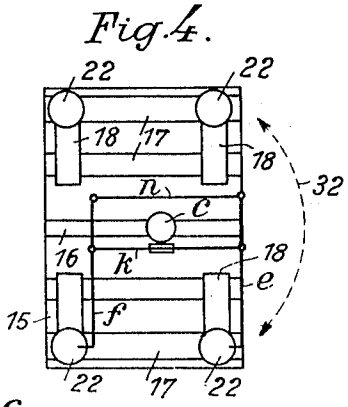
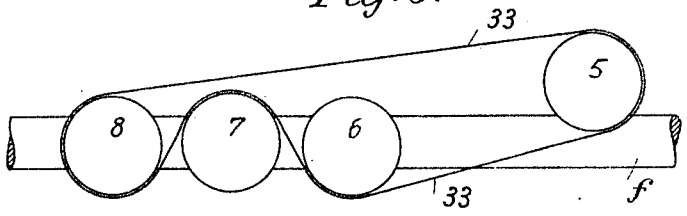


Fig. 6.



Witnesses:
Katherine Fink
Daniel Holmgren

Inventor:
Hans Hundrieser
by his attorneys
Briesen & Dumpe

H. HUNDRIESER.

SCULPTOR'S COPYING MACHINE.

APPLICATION FILED DEC. 29, 1911.

1,039,406.

Patented Sept. 24, 1912.

4 SHEETS—SHEET 2.

Fig. 2.

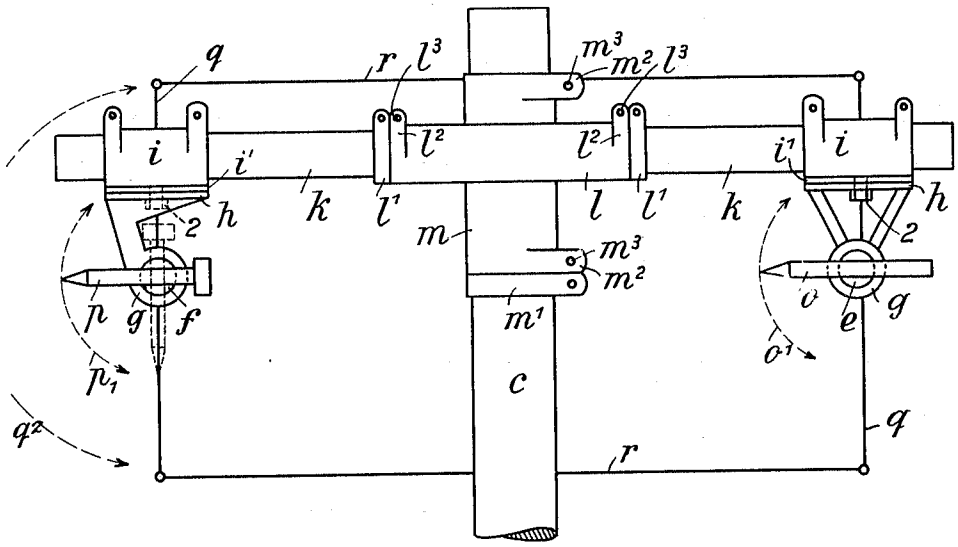
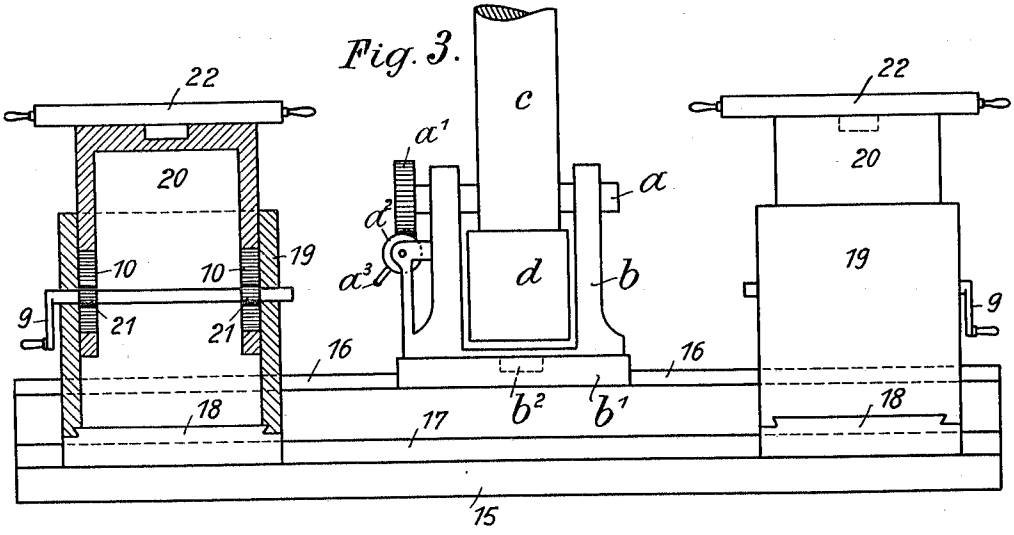


