

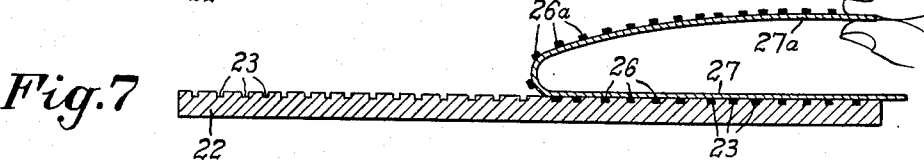
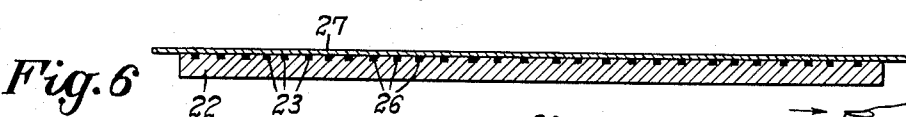
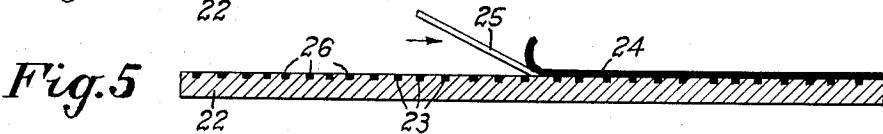
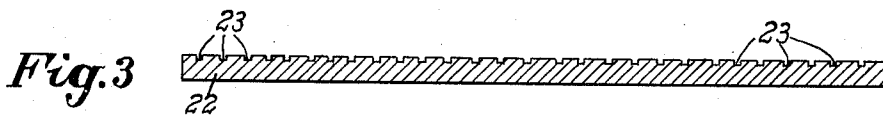
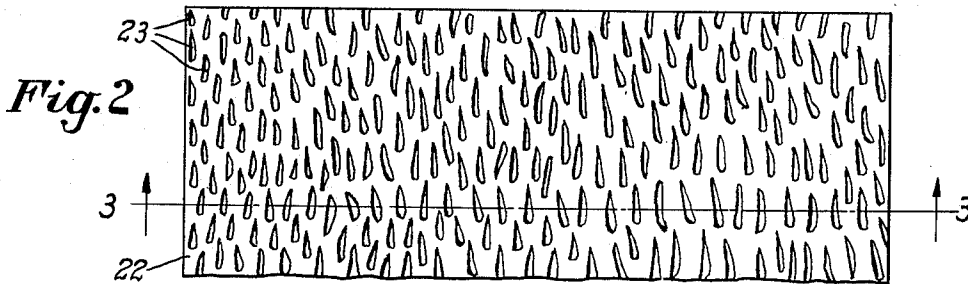
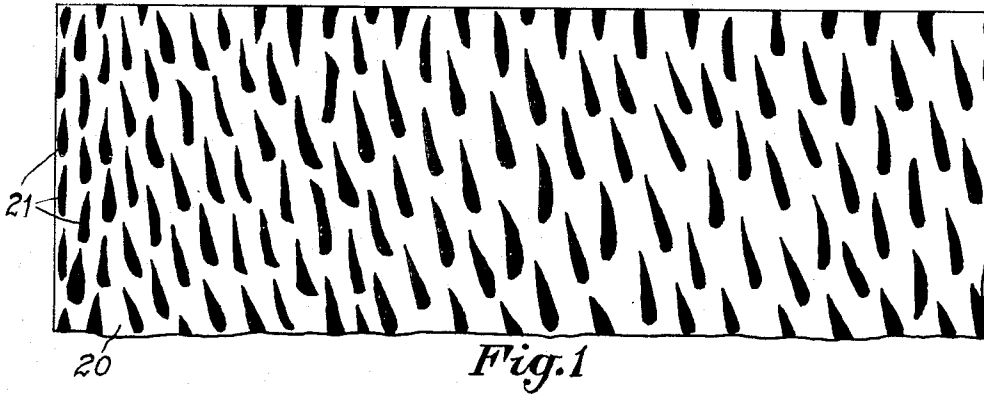
July 20, 1954

