No. 637,551. Patented Nov. 21, 1899.

P. G. FRAUENFELDER.

LITHOGRAPHIC PRINTING PLATE.

(Application filed Mar. 31, 1899.)

No Model.)

Fig. 2.

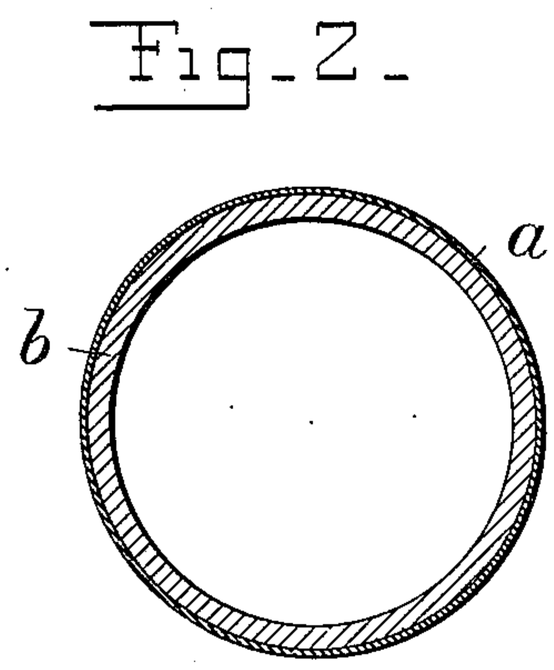


Fig. 1.

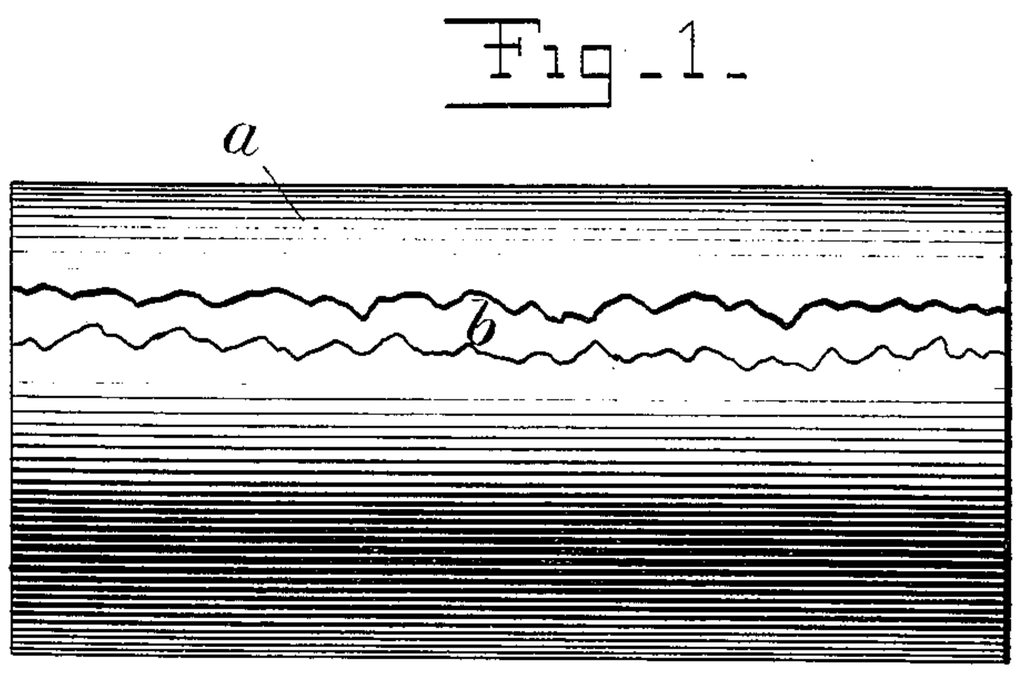


Fig. 4.

