UNITED STATES PATENT OFFICE.

CLAUDE A. O. ROSELL, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN LITHOGRAPHIC COMPANY, A CORPORATION OF NEW YORK.

PROCESS OF MAKING PRINTING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 685,462, dated October 29, 1901.

Original application filed November 4, 1898, Serial No. 695,495. Divided and this application filed May 12, 1900. Serial No. 16,429. (No specimens.)

To all whom it may concern:

Be it known that I, CLAUDE A. O. ROSELL, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, have invented a certain new and Improved Process of Making Printing-Surfaces, of which the following is a specification.

The invention relates to planographic printing-surfaces, and has especial reference to and consists in the improved process herein described and claimed.

The invention has especial applicability and usefulness in connection with rounded or cylindrical printing-forms and will be more especially described in that connection. More particularly, it has in view the repeated renewal of a given planographic printing form or device with a new fresh printing-surface after each printing job or edition is completed, and this repeated renewal of the surface without creating undulations or unevenness therein and while accurately maintaining the special shape, size, diameter, &c., of the printing-form.

In planographic cylinder-printing two methods have been used or suggested. In one a thin flexible sheet of aluminium or zinc is bent around a cylinder and is fastened there in place by suitable mechanical means, and the printing is effected from such sheet so cylindrically held and supported. In the other zinc is electrolytically deposited upon a cylinder of copper and the printing is effected from the zinc surfaces thus deposited. In the former case the mechanical incidents and difficulties accompanying the application and holding of the flexible sheets, as well as the expense incidental to preparing the face of those sheets for printing purposes, as by sand blasting, have constituted serious obstacles in the way of extended use. In the latter case after the edition has been printed the effort has been made to remove the zinc printing-surface by means of nitric acid; but the nitric acid in this operation has the disadvantage of removing also a notable amount of copper, thereby gradually diminishing the diameter of the copper cylinder, and, moreover, diminishing it unevenly—a feature which interferes with and prevents the uniform taking of ink and water from the ink and water rollers, respectively, and the uniform printing of the same. Moreover, any notable diminution in the diameter of the printing-cylinder would interfere with and prevent the proper coöperation of that cylinder with the other parts of the printing-press and register would be gradually interfered with and finally rendered impossible to attain without the reconstruction of the entire press. These difficulties are overcome in the following manner: In the preferred form of my invention I prepare a cylinder of aluminium sufficiently strong to stand the pressure of printing or a cylindrical shell of aluminium supported upon an interior mandrel of iron or copper or any suitable metallic base, the outer surface of which is aluminium. This cylinder or base having this outer surface of aluminium is finished with great accuracy and care with respect to uniformity of surface, exactness of dimensions, &c., all with reference to the exact shape and size of printing-form desired in the press. Upon this surface I then deposit electrolytically an outer coating or face of zinc in such way as, while causing such zinc surface to be an integral part of the composite form, shall at the same time render it sufficiently porous and of the necessary surface character to adapt it to act as a lithographic or planographic printing-surface. In order to achieve this result and to secure a zinc surface that will properly adhere to or integrate with the aluminium surface and be of the proper porous character for planographic printing, I electrodeposit the zinc from a solution of a zinc salt and an ammonium salt made basic by the addition of ammonia, or from a solution of a zinc salt, an aluminium salt, and an ammonium salt made basic by the addition of ammonia. For this purpose a solution of zinc sulfate, aluminium sulfate, ammonium sulfate, and ammonia has been found satisfactory. A solution containing three per cent. of zinc sulfate and an equal amount of aluminium sulfate and of ammonium sulfate will be found suitable. The

chemical reaction involved in adding ammonia to a solution of zinc sulfate, aluminium sulfate, and ammonium sulfate may be expressed by the following equation:

$$Al_2(SO_4)_3+2(NH_4OH)= Al_2(OH)_2(SO_4)_2+(NH_4)_2SO_4.$$

The basic aluminium sulfate thus formed dissolves in the solution upon agitation. The zinc sulfate and ammonium sulfate remain unchanged. It is evident that if the solution contains only aluminium sulfate and zinc sulfate ammonium sulfate will be formed by the reaction indicated in the above equation. If to a solution of a zinc sulfate and ammonium sulfate ammonia be added, the reaction involved may be expressed by the following equation:

$$ZnSO_4+2NH_4OH=Zn(OH)_2+(NH_4)_2SO_4.$$

The zinc hydrate thus formed dissolves in the solution upon agitation. The deposit of the zinc should be made by a low current. A current strength of from a quarter or one-half ampere per square foot would be suitable. In the above solutions the ammonia should not be added in quantity sufficient to form at any time a permanent precipitate. If to a solution of a zinc salt ammonia is added until the solution becomes alkaline to litmus-paper and the precipitate at first formed is redissolved, the electrodeposited zinc will not adhere to the aluminium plate. In making the electrical deposition of this invention a zinc anode should be employed to maintain the electrolyte of uniform composition and permanently basic. The bath may also be maintained in a basic condition by the addition of zinc hydrate from time to time during the operation.