L. H. WILSON ET AL  
PROCESS FOR PRODUCING EMBOSSED  
DESIGNS ON HARD SURFACED ROLLS

2,684,291

Filed April 30, 1951

3 Sheets-Sheet 1



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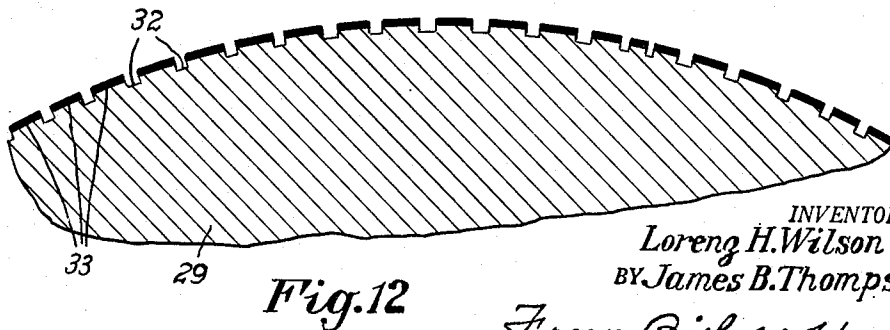
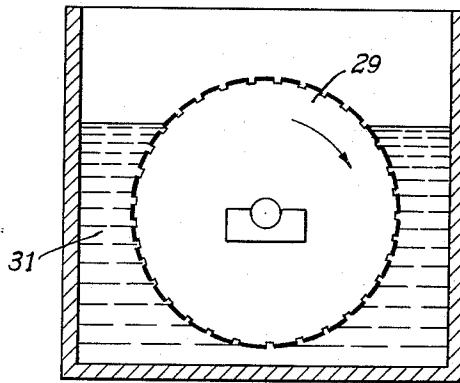
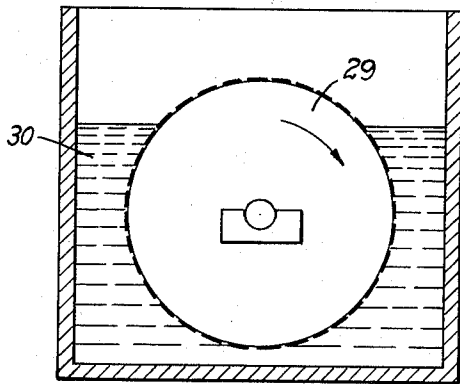
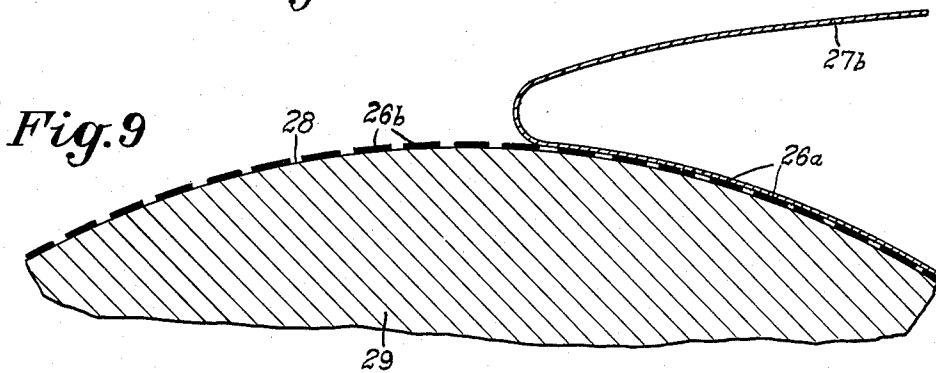
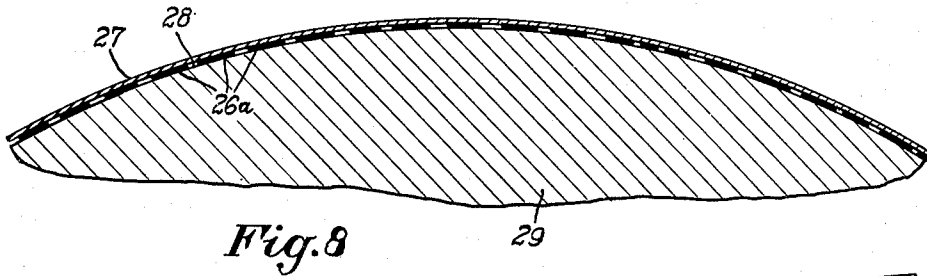
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3 Sheets-Sheet 3

