Jan. 12, 1937. R. R. ROBERTSON 2,067,290

ETCHING MACHINE

Filed Feb. 23, 1935 4 Sheets-Sheet 1

Fig. 1.

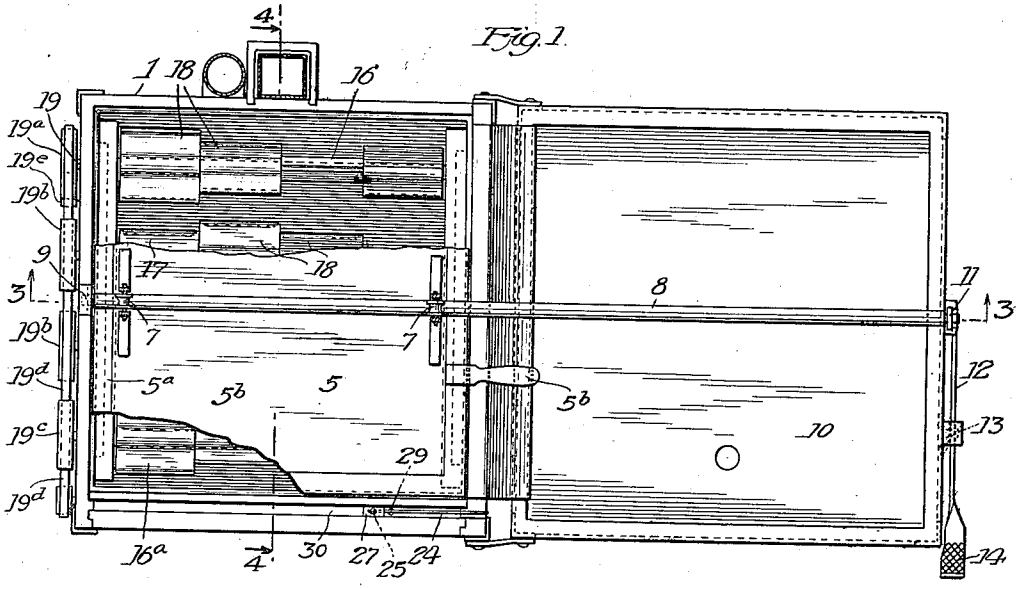
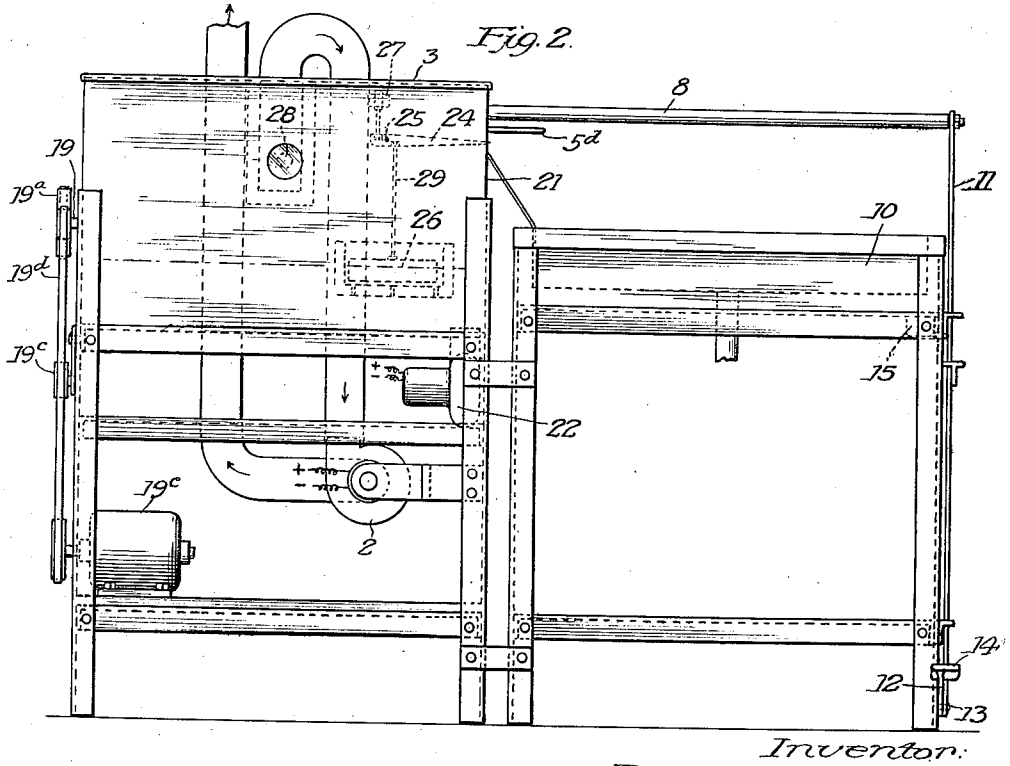