After the planographic zinc surface has been suitably applied the plate is at once ready to receive a transfer after the lithographic manner and to be suitably developed into a printing-surface by the process of etching familiar to that art—as, for example, by the use of a weak solution of gum arabic and phosphoric acid—and to be thereupon used as a planographic printing-surface in a press containing both inking and dampening devices. After the use of the printing-form for printing purposes and the removal of the ink of the transfer in the usual way, as with turpentine, &c., the entire zinc coating is removed by means of suitable dilute nitric acid. By this operation the aluminium protective surface will be exposed, but without being in any way substantially affected or modified or itself removed and will be immediately ready to receive a second deposit of zinc for a second printing operation or edition. Care should be taken not to employ nitric acid that is very strong, for such acid would have some slight action upon the aluminium, although even then the action would be insignificant as compared with the action upon copper and so would be practically negligible. Dilute nitric acid will be found suitable for removing the zinc and will have substantially no action upon the aluminium, so that the aluminium cylinder will last indefinitely long. Thus the printing-form consists of an outer coating or face of electrolytically-deposited zinc and suitable for planographic printing, but adapted to be wholly removed by a suitable reagent after the printing of one job is finished, and a base of suitable material integral with the outer printing coating, the base having a protective face or coating of aluminium underlying the printing-coating. In this way and by the application of an even printing-surface of uniform and predetermined thickness the resulting printing form or device as a whole is always and permanently of the same shape and size, thus fitting it to coöperate permanently with the other parts of the printing-press. Moreover, as all the wear of the printing operation is on the coating or face which is wholly removed and a new fresh coating or face applied for each new printing job a printing-cylinder prepared as above described is practically indestructible.

Although specifically described with reference to cylinder-printing, where the invention has peculiar usefulness and advantages, and especially in connection with multicolor cylinder-printing, it nevertheless applies equally well to printing from flat or curved surfaces of any shape.

The herein-described printing-form is not specifically claimed as the product in this application, but forms the subject-matter of a separate application filed by me in the United States Patent Office on the 4th day of November, 1898, Serial No. 695,495, of which this is a division.

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

1. The process of coating an aluminium surface with zinc which consists in electrodepositing zinc upon the aluminium surface from a basic non-alkaline solution of an ammonium salt, a zinc salt and an aluminium salt, the bath being maintained in a basic and non-alkaline condition throughout the operation, substantially as described.

2. The process of coating an aluminium surface with zinc which consists in electrodepositing zinc upon the aluminium surface from a non-alkaline solution of zinc sulfate, aluminium sulfate, ammonium sulfate and ammonia, the bath being maintained in a basic and non-alkaline condition throughout the operation, substantially as described.

3. The process of making a planographic printing-surface which consists in electrodepositing zinc by a current having a density of from one-quarter to one-half an ampere per square foot of cathode-surface upon a base having an aluminium surface, from a basic non-alkaline solution of zinc and maintaining the bath in a basic and non-alkaline condition throughout the operation, thereby pro-

ducing an adherent and granular coating of zinc, substantially as described.

4. The process of making a planographic printing-surface which consists in electrodepositing zinc by a current having a density of from one-quarter to one-half an ampere per square foot of cathode-surface upon a base having an aluminium surface, from a non-alkaline solution of an ammonium salt and a basic zinc salt, and maintaining the bath in a basic and non-alkaline condition throughout the operation, thereby producing an adherent and granular coating of zinc, substantially as described.

5. The process of making a planographic printing-surface which consists in electrodepositing zinc by a current having a density of from one-quarter to one-half an ampere per square foot of cathode-surface upon a base having an aluminium surface, from a basic non-alkaline solution of an ammonium salt, a zinc salt and an aluminium salt, and maintaining the bath in a basic and non-alkaline condition throughout the operation, substantially as described.

6. The process of making a planographic printing-surface which consists in electrodepositing zinc by a current having a density of from one-quarter to one-half an ampere per square foot of cathode-surface upon a base having an aluminium surface, from a non-alkaline solution of zinc sulfate, aluminium sulfate, ammonium sulfate and ammonia, and maintaining the bath in a basic and non-alkaline condition throughout the operation, substantially as described.

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

CLAUDE A. O. ROSELL.

Witnesses:
JOHN O. GEMPLER,
EDWIN SEGER.