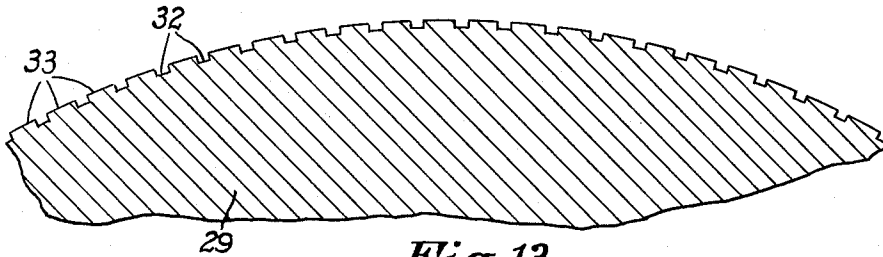


Fig. 13

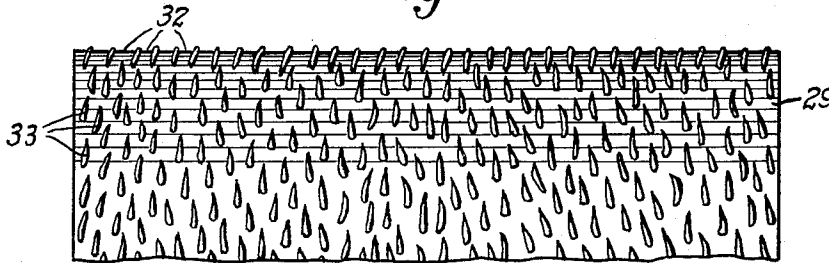


Fig. 14

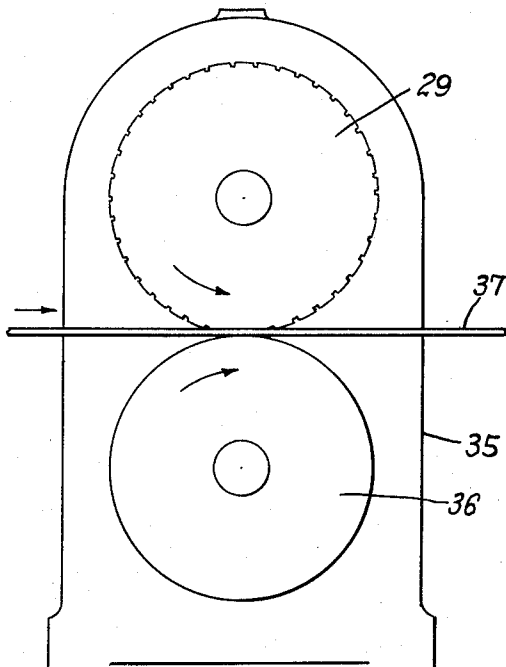


Fig. 15

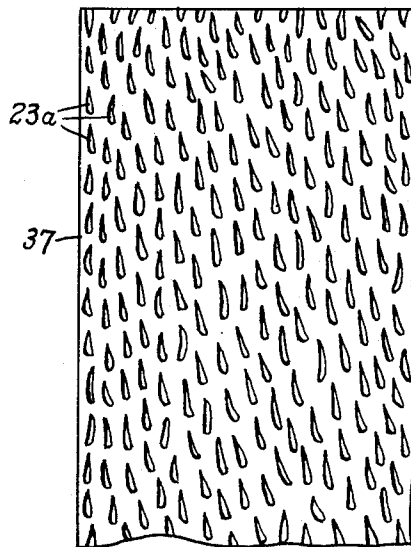


Fig. 16

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## PROCESS FOR PRODUCING EMBOSSED DESIGNS ON HARD SURFACED ROLLS

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The invention relates to the embossing of designs, figures or letters upon hard surfaced rolls, such as are used in cold roll mills, for pressing or rolling the reverse of such designs, figures or letters into the surfaces of metal such as steel which is passed through the cold roll mill, and the invention also relates to the production of steel or other metal sheets or strips with embossed surfaces.

Such embossed designs, and the like, are rolled into metal sheets, or strips, by producing the desired designs, figures, letters or the like, in reverse, on the surface of a roll which is placed in a standard cold roll mill, in cooperation with another roll, which may be a conventional roll with a smooth surface, and as metal sheets, strips, or the like, are passed through the mill the pressure of the rolls causes the reverse of the design on said roll to be pressed or rolled into the surface of the metal sheets or strips.

Under present practice there are two methods for producing such embossed designs upon rolls for this purpose, both of which methods are quite expensive and neither of which is entirely satisfactory.

One method now in use for embossing such rolls is to first hand engrave the designs, figures or letters on a small roll, which is subsequently hardened and ground and then, using extreme pressure, this small embossed roll is pushed against the larger roll to be used in the rolling mill, embedding the design in the surface thereof.

Obviously, the roll embossed in this manner cannot be very hard, or the design could not be pressed into the surface thereof by the smaller roll, and, as a consequence, designs embossed upon the surfaces of rolls in this manner will quickly wear off in use. Owing to the size of such rolls it is usually very expensive to heat treat and grind them to overcome this objection.

