March 31, 1959 F. R. LEAR, SR 2,879,616

ETCHING MACHINE

Filed Dec. 3, 1956 3 Sheets-Sheet 1

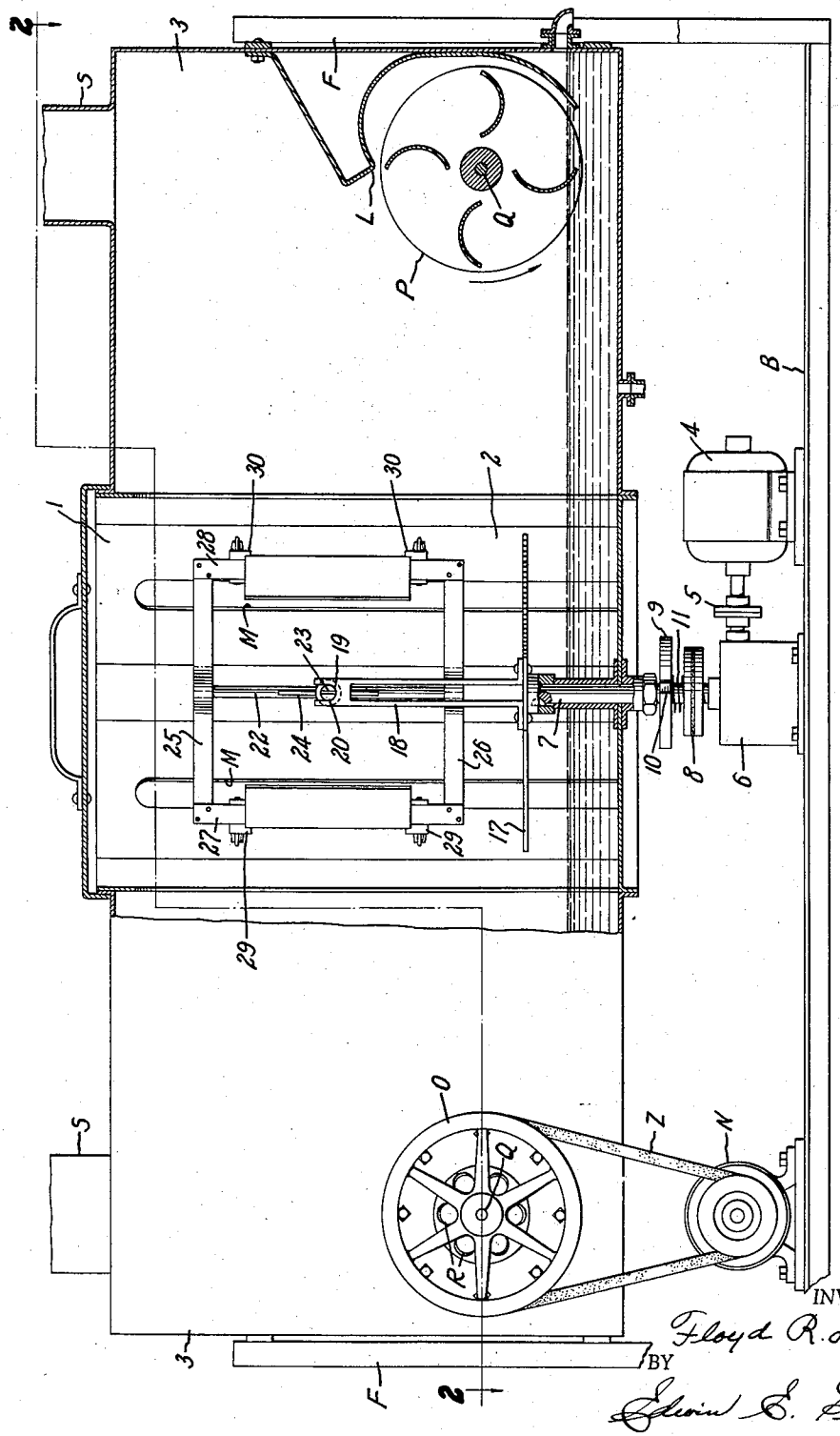


Fig. 1.