Fig. 3.



Witnesses:
Katheryne Koch
Daniel Holmgren.

Inventor:
Hans Hundrieser
by his attorneys
Briesen & Knappe

H. HUNDRIESER.

SCULPTOR'S COPYING MACHINE.

APPLICATION FILED DEC. 29, 1911.

1,039,406.

Patented Sept. 24, 1912.

4 SHEETS—SHEET 3.

Fig. 7.

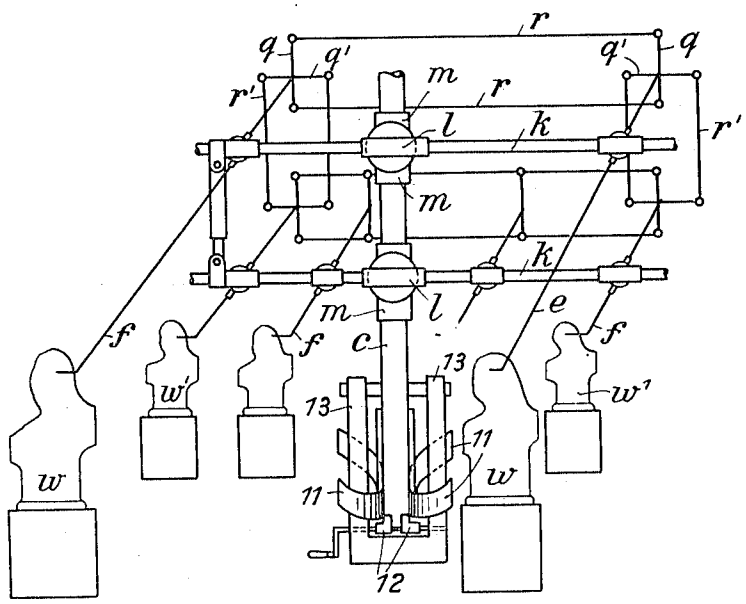


Fig. 11.

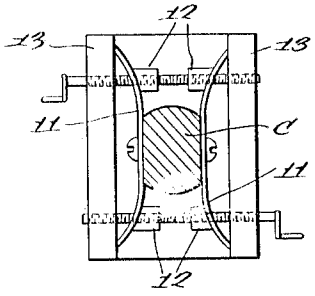
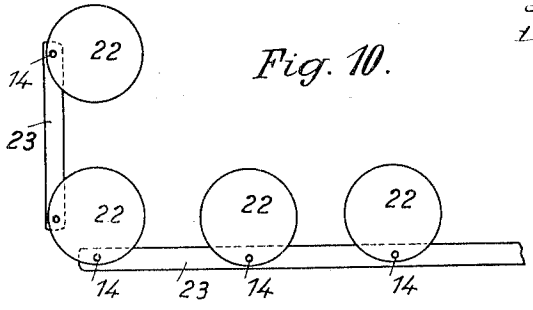


Fig. 10.



Witnesses
Hutchinson Wood
Daniel Holmgren.

Inventor:
Hans Hundrieser
by his attorneys
Briesen & Jumpe

H. HUNDRIESER.

SCULPTOR'S COPYING MACHINE.

APPLICATION FILED DEC. 29, 1911.

1,039,406.

Patented Sept. 24, 1912.

4 SHEETS—SHEET 4.

Fig. 8.