Fig. 2.



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Fig. 3.

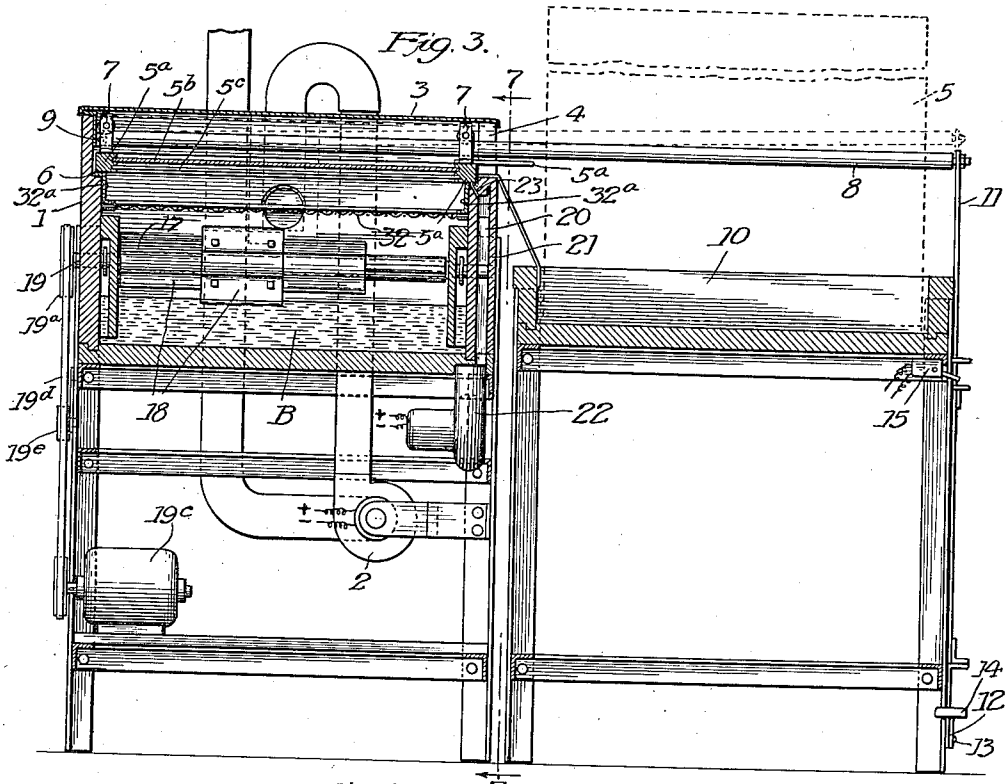
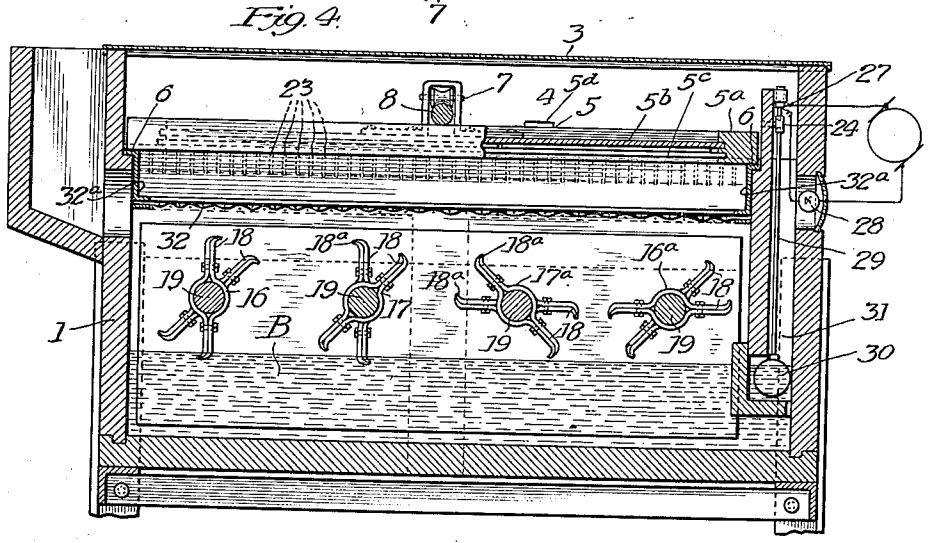


