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METHOD OF REGRAINING ALUMINUM PLATES

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This invention has to do with lithographic plates. Particularly, it has to do with lithographic plates which consist of sheets of aluminum which have been grained by treating them in a solution of sodium carbonate which has been conditioned by reaction with pieces of aluminum. In the senses in which they are used in this specification the word aluminum embraces both aluminum and alloys high in aluminum and the word grain embraces both the pits in and the crystalline coating on the surface of the aluminum which are produced by the treatment which has been mentioned.

Prior to our invention it was the practice to discard lithographic plates of the type mentioned after they had been used once. This because there was no, or in any event, no practicable, way known to render them reusable. However, because of the difficulty of obtaining and the increase in cost of new plates, brought on by the demand for aluminum for military purposes, we were called upon to see what we could do about working out a method of making used plates reusable and thus rendering available for further use the large number of used plates which had accumulated at the place at which we are employed. The result of our work was the invention or discovery, not merely of a practicable method of making used plates reusable, but of a method of doing this which produced plates which were superior to the new plates and not only this but a method which can be applied to plates several times before their useful life is ended and each time at only a fraction of even the pre-war cost of new plates. In this method and the plate produced thereby resides the invention or discovery with which this application is concerned. Briefly, the method consists of removing the coatings and the images carried thereby from and then regaining the plates.

To remove the coatings and the images carried thereby from the plates, there are preferably employed the following solutions:

(a) A nitric-sulfuric acid solution, which consists of 30 parts, by volume, of nitric acid (43° Bé.) and 1 part, by volume, of sulfuric acid (66° Bé.) dissolved in 69 parts, by volume, of water, at room temperature (say 70° F.)

(b) A caustic soda solution, which consists of 6 to 7 parts, by weight, of caustic soda dissolved in 94 to 93 parts, by weight, of water, at 175° F.

According to the preferred procedure, after the paper backings have been stripped from the plates, they are first hung in the nitric-sulfuric acid solution for approximately ten minutes, then

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rinsed by dipping them in cold (say 60° F.) water, and then placed in the caustic soda solution for approximately, preferably not more than, thirty seconds. Upon removal from the caustic soda solution, the plates are immediately rinsed in cold water, then dipped into the nitric-sulfuric acid solution for a few (approximately four or five) seconds, then rinsed in cold water, and then placed in the caustic soda solution for fifteen to thirty seconds. It is sometimes necessary to wipe or brush the plates after removal from the second caustic soda solution for a final and complete removal of the ink images. Upon removal from the caustic soda solution, and after wiping or brushing when necessary, the plates are rinsed in cold water, then dipped into the nitric-sulfuric acid solution for a few (approximately four or five) seconds to remove the black film with which the caustic soda solution coats them, and then rinsed in cold water.

The result of this procedure is to cause the coatings and the images carried thereby to slip cleanly and easily from the plates and to leave clean aluminum surfaces which are receptive to regaining. If the coatings and the images carried thereby are not entirely off the plates after the second immersion in the caustic soda solution and the subsequent wiping or brushing if it appears necessary, the plates should be replaced in the caustic soda solution for a few (say four or five) seconds before they are dipped into the nitric sulfuric acid solution.

While we prefer to employ the particular solutions at the particular temperatures and in the particular manner mentioned, because we have found that this gives the best results, it is not necessary to do precisely this to obtain satisfactory results. For examples, the concentrations and temperatures of the solutions and the numbers and lengths of times the plates are immersed in them may be varied somewhat. Of course, other alkali metal hydroxides, e. g., potassium hydroxide, may be used instead of the caustic soda. And a solution of nitric acid alone may be used instead of the nitric-sulfuric acid solution but not as satisfactorily.

Other solutions than those mentioned may be employed to remove the coatings and the images carried thereby from the plates, e. g., a caustic soda solution alone or a sulfuric acid solution alone followed by a dip in nitric or nitric-sulfuric acid to remove from the plates the dark films with which the solutions coat them. But these solutions are not as satisfactory as those first mentioned in that they take more time and do

not slip the coatings and the images carried thereby from the plates as cleanly and easily. Sometimes when a sulfuric acid solution alone is employed it is necessary to wipe or brush the plates in order to remove the coatings and the images carried thereby from them. Moreover, when a caustic soda solution alone is employed it consumes more of the plates than when the nitric-sulfuric acid and caustic soda solutions are employed. This is a matter of importance, especially in the case of plates like those used at the place at which we are employed which are only about 0.005" thick when new and cannot satisfactorily be used after they are thinner than about 0.0035" to 0.003" thick. The loss when the nitric-sulfuric acid and caustic soda solutions are employed is only about 0.0005" to 0.0008" in thickness each time the coatings and images are removed from the plates and the plates are regained which means that when those solutions are employed the plates can be made reusable two to four times.