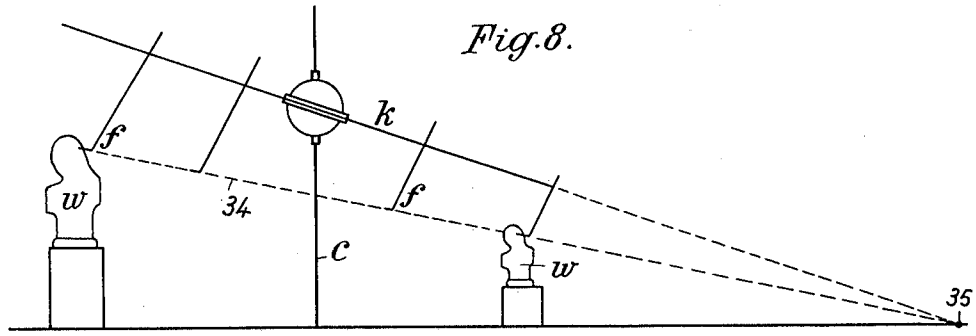
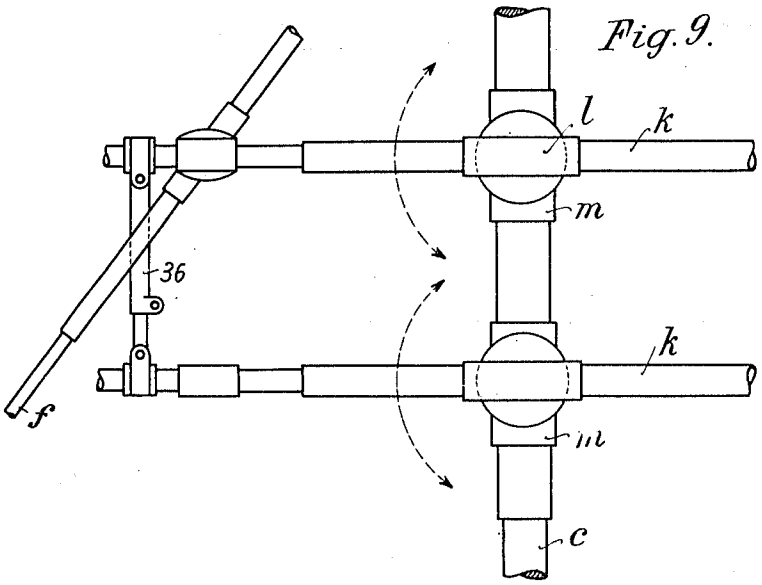


Fig. 9.



Witnesses:
Katherine Koch
Daniel Holmgren.

Inventor.
Hans Hundrieser
by his attorneys
Briesen & Klauke

UNITED STATES PATENT OFFICE.

HANS HUNDRIESER, OF HALENSEE, NEAR BERLIN, GERMANY.

SCULPTOR'S COPYING-MACHINE.

1,039,406. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed December 29, 1911. Serial No. 668,462.

To all whom it may concern:

Be it known that I, HANS HUNDRIESER, a citizen of Germany, residing at Halensee, near Berlin, Germany, have invented a new and Improved Sculptor's Copying-Machine, of which the following is a specification.

This invention relates to an improved machine for copying or reproducing sculptors' models, so that a duplicate of such model is cut from a block of stone or other material.

In the present sculptors' copying machines arms carrying feelers and tools are mounted to rock on stationary joints or pivots, so that the tools invariably work in the same direction and are consequently not suitable for the reproduction of models, parts of which project to a considerable extent or are braced together, because these parts cannot be fully reached by a feeler movable only in one direction and therefore cannot be fully worked by tools. Frequently other parts of the copying machine, such for example as the connections between the arms, are on the side facing the model and the work-piece, so that the capability of motion of the machine and consequently its sphere of action is reduced. Experience shows that for the reproduction of very irregular models the arm with the feeler can be moved only by hand, so that the movable parts require to be as light as possible.

My invention comprises improvements in sculptors' copying machines, whereby the range of working of these machines is considerably increased.

According to this invention, two arms one carrying feelers and the other tools, are held in clamping supports, which are constructed as pivots. The arms are therefore longitudinally movable as well as rotatable and laterally adjustable, while parts only of the machine with their tools and driving organs reach out over the connecting traverse in direction of the model and the work piece. All other parts of the machine lie behind the traverse and are movably supported in such a manner that it is possible to counterpoise the mechanism without counterweights.

