H. S. & L. F. LEVY.

ETCHING MACHINE.

APPLICATION FILED MAY 19, 1914.

1,189,457.

Patented July 4, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

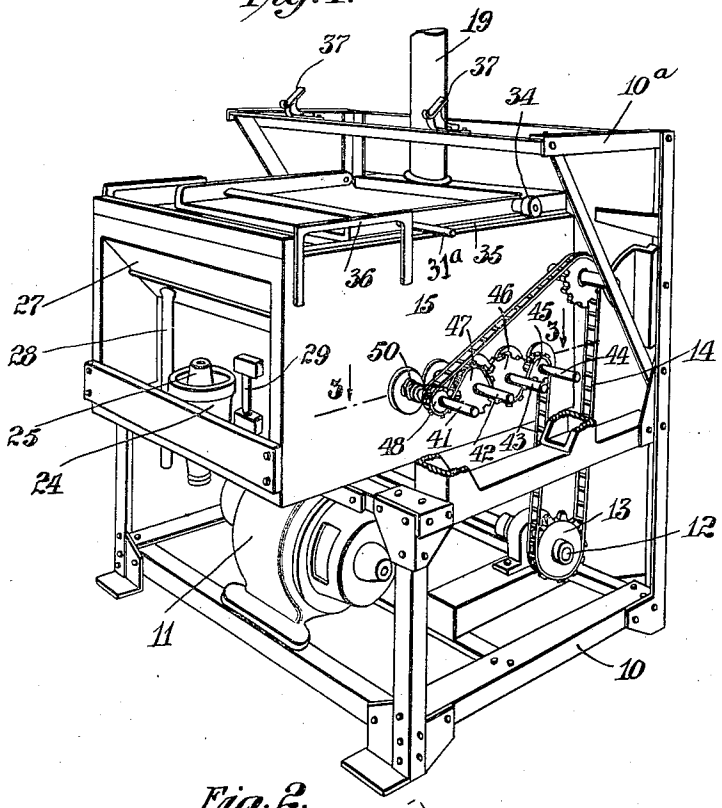
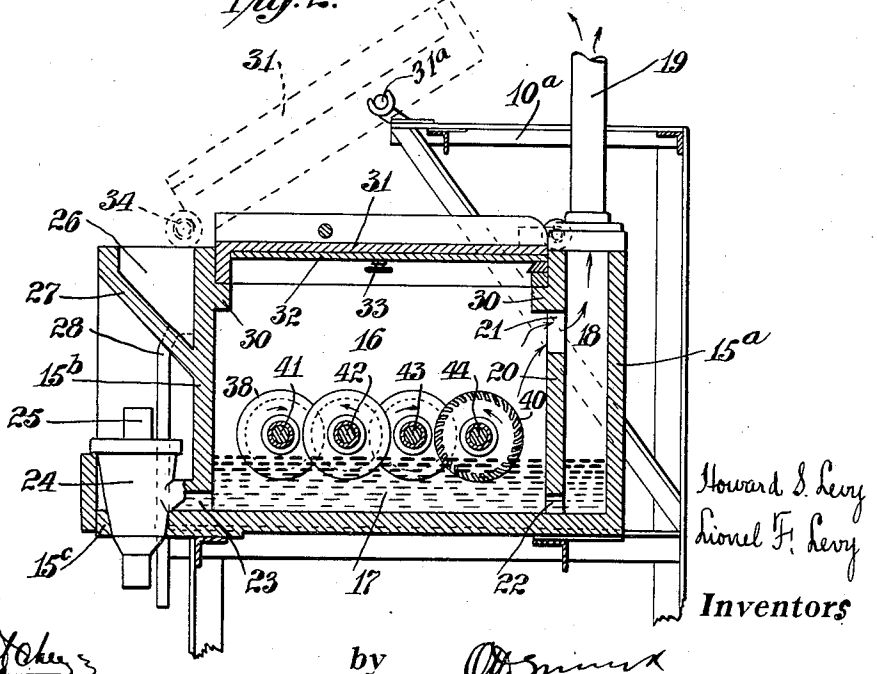



Fig. 2.




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2 SHEETS—SHEET 2.