To regain the plates, there is preferably employed, at a temperature of 175° F., a sodium carbonate solution which consists of one part by weight of (anhydrous) sodium carbonate dissolved in ninety-nine parts by weight of water conditioned by reaction with clean pieces, such as shavings or turnings, of aluminum until the evolution of gas bubbles subsides. Just what the composition of the resulting solution is we are not certain but it undoubtedly contains sodium carbonate and sodium aluminate and smaller, probably much smaller, amounts of aluminum hydroxide and sodium hydroxide. When the evolution of gas bubbles subsides the aluminum pieces should be removed from the solution and the solution tested to see whether it is in condition to regain the plates by immersing in it a clean aluminum plate. If the solution is in condition to regain the plates there will be produced on the plate, within about five minutes, an adherent crystalline coating, which is light brownish in color and probably composed of aluminum oxide and aluminum hydrate saturated with the aluminized sodium carbonate solution. If the solution is not in condition to regain the plates there will be produced on the plate, instead of the adherent crystalline coating, a dark gray to black coating which can be wiped from the plate with the fingers. If the coating produced on the plate is of the character last mentioned the pieces of aluminum should be replaced in the solution until when it is tested in the manner prescribed there is produced on the plate the adherent crystalline coating which has been described.

Production on the plates of this coating constitutes the desired regaining of them. Consequently, to regain the plates, it is only necessary, after the old coatings and the images carried thereby have been removed from them, to hang the plates in the aluminized sodium carbonate solution until the light brownish color which has been mentioned just begins to appear on them. This which usually takes from about five to about fifteen minutes, depending upon the strength of the solution, indicates that the plates have been sufficiently grained. They are then successively removed from the solution, hung in cold running water to rinse from them the aluminized sodium carbonate solution which clings to their surfaces and dried by hanging them in the air. The water which clings to the surfaces of the plates may be blow from them but to obviate tearing or bending of the plates

too strong a current should not be used. After the plates have been dried they are ready for reuse.

The aluminized sodium carbonate solution should be stirred occasionally while it is in use and if it is allowed to cool to a temperature considerably below the prescribed operating temperature should be reconditioned by reaction with pieces of aluminum before it is used again. To replace losses due to evaporation, drag-out or other causes there may be added to the solution one-half of one percent of its weight of (anhydrous) sodium carbonate. Thereafter, before the solution is used again, it should be reconditioned by reaction with pieces of aluminum. When the aluminized sodium carbonate solution has been used so long that it requires more than about fifteen minutes to regain plates, it is preferable to discard it.

While, to regain the plates, we prefer to use the particular solution at the particular temperature mentioned, because we have found that this gives the best results, it is not necessary to do precisely this to obtain satisfactory results. For examples, a somewhat weaker or stronger solution of sodium carbonate may be employed as the basis of the solution and the operating temperature of the solution may be varied somewhat. Of course, other alkali metal carbonates, e. g., potassium carbonate may be used instead of the sodium carbonate. As a matter of fact the plates can be regained by methods other than that described above, such as anodizing, but we do not consider any of the other methods of which we know as satisfactory as that described above.

As we have indicated, plates from which the old coatings and the images carried thereby have been removed and which have been regained in accordance with our preferred method are superior to the original plates. This in that they hold images better and produce sharper and cleaner impressions of the images and, consequently, a larger number of acceptable impressions of the images. To what the superiority is attributable we are not certain but is perhaps attributable to refinement of the original pitting effected by the action of the solutions employed. We claim:

1. The method of reclaiming aluminum lithographic plates grained by treating them in an aluminized solution of sodium carbonate which includes removing the coatings and the images carried thereby from the plates by immersing them in a water solution which contains by volume approximately 30% 40° Bé. nitric and 1% 66° Bé. sulfuric acid at approximately room temperature for approximately ten minutes, then immersing them in a water solution which contains by weight approximately 6% to 7% caustic soda at approximately 175° F. for approximately thirty seconds, then immersing them in the nitric-sulfuric acid solution for a few seconds, then immersing them in the caustic soda solution for approximately fifteen to thirty seconds or somewhat longer, and then immersing them in the nitric-sulfuric acid solution for a few seconds, and then regaining the plates by immersing them in a water solution which contains by weight about 1% sodium carbonate conditioned by reaction with aluminum until the evolution of gas bubbles subsides at approximately 175° F. until a light brownish color begins to appear on the plates.

2. The method of reclaiming coating grained aluminum lithographic plates which includes re-

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moving the coatings and the images carried thereby from the plates by immersing them alternately in a nitric-sulfuric acid solution and a caustic soda solution, and then regaining the plates by immersing them in an aluminized sodium carbonate solution.

3. The method of reclaiming coating grained aluminum lithographic plates which includes removing the coatings and the images carried thereby from the plates by immersing them alternately in a sulfuric acid solution and an alkali metal hydroxide solution, and then regaining the plates by immersing them in an aluminized alkali metal carbonate solution.

4. The method of removing the coatings from aluminum lithographic plates grained by treating them in an aluminized solution of sodium carbonate which includes immersing them in a water solution which contains by volume approximately 30% 43° Bé. nitric and 1% 66° Bé. sulfuric acid at approximately room temperature for approximately ten minutes, then immersing them in a water solution which contains by weight approximately 6% to 7% caustic soda at approximately 175° F. for approximately thirty seconds, then immersing them in the nitric sulfuric acid solution for a few seconds, then immersing them in the caustic soda solution for approximately fifteen to thirty seconds or somewhat longer, and then immersing them in the nitric-sulfuric acid solution for a few seconds.

5. The method of removing the coatings from

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aluminum lithographic plates grained by treating them in an aluminized solution of an alkali metal carbonate which includes immersing them alternately in a nitric-sulfuric acid solution and a caustic soda solution, and then regaining the plates by immersing them in an aluminized sodium carbonate solution.

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