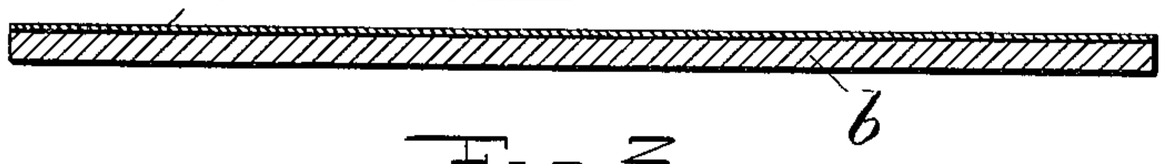
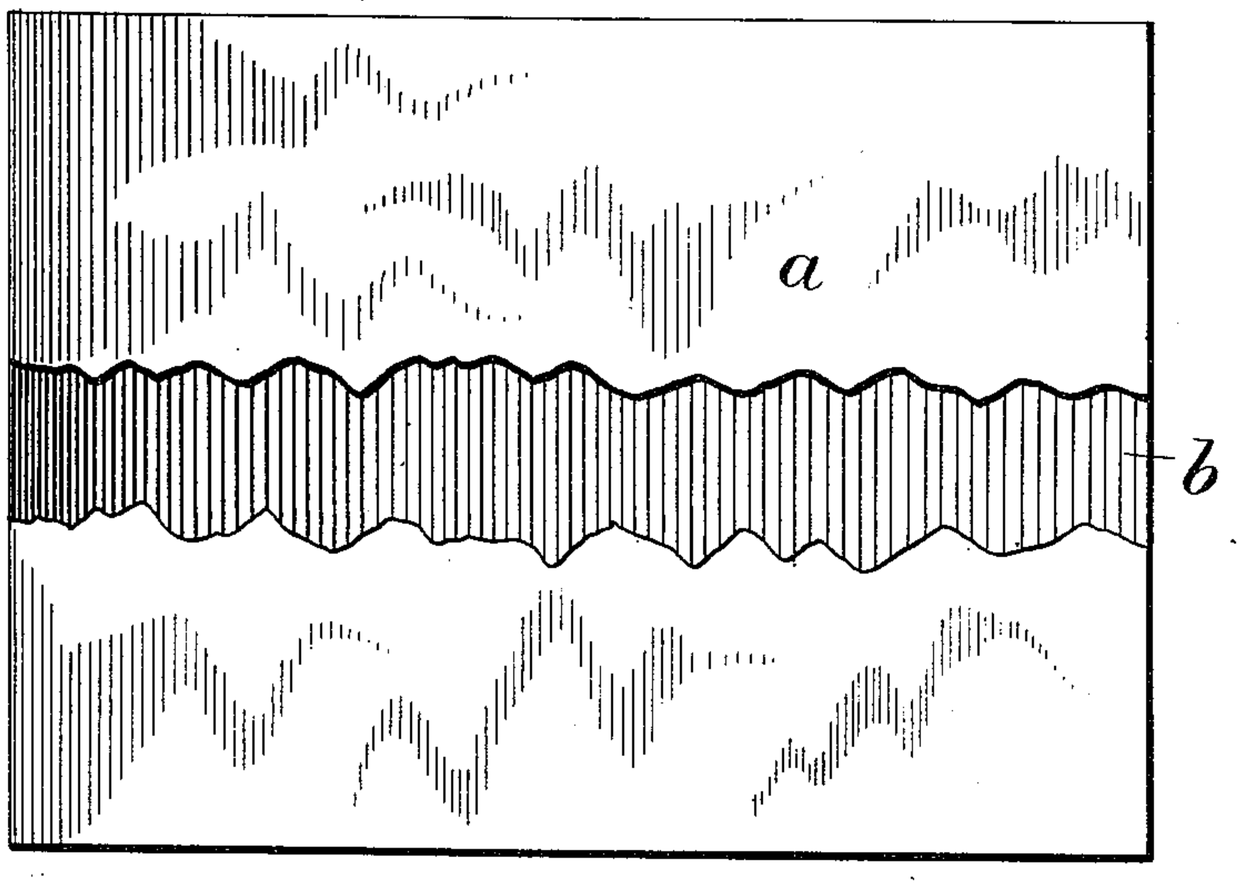


Fig. 3.



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LITHOGRAPHIC-PRINTING PLATE.

SPECIFICATION forming part of Letters Patent No. 637,551, dated November 21, 1899.

Application filed March 31, 1899. Serial No. 711,194. (No model.)

To all whom it may concern:

Be it known that I, PAUL GEORGE FRAUENFELDER, a citizen of Switzerland, and a resident of the city, county, and State of New York, have invented an Improvement in Lithographic-Printing Plates, of which the following is a specification.

