July 2, 1940. A. G. MEYER 2,206,290

METHOD OF ETCHING

Filed Aug. 4, 1939

Fig. 1

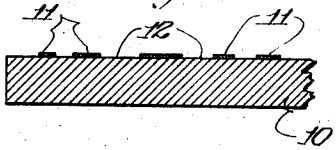


Fig. 2

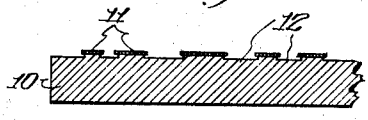


Fig. 3

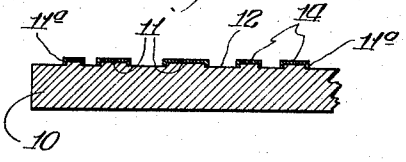


Fig. 4

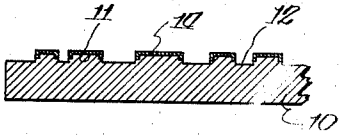


Fig. 5

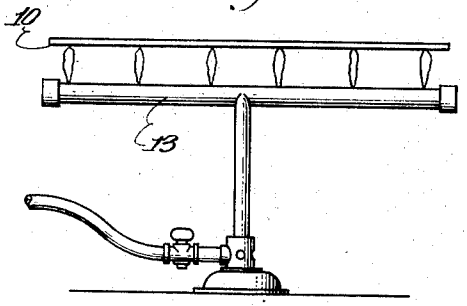


Fig. 6

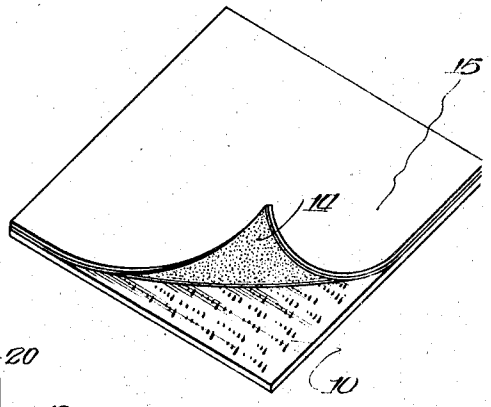
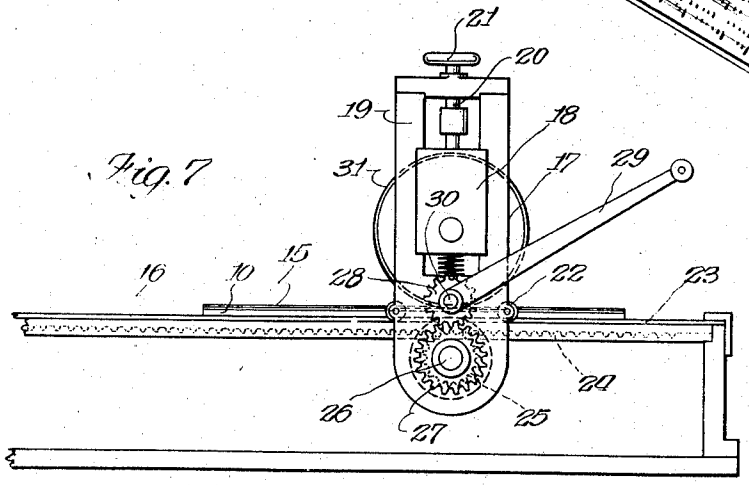


Fig. 7



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UNITED STATES PATENT OFFICE

2,206,290

METHOD OF ETCHING

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Application August 4, 1939, Serial No. 288,291

4 Claims. (Cl. 41—43)

My invention relates to the art of making printing plates by photomechanical procedure and it relates more particularly to the application and control of the acid-resisting ink to the impression areas and the sides or shoulders thereof preparatory to the etching of the depressed portions of the plate surrounding such areas.

