J. A. COREY.

PRINTING SURFACE.

APPLICATION FILED MAR. 4, 1919.

1,426,549. Patented Aug. 22, 1922.

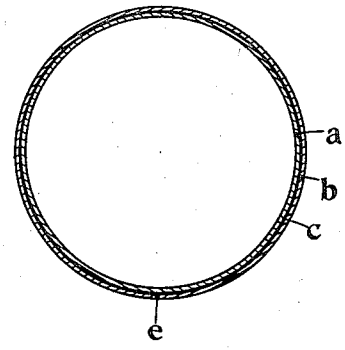


Fig. 1.

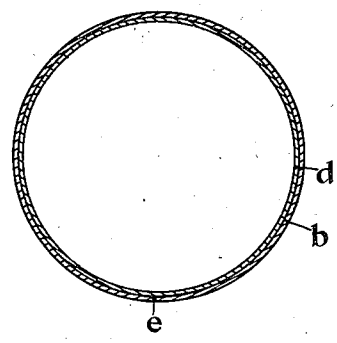


Fig. 2.

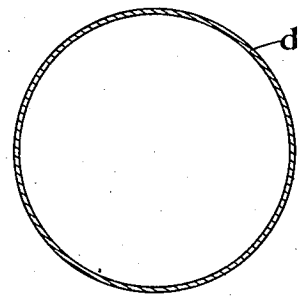


Fig. 3.

Inventor

J. A. Corey.

by

W. E. Evans.

Attorney.

UNITED STATES PATENT OFFICE.

JAMES ALBERT COREY, OF LONDON, ENGLAND.

PRINTING SURFACE.

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To all whom it may concern:

Be it known that I, JAMES ALBERT COREY, an American citizen, residing at 18 Manor Mansions, Belsize Grove, Hampstead, London, N. W., England, have invented certain new and useful Improvements Relating to Printing Surfaces (for which I have filed application in Great Britain February 25, 1918, application No. 3,269), of which the following is a specification.

This invention relates to printing surfaces.

The invention has for one of its objects to produce cylindrical printing surfaces by electrotyping and has especial utility in its application to repetition work such for instance as bank notes, postage stamps, and the like with respect to which it is difficult in a practical way to ensure substantial identity of image and tone from a number of printing surfaces repeated by engraving or photogravure from the same original.

The use of flat intaglio printing surfaces duplicated from the original by electrotyping is known for printing in flat bed printing machines but the use of intaglio and other printing surfaces in rotary printing machines is restricted by the practical difficulty referred to.

The invention has thus among its objects to secure substantial identity of impression and tone values from a number of cylindrical printing surfaces by their production by electrotyping from the original.

The invention broadly comprises the production of cylindrical printing surfaces as relatively thin, hard and dense deposits by electrotyping, and it comprises the methods hereinafter described and the products thereof.

According to the invention the electrotype printing cylinder may be produced as a relatively thin and hard deposit from an original of identical cylindrical form or it may be produced from an original in the flat, or again the electrotype in the form of a relatively thin and hard deposit may be produced in the flat and subsequently shaped to a cylindrical form as hereinafter described.

The invention is illustrated diagrammatically in the accompanying drawing in which—

Figure 1 represents a diagrammatic section illustrating the manner in which the "mother" is formed upon the "master."

Figure 2 is a similar section showing the manner in which the electrotype is produced within the "mother," and

Figure 3 illustrates in a similar view a sectional view of the electrotype produced.

In carrying the invention into effect according to one modification in the production of an intaglio printing cylinder, I produce an original *a* of identical cylindrical form to that to be electrotyped and from this original or "master" *a* I produce a number of identical cylindrical electrotypes *d* which are relatively thin and hard. For repetition work such as postage stamps the original image may be multiplied as many times as required, assembling these copies in register and then proceeding in the same way as in reproducing the original of a single image. The "master" cylinder *a* is prepared for the production of a relief or "mother" *b* by treating the surface so that the deposit may be separated from it without injury or loss of definition to the engraved image. This may be conveniently done by a deposit of silver upon the engraved surface or by any other methods commonly practised by the electrotyper. A layer of metal such as copper is then electro-deposited upon the "master" cylinder *a* and the deposit while being relatively thin may be made sufficiently thick for example for the cylinder to be self-supporting when stripped from the "master," that is, it may be of such a thickness and degree of hardness that it will spring back or not be so thick as to be incapable of being gently forced back into exact circular form, thus having sufficient strength to withstand the strains, to which it is subjected in handling, without any distortion. It has been found by trial that a thickness of $\frac{1}{16}$ inch is effective, but a thickness of $\frac{1}{32}''$ or $\frac{1}{8}''$ may for example be used, or any such thickness as will permit of the removal of the "mother" *b* from the "master" *a* without permanent distortion or injury. It will, however, be understood that a very thin deposit is practicable and the most economical. For this purpose the electro-deposition is effected in the use of high current densities and in the