Fig. 4.



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Fig. 5.

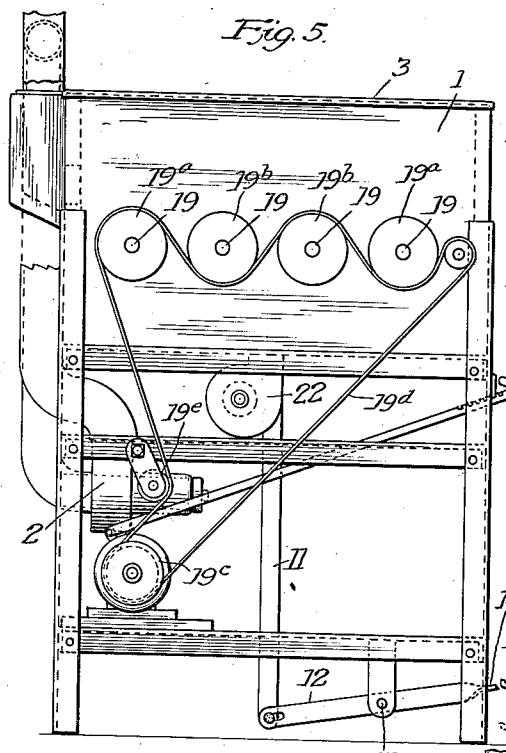


Fig. 6.

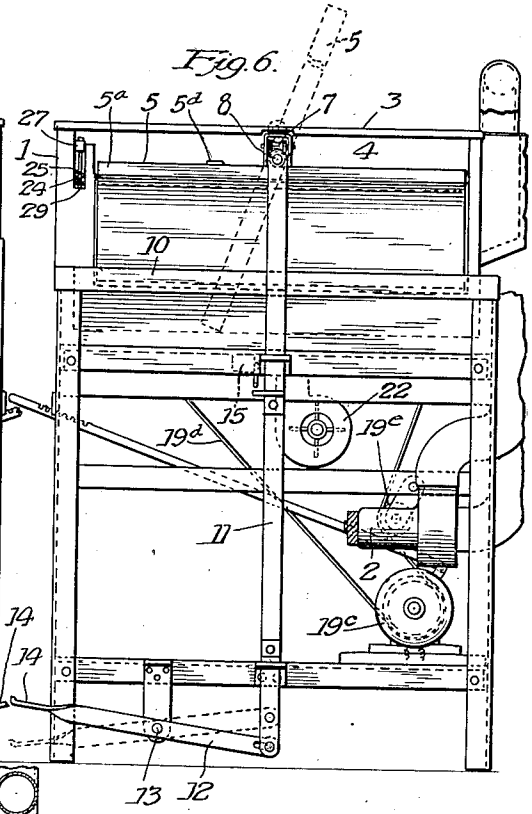


Fig. 7.