*Fig. 3.*

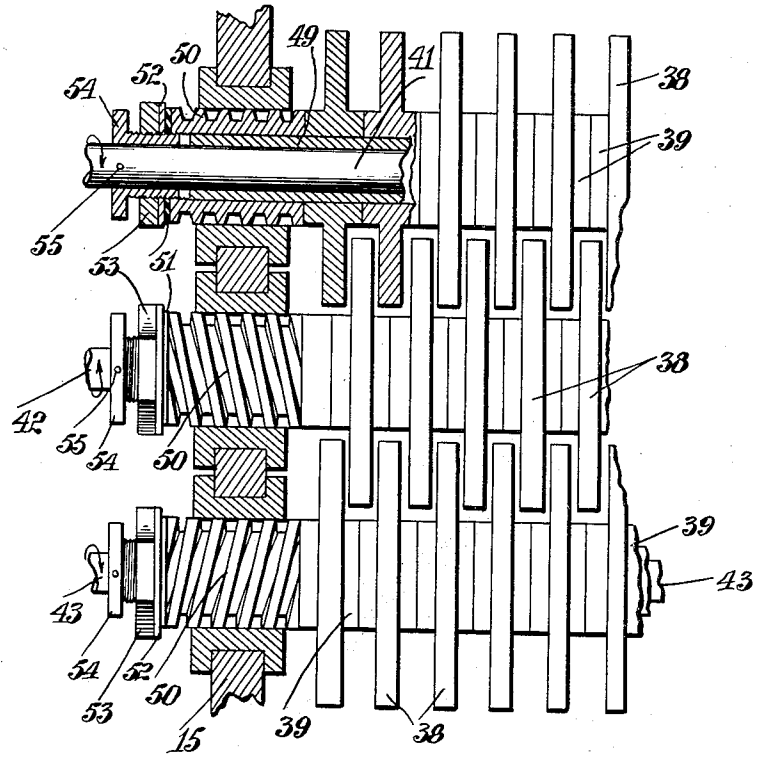
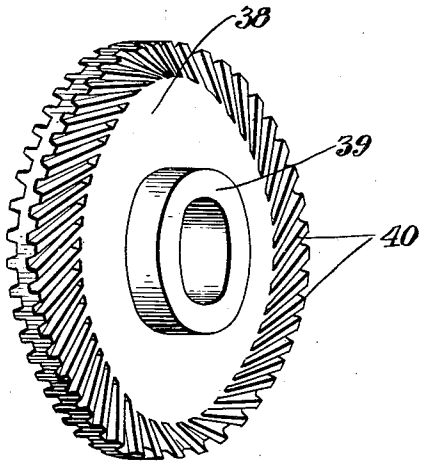



*Fig. 4.*




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# UNITED STATES PATENT OFFICE.

HOWARD S. LEVY AND LIONEL F. LEVY, OF PHILADELPHIA, PENNSYLVANIA.

## ETCHING-MACHINE.

1,189,457. Specification of Letters Patent. Patented July 4, 1916.

Application filed May 19, 1914. Serial No. 839,497.

*To all whom it may concern:*

Be it known that we, HOWARD S. LEVY and LIONEL F. LEVY, citizens of the United States, residing at Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Etching-Machines, of which the following is a specification.

Our invention relates to etching machines, especially adapted to etch metal plates such as printing plates, name plates, embossing dies and the like.

The type of machine with which our invention is concerned is that wherein acid is projected in comminuted form, by means of mechanical projecting or spraying means, against the metal plate to be etched. In machines of this type as heretofore used, some difficulty was experienced in obtaining a uniform etching effect over the entire surface of the plate, the ends of the plate being less deeply etched than the middle portion thereof, and one object of the present invention is to remedy this condition by causing the mechanical sprayers at either end of the apparatus to project a greater quantity of spray than the intermediate sprayers. This object may be attained by making the end sprayers of greater diameter than the intermediate sprayers, or by setting them deeper into the liquid, but the preferred manner of obtaining the desired result is to revolve the end sprayers at greater speed than the intermediate sprayers, and a construction of this kind is herein referred to. It also developed in the operation of etching machines of the general type above referred to, that there was a tendency of the shafts on which the sprayers are carried to force acid out of the etching chamber, between these shafts and their bearings, and a further object of the invention is to provide a structure wherein such escape of acid is entirely prevented. We attain this object by a peculiar construction of bearing sleeve for the shafts, hereinafter fully described.

Other objects and advantages of the invention will be disclosed in the following specification and particularly pointed out in the appended claims.

The preferred form of the invention is illustratively exemplified in the accompanying drawing, wherein—

Figure 1 is a perspective view of an etching machine embodying our invention; Fig. 2 is a substantially central vertical sectional view of the upper part of the machine; Fig. 3 is a fragmentary horizontal sectional view on the line 3—3 of Fig. 1; and Fig. 4 is a perspective view of one of the mechanical sprayer units used in projecting the acid.