circulation of the electrolyte, or in the movement of the cathode therein. The relief or "mother" cylinder *b* thus produced together with the "master" *a* may be mounted upon a mandrel in a lathe or grinding machine and be ground true and the deposit trimmed to the desired length by cutting just through the deposit to the original or "master" cylinder *a* at both ends. A longitudinal cut as at *e* is then made through the deposit *b* parallel with the longitudinal axis. Boiling water is then poured over the outer cylinder *b* which will then expand. The separation is thus facilitated and the divided tube *b* is then sprung off the "master" cylinder or original *a* carries will be understood that this tube which is a "mother" cylinder from which a number of electrotypes can be made identical with the "master" cylinder or original *a* carries the image on the inner side and in relief.

For the purpose of producing an intaglio printing cylinder having a continuous "doctoring" or wiping surface from such a "mother" cylinder, the following method may be employed.

The longitudinal edges of the "mother" or relief cylinder *b* where the cylinder is slit at *e* are brought together in alignment, and in order to maintain the edges in position and to make good electrical contact I may tack the edges with solder at a number of points and fill in any slight gap that remains in the intervals between the solder points with the wax or other suitable non conducting material and carefully scrape away any superfluous wax so as to make an uninterrupted curved surface over the slit at *e*. The wax may then carefully be polished with graphite to make it electrically conductive and so that the deposit may then be made continuous around the entire surface of the relief or "mother" cylinder.

The "mother" cylinder or relief *b* is then mounted in a holder by which it may be fixed to a spindle by which it may be rotated within the electrolyte. The inner surface carrying the image may be prepared for separating the deposit by silvering or by other means and the deposit may then be made under the same conditions and to the same degree as before, except that the deposit will be now made on the inside of the cylinder *b* instead of upon the outside, and may be confined to minima thicknesses of deposit.

The deposit having reached the desired thickness the "mother" cylinder or relief *b* with the deposit upon it are taken out of the electrolyte and the electrotype *d* produced is separated from the "mother" *b*. For this purpose the solder joints at *e* are melted away and boiling water may be poured as before upon the outer cylinder *b* which will then expand and facilitate separation from the inner cylinder *d*. The outer cylinder *b* can then be grasped by the two edges and gently sprung open sufficiently to allow of slipping clear off the inner cylinder *d* without damage to either. Any traces of the image that may appear in relief on the inner surface of the cylinder are removed and in the same operation any inequality in thickness may be corrected by turning or grinding.

For this purpose a clamping forme may be employed composed of two semi-circular concave members provided with a flange at one end by which it may be clamped to the face plate of a drilling or similar machine. The cylinder is now enclosed in this forme and the two semi-circular concave members are drawn up by binding screws until they grip the cylinder sufficiently to prevent its movement. The forme is now clamped on the face plate of the machine concentric with the grinding or tool head and the plate and forme are gradually moved so that the full length of the cylinder will pass the grinding or tool head fitted upon the spindle, or the cylinder may remain stationary and the spindle carrying the grinding or tool head may be gradually moved. The cylinder carrying the intaglio image on its outer surface identical in every respect with the image on the "master" cylinder or original is now slipped over the expanding mandrel for mounting in the printing machine ready for printing.

Where cylindrical electrotypes of exceptional thickness are produced, I may provide metal filling strips for insertion into the gaps of the expanding mandrel.

When producing relief printing surfaces according to the invention and where the surface of the relief has deep cuts or recesses, the relief "mother" may be cut on two longitudinal lines in diametrically opposite positions with a view to ensure its separation from the final product. Furthermore the outside of the "mother" may be ground so that the "mother" may be fitted into a holder adapted to receive it. Thus the inside as well as the outside surface of the "mother" may have a constant diameter.