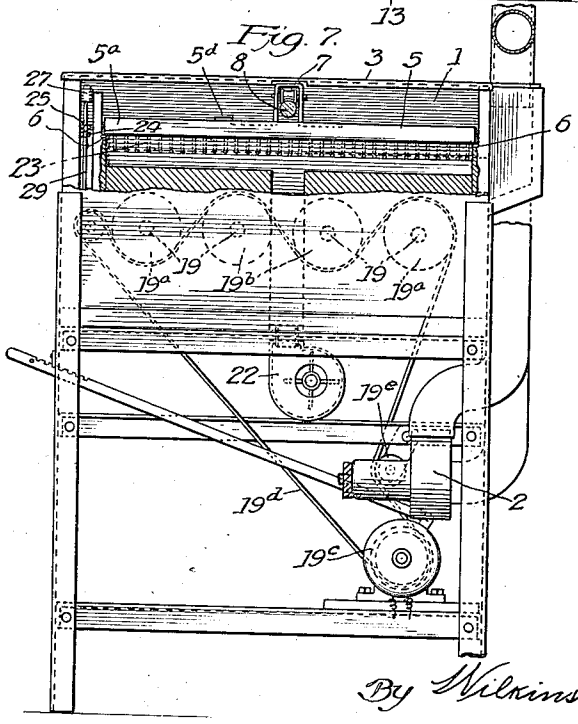
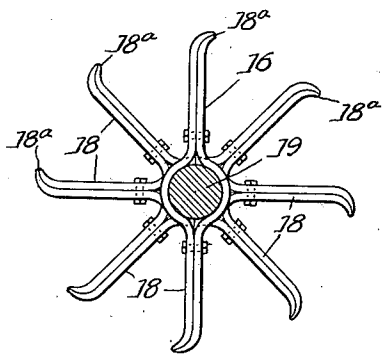


Fig. 8.



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Fig. 9.

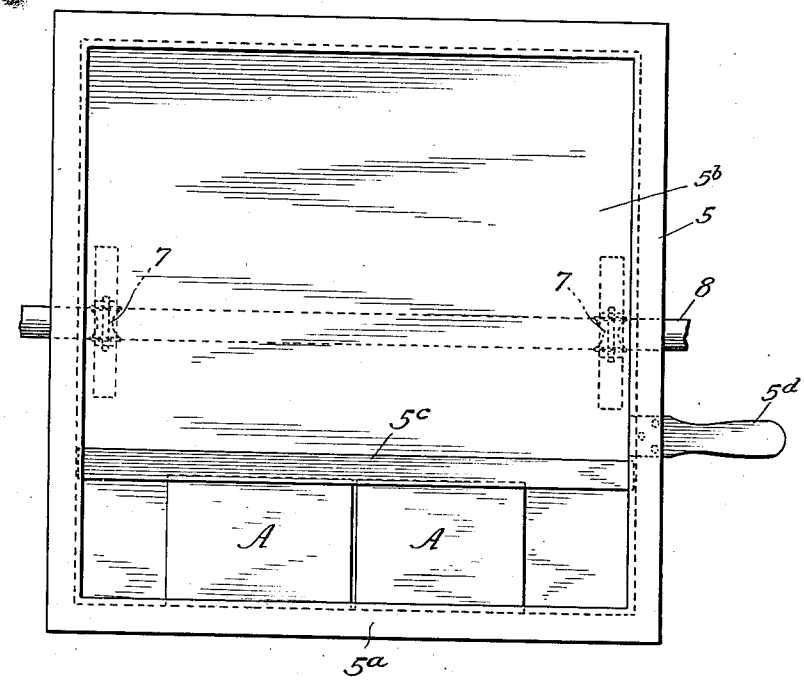


Fig. 10.