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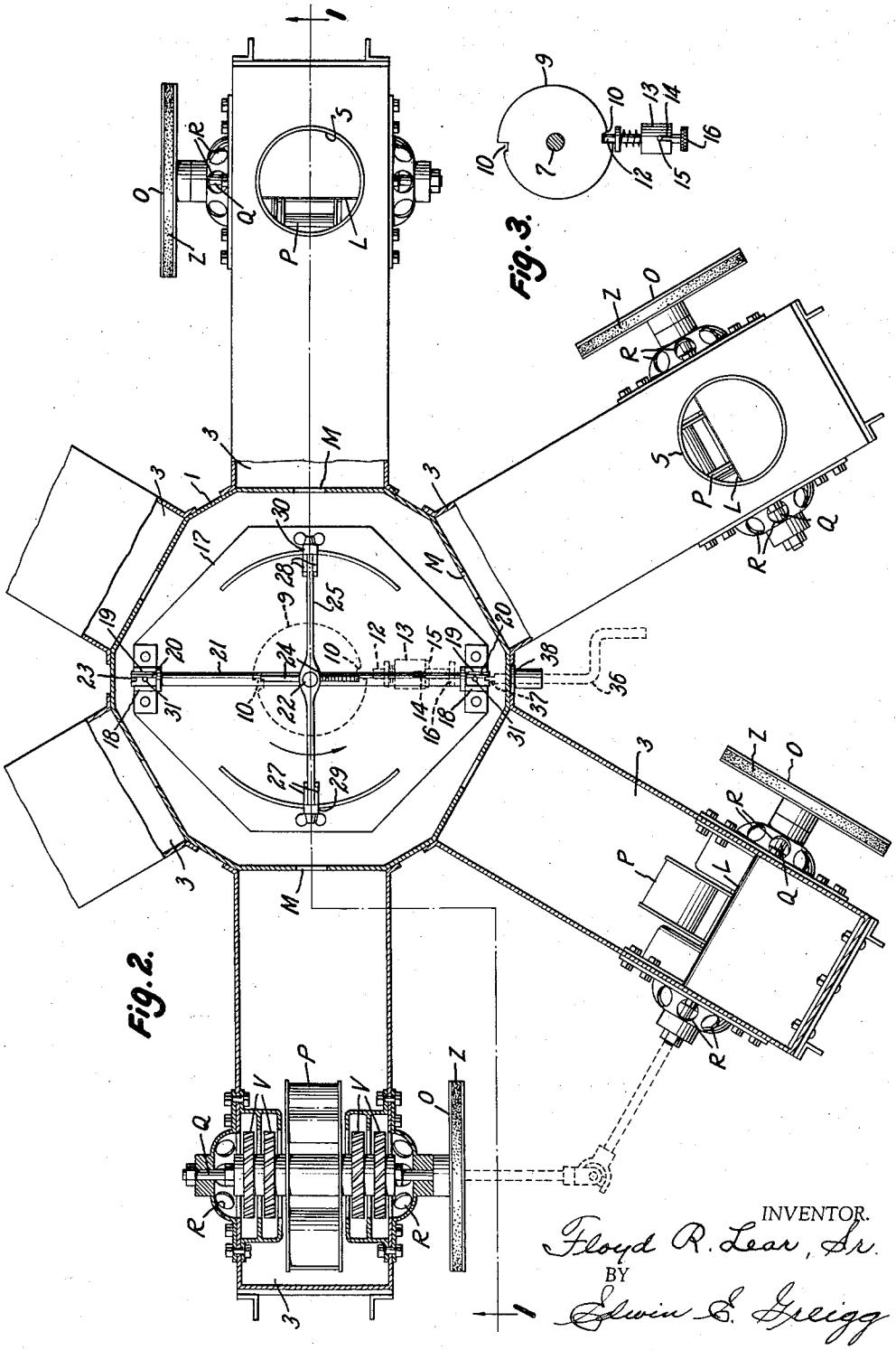


Fig. 2.

Fig. 3.

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Fig. 4.