The object of the present invention is to provide a new and improved lithographic-printing form which shall be free from some of the disadvantages hitherto inherent in such forms and which shall at the same time be less expensive than forms usually employed; and the invention consists in providing the printing-forms with an ink and water carrying printing-surface of electrodeposited zinc.

The accompanying drawings show my invention in its preferred form.

Figure 1 shows a lithographic-printing form cylindrical in shape, of which *a* represents the electrodeposited zinc printing-surface, which is partly broken away to show the cylinder *b*, upon which said surface has been electrodeposited. Fig. 2 is a vertical section of the same. Fig. 3 shows a flat lithographic-printing form, the letter *a* indicating the electrodeposited zinc surface, which is partly broken away to show the supporting-plate *b*, upon which the zinc is deposited. Fig. 4 is a vertical section of the same. These forms may be of any desired shape or size.

Heretofore stone has been almost exclusively used as the printing-surface in practical lithographic work, and metal has been but little, if at all, used with satisfactory results in spite of the great cost, the inconvenience and expense of handling, and the other manifest disadvantages of stone and in spite of the attention that has been directed toward making metal available for this purpose, as evidenced by the patents granted therefor and otherwise. Zinc in the form of sheets or plates has been experimented with probably more than any other metal, but with little, if any, practical success. Among the reasons are the following: The ordinary rolled zinc sheets or plates of commerce which have been heretofore the subject of such experiments have not a surface suitable for lithographic-printing purposes. The use of sand-blasting or some other equivalent mechanical process has been found necessary for preparing the surface of such plates. Moreover, a zinc surface cannot practically be used with any reliability for printing a second or third design without cutting down or grinding down to a substantially new level or surface and sand-blasting that new surface and preparing it, as before. Sand-blasting is expensive, and the cutting down to a new level or surface is not practicable. Zinc sheets or plates such as have ordinarily been proposed for use have been very thin—say one-sixtieth of an inch in thickness—in order to avoid the loss of a great body of zinc, since only the surface film is useful for the printing. These thin plates, however, while light to handle are the more liable to injury in handling from the lack of rigidity, and every crinkle, bend, or inequality of surface shows in the printing. In fact, if one of these thin zinc sheets or plates prepared as a printing-surface with a design upon its face is laid upon the bed of a press it will almost invariably show slight bends, swells, elevations, and depressions. These defects cannot be eliminated by pressure or by hammering, for such treatment would destroy the work upon the printing-surface. These evils have been sought to be remedied as much as possible by tightly stretching the sheets over their supports; but they cannot be wholly eliminated in this way nor their effects in the printing wholly counteracted. In order to increase the effects of this stretching, the sheets have ordinarily been made as thin as possible, but not with satisfactory results. Furthermore, the work is often worn off unevenly by the friction of the rollers, &c., in the printing operation at the places where the zinc sheet or plate springs up, swells, crinkles, or bends. Again, these thin zinc sheets will soon tear or break along the lines where they are bent and stretched over the edges of the bed and so become useless for that press because too small. A sufficient thickness or body of zinc in the sheets to render them reliably rigid and so to avoid the evils above referred to would end either in the loss of the entire mass of zinc after practically only one or two uses of the printing-

surface thereof or in the necessity of repeatedly resorting to the impracticable grinding and sand-blasting process. In the case of cylindrical or other curvilinear-shaped zinc sheets most of the above evils would be greatly exaggerated and others supervene, arising from the increased difficulty of securing uniformity of surface in such shapes. Again, the zinc sheets of commerce are quite impure, and especially is this true of very thin sheets such as must be used in lithography, for in such case lead has to be used in admixture with the zinc to give rollability. Chemically-pure zinc is expensive and would be difficult to roll out into thin sheets successfully and economically. These considerations suggest some of the causes for the observed fact that in experimenting with metals, including zinc as ordinarily attempted to be used for lithographic-printing purposes, many defects and imperfections are exhibited in comparison with stone, such as false tinting, smearing, rapid deterioration, lack of porosity, oxidation, &c. My invention obviates these difficulties, for I have discovered a character of zinc surface that is at once—that is to say, without the necessity of resorting to the sand-blasting process or to any process of bending or stretching or hammering—suitable for and especially adapted to receive an ink transfer or design after the lithographic manner and to act, after being suitably developed, as a lithographic-printing surface therefor and more perfectly adapted thereto than has been any metal surface heretofore practically obtainable. I have discovered that zinc when deposited electrolytically under suitable control is adherent and coherent, is suitably porous and absorbent, is even and uniform, without corrugations, seams, bends, streaks, ruts, nodules, or other like imperfections, and has a surface condition admirably adapted to the requirements of lithographic transferring and subsequent printing, and this at once and without the necessity of mechanical preparation of the surface, such as sand-blasting, bending, stretching, hammering, &c. Such an electrolytically-deposited zinc surface is also at once and without the intervention of any transfer or transferring process suitable to receive a design and be printed from directly in the lithographic manner. Moreover, a zinc surface thus obtained is readily removable from the metallic backing and can be economically applied thereto an indefinite number of times.