It will be understood that in the production of a cylindrical electrotype as hereinbefore described, there will be a relief formed on the back of the deposit and this relief will be removed in grinding or turning. Furthermore in deposition the layer is apt to become thicker at the ends and the grinding of the inner surface or the bore of the electrotype may remove the increased thickness of the ends and render the bore uniform. With a view however to avoid the thickening of the deposit at the respective ends of the electrotype to which the respective connections are made, the anode which in depositing the electrotype upon

the "mother" is disposed centrally may be provided slightly tapered, that is so that the anode is gradually reduced in diameter towards the end or ends and the respective shapes or sizes of the sections of the anode may be determined by trial with a view to ensure a substantially uniform deposit.

In carrying the invention into effect according to another modification of method, the original is produced in the flat and a thin and hard metal relief is deposited thereon of such a thickness that it may be bent to a circular shape. This relief is then mounted in hollow circular formes so that the image is on the inside and so that a complete cylinder or "mother" is produced of true cylindrical form. A tube of sufficient thickness as hereinbefore described is then deposited as a relatively thin and hard layer within the "mother" cylinder or relief.

In carrying the invention into effect according to another modification of method in the use of an original in the flat or otherwise, I may produce a mould preferably in lead from the original preferably in the flat and produce a flat electrotype from the lead mould. This flat or sheet electrotype is deposited as a hard layer and to a sufficient thickness as hereinbefore described so that it may be bent into a true cylindrical form. Its edges are soldered, brazed or welded and the cylindrical electrotype produced is finished in the same manner as described according to the first method.

In carrying the invention into effect according to another modification of method, the mould preferably in lead, may itself be formed into a cylindrical shape and a thin and hard cylindrical electrotype produced from the lead mould, the product being then finished as before. It will be understood that this modification is not preferred for fine work.

I claim:—

1. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting and stripping the "mother" from the original and using the "mother" as a mould, substantially as described.

2. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original after the exterior surface of the original has first been treated for the ready separation from it of the "mother" without injury or loss of definition, splitting and stripping the "mother" from the original and using the "mother" as a mould, substantially as described.

3. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of hard and dense metal by electrotyping from a cylindrical original, the metal being sufficiently thick to permit of the "mother" being self-supporting but sufficiently thin to be incapable of permanent distortion on release from the original, splitting and stripping the "mother" from the original and using the "mother" as a mould, substantially as described.

4. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting the "mother" from the original and stripping the "mother" from the original by pouring hot liquid over it, and then using the "mother" as a mould, substantially as described.

5. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting the "mother" by cutting on a longitudinal line, stripping the "mother" from the original and then bringing together into alignment and contact the edges of the "mother" at the part at which it is cut and securing the edges together temporarily, then using the "mother" as an electrotyping mould, then disconnecting the edges and stripping the "mother" from the electrotype produced, substantially as described.

6. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting the "mother" by cutting on a longitudinal line, stripping the "mother" from the original and then bringing together into alignment and contact the edges of the "mother" by the use of solder at the part at which it is cut and securing the edges together temporarily, then using the "mother" as an electrotyping mould, then disconnecting the edges and stripping the "mother" from the electrotype produced, substantially as described.

7. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting and stripping the "mother" from the original, then mounting the "mother" upon a holder and using the "mother" as a mould, substantially as described.

8. A method of producing a jointless cy-

lindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting and stripping the "mother" from the original, then mounting the "mother" upon a holder and using the "mother" as a mould by rotating the "mother" within an electrotyping bath, substantially as described.

9. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting and stripping the "mother" from the original, then mounting the "mother" upon a support and depositing the jointless cylindrical electrotype printing surface within the mould after first treating the inner face of the "mother" so that the jointless cylindrical printing surface may be separated from it without injury or loss of definition, substantially as described.

10. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, using the "mother" as a mould and then splitting the "mother" and stripping the "mother" from the original by pouring hot liquid over it, substantially as described.

11. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, splitting and stripping the "mother" from the original, using the "mother" as a mould and then grinding the inner surface of the jointless cylindrical electrotype printing surface produced, substantially as described.

12. A method of producing a jointless cylindrical electrotype printing surface, comprising the production of a flexible cylindrical "mother" of relatively thin, hard and dense metal by electrotyping from a cylindrical original, mounting the original with the "mother" upon it within a machine tool for grinding or machining the exterior of the "mother," splitting and stripping the "mother" from the original, and using the "mother" as a mould, substantially as described.

13. A cylindrical electrotype "mother" of hard, dense and flexible metal sufficiently thick to be self-supporting but sufficiently thin to be incapable of permanent distortion on release from the original or from the electrotype produced therein, substantially as described.

JAMES ALBERT COREY.