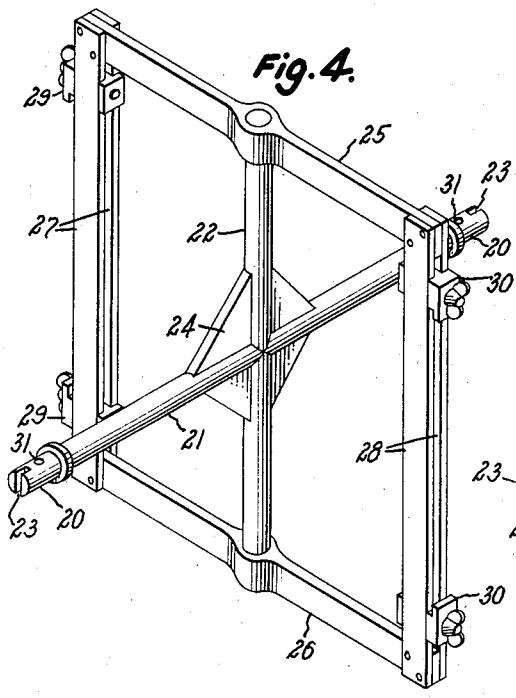


Fig. 5.

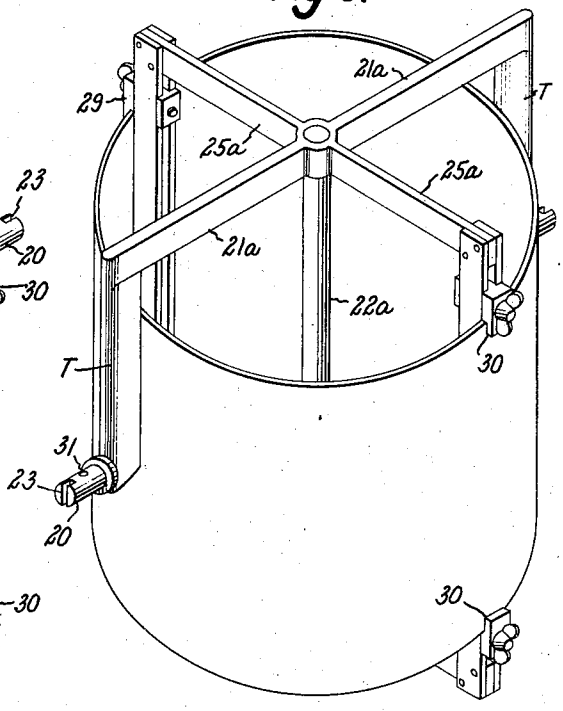


Fig. 6.

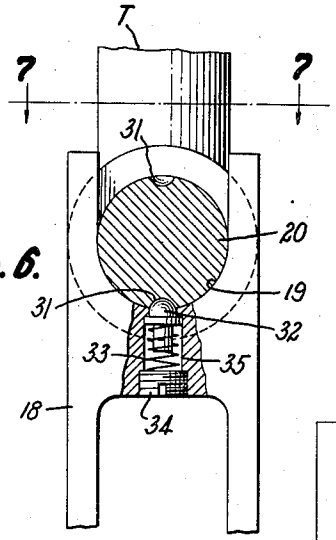
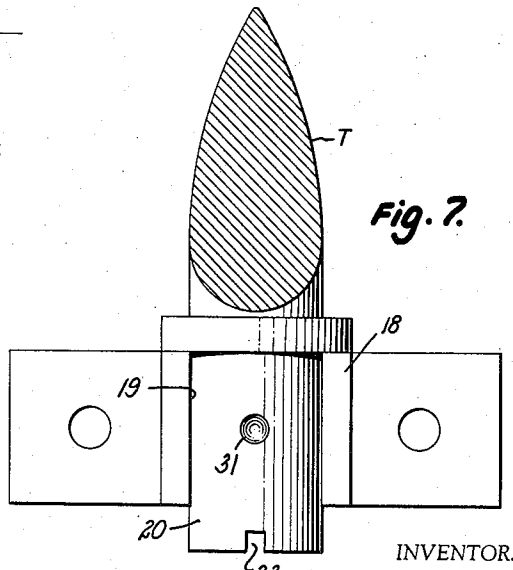


Fig. 7.



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ETCHING MACHINE

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Application December 3, 1956, Serial No. 625,650

7 Claims. (Cl. 41—9)

This invention relates to the art of etching rotogravure printing segments and cylinders, and more particularly to a chamber method of etching wherein the cylinder to be etched is revolved in a receptacle or chamber about an axis, and wherein provision is made to rotate the segments and cylinders about their respective axes.