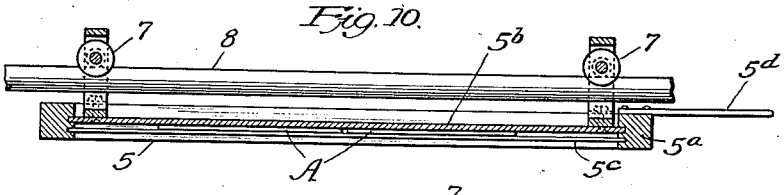
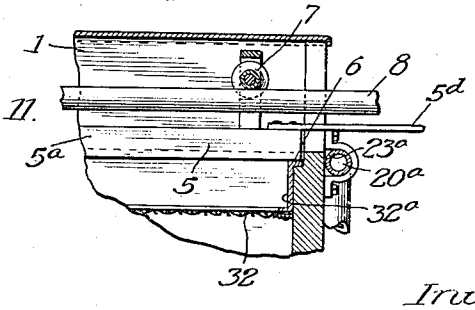


Fig. 11.



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UNITED STATES PATENT OFFICE

2,067,290

ETCHING MACHINE

Robert R. Robertson, Glencoe, Ill.

Application February 23, 1935, Serial No. 7,689

11 Claims. (Cl. 41—9)

This invention relates to a machine through means of which an object, for instance, a relief printing plate, may be held in position to have delivered against its surface a reagent such as an etching fluid.

One object of the invention is to provide an improved means of mounting the plate which is to be etched, moving it into the etching vat, positioning it therein appropriately to the performance of the etching function, removing it therefrom, and manipulating it to position for inspection without permitting the etching fluid to contact the hands of the operator or surfaces that might be injured thereby; to which end, a carriage is provided, preferably in the form of a flat frame or board, with means for supporting a plate or plates upon one face thereof, and this carriage is mounted through means of a trolley or trolleys upon a jib extending into the upper portion of the vat from a position exterior thereto so that the carriage may slide longitudinally of the jib into and out of the vat and be rotated thereon to present its plate-supporting side either downwardly so that it will receive the upwardly directed etching fluid when within the vat, or inclined upwardly when it is out of the vat in order to facilitate inspection. Within the vat, and substantially commensurate with the horizontal section thereof, is a supporting ledge upon which the carriage substantially fits in a manner to close the vat against escape of any of the fluid directed upwardly therein, and the jib, which provides a rotatable support for the carriage, has a limited vertical movement to take the carriage to and from its seat upon the ledge and enable the carriage to clear the side of the vat as it is introduced and withdrawn. Movement of the jib is preferably afforded through a pivotal mounting of its inner end and imparted by a pedal device accessible to the operator while standing in inspection position; and a drip pan is located beneath the position, outside of the etching tank, occupied by the carriage during inspection.

Another object of the invention is to restrict to a minimum the opening of the etching vat incident to introduction and withdrawal of the plate carriage; to which end, a permanent cover is applied to the vat and the supporting jib for the carriage is positioned to cause the latter to enter and withdraw through an opening in the upper portion of one of the side walls.

Another object of the invention is to provide means for displacing from the plate and carriage, as the carriage leaves the vat, the surplus fluid adhering thereto in order to reduce to a minimum the fluid dripping from the carriage while in position of inspection; to which end, air blasting means are provided in the form of a source of air under pressure, together with an air trunk, receiving such air and existing either as a hollow space in one of the vat walls or as a pipe, connected with the air source, and a multiplicity of jet openings leading from the air trunk in a position to impinge at a substantial angle of incidence against the plate holding side of the carriage as it passes the jet openings, the effect being to dislodge surplus fluid and cause it to drop into the vat from successive portions of the carriage and plate as they emerge from the vat.

Another object of the invention is to provide an improved construction of fluid dashers which will have the effect of uniformly distributing etching fluid over the entire plate-holding side of the carriage, with delivery substantially perpendicular to the plane of said side when in etching position, and thereby cause etching to take place with a minimum of undercutting and greater uniformity than has heretofore been attainable; also to make the fluid dashers in the form of paddles readily removable for replacement or repair. To this end, another feature of the invention consists in providing a plurality of rotary shafts, for instance, four in number, each equipped with a plurality of paddles of substantial individual width, distributed along the length of the shaft from side to side of the vat; staggered in position so that the different paddles on each shaft will act consecutively in picking up and centrifugally delivering the etching fluid against the plate; each paddle consisting preferably of a pair of dasher plates, separable in a plane which includes the axis of the shaft, formed intermediately with half bearings through which, when assembled, they clamp themselves in position upon the shaft, and having circumferentially forward deflections at their ends to increase the quantity of fluid picked up in their revolution. The series of paddles upon each shaft occupy different radial positions. The several shafts are driven in alternating directions so as to insure a more thoroughly diffused delivery, and the liquid level into which they dip is kept as nearly constant as conveniently practicable for the sake of uniformity of delivery and distribution. As speed of revolution is variable at will through control of the motor that drives the shafts, their efficiency is found in practice to be such as will admit of use of etching fluid of materially lower Baumé scale because of such increased efficiency.