In the making of such plates, the practice usually followed is to produce on the surface of the plate by a photographic process an image composed of a thin film of an agent adapted to resist the action of the etchant used. Various sensitizers are in use for producing the image as, for example, a light sensitive solution of albumen mixed with bichromate of potash. After the usual printing and developing of the image, the plate is prepared in the customary manner for receiving the preliminary bite of the etchant. Usually the plate is exposed but a few seconds to the action of the etching fluid and the depth of the preliminary bite is only about .0015". It is now necessary to protect the sides or shoulders of the impression areas, produced by the preliminary bite, against further attack by the etching fluid and against undercutting while the etching process is being further carried out, by the application to such sides or shoulders of a suitable acid-resisting agent. One of two methods may be employed. According to one method a powder known as dragon's blood is applied to the plate and brushed four ways in an effort to protect the sides or shoulders at every point; and by the other method a suitable ink is applied to the impression areas and is permitted to flow down over the sides or shoulders thereof preparatory to subjecting the plate to the second bite by the etching fluid. Notwithstanding the various attempts to produce satisfactory plates by the use of suitable acid-resisting inks, most of the plates in use today are made by the older, tedious and health menacing method carried out by the use of dragon's blood. My invention relates particularly to certain improvements in the art of etching which are obtained by the use of a suitable acid-resisting ink.

It is one of the objects of my invention to provide an improved method of applying ink to and controlling its flow over the impression areas and the sides thereof; and, to this end, I contemplate applying a uniform film of ink to one surface of a thin and flexible sheet of metal which may be readily placed over a plate with the inked surface of the sheet in contact with the impression areas on the plate and then applying pressure to the back or non-inked surface of the flexible sheet preferably by means of a pressure roller covered with a suitable yieldable material and slowly moved over the sheet thereby bringing its inked surface into firm contact with the impression areas on the plate. A slow movement of a roller of that type over the back of the flexible sheet insures uniform transfer of the ink on the sheet to the impression areas of the plate and ink sufficient in quantity to cover the sides or shoulders of the areas is squeezed out between the sheet and the margins of such areas ready to flow down over and protect the sides of those areas.

It is a further object of my invention to insure complete control of the ink applied to the plate and, as my improvements are preferably practiced, I subject the plate to heat prior to the application of the inked flexible sheet thereto to the end that the ink upon being transferred from the flexible sheet to the impression areas will readily flow over the sides thereof and protect them from the action of the etching fluid when the plate is subjected to the next bite of the fluid. A careful and skilled operator can readily observe the viscosity of the ink under the conditions prevailing at the time of its use, the temperature to which the plate should be preliminarily heated, the amount of ink which should be applied to the flexible sheet, and the amount of rolling that should be applied to the back of the sheet to cause the ink to flow uniformly over the sides of the impression areas and yet not flow over the bottoms of the depressed portions surrounding such areas. When those factors are given proper consideration, the flexible sheet may be readily separated from the plate without materially disturbing the ink transferred from the sheet to the plate. Thereupon, the plate is treated to set the ink and check any tendency of the ink to continue to crawl or flow.

The aforesaid objects and other objects and advantages of my present invention will be more fully appreciated from the following description taken in connection with the accompanying drawing in which like characters of reference designate similar parts throughout the several views, and wherein—

Fig. 1 is a sectional view of a portion of a plate, on an enlarged scale, before being subjected to the preliminary bite of the etching fluid;

Fig. 2 is a similar view of the plate after it has received the preliminary bite;

Fig. 3 is a similar view of the plate after the acid-resisting ink has been applied to the impres-

sion areas of the plate and has flowed down over the sides or shoulders of such areas;

Fig. 4 is a similar view of the plate after it has been subjected to the second bite by the etching fluid;

Fig. 5 is a diagrammatic view illustrating one method of heating the plate prior to the application of the ink to its impression areas;

Fig. 6 is a perspective view of the flexible sheet applied to the plate, one corner of the sheet having been turned up and back to show the ink on its under surface ready to be applied to the impression areas of the plate; and

Fig. 7 is a side elevational view of apparatus suitable for applying pressure to the non-inked side of the flexible sheet.