It is well known in the art that rotogravure printing cylinders are commonly prepared for etching by providing a cylinder having a polished copper surface, mounted on a horizontally disposed shaft having journals or trunnions extending axially from each end of the cylinder and positioning the cylinder on a suitable stand or other support with the journals held in bearings and with at least one end of the shaft extending and carrying a means by which it may be readily revolved during the etching operation.

At the present time, one of the more common methods of etching is to mount the cylinder in a horizontal position, over a sink adapted to collect the mordant as it drips from the cylinder and with the ends of shafts which extend from the cylinder resting in bearings on a suitable truck or stand. The cylinder may be revolved by means of a handwheel attached to one end of the shaft or by a motor which may be connected to the shaft by a suitable gear arrangement so as to revolve the cylinder slowly in the bearings. The mordant is either poured over the cylinder or is applied by swabbing it on by hand and rubbing the cylinder as it revolves so as to apply the mordant to the surface of the cylinder as uniformly as possible.

Still another more common method of etching where flat plates are involved, is accomplished by utilizing an acid-proof receptacle to contain the mordant, means being provided in the receptacle for supporting a plate or plates and a rotating spreader arranged in such a manner as to pick up the mordant during rotation and then throw it onto the plate or plates. Depending on the fancy of the designer of such receptacles, the plates are sometimes arranged in a horizontal plane above the rotating spreaders or some support is provided in the receptacle for holding the lower edge of the plate above the mordant while the upper edge of the plate leans against one of the vertically disposed walls of the receptacle.

While machines of the types referred to above have been considerably improved over the years and may have been thought to be satisfactory, it is believed that the present arrangement of elements provides the ultimate in etching apparatus, particularly insofar as curved plates or segments and cylindrical elements are concerned.

The principal object of the present invention is a provision of means for revolving work pieces that are to be etched about an axis in a receptacle, additional means being included to permit said work pieces to be revolved in another plane about their own axes.

Another object of the invention is the provision of means for arresting the travel of the work carrier element during the etching operation, at a predetermined interval

during its rotation, and to thereafter invert the work carrier and resume rotation and the etching operation.

With these and other objects in view, the invention includes an etching chamber having radially disposed offstanding intercommunicating chambers, a revoluble work carrier means within the chamber for supporting work pieces during the etching operation and means for interrupting the revoluble carrier means and subsequently inverting the work pieces, all as will be explained more fully hereinafter, and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

Fig. 1 is a side elevation of the etching receptacle with several of the radially disposed chambers removed and the parts of the revoluble carrier and one chamber thereof exposed in section,

Fig. 2 is a top plan view of the etching receptacle clearly illustrating the liquid impelling means and the revoluble carrier,

Fig. 3 is a top plan view of the locking mechanism utilized for arresting and holding the work carrier means in a predetermined position for inverting the work pieces,

Fig. 4 is a perspective view of a work carrier which is associated with a revoluble carrier means and is arranged to support segmental work pieces,

Fig. 5 is a perspective view of a work carrier which is associated with a revoluble carrier means and is adapted to support cylindrical work pieces,

Fig. 6 is a fragmentary elevational view of one of the horizontal arms that supports a part of the work carrier relative to its complemental carrier portion, and

Fig. 7 is a top plan view on line 7—7 of Fig. 6 of one of the upstanding carrier arms associated with said horizontal arm.

Having reference particularly to Fig. 1, it will be seen that the receptacle or chamber, designated 1, and within which the revoluble work carrier means, generally indicated at 2, is positioned for rotation about a vertical axis, intercommunicates with one of a plurality of radially arranged chambers or tanks 3. An inspection of Fig. 2 at this time will clarify this statement. In a manner of speaking, the chamber within which the work is positioned and wherein the etching takes place forms a hub with the tanks radiating therefrom in a spoke-like fashion. The chamber and its intercommunicating chambers or tanks all form a unitary device that is supported by a suitable structure comprising a base B and perpendicularly disposed arms F.