Another object is to provide means for reliably

apprizing the operator of change in fluid level of the etching reagent, thereby enabling him to insure the uniformity of etching operation referred to; to which end, a further feature of the invention consists in providing a suitable form of fluid level gauge incuding a float and means manifesting the movement of said float, such, for instance, as a pivoted indicating arm or an electric circuit closer capable of glowing a signal lamp when the level is below a predetermined point.

In the accompanying drawings, in which the preferred embodiments of the several features of the invention are shown by way of illustration—

Figure 1 is a plan view of the machine with the cover of the etching tank omitted to expose the plate carriage and its supporting jib, and with a portion of the plate carriage broken away to disclose the arrangement of fluid-dasher paddles.

Figure 2 is an elevational view of the complete machine from the side occupied by the operator, the pointer form of fluid level indicator being shown in dotted lines.

Figure 3 shows the complete machine viewed from the same position as Figure 2, but showing in vertical section the etching vat with the air spray trunk embodied in the hollow wall thereof and the drip pan adjacent thereto.

Figure 4 is a sectional view of the etching vat in a plane through the middle of the etching vat of Figures 1, 2 and 3, and showing a float chamber of the glow lamp type of fluid level indicator incorporated in the wall construction of the vat.

Figure 5 is an end elevation of the machine as seen from the left of Figures 1, 2 and 3.

Figure 6 is an elevational view of the opposite end of the machine from Figure 5.

Figure 7 is an elevational view, as seen in the same direction as Figure 6, but with portions of the etching vat broken away and with the foot control of the jib omitted.

Figure 8 is a detail view of one of the dashers with the shaft in section, but seen from a position which discloses all of its paddles.

Figure 9 is a plan view of that side of the plate carriage which is presented downwardly in the etching position and showing the means for mounting different sizes of plates therein.

Figure 10 is a detail view of the carriage mounting and its supporting jib; and

Figure 11 is a detail view of a modified construction of spray for driving from the plate an excess of etching fluid as the plate emerges from the vat.

1 represents an etching vat, preferably of earthen material, which may be provided with air exhausting apparatus 2 preferably following the lines of my British Letters Patent No. 271,615 of April 20, 1926, and my United States Letters Patent No. 1,783,390, of December 2, 1930. This vat is preferably constructed with a permanent cover 3 and a lateral opening 4 (Figures 3, 4 and 6) through which to introduce and withdraw a plate carrier 5 consisting of a frame 5*a*, a glass or other diaphragm 5*b* (Figures 3 and 4), and a sliding cleat 5*c* for confining plates such as A (Figure 9) between it and one of the grooved frame members 5*a* of the said carriage.

When the carriage is in etching position in the vat, as seen more clearly in Figures 3 and 4, it is made to rest upon a ledge 6 extending around the perimeter of the vat and upon which the said carriage fits in a manner to constitute a substantial upper closure of the etching chamber.