A fragmentary portion of a plate 10 is shown in Fig. 1 ready to receive the preliminary bite of the etchant fluid, the impression areas 11 thereon surrounded by the depressed portions 12, constituting a negative of the image desired, having been produced thereon by printing and developing as is well-known in the art. A fragmentary portion of the same plate after it has been subjected to the preliminary bite of the etchant fluid is shown in Fig. 2, the portions 12 having been depressed approximately .0015".

Preferably the plate 10 is now heated by any suitable means, as by placing it over a gas burner 13 shown diagrammatically in Fig. 5. While the plate is being heated a film of acid-resisting ink 14 of uniform thickness is applied to a flexible sheet 15 in any desired way, for example, by spraying or by the use of a suitable inking roller. The heated plate is then placed in a horizontal position, with its impression areas face up, on a suitable support such as the bed 16 of a press such as that shown in Fig. 7. The flexible sheet 15 is then placed over the plate 10 with the inked surface of the sheet in contact with the impression areas on the plate. Pressure is then applied to the non-inked side of the flexible sheet for transferring ink from its inked surface to said impression areas and for this purpose the apparatus shown in Fig. 7 may be employed.

As shown, an impression roller 17 is journaled in bearing blocks 18 vertically adjustable in the ends of a frame 19 by means of screws 20 operated by hand wheels 21. The frame at each end is provided with rollers 22 which operate on a suitable track 23 provided on the edge of the platform or bed 16. The under side of the platform at each edge is provided with a rack 24 engaged by a spur gear 25 fixed on a shaft 26 which also has fixed to it a spur gear 27 in mesh with a gear 28 associated with a crank 29 mounted on a shaft 30 carried by the frame. It will be obvious that upon turning the crank 29 the gear 28 will also turn thereby driving the gear 27, the shaft 26 and the gears 25 thus causing the frame 19 to travel over the bed 16 to the right or the left, depending upon the direction in which the crank is turned. Movement of the frame 19 over the bed 16 causes the pressure roller 17 to move over the back or non-inked surface of the flexible sheet 15.

The sheet 15 may be of zinc or any other suitable material and is preferably from .0010" to .0018" in thickness. The surface of the roller 17 is preferably covered by a blanket 31 of any suitable flexible material, such as soft rubber. By means of the flexible sheet and the blanketed roller adjustably mounted as desired, the pressure on the flexible sheet and the speed at which the roller travels over the sheet are well within the control of the operator.

The ink is transferred from the inked surface of the flexible sheet to the impression areas 11 of the heated plate as best shown in Fig. 3 and due to the temperature of the plate and the rolling pressure slowly applied to the back of the flexible sheet the ink flows uniformly down over the sides or shoulders 11*a* of the impression areas. Since the ink is brought into firm contact with the impression areas of the heated plate the ink is heated and, therefore, offers little resistance to the separation of the flexible sheet from the heated plate which is a distinct advantage over methods heretofore employed according to which the plate is not heated until after the ink has been applied to the impression areas. After the flexible sheet 15 has been stripped from the heated plate and immediately upon the ink flowing down over the sides or shoulders of the impression areas to the bottoms of the depressed portions 12, the plate is treated in any suitable manner to set the ink and prevent it from flowing over the bottoms of the depressed portions. Setting of the ink may be accomplished by chilling the plate to harden the ink, by spraying the plate with a citric acid solution or by any other suitable method. The plate, so treated, is now ready for the second application of the etching fluid. It is placed face down in a suitable etching machine and subjected to the action of the etching fluid until the depressed portions are deepened about .002" more. The plate after having been subjected to the first main bite of the etching fluid is shown in Fig. 4 and it will be noted that the depressed portions 12 surrounding the inked protected impression areas 11 have been substantially deepened. The operations of heating the plate, applying the ink to the impression areas and their sides or shoulders, setting the ink and etching may be repeated as many times as desired to produce a plate having the desired printing qualities.

