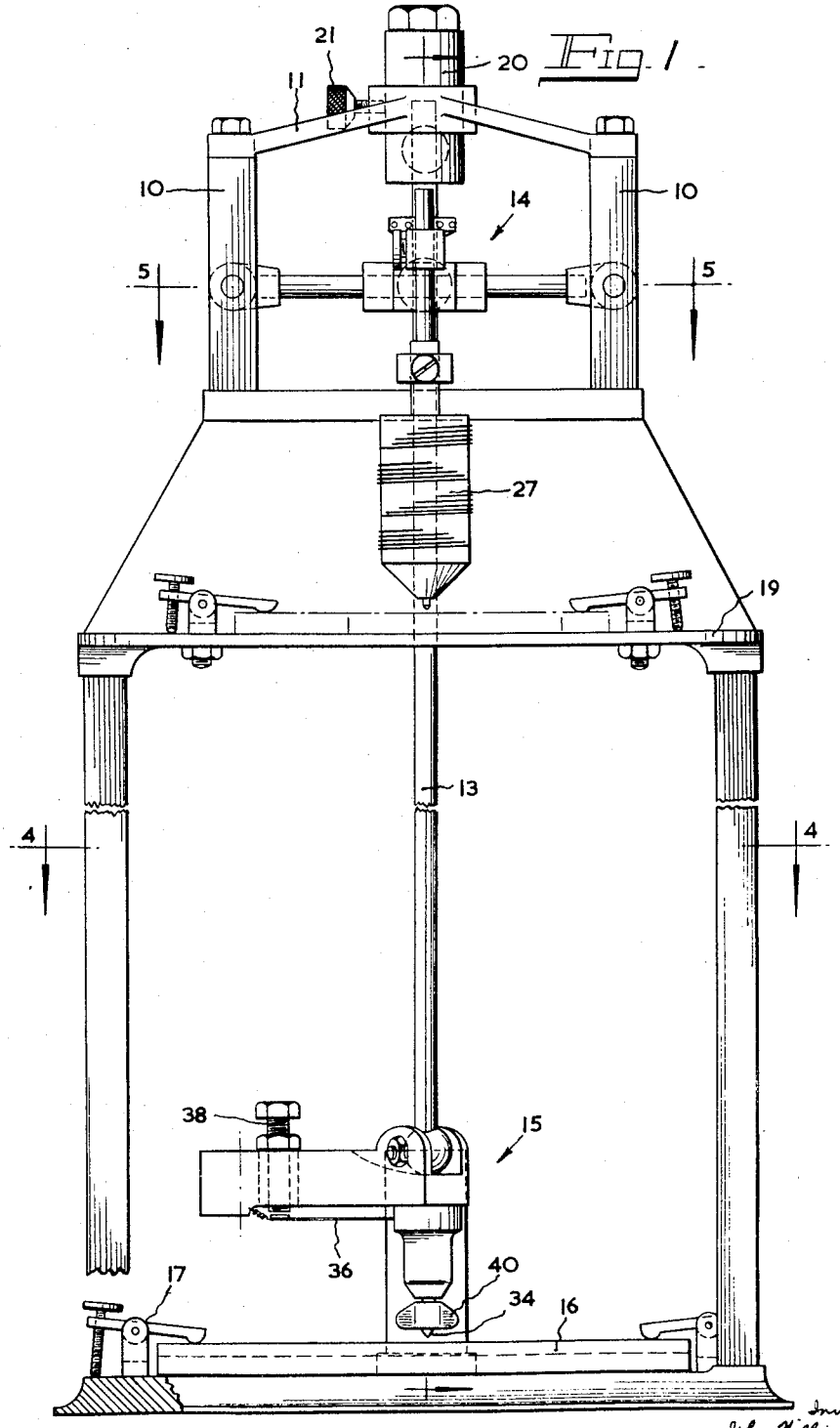
Sept. 30, 1958 J. W. HILL 2,854,560

ELECTRICAL ENGRAVING MACHINES

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Fig. 1.