In each of the chambers or tanks 3 is located at revoluble paddle element P the axle Q of which is appropriately supported in bearings carried by the exterior walls of the respective chamber. Venting means V are also disposed on said axle on opposite sides of the paddle element and are utilized to introduce fresh air to the chamber through apertures R and expel the gases through a stack S mounted on top of each of the chambers. From an examination of Fig. 1, it will be observed that the paddle element P, which rotates in a counter-clockwise direction as by means of a motion imparting means N, will squeeze the etching mordant between itself and the baffle L and consequently thereafter project it onto the work to be treated. The central chamber or hub of the machine is provided with perpendiucular slits M in the center of each of the walls that communicate with the aforementioned chambers or tanks 3. It will be apparent that one or a plurality of motion imparting means N may drive pulleys O by means of belts Z and thereby provide the means by which the mordant may be propelled against the work surface during rotation.

As also shown in Fig. 1, there is positioned on base B

a driving motor 4, suitably coupled at 5, through a gear-reduction box 6, to the perpendicular driven shaft 7. Disposed immediately above the gear-reduction box 6 and carried by shaft 7 is a suitable braking mechanism 8, the purpose of which will become apparent as this disclosure progresses.

Interposed between the braking mechanism 8 and the bottom of the receptacle 1 there is also mounted on shaft 7 an indexing mechanism 9 comprising a disc-like element, the periphery of which is provided with locking recesses 10 disposed 180° apart. Disposed between the indexing mechanism and the braking mechanism is a spring 11. Referring now to Fig. 3, it will be noted that a locking plunger 12 is spring-urged into association with one of the recesses 10. A collar 13 suitably mounted beneath the receptacle and appropriately slotted, as at 14, is adapted to receive the pin 15 when the revoluble work carrier means is to be arrested in a predetermined position. A knurled portion 16 mounted on the shaft carrying the plunger 12 permits the plunger to be withdrawn from the indexing recess 10 and by rotating the plunger 12 by means of the knurled head 16 through an arc of 90° the pin 15 will be stopped against an unslotted portion of the collar 13. Hence upon releasing the brake means 8 the carrier may revolve until it is again desired to arrest its travel for the purpose of inverting the work pieces as explained hereinbefore.

The revoluble carrier means 2, referred to heretofore, includes a turntable 17, which through any suitable means may be keyed or otherwise positively held for rotation on the driven shaft 7.

Secured to said turntable are upstanding bifurcated legs or other elements 18—18 the lower extremities of which may be suitably fastened to the turntable 17 by riveting, welding, etc. The upper portion of legs 18—18 are provided with opposed horizontally aligned bearings 19—19 forming a supporting means for trunnions 20—20. The trunnions 20—20 are provided at the opposite free ends of a horizontal rod-like member 21 and disposed medially thereof in a vertical plane is an intersecting rod-like member 22 constructed and arranged to support a work carrier means clearly shown in Fig. 4. Strengthening means 24 of any suitable type or construction may be utilized to reinforce the rod-like members 21 and 22 at their point of intersection.

The work carrier shown in Fig. 4 comprises a pair of parallel bars 25 and 26 that are carried by, and at the opposite ends of, the vertical rod-like element 22. Appropriately attached to each of the vertically disposed edges and at the free ends of bars 25 and 26 are coplanar narrow plate-like members 27—27 and 28—28. Positioned for sliding movement between said plate-like members are pairs of clamps 29—29 and 30—30. The aforementioned clamp means are held in predetermined spaced relation by a threaded bolt and wing nut arrangement, in a manner clearly obvious to those skilled in the art. It will be immediately apparent that other suitable singular clamping means may be made available as a substitute to accomplish the same purpose and still be within the scope of the present invention.

Segmental sections or parts of a cylindrical element to be etched may be readily clamped in position for etching and held against displacement by means of the bolted clamps. See Figs. 1 and 2 for views showing segmental parts clamped to the work carrier.