Referring to the drawings, the numeral 10 denotes generally the machine frame carrying at its lower portion a suitable motor 11 which is the immediate source of power, and rotates the main driving shaft 12 provided at one end thereof with a sprocket wheel 13 from which power is transmitted to the mechanical sprayers through the medium of the sprocket chain 14. The motor is preferably reversible and capable of revolving at varying speeds.

Supported by the frame 10 is a casing 15 the inner intermediate portion of which forms the etching chamber 16 in which the etching liquid 17 is contained.

At one end of the etching chamber is an exhaust chamber 18 through which fumes from the acid pass to and through a vent pipe 19, which is preferably carried from the etching room to open into atmosphere. The exhaust chamber 18 is formed between one end wall $15^a$ of the casing 15 and an inner wall 20 provided with an upper aperture 21 through which the fumes pass to the flue 19, and a lower aperture 22 to afford free passage of the etching fluid between chambers 16 and 18.

The front wall $15^b$, of the casing 15, is provided at its lower end with a duct 23 in communication with an earthenware pot 24 preferably of conical formation and resting in a suitable groove formed in the projecting forward portion of the base $15^c$ of the casing 15. The pot 24 is provided with a plug 25, preferably of rubber, which closes the opening in the pot and enables the retention of the acid in the apparatus until such acid is to be drained therefrom.

Adjacent the etching chamber 16 is a chamber or compartment 26 which may be termed the washing compartment, and is formed by an inclined wall 27 having its lower end secured to or formed integrally with the front wall $15^b$ of the casing 15. As hereinafter explained, the plates after being etched are moved into a position where they may be sprayed with water, the water from the plates running into the washing compartment 26 and passing out through a pipe 28 which has an upper opening in the cham-

ber 26 and a lower opening at a point below the base 15[c] of the casing 15.

29 designates a liquid gage of any suitable construction, arranged at the front of the apparatus and intended to denote the level of liquid within the etching chamber 16.

Each of the end walls 20, 15[b] and the side walls 15, is provided with a shoulder or bearing portion 30 extending within the etching chamber 16 and designed to support the plate holder 31 on which the plate or plates 32, to be etched, may be secured by any suitable means, such as a thumb screw 33.

The plate holder 31 is provided with oppositely disposed rollers 34 (only one of such rollers being shown in the drawings), these rollers being movable along guides or rails 35 formed on the upper edges of the lateral walls of the casing 15. Upwardly projecting stops 36 for the plate holder 31 are provided at the forward portion of the apparatus, and the upper part 10[a] of the frame 10 is provided with curved rests 37 designed to receive the projecting ends of the handle 31[a] when the plate holder 31 is swung into the inclined position, shown in dotted lines in Fig. 2, for the purpose of washing the plates carried by the plate holder.

As shown in Fig. 4, the means for projecting the acid against the printing plates is preferably in the form of a disk, designated generally as 38, having a central hub 39 and peripheral inclined grooves 40 on each of its lateral faces. It will be noted that the grooves 40 do not extend from the periphery of the disk to the hub, but stop short a distance therefrom. The disks 38 are arranged in any desired number of series on shafts which traverse the machine, the disks of one series alternating with or extending between the disks of an adjacent series, this arrangement being best shown in Fig. 3.

In the machine illustrated, there are four series of disks 38 mounted by means of the hubs 39 upon shafts numbered from 41 to 44, each shaft projecting beyond both lateral walls of the casing 15 and having fixed to one projecting end a sprocket wheel, the sprocket wheels being numbered from 45 to 48, and the chain 14, which is endless, passing over the sprocket wheels alternately in an up and down direction. The two end sprockets 46 and 48 are of smaller diameter than the intermediate sprockets 46 and 47, so that when the shafts are driven the end shafts 41 and 44 will revolve at greater peripheral speed than the intermediate shafts 42 and 43. Owing to the manner in which the sprocket chain is carried over the sprocket wheels, each shaft with the disks thereon will revolve in a direction opposite to the direction of revolution of the adjacent shafts and disks, this operation being illustrated by the arrows on the disks in Fig. 2.

Surrounding each of the shafts 41 to 44 is a longitudinal sleeve 49 and embracing this sleeve 49 near each end of each shaft is a threaded sleeve or screw 50 of acid resistant material, the direction of the threads of the screw being opposite the direction in which the shaft carrying such sleeve is rotated. The screws 50 bear in the lateral walls of the casing 15 and extend a short distance beyond the same, while the opposite ends of the screws 50 abut the hubs 39 of the end disks 38. By this arrangement any tendency of the acid to work out of the casing is counteracted by the screws 50 which force the acid back into the chamber 16 as rapidly as the acid would be carried out thereof by the revolution of the shafts. Abutting the end or head of each screw 50 is a rubber ring or washer 51 against which is forced a metal washer 52 by a nut 53 held in position by a hollow screw 54, the exterior threads of which mesh at one end thereof with an internally threaded portion of the screw 50. By this arrangement the screw 50 is prevented from movement longitudinally of the shaft upon which it is mounted. The screw 54 is secured in position on the shaft by means of the pin or key 55.