The other method at present in use for embossing such rolls is to hand engrave the rolls, which is a very laborious, time-consuming and expensive operation, and the rolls thus embossed are not sufficiently hard to withstand long wear.

The present invention contemplates the provision of a process by means of which designs, figures, letters and the like, may be quickly and inexpensively embossed on very hard surfaced, metal rolls, without requiring that the rolls be annealed before the embossing operation, or that they be heat treated subsequent thereto.

An object of the invention is to provide a process which consists in first engraving the desired design in intaglio upon a flat plate, and then, by means of an acid resistant substance and a

sheet of thin paper, transferring the design to the surface of a roll, and etching the design in relief on the roll.

It is also an object to provide a process for embossing such rolls by first producing the desired designs, figures, letters or the like by photo-engraving the same upon a flat steel plate, the depressions or low places in the engraved plate being filled with a waxy, bituminous acid resistant substance, which is then transferred, by means of a sheet of thin paper, to the surface of the roll to be embossed, after which the roll, with the design in said acid resistant substance upon the surface thereof, is etched in acid, producing the embossed designs, figures or letters upon the surface of the roll, in reverse to the design upon the engraved plate, that is in relief, so that the low points of the design on the engraved plate are the high points of the design on the roll, and vice versa.

The above objects together with others which will be apparent from the drawings and following description, may be attained by carrying out the process for embossing rolls in the manner hereinafter described in detail, and illustrated in the accompanying drawings, in which:

Fig. 1 is a fragmentary view of a portion of a sheet of paper having an enlarged black and white drawing of the desired design thereon;

Fig. 2 a fragmentary plan view of a portion of a flat steel plate upon which the design, reduced to the exact size desired on the roll, is reproduced by photo-engraving;

Fig. 3 a section through the engraved plate taken as on the line 3—3, Fig. 2;

Fig. 4 a section similar to Fig. 3, showing the engraved plate covered with a waxy, bituminous, acid resistant substance;