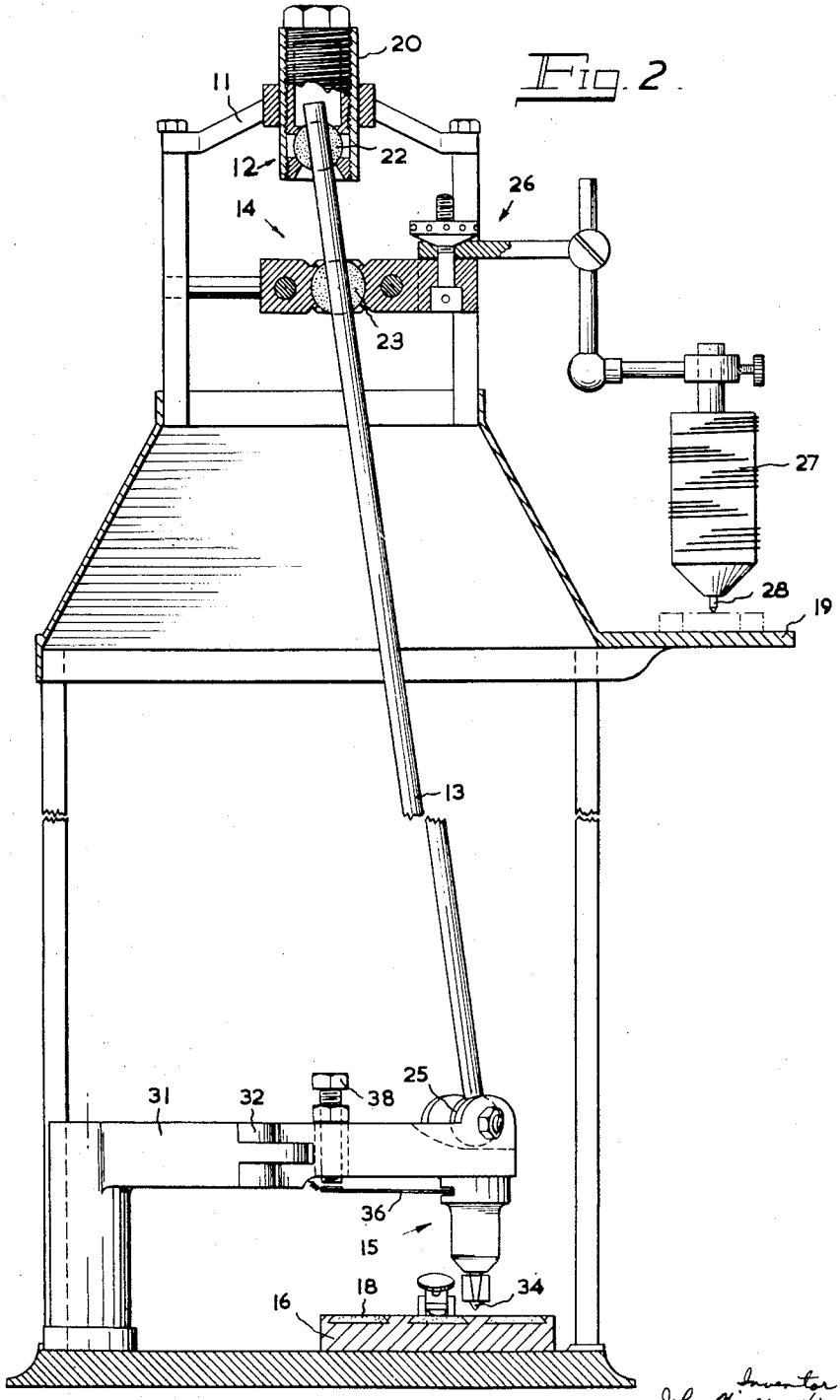
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ELECTRICAL ENGRAVING MACHINES

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Fig. 2.