My improved method is well suited to the production of high-grade printing plates, both halftones and line work, economically and expeditiously. The method may be readily practiced by any person skilled in the art. All factors affecting the method are well within the control of the operator at all times. The viscosity of the ink under the temperature conditions prevailing at the time it is used may be readily noted and the heating of the plate may be carried to the point best suited to produce the desired result with such ink. The thickness of the film of ink applied to the flexible sheet, of course, is entirely within the control of the operator; and the amount of pressure applied to the non-inked surface of the flexible sheet, the speed at which the pressure roller travels over the flexible sheet, and the number of times it travels back and forth over the sheet are factors within the control of the operator and may be carried out in such manner that by the time the flexible sheet is stripped from the plate the ink has not only been applied to the impression areas but has progressed down over the sides thereof to the bottoms of the depressed portions thereabout. Stripping of the flexible sheet from the heated plate can be effected without material disturbance of the ink on the impression areas or the sides thereof. As the result, upon removal of the flexible sheet the plate may be immediately treated to set the ink and the next etching step proceeded with promptly.

The term "ink" as used in the foregoing de-

scription and in the appended claims is intended to cover any viscous material suitable for use as a resistant to the etching acid used in carrying out my method.

I claim:

1. In the method of etching a photomechanical printing plate those steps which comprise subjecting the plate after it has been printed to a short preliminary acid treatment to depress slightly the portions surrounding the impression areas, heating the plate sufficiently to cause ink applied to its impression areas to flow down the sides thereof, applying a uniform film of ink to one side of a flexible sheet, placing the plate in horizontal position with the impression areas face up, placing said flexible sheet with its inked surface in contact with said impression areas, applying pressure to the non-inked side of said flexible sheet for transferring ink from its inked surface to said impression areas, removing the flexible sheet from the plate, setting the ink on said areas and sides, and then subjecting the plate to another acid treatment for deepening the depressed portions.

2. In the method of etching a photomechanical printing plate those steps which comprise subjecting the plate after it has been printed to a short preliminary acid treatment to depress slightly the portions surrounding the impression areas, heating the plate sufficiently to cause ink applied to its impression areas to flow down the sides thereof, applying a uniform film of ink to one side of a flexible sheet, placing the plate in a horizontal position with the impression areas face up, placing said flexible sheet with its inked surface in contact with said impression areas, slowly moving a pressure roller covered with yieldable material over the non-inked side of said flexible sheet for bringing its inked surface into firm contact with said impression areas, removing the flexible sheet from the plate, setting the ink on said areas and sides, and then subjecting the plate to another acid treatment for deepening the depressed portions.

3. In the method of etching a photomechanical printing plate those steps which comprise subjecting the plate after it has been printed to a short preliminary acid treatment to depress slightly the portions surrounding the impression areas, heating the partially etched plate sufficiently to cause ink when applied to the impression areas to flow down the sides thereof, applying a uniform film of ink to one side of a flexible sheet, placing the heated plate in a horizontal position with the impression areas face up, placing said flexible sheet with its inked surface in contact with said impression areas, applying pressure to the non-inked side of said flexible sheet for transferring ink from its inked surface to said impression areas, removing the flexible sheet from the heated plate, setting the ink on the faces and sides of the impression areas before it has flowed over the bottoms of said depressed portions, and then subjecting the plate to another acid treatment for deepening the depressed portions.

4. In the method of etching a photomechanical printing plate those steps which comprise subjecting the plate after it has been printed to a short preliminary acid treatment to depress slightly the portions surrounding the impression areas, heating the partially etched plate sufficiently to cause ink when applied to the impression areas to flow down the sides thereof, applying a uniform film of ink to one side of a flexible sheet, placing the heated plate in a horizontal position with the impression areas face up, placing said flexible sheet with its inked surface in contact with said impression areas, slowly moving a pressure roller covered with yieldable material over the non-inked side of said flexible sheet for bringing its inked surface into firm contact with said impression areas, removing the flexible sheet from the heated plate, setting the ink on the faces and sides of the impression areas before it has flowed over the bottoms of said depressed portions, and then subjecting the plate to another acid treatment for deepening the depressed portions.

ALBERT G. MEYER.