Fig. 5 a similar view, showing the manner in which the excess acid resistant substance is removed from the engraved plate, so that it remains only in the depressions or low points in the plate;

Fig. 6 a similar view, showing the next step in the process, in which a sheet of tissue paper is pressed upon the engraved surface of the plate and stuck tightly to the resist;

Fig. 7 a similar section, showing the next step of the process, in which the sheet of tissue paper is removed from the engraved plate, with the design in the acid resistant substance transferred from the depressions in the plate to the paper;

Fig. 8 a fragmentary sectional view of a portion of a roll with the tissue paper, having the resist design thereon, pressed around the surface of the roll;

Fig. 9 a similar view, showing the tissue paper

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being removed from the roll, leaving the resist upon the surface of the roll in the desired design;

Fig. 10 an end elevation of the roll, on a small scale, showing the manner in which it is rotated in an acid bath to etch the surface thereof;

Fig. 11 a similar view, showing the washing of the roll with water to remove the acid;

Fig. 12 an enlarged, fragmentary, sectional view of a portion of the etched and washed roll;

Fig. 13 a similar view, showing the embossed roll after the resist has been removed therefrom, and the roll is ready for use in a cold roll mill for embossing metal sheets, strips and the like;

Fig. 14 a fragmentary, side elevation of a portion of the finished embossed roll;

Fig. 15 a view of a cold roll mill provided with one of the embossed rolls, showing the manner in which sheet metal may be passed through the mill to impress the design thereon; and,

Fig. 16 an elevation of a portion of a metal sheet embossed with the design.

Referring now more particularly to the process for embossing designs upon hard surfaced rolls, as illustrated in the drawings, an enlarged paper drawing of the design is first made, as indicated at 20, being as much larger than the finished design to be placed on the roll as can be conveniently made. Usually an enlargement of two to four times the size desired on the roll is sufficient. The design, as shown at 21, is drawn or printed upon the paper sheet 20, preferably in black or other solid color, as shown.

The design, as produced on the paper drawing 20, is then engraved upon a flat steel plate, as indicated at 22, in Figs. 2 to 7, by well known photo-engraving procedure, the design, as indicated at 23, being reduced in the photo-engraving process to the exact size desired upon the roll.

The design indicated at 23 is thus engraved in the surface of the steel plate 22, forming depressions or recesses in the surface of the plate, as shown in Figs. 2 to 7. This engraved surface of the plate 22 is next covered with a waxy, bituminous, acid resistant substance, such as asphalt and beeswax, preferably about the consistency of putty, as indicated at 24 in Fig. 4, the engraved master plate 22 being maintained at a suitable temperature to facilitate the proper working of this waxy, bituminous substance or acid resist.

Then, as shown in Fig. 5, this acid resist is removed from the high points of the surface of the engraved plate, as by means of a smooth blade 25, such as a putty knife or the like, leaving only the depressions 23 filled with the resist, as indicated at 26.

When all of the excess resist has been removed from the surface of the engraved master plate, a sheet of thin tissue paper, as indicated at 27 in Fig. 6, is placed upon the engraved plate 22 and is pressed or rubbed down with the fingers, lamb's wool, or other soft object, so as to exclude all air from under the paper, and cause it to adhere tightly to the resist 26 remaining in the depressions or low places 23 of the engraved plate.

Then, as shown in Fig. 7 the sheet of tissue paper 27 is carefully and slowly pulled away from the surface of the engraved plate 22, as indicated at 27a, with the portions 26 of the resist, which had remained in the depressions 23 of the plate, adhering to the paper, whereby the design is thus transferred from the engraved plate to the tissue paper 27.

The tissue paper 27, with the resist design adhered thereto, as indicated at 26a, is then laid around the peripheral surface 28 of the hard sur-

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faceted steel roll 29, which is to be embossed, with the resist design 26a against the surface of the roll.