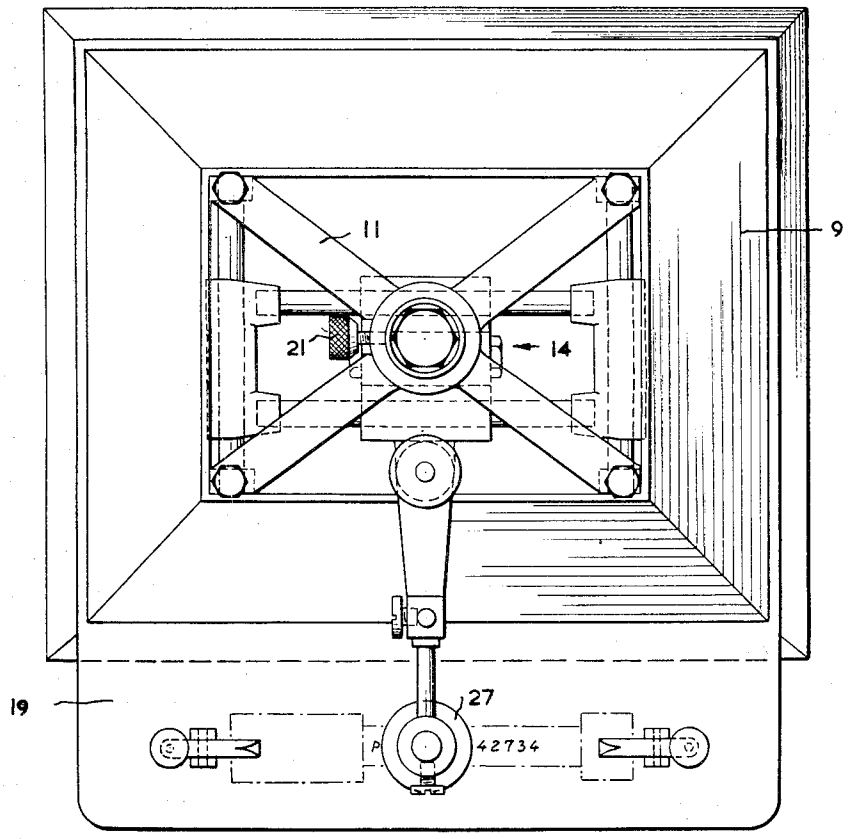
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Fig. 3



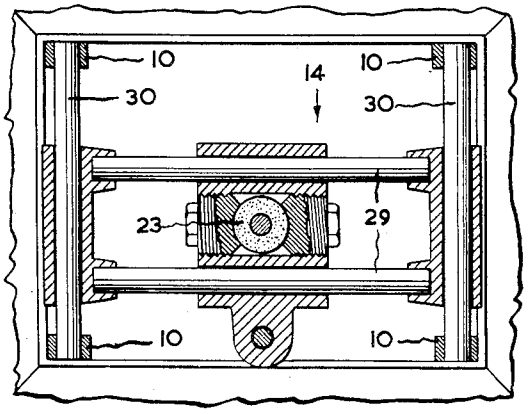


Fig. 5.