To facilitate introduction and withdrawal of the carriage 5 with respect to the etching vat, the said carriage is provided with trolleys 7 through which it is mounted upon a jib 8 having pivotal mounting 9 (Figure 3) within the vat and extending approximately horizontally through the side opening 4 of the vat and across a drip pan 10, so that the carriage may be slid (for instance, by manipulation through its handle 5*d*) from etching position shown in Figures 1, 3, 4 and 7, to inspection position indicated by dotted lines in Figures 3 and 6, where it is over the drip pan 10 in an upwardly inclined position convenient for inspection, and which position it will have attained by sliding movement out of the vat, followed by rotary movement permitted by its trolleys 7 upon the supporting jib. In order to permit sliding movement of the carriage from the vat, jib 8 is free to take on a sufficient angle of elevation, by upward movement of its outer end, to enable the frame 5*a* to clear the side wall of the vat (Figure 3); and in order to impart this angle of elevation and insure this clearance of the carriage, jib 8 is connected at its said outer end through slide rod 11 with pedal 12 fulcruned at 13 and presenting its free end 14 within reach of the operator while standing in inspection position.

For convenience, there is also located within reach of the operator standing in inspection position, an electric switch 15 through which to control the motors of the machine.

Located within the vat 1 are a plurality of dashers 16, 16*a* and 17, 17*a*, each composed of a series of paddles 18 mounted upon shafts 19 with the paddles in each series or upon each shaft occupying different radial positions so that they are angularly spaced circumferentially around their shafts, as suggested in Figure 4, where, however, the plane of section presents only two paddles on each shaft to view, and so that a complete group of paddles will appear as illustrated in Figure 8. These dashers are located intermediate of the carriage 5 and a body of etching fluid B maintained at a level that enables the end of the paddles to dip into and pick up fluid and cause it to be driven off by centrifugal force as the paddles attain a direction that is toward the plate carriage; the distribution, dimensions and relations of these paddles being such that the aggregate of dashers causes a well distributed and uniform impingement of fluid against the plates to be etched in a direction substantially perpendicular to the plane of the plate carriage.

The paddles 18 are united in pairs where they meet at the shafts 19, and the paddles are composed of two overlapping plates, united by hub portions, so that each lamina extends integrally across the shaft. The laminae are substantially coextensive and are deflected circumferentially at their outer extremities so that they not only overlap in radial planes, but through faces at sufficiently large angles to said planes to interlock and relatively position the laminae against relative displacement radially. The pairs of paddles are of such reduced dimension in the direction of the axis of rotation as to admit of a plurality thereof on one shaft, located in different planes and thereafter staggered circumferentially on each shaft. As shown in Figures 1 and 3, the paddles are of substantial dimension in the direction of the axis of the shaft and they preferably aggregate, in such dimension, substantially the entire distance from wall to wall of the spraying chamber.

Shafts 19 are provided with pulleys 19*a*, 19*b*

driven by motor 19c through the medium of belt 19d which passes from belt tightener 19e alternately over and under said pulleys, as shown in Figure 5, thereby driving the end shafts toward the middle of the vat and the two intermediate shafts in opposite directions away from the middle of the vat.

In order to minimize the quantity of fluid accompanying the plate carriage from the vat, an air trunk 20, embodied in the wall 21 on the exit side of the vat (Figure 3) or in the form of a pipe 20a (Figure 11) and supplied with air under pressure from a suitable source, such, for instance, as a blower 22, is adapted to deliver air through a multiplicity of jet openings 23 (Figure 3, see also dotted lines Figure 7), or 23a (Figure 11) against the underside of the carriage 5 and at an angle of incidence that will tend to drive surplus moisture therefrom as the said carriage is slid along the elevated jib 8 in moving out of the vat. As suggested in Figure 3, the frame 5a—when the carriage is in etching position—may overlie the jet openings 23 and retard waste of air when the carriage is not being withdrawn.

Inasmuch as it is desirable to maintain the level of the etching fluid within predetermined limits, a fluid level indicator is preferably associated with the etching vat in some suitable form, such, for instance, as an indicator 24 pivoted at 25 and controlled by float 26 as shown in dotted lines in Figure 2, or a circuit closer 27 for a glow lamp 28 connected by rod 29 to float 30 in the float chamber 31 incorporated in the construction of a wall of the vat, as shown in Figure 4.