In the accompanying drawing: Figure 1 is a perspective view of a sculptor's copying machine embodying my invention with some of the parts omitted; Fig. 2 a front elevation of the upper part thereof; Fig. 3 a similar view partly in section of the lower part showing the tables; Fig. 4 a plan of the machine base; Fig. 5 a detail of the cutting-tool driving mechanism; Fig. 6 a diagram showing a number of tool shafts engaged by a common driving belt; Fig. 7 a diagrammatic perspective view of a modification of the machine; Fig. 8 a diagrammatic view showing the reproduction of the features of a model on a work piece of different size; Fig. 9 a detail of a modification of the rotatable arms; Fig. 10 a diagrammatic view showing a plurality of interconnected table tops, and Fig. 11 a top view of the machine base of Fig. 7 with the post in section.

In standards or bearings b is journaled a horizontal shaft a, upon which is mounted a column c, the lower part of which forms a counterweight d. Bearings b are rotatably mounted upon a slide or carriage b^1 by pivot b^2 entering a socket of said slide. Column c is embraced by a clamping tube or strap m adaptable to be longitudinally shifted and also to be rotated. This clamping tube is secured in position by clamping ears m^2 and bolts m^3 and also if desired by a ring m^1. Tube m is made integral with another horizontal clamping tube l in which a traverse k is longitudinally shiftable and rotatable. Traverse k is held in position by clamping ears l^2 and bolts l^3 and also if desired by rings l^1. On the traverse k two clamping supports $i\ i$ may be longitudinally adjusted and fastened. The supports $i\ i$ are made integral with circular disks $i^1\ i^1$, which are engaged by corresponding disks h h of rotatable bearings $g\ g$. Disks i^1, h are pivotally connected by bolts 2, but the pivotable connection between the parts may be effected in other known manner. In the bearings $g\ g$ a pair of arms e and f are both slidable and rotatable. Arm e carries at its free end one or more feelers o adapted to engage a model, while arm f carries at its free end one or more tools p adapted to operate upon the work piece. At their rear ends arms $e\ f$ are connected to opposite levers or arms $q\ q$ of a parallelogram, which are pivotally connected to each other by rods $r\ r$ so that in this manner the two arms e f are obliged to move together when one of them is turned by hand, as indicated by dotted line q^2 Fig. 2. The tools p are driven by means of a pulley x and belt x^2 from an electromotor x^1.

For the enlargement or reduction of

models, a secondary arrangement of arms is mounted sidewise from arms *e f* in such a manner that they have a movement similar thereto, the feeler or tool *u* of this secondary arrangement following all the movements of arms *e* and *f*. For this purpose a second strap *z* fitted on column *c* is provided with a tube 24, in which a transverse bar 25 is longitudinally movable and rotatable. On bar 25 a sleeve *s* is longitudinally shiftable which carries a rotatable bearing 26 in which a longitudinal bar 27 is axially movable. At one end, bar 27 carries the feeler *u*. Sleeves n^1 loosely embrace arms *e f* and are provided with pivoted bearings n^2 in which a transverse bar *n* is longitudinally slidable. A sleeve 28 longitudinally slidable on bar 27 is connected to bearing n^2 of arm *e* by link *t*. A pivoted bearing 29 of sleeve 28 supports a longitudinally adjustable bar 30, which is arranged in parallelism with bar *n*. Bar 30 is by rod 31 pivotally connected with the bearing n^2 of arm *f*. By the means described, bar 27 is so connected to both the arms *e* and *f* as to move in unison therewith. For enlarging purposes the feeler *u* is passed along the model while the tools *p* are working. For reducing purposes the feeler *u* is replaced by a tool, while tool *p* is passed along the model.

In Figs 3 and 4 a guide rail 16 is shown to be arranged between rows of tables 20 along which the carriage b^1 of standard *b* is movable. The tables 20 are movable along guide rails 18 which are arranged at right angles to rail 16 and along guide rails 17 which are parallel to rail 16. Each table is provided with a rotatable top plate 22, which plates support the models and work pieces and permit the same to be adjusted and turned. By means of a crank handle 9, pinions 21 and racks 10 the tables may be raised or lowered.