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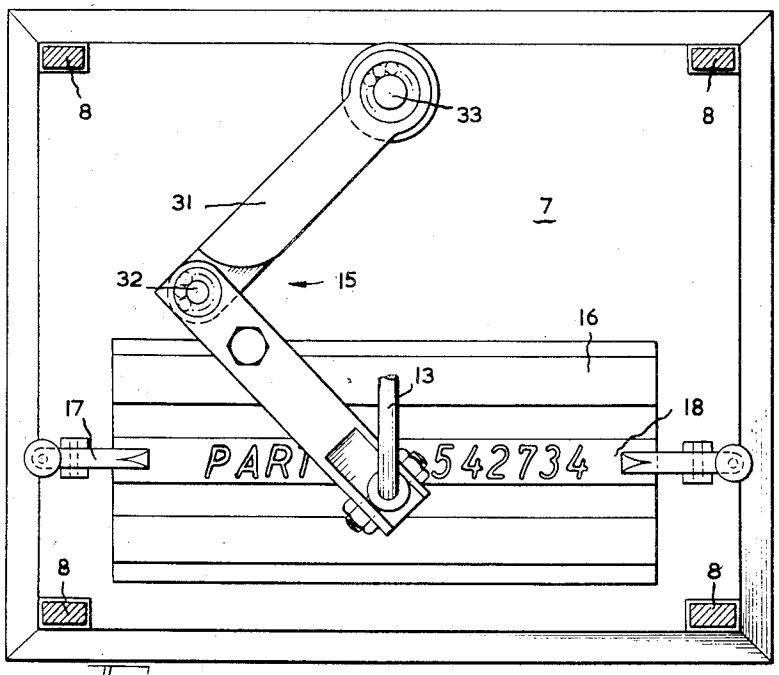


Fig. 4

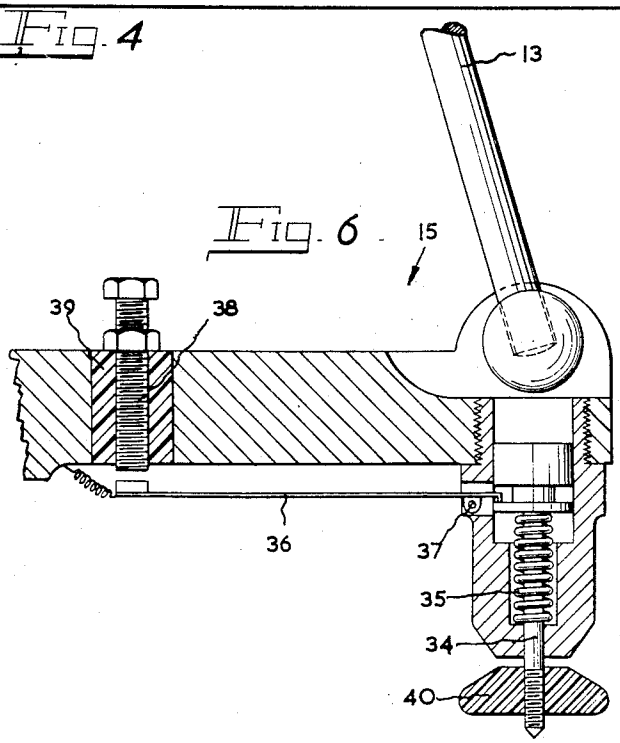


Fig. 6

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ELECTRICAL ENGRAVING MACHINES

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Application September 28, 1956, Serial No. 612,690

8 Claims. (Cl. 219—69)

This invention relates to electrical engraving machines, that is to say, machines in which the engraving is done by an electric arc produced between an electrode and the work and of the kind in which a master copy of a design or lettering is followed by a tracer and reproduced at a reduced or enlarged scale on the work. Master lettering is usually hollow or intaglio in character and in use the tracer engages and is moved along the grooves of the lettering.

Commercially available machines of this kind usually employ a pantograph mechanism for reduction or enlargement and are complicated, heavy and cumbersome.

According to the present invention a vertically spaced tracer and electrode are mounted on carriages permitting movement in spaced horizontal planes and are linked by a substantially vertical lever having a universal fulcrum at one end.

The relative distance from the fulcrum of the points of connection of the tracer and electrode carriages to the lever determine the size ratio of the work to the copy. If the work is to be an enlargement of the original the tracer carriage will be nearer the fulcrum than the electrode carriage, but if reduction is required the positions of the tracer and electrode carriages with respect to the fulcrum are reversed. Provision may be made for change of scale by making the relative position of the fulcrum, tracer and electrode carriages adjustable. This may be conveniently done by making the fulcrum mounting vertically adjustable.