The operation of the invention will be readily understood from the following brief description thereof: The plates to be etched are secured to the underface of the plate holder 31, and the latter is then dropped on to the shoulders 30 in the position indicated in Fig. 2. The motor 11 is then started, whereby the shafts 41 to 44 are caused to revolve and project the acid in comminuted or spray form against the object to be etched (plates) carried by the plate holder 31. The fumes from the acid pass through the aperture 21 out through the flue 19, while the liquid itself, after having performed its function, falls away from the plates 32 back into the body of acid in the chamber 16. When the plates have been etched the plate holder is moved into the position shown in dotted lines in Fig. 2, and the plates thereon are washed with water, which flow into the chamber 26 and out through the pipe 28 to waste. When it is desired to empty the chamber 16 of acid, the plug 25 is pulled out of the pot 24 and the acid flows through the duct 23 into, and out of, the pot 24.

A machine of this type, to be efficient in practice, must be capable of etching different classes of objects requiring different degrees or duration of etching. Owing to the use of a motor, such as the electric motor 11 herein shown which is reversible and may be driven at low, intermediate, and

high speeds, we are enabled to revolve the sprayers in either direction of rotation, and at any desired practical speed, whereby the etching action in any particular case may be accommodated to the requirements of the object or objects under treatment.

What we claim as new and desire to secure by Letters Patent is:—

1. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, mechanical sprayers revoluble within said chamber to project said etching fluid, means for oppositely revolving adjacent sprayers, and means whereby certain of said sprayers project a greater quantity of etching fluid than other of said sprayers.

2. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, a plurality of series of mechanical sprayers revoluble within said chamber to project said etching fluid, and means whereby each end series of sprayers projects a greater quantity of etching fluid than the intermediate series of sprayers.

3. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, mechanical sprayers revoluble within said chamber to project said etching fluid, means for revolving said sprayers at varying speeds and whereby adjacent sprayers are revolved in opposite directions, and means whereby certain of said sprayers project a greater quantity of etching fluid than other of said sprayers.

4. An etching machine, embodying therein an etching chamber, adapted to contain etching fluid, mechanical sprayers revoluble within said chamber to project said etching fluid, means whereby adjacent sprayers may be revolved in opposite directions, and means whereby certain of said sprayers project a greater quantity of etching fluid than other of said sprayers.

5. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, mechanical sprayers revoluble within said chamber, and means whereby certain of said sprayers are revolved at greater speed than others thereof and adjacent sprayers are revolved in opposite directions.

6. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, a plurality of series of mechanical sprayers revoluble in said chamber, and means whereby each end series of said sprayers is revolved at greater speed than the intermediate series of sprayers.

7. An etching machine, embodying therein an etching chamber adapted to contain etching fluid, a plurality of shafts traversing said etching chamber, said shafts being arranged in substantially the same plane, a series of mechanical sprayers fixed to each shaft, and means for driving each end shaft at a greater speed than the intermediate shafts.

8. An etching machine, embodying therein an etching chamber and an adjacent fume escape chamber, a plurality of series of mechanical sprayers revoluble in said etching chamber, and means for revolving certain of said series of sprayers at greater speed than other series and whereby adjacent sprayers are revolved in opposite directions.

9. An etching machine, embodying therein a casing containing an intermediate etching chamber, a fume chamber and a washing compartment at opposite ends of said etching chamber, a series of shafts traversing said etching chamber, said shafts being arranged in substantially the same horizontal plane and each thereof projecting beyond opposite walls of the etching chamber, mechanical sprayers arranged in series on each shaft, the sprayers on one shaft alternating with those on the adjacent shaft, sprocket wheels on the projecting ends of said shafts, the sprocket wheels on the end shafts being of smaller diameter than those on the intermediate shafts, a sprocket chain extending alternately in an upwardly and downwardly direction over said sprocket wheels, means for imparting driving motion to said sprocket chain, and means on the ends of each shaft for preventing escape of acid from the etching chamber between the shaft and its bearings.

In testimony whereof we have affixed our signatures in presence of two witnesses.

HOWARD S. LEVY.
LIONEL F. LEVY.

Witnesses:
OTTO MUNK,
CLARICE FRANCK.