The movement and adjustment of column *c* is effected by a worm-wheel gear, comprising worm wheel a^1, worm a^2, and crank handle a^3 by turning which, any desired dip may be given to the column.

Fig. 5 illustrates an arm *f* carrying two tools *p*, the shaft *v* of one of said tools being arranged at right angles to the arm. The tools are journaled in an angular bracket w^2 and are intergeared by bevel wheels *y*. The spindles of the tools are driven either directly by the electromotor x^1 or through known transmissions engaging pulley *x* mounted on shaft *v*.

Fig. 6 illustrates diagrammatically a plurality of tool spindles 6, 7, 8 arranged side by side and driven by a single belt 33 from a single pulley 5. This arrangement not only permits the production of enlargements and reductions, but the simultaneous production of objects of different sizes by varying the distance of the traverses and the arms from each other. So also the counterweight *d* may be replaced by springs pressing against the posts of the standard with adjustable pressure, thereby rendering the machine lighter and causing the column to retain any position selected. If desired, the traverses, arms and connecting rods may be made telescoping, while the table-plates may be provided with pins connected by a telescoping connecting gear through which the table-plates may be turned simultaneously.

Fig. 7 shows diagrammatically the machine adapted for the reproduction of work-pieces of two different sizes, with two traverses situated above one another and at right angles to the column. These traverses are pivotally attached to the column and are so connected by a pivoted and telescoping train of intergeared rods that the traverses are caused to make the same movements. The arms *e* and *f* are here again connected in a vertical direction by a system of pivoted and telescoping rods to achieve a corresponding turning of all the arms of all the traverses. In this figure the counterweight *d* is shown to be replaced by a pair of bow-shaped springs 11. These springs are fixed to the column *c* and glide over the inner sides of posts 13 when the column is moved, screw threaded nuts 12 serving to vary the pressure of the ends of springs 11, against posts 13.

Fig. 8 shows diagrammatically a traverse with four arms adjusted at a certain angle to the column *c* and the reproduction of work pieces in various sizes.

Fig. 9 illustrates how column *c*, traverse *k*, arms *e* and *f* and the system of connecting rods may be formed from telescopical tubes drawn out to accord to the various positions desired.

Fig. 10 illustrates a series of table tops 22 that may be simultaneously turned by means of a connecting rod 23 engaging pins 14 of said tops.

The feeler may be passed along either the inner-side or the outer side of the model, and the machine may by the employment of suitable tools be readily adapted for modeling of various characters.

In use the tool *p* is placed opposite a block of stone, wood, metal, clay or other material, while the feeler *o* faces the model at a distance therefrom. As the tool is being operated, it will cut into or penetrate the work piece, its action being continued until the feeler contacts with the model. The device is then shifted so that the tool operates upon an adjoining section of the work piece, this operation being continued until the entire model has been reproduced.

I claim:

1. A sculptor's copying machine comprising a column, a sleeve rotatable thereon, a traverse rotatable and slidable in the sleeve,

a pair of rotatable and oscillable arms carried by the traverse, levers fast on the arms, rods connecting the levers, and a feeler and tool carried respectively by the arms.

2. A sculptor's copying machine comprising a column, a pair of sleeves rotatable thereon, a pair of traverses rotatable and slidable in the respective sleeves, a pair of rotatable and oscillable arms carried by one of the traverses, a third arm carried by the other traverse, and means for pivotally connecting said third arm to the first mentioned arms.

3. A sculptor's copying machine comprising a pair of connected arms, a feeler carried by one of said arms, a pair of tools carried by the other arm, said tools being intergeared and disposed at right angles to one another.

4. A sculptor's copying machine comprising a column, a pair of connected arms, a tool and a feeler secured respectively thereto, a plurality of superposed traverses pivotally connected to each other and provided with arms adjustable at any angle to the column, said arms being so connected as to perform uniform rotary motions, the arms and connecting parts being composed of telescoping tubes.

5. A sculptor's copying machine comprising a rocking column, a pair of connected arms carried thereby, a tool and a feeler carried by the respective arms, springs engaging the column and brakes controlling the springs.

HANS HUNDRIESER.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.