Where the copy or master lettering to be used is of hollow or intaglio form the tracer is preferably provided with contacts included in the supply circuit of the electrical engraving unit which are closed only when the tracer is properly engaged in a groove of the copy or lettering.

If the operator fails to keep the tracer in proper engagement with the groove the current to the engraving unit is cut off so that damage to the work is avoided.

The carriages for the tracer and electrode are required to permit free movement of the supported member in the appropriate plane but to restrain vertical movement apart from the small movement which may be permitted to the tracer for engaging copy or lettering of hollow or intaglio form.

One suitable form of carriage is a compound carriage that is to say a carriage slidably mounted for movement in one horizontal direction on a slide which is itself slidably mounted for movement in a horizontal direction at right angles to the direction of movement of the carriage.

Another suitable carriage comprises a member articulated about a vertical axis pivotally connected at one end to a rigid support and at the other end to the lever.

An especially useful application of a machine according to the present invention is in the marking of small metal articles such as tools and small engineering components. An embodiment of the invention will now be

described, by way of example, in a machine designed for this purpose, and illustrated in the accompanying drawings in which:

Figure 1 is an elevation of the electrical engraving machine.

Figure 2 is a side sectional elevation of the machine.

Figure 3 is a top plan view.

Figures 4 and 5 are sections on lines 4—4 and 5—5 respectively of Figure 1.

Figure 6 is a sectional view showing constructional details of the tracer support.

The machine illustrated has a rigid frame having a base plate 7 on which is supported by four pillars 8 a casting 9 which in turn supports by four pillars 10 a spider 11. The spider 11 supports a universal fulcrum 12 for the upper end of a substantially vertical lever 13 which passes down through the frame and is pivotally connected to an electrode carriage 14 and a tracer carriage 15.

The base plate 7 forms the copy table and is shown fitted with a type holder 16 which is secured to the base plate by screw clamps 17. The type holder has a series of spaced parallel grooves of dovetail cross-section into which blocks 18 of complementary cross-section and bearing characters in intaglio can be slid to make up the required lines of lettering, numbering or the like.

The casting 9 has a forwardly projecting horizontal shelf 19 which forms a work table which is above the copy table so that reproduction can be readily observed by the operator and is nearer the fulcrum than the copy table so that reproduction on the work is on a reduced scale.

A socket 20 of the fulcrum 12 is vertically slidable in the spider 11, in which it is gripped by a clamping screw 21, to adjust the position of the fulcrum and so vary the size reduction ratio of the machine. The socket 20 receives a ball 22 forming part of the fulcrum 12. The lever 13 is slidable in the ball 22 and in a similar ball 23 in the electrode carriage 14 but is rigidly secured to a ball 25 in the tracer carriage 15.

The electrode carriage 14 supports an adjustable clamp 26 by which an electrical engraving unit 27 with an integral electrode 28 is mounted above and angularly and vertically adjustable with respect to the work table. The electrode carriage 14 is slidably mounted for sideways movement on a pair of parallel rods 29 which are themselves mounted slidably for forward or backward movement on parallel rods 30 secured to the pillars 10 at right angles to the rods 29. This arrangement forms a compound slide allowing free movement of the electrode in a horizontal plane but preventing movement in other directions.