In using the machine above described, the pedal 12 is depressed to elevate the jib 8; the plate carriage 5 is manipulated through means of the handle 5d to rotate it upon the jib until it assumes a substantially horizontal position with its plate holding face downward; the carriage is then slid longitudinally of the jib through the opening 4 in the vat and until the carriage overlies its seat provided by the ledge 6, whereupon the pedal 12 is released, the carriage settles upon the ledge and constitutes a substantial closure against the free escape of fumes from the vat, and presents the plates mounted thereon toward the etching spray. Motor 19 is then energized, for instance, by closing switch 15 (Figure 3) to set the dashers in operation, as already described. During the etching operation, the carriage may as frequently as desired be lifted from its seat by pedal 12, moved out through the opening 4, rotated to inspection position, and returned for further etching as the need thereof may appear.

Another important feature of the present invention resides in the safety grid 32 which acts as a safety screen to prevent a falling plate from entering the path of the rapidly rotating paddles. While this may be of any desired construction, it is here shown as an open wire structure suspended by its ends 32a from the same ledge 6 that supports the carriage 5 in etching position.

I claim:

1. An etching machine comprising an etching chamber and a carriage mounted for movement by which it conveys objects to be etched into and out of said chamber, and in which the etching chamber has a seat to which the carriage is applied and removed by movement substantially transverse to its conveying movement and upon which the carriage fits to provide a substantial closure for the etching chamber.

2. An etching machine comprising an etching chamber and a carriage having supporting means upon which it moves to convey objects to be etched into and out of said chamber in which the etching chamber has a seat to which the carriage is applied and removed by vertical movement and upon which the carriage fits to provide a substantial closure for the upper portion of the etching chamber; and in which the carriage supporting means consists of a jib mounted for vertical movement and by its upward movement moving the carriage from its seat to an elevation that clears the structure of the etching chamber and leaves the carriage free to move laterally from the fluid delivery area.

3. In a machine of the character described, an etching chamber, a carriage upon which to mount objects to be etched having supporting means which renders the carriage movable to and from etching position; said supporting means comprising a jib upon which the carriage slides, pivoted at one end near the etching position, extending approximately horizontally therefrom to a place of inspection, and having a free end through which it is moved to an elevation that clears the carriage from the etching chamber.

4. An etching machine as described in claim 3, in which the carriage, when in position of inspection, has rotating movement upon its supporting jib.

5. An etching machine as described in claim 3, which includes, as the means of connecting the carriage with its jib, trolleys which have trackage upon the jib and also rotate on the jib in planes transverse to its axis.

6. In an etching machine, an etching chamber, trackage extending from said etching chamber to a place of inspection, a carriage for objects to be etched traveling on said trackage from the etching chamber to said place of inspection, said trackage being movable vertically to clear the carriage from the structure of the etching chamber, and a pedal device imparting vertical movement to said trackage.

7. In an etching machine, an etching chamber, trackage extending from said etching chamber to a place of inspection, a carriage for objects to be etched traveling on said trackage from the etching chamber to said place of inspection, said trackage being movable vertically to clear the carriage from the structure of the etching chamber, and a pedal device imparting vertical movement to said trackage; said trackage comprising a jib pivoted near the etching chamber and presenting a free end near the inspection position; and said pedal having link connections with said free end.

8. In an etching machine having an etching chamber, a carriage for objects to be etched, said carriage being movable into and out of said chamber, and a surface clearing device comprising means for projecting air under pressure into liquid-displacing relation to the sprayed surface of the object as it emerges from said chamber.

9. An etching machine as described in claim 8, in which the fluid medium projecting device consists of a multiplicity of jet openings directed to deliver air under pressure into the path of the etched object, and a source of air under pressure communicating with said jet openings.

10. In an etching machine having an etching chamber and a carriage for objects to be etched, movable into and out of said chamber, a multiplicity of jet openings presented to deliver air under pressure against the etched surface as the object emerges from the chambers; said carriage being adapted to overlie said jet openings when the

object is in etching position and relieving said jet openings by its movement to convey the object out of the chamber.

11. In an etching machine, an etching chamber, means for supporting in said chamber an object to be etched, and a safety cage or grid interposed between the etching position of said object and means which delivers the etching fluid to the object, adapted to arrest the object being etched in case of its displacement from its supporting means.

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