The paper 27 is then rubbed or pressed tightly against the surface of the roll with any soft object such as the fingers, lamb's wool, or the like, until all air is excluded from beneath the paper and the resist 26a is adhered tightly to the surface of the roll.

The paper is then sufficiently moistened, with a solution of approximately 50% alcohol and 50% water, to cause the paper to separate from the resist 26a, after which the paper is pulled from the roll, as indicated at 27b in Fig. 9, leaving the resist adhering to the surface of the roll in the design which has been transferred from the depressions 23 of the engraved master plate 22, as indicated at 26b in Fig. 9.

Any small imperfections which may appear in the design thus transferred, onto the surface of the roll with the acid resist, may be touched up with a small brush and suitable lacquer, paint or the like.

The roll, with the resist design thereon, is then allowed to set for sufficient time to permit the resist to dry and harden, after which, as shown in Fig. 10, the roll is slowly revolved in an acid bath indicated at 30, preferably a cold, 5% nitric acid solution.

All portions of the surface of the roll which are not covered by the resist will be etched by the action of the acid bath and the operation will be continued until the desired depth of embossment is obtained. The roll is then washed in water, as indicated at 31 in Fig. 11, to remove the acid from the surface of the roll.

As shown in Fig. 12 the portions of the roll not covered by the acid resist 26a will be etched by the acid forming low points 32, while the portions, which have been protected by the resist 26a, will form the design in relief, as indicated at 33.

The resist 26a may then be cleaned from these high spots upon the roll, with a suitable solvent such as kerosene, and the roll, as shown in Figs. 13 and 14, has the embossed or raised design 33 which is the reverse of the etched or cut out design 23 on the engraved master plate 22.

The roll 29, with the desired embossment in reverse thereon, may then be placed in a standard cold roll mill, as indicated at 35 in Fig. 15, and properly adjusted relative to the other roll 36 therein. The embossed roll thus produced may be either the top or bottom roll of the mill, or, if it is desired to emboss both sides of the metal sheets, or the like, passed through the mill, both rolls may be embossed as above described. Generally the top roll of the mill is embossed and the lower roll is a conventional, plain roll which may be suitably crowned.

When metal, as indicated at 37, is passed through a mill provided with an embossed roll such as illustrated and described, the desired design, or embossment 23a, will be impressed into the metal, in reverse to the design on the roll, the design impressed into the metal being the same as the design upon the engraved master plate 22.

Thus, the improved method provides not only an inexpensive way of forming embossed rolls with any desired embossed design but also provides an inexpensive way of producing sheet or strip metal with embossed designs thereon. Obviously, the engraved master plate 22 can be used repeatedly for the manufacture of a number of embossed rolls 29.

Moreover, the present invention enables very hard steel rolls to be provided with embossed designs which have a much longer life in use than embossed rolls heretofore made by the hand-engraving of designs directly in surfaces thereof.

Embossed rolls made in accordance with the present invention may be used for rolling embossed surface steel sheets or strips, and by reason of the economies resulting from the present discoveries, such material may be produced much more inexpensively than has heretofore been possible. As indicated, the material rolled may be steel or if desired stainless steel sheets and strips may be rolled in accordance with the present invention as well as aluminum sheet or strip metal or sheets or strips formed of other metals.

The embodiments of the present invention illustrated and described herein are by way of example, and the scope of the invention is not limited to the exact details illustrated.

Finally, in the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and not for the purpose of limitation, and are intended to be broadly construed.

Having now described the features of the invention, the preferred steps of the new methods, and the advantageous, new and useful results obtained thereby; the new and useful methods, steps, procedures and combinations, and reasonable mechanical equivalents thereof, obvious to those skilled in the art, are set forth in the appended claims.