The tracer carriage 15 comprises an articulated member 31 which is rule jointed at 32 about a vertical axis. At the rear the member 31 has a boss which is pivoted to a pillar 33 rigidly secured to the base plate 7. At the forward end the articulated member has a socket for the ball 25 and a mounting for a tracer 34 which as shown in Figure 6 is permitted some vertical sliding movement to enable it to be lowered into the groove of hollow or intaglio lettering held in the type holder 16. To enable it to be lowered and guided the tracer is provided with a finger grip 40. The tracer is normally raised by a spring 35 and its vertical movement rocks a movable contact arm 36 about a pivot 37. When the tracer is lowered into the lettering groove the movable contact arm 36 engages an adjustable contact screw 38 which is mounted by an insulating screw-threaded bush 39 in the articulated member 31. The contacts 36 and 38 are included in the electrical circuit of the engraving unit 27 which can therefore only be energized when the tracer is properly

engaged with the lettering. If the tracer should become displaced from the groove during use the work will not be damaged.

This machine according to the present invention is simple to use and the size of the reproduction of the lettering upon the work can be readily and quickly altered. It is lighter and more portable than existing equipment and is capable of doing very accurate work. The simple nature of the mechanism with a single ratio arm in place of a pantograph linkage and the substantial bearing surfaces provided permit accuracy to be maintained even after a long period of use. The arrangement of the work and copy tables in vertically spaced horizontal planes enables them both to be in convenient positions in front of the operator while the position of the work table above the copy table enables the former to be easily seen and the latter to be readily accessible to the operator's hands.

I claim:

1. An electrical engraving machine comprising a rigid framework including a horizontal base; means supported by said rigid framework for holding work with a surface to be engraved disposed in a first horizontal plane; means on said rigid framework for holding in a second horizontal plane spaced below said first horizontal plane master copy having, in intaglio, characters required to be reproduced on said work; means mounted on said rigid framework including an element constrained for solely horizontal movement; a tracer adapted to engage such intaglio characters and mounted on said element for limited vertical sliding movement with respect to said arm for engagement with and disengagement from such intaglio characters; an electric engraving unit having an electrode and adapted when energized to produce an electric arc between said electrode and a conducting surface in contact with said electrode; a compound electrode carriage including a member and a slide, the member being slidably mounted for movement in a first horizontal direction on a slide which is itself slidably mounted for movement in a second horizontal direction at right angles to said first horizontal direction; means mounted on said member for holding said electrode in contact with said work surface in said first horizontal plane; a substantially vertical lever having a universal fulcrum by which said lever is connected to said rigid framework above said first and second horizontal planes and universal pivoted connections one linking said lever to said member of said electrode carriage and the other linking said lever to said element for horizontal movement of said electrode identical, but on a reduced scale, to the horizontal movement of said tracer; and means for energizing said engraving unit solely while said tracer is in contact with such intaglio characters.

2. An electrical engraving machine comprising a rigid framework including a horizontal base; means supported by said rigid framework for holding work with a surface to be engraved disposed in a first horizontal plane; means on said rigid framework for holding in a second horizontal plane spaced below said first horizontal plane master copy having, in intaglio, characters required to be reproduced on said work; an articulated arm mounted and constrained for solely horizontal movement by having a pivotal connection about a vertical axis to said rigid framework and a joint with a vertical axis between articulated portions of the arm, one having said pivoted connection, the other having a free end; a tracer adapted to engage such intaglio characters and mounted on said free end for limited vertical sliding movement with respect to said arm for engagement with and disengagement from such intaglio characters; an electric engraving unit having an electrode and adapted when energised to produce an electric arc between said electrode and a conducting surface in contact with said electrode, an electrode carriage including a member confined to horizontal movement; means mounted on said member for holding said electrode in contact with said work surface in said first horizontal plane; a substantially vertical lever having a universal fulcrum by which said lever is connected to said rigid framework above said first and second horizontal planes and universal pivoted connections one linking said lever to said member of said electrode carriage and the other linking said lever to said free end of said articulated arm for horizontal movement of said electrode identical, but on a reduced scale, to the horizontal movement of said tracer; and means for energizing said engraving unit solely while said tracer is in contact with such intaglio characters.