Referring now to Fig. 5, it will be noted that a different embodiment of the invention is shown, and in this view a work carrier of generally similar configuration to that of Fig. 4 has been modified to adapt it to support a cylindrical element for the etching operation. With further reference to Fig. 5, we note that the bar 21, which intersected the vertical bar 22, in Fig. 4, substantially medially thereof, has now become arms 21*a*—21*a* and been conjoined to the bar 25*a*—25*a* at the point of association with the vertically extending rod-like element 22*a* thereby forming a cruciform configuration. The offstanding arms 21*a*—21*a* are of sufficient length to extend beyond the cylinder comprising the work that is to be held in the carrier means. Depending from the opposite ends of arms 21*a*—21*a* are teardrop shaped elements or arms T. As in Fig. 4, trunnions 20—20 also form a part of this embodiment of the invention, since they form the means about which the carrier means may be rotated in the bearing 19—19. It should be understood that the T-shaped arms, while shown dependent in the drawing will be upstanding with the work cylinder confined therewithin when the work piece is inverted during the etching operation. The arms T are shaped in the form of a teardrop for the purpose of offering less resistance and interference with the free flow of the etching material when it is being projected onto the cylindrical work surface.

It will be apparent that some portions of a cylinder will lack a design area, therefore, when the operator of the machine is positioning the cylinder into the carrier it will be his duty to ascertain the best manner of positioning the cylinder for the most efficient etching operation. Obviously, the arms T may be manufactured of any suitable material and their configuration and overall dimensions may be best determined by the weight of the entire carrier means.

As more clearly shown in Fig. 6, the trunnions 20—20 are provided with oppositely disposed depressions 31 into which a spring-pressed ball-shaped plunger 32 is urged. The legs 18—18, as previously mentioned, are formed in such a manner as to provide the bearings 19—19 at the upper ends thereof and by counterboring an aperture 33 beneath the bearing surface and countersinking a threaded plug 34 may be arranged as a holding means for the spring 35.

Referring now to the view in Fig. 2, and particularly the portions shown in dotted outline, it will be noted that the plunger 12 has been retracted from the slot or locking recess 10. Assuming that the machine is in operation, with the turntable and the work carrier means revolving at a suitable speed adequate to accomplish desired etching of the work surface, the operator determines the appropriate time to invert the carrier and consequently the work pieces. He actuates the braking mechanism 8 carried by the shaft 7 and thereupon releases the plunger 12 when the rotation of the turntable is substantially arrested so that the indexing mechanism will bring the turntable to a position of rest, as shown in Fig. 2.

Thereafter, the crank 36 which is provided with a projection 37, generally simulating a screw driver is introduced through an aperture 38 in the wall of the chamber and brought into engagement with one of the complementally slotted openings 23 carried by the trunnions 20—20. Then the crank is revolved through an arc of approximately 180°, and the carrier and its work pieces are inverted. The crank is then withdrawn from the chamber wall, the plunger 12 is immediately retracted from the indexing mechanism and the brake released, whereupon the etching operation progresses to completion. It will be apparent to those skilled in the art that the complemental conformations of the free ends of the trunnions 20—20 and the projection 37 carried by crank 36 may take any desired configuration since the arrangement shown in the drawing is merely by way of illustration and is not critical.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims.

What I claim is:

1. In an etching machine, means providing a substantially closed chamber, turntable means revoluble within said chamber, spacedly arranged means attached to and extending perpendicularly to said turntable means, axially aligned bearing means carried by said spacedly arranged means, a work carrier means capable of carrying elements to be etched supported on said bearing means,

and means connectible to said work carrier for inverting the same.

2. In an etching machine as claimed in claim 1, wherein the work carrier means supported by the bearing means include spacedly arranged parallel members connected together by relatively spaced right angularly extending members, said last-named members being provided with means to position the work to be etched.

3. In an etching machine as claimed in claim 2, wherein each of the relatively spaced right angularly extending members includes at least one element serving to support in slidable arrangement means capable of predetermined position of the work to be etched.

4. In an etching machine as claimed in claim 3, wherein the relatively spaced right angularly extending members include plural elements between the confronting surfaces of which at least one clamp means is slidably arranged.

5. In an etching machine as claimed in claim 2, wherein indexing means associated with said revoluble turntable

means serves to arrest the rotation of said revoluble turntable means at a predetermined position relative to said chamber.

6. In an etching machine as claimed in claim 5, wherein braking means is interposed between said revoluble turntable means and said means for imparting motion thereto.

7. In an etching machine as claimed in claim 5, wherein a wall of the chamber is provided with means for introduction of a member for imparting rotation to the work carrier upon its trunnion bearings to invert said carrier.

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