We claim:

1. The process for producing a raised embossed design upon a hard surfaced metal roll to be used for rolling the raised design into metal surfaces, which consists in executing an enlarged drawing of the design to be made, engraving a reduced reproduction of the design upon a flat metal plate to the exact size ultimately desired on the hard surfaced metal roll, then filling the depressions in the engraved plate with an acid resistant substance while maintaining said engraved plate at suitable temperature to facilitate working of the acid resistant substance, then transferring the acid resistant substance from the depressions in the engraved plate to a sheet of thin tissue paper, then laying the paper around the surface of the roll to be embossed and causing the acid resistant substance to adhere to the surface of the roll, then wetting the paper with an aqueous alcohol solution, then removing the paper leaving the acid resistant substance upon the roll, and then etching the uncovered portions of the roll surface with acid so as to produce the design in relief upon the roll in reverse to the design upon the flat engraved plate.

2. The process for producing a raised embossed design upon a hard surfaced metal roll to be used for rolling the raised design into metal surfaces, which consists in executing an enlarged drawing of the design to be made, engraving a reduced reproduction of the design upon a flat metal plate to the exact size ultimately desired on the hard surfaced metal roll, then covering the engraved plate surface with a layer of waxy bituminous acid resistant substance while maintaining said engraved plate at suitable temperature to facilitate working of the acid resistant substance, then removing the excess acid resist-

ant substance from the engraved plate surface so that only the depressions in the engraved plate remain filled with said acid resistant substance, then laying a sheet of thin tissue paper upon the engraved plate surface and pressing the paper against the engraved plate surface so as to exclude all air from beneath the paper to cause the paper to adhere tightly to the acid resistant substance in the engraved plate depressions, then removing the paper with the acid resistant substance adhering thereto from the engraved plate, then placing the paper with the acid resistant substance side on the hard surfaced metal roll to be embossed and pressing the paper against the roll surface to cause said acid resistant substance to adhere to the roll, then moistening the other side of the paper with an aqueous solution of 50% alcohol, then removing the paper from the roll, and then etching the uncovered portions of the roll surface with acid so as to produce the design in relief upon the roll in reverse to the design upon the flat engraved plate.

3. The process for producing a raised embossed design upon a hard surfaced metal roll to be used for rolling the raised design into metal surfaces, which consists in executing an enlarged drawing of the design to be made, engraving a reduced reproduction of the design upon a flat metal plate to the exact size ultimately desired on the hard surfaced metal roll, then covering the engraved plate surface with a layer of waxy bituminous acid resistant substance, then removing the excess acid resistant substance from the engraved plate surface so that only the depressions in the engraved plate remain filled with said acid resistant substance, then laying a sheet of thin tissue paper upon the engraved plate surface and pressing the paper against the engraved plate surface so as to exclude all air from beneath the paper to cause the paper to adhere tightly to the acid resistant substance in the engraved plate depressions, then removing the paper with the acid resistant substance adhering thereto from the engraved plate, then placing the paper with the acid resistant substance side on the hard surfaced metal roll to be embossed and pressing the paper against the roll surface to cause said acid resistant substance to adhere to the roll, then moistening the other side of the paper with an aqueous solution of 50% alcohol to cause the paper to separate from the acid resistant substance, then removing the paper from the roll, and then slowly revolving the roll in a nitric acid solution to etch the uncovered portions of the roll so as to produce the design in relief upon the roll in reverse to the design upon the flat engraved plate.

References Cited in the file of this patent  
UNITED STATES PATENTS

Number	Name	Date
112,924	Johnson	Mar. 21, 1871
848,323	Ridd	Mar. 26, 1907
1,804,024	Nicolas et al.	May 5, 1931
1,911,254	Wolfsohn	May 30, 1933
1,968,370	Barns	July 31, 1934
2,105,969	Castel	Jan. 18, 1939
2,303,395	Schultz et al.	Dec. 1, 1942
2,315,903	Ormond	Apr. 6, 1943
2,319,944	Ormond	May 25, 1943
2,333,251	Huggins	Nov. 2, 1943
2,345,989	Ormond	Apr. 4, 1944
2,346,230	Ormond	Apr. 11, 1944