In practicing my invention in its preferred form I have found the following procedure effective: A backing of suitable metal—copper, for example—and of any desired size or shape—flat, cylindrical, or otherwise—and of suitable rigidity is evened and polished as to its outer surface and thoroughly cleaned and then mounted in a suitable zinc electrolytic bath, and after the application of a suitable current for the length of time necessary to deposit an even, continuous, adherent, coherent, and absorbent coating of zinc of the requisite thickness to constitute a lithographic-printing surface the plate is removed from the bath, thoroughly washed off with water, and is then at once ready to receive, for example, an ink transfer or design after the lithographic manner and after development to be used as a printing-form for lithographic work.

It will be seen that in the case of this present invention the desired form or shape of the printing-surface may be attained by a manipulation of the rigid metallic backing, the zinc printing-surface being applied electrolytically and conforming thereto after such shape has been exactly and satisfactorily attained. It is also of advantage that there should be not only no bending or stretching or other such change in the printing-surface after the same has been etched or prepared for printing, but also that there should be no slipping or moving of that printing-surface on or to or from its metal backing under the pressure of the rollers, cylinders, &c., in the various steps of printing.

The present invention is peculiarly advantageous in connection with cylindrical printing-surfaces. In fact, it makes the use of cylindrical printing-surfaces practically possible, and its advantages are conspicuously present in such combination and application, since thereby a continuous, seamless, adherent, coherent, absorbent, and readily-removable surface may be economically obtained.

The plating-bath and the current and all the details of the plating must of course be so manipulated and controlled as to yield the proper character of zinc deposit. In practice I have found the following details of manipulative treatment in a plating-bath effective: With a plate forty (40) inches by thirty (30) and a suitably sized and arranged bath I employ as the electrolyte to one hundred (100) pounds of water twenty-five (25) pounds of sulfate of zinc and three (3) ounces of gum-arabic. A current measuring eight (8) volts and thirty (30) amperes is furnished by a dynamo. When the plating is completed, the printing-form is removed from the bath and is plunged in a one-per-cent. bath of cyanid of potassium and is thoroughly washed off. It is then at once fitted to receive a design. The zinc surface, after the design has been made upon it or transferred to it, is developed into a printing-surface planographic throughout, the electrodeposited zinc performing both the ink-carrying and the water-carrying functions. The electrolytically-deposited zinc surface is a uniform planographic surface covering the whole of the printing-form prior to the producing or transferring of the design to it, and every part of it is capable of receiving the ink of such transfer or design, and the parts which do receive the ink of the transfer or design become and are, after the development of the surface as a whole into a lithographic-printing surface,

the ink-carrying parts or true printing parts of the printing-surface and remain substantially in the original planographic level. Moreover, the other portions of the zinc surface in the mode of development employed also remain in substantially the original planographic level, but become the water-carrying parts or surface. In other words, by the mode of development common in lithographic printing the printing-surface as a whole after such development is still a planographic surface and the electrolytically-deposited zinc performs both the ink-carrying and the water-carrying functions of the printing-surface.

What I claim as new, and desire to secure by Letters Patent, is—

A lithographic-printing form having a design developed upon its printing-surface in the lithographic manner, the ink-carrying and water-carrying portions of which printing-surface consist of electrolytically-deposited zinc.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL GEORGE FRAUENFELDER.

Witnesses:

EDWIN SEGER,

SIDNEY MANN.