3. An electric engraving machine comprising in combination a rigid framework including a base and a head-piece above and spaced from said base, a universal fulcrum mounted substantially centrally in said head-piece, a lever depending from said fulcrum, an electrode carriage mounted under said head-piece, confined to movement in a horizontal plane and pivotally connected to said lever, a horizontal work shelf extending forwards from said head-piece means for securing work to be engraved on said shelf, an electric engraving unit having an electrode and adapted when energized to produce an electric arc between said electrode and a conducting surface, means for rigidly mounting said engraving unit on said electrode carriage with its electrode over said work shelf, means for supporting master copy having intaglio characters from said base, a tracer carriage supported from said framework above said supporting means, constrained for movement in a horizontal plane and pivotally connected to said depending lever, a tracer slidably mounted on said tracer carriage for limited vertical movement enabling said tracer to engage and disengage such intaglio characters, and means actuated on engagement of said tracer solely with said intaglio characters of said master copy for energizing said engraving unit.

4. An electrical engraving machine comprising a rigid framework including a horizontal base; means supported by said rigid framework for holding work with a surface to be engraved disposed in a first horizontal plane; means on said rigid framework for holding in a second horizontal plane spaced below said first horizontal plane master copy having, in intaglio, characters required to be reproduced on said work; an articulated arm mounted and constrained for solely horizontal movement by having a pivotal connection about a vertical axis to said rigid framework and a joint with a vertical axis between articulated portions of the arm one having said pivoted connection, the other having a free end; a tracer adapted to engage such intaglio characters and mounted on said free end for limited vertical sliding movement with respect to said arm for engagement with and disengagement from such intaglio characters; an electric engraving unit having an electrode and adapted when energized to produce an electric arc between said electrode and a conducting surface in contact with said electrode; a compound electrode carriage including a member and a slide, the member being slidably mounted for movement in a first horizontal direction on a slide which is itself slidably mounted for movement in a second horizontal direction at right angles to said first horizontal direction; means mounted on said member for holding said electrode in contact with said work surface in said first horizontal plane; a substantially vertical lever having a universal fulcrum by which said lever is connected to said rigid framework above said first and second horizontal planes and universal pivoted connections one linking said lever to said member of said electrode carriage and the other linking said lever to said free end of said articulated arm for horizontal movement of said electrode identical, but on a reduced scale, to the horizontal movement of said tracer; and means for energizing said engraving unit solely while said tracer is in contact with such intaglio characters.

5. An electric engraving machine comprising in combination a horizontal base, spaced upright columns

mounted on said base, a turret supported by said columns over said base and forming with said columns and said base a rigid structure, a universal fulcrum mounted substantially centrally in said turret, a lever depending from said fulcrum, an electrode carriage mounted in said turret confined to movement in a horizontal plane and pivotally connected to said lever, a horizontal work shelf extending forwards from said turret, means for securing work to be engraved on said shelf, an electric engraving unit having an electrode and adapted when energized to produce an electric arc between said electrode and a conducting surface, means for rigidly mounting said engraving unit on said electrode carriage with its electrode over said work shelf, means for supporting master copy having intaglio characters on said base, a tracer carriage supported from said base, constrained for movement in a horizontal plane and pivotally connected to said depending lever a tracer slidably mounted on said tracer carriage for limited vertical movement enabling said tracer to engage and disengage such intaglio characters, means actuated on engagement of said tracer solely with said intaglio characters of said master copy for energizing said engraving unit.

6. An electrical engraving machine according to claim 4 and further comprising means for completing the circuit of the electrical engraving unit solely upon proper engagement of the tracer in the grooves of the master copy.

7. An electrical engraving machine according to claim 4 wherein the tracer is permitted slight vertical movement in order to engage hollow or intaglio lettering and contacts are provided which are closed only when the tracer is properly engaged in the grooves of the master copy and are connected in the electrical circuit of the engraving unit for energizing the electrode.

8. An electrical engraving machine according to claim 4 wherein the fulcrum is vertically adjustable to vary the ratio of reduction or enlargement.

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