

UNITED STATES PATENT OFFICE.

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STENCILING.

1,238,906.

Specification of Letters Patent.

Patented Sept. 4, 1917.

No Drawing.

Application filed November 29, 1912. Serial No. 734,027.

To all whom it may concern:

Be it known that I, WILLIAM G. FUERTH, a citizen of the United States, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Stenciling, of which the following is a specification.

This invention relates to typewriter and other stencil sheets.

may have been hardened previous to writing thereon, as for instance in treating a gummy sheet with formaldehyde.

One of the advantages of my invention is that a stencil made in accordance therewith is not liable to become punctured in running through the stenciling machine; and in fact by actual test more than one thousand stencil copies of the best character have been made from a single stencil without apparently wearing it out, the last copy appearing as good as the first, even though the stencil sheet had been taken out of the stenciling machine and washed several times.

Although the hard film or membrane is rendered soft for operating upon the same with the typewriter, still the re-agent which does the softening contains a hardener to replace or restore the hard face or finish to the sheet, and render the stencil harder than it was before being softened.

I employ a stencil sheet consisting of Yoshino paper preferably coated with fish-isinglass; the latter being prepared from fish bladder. The fish-isinglass is soaked in a little water, which is absorbed by the substance, and has the effect of making the substance easily soluble. Then the mixture thus partly prepared is placed in water and boiled until a thorough solution is made; the entire quantity of water used being about 40 parts by weight to one part of the fish isinglass. (See my pending application No. 728,411). Preferably I use Russian fish-isinglass because of its superiority for this purpose to the domestic isinglass, the latter being made partly from fish bladders and partly from other parts of fish. The coating so prepared is preferably applied to the Yoshino sheet over a water bath.

This coating meets the peculiar requirements of filling up the pores of the Yoshino sheet for the purpose of making a stencil sheet. The sheet so prepared is thin and extremely flexible, and not liable to crack, practically impermeable, and has great strength.

The durability of such stencil sheet may be increased by subjecting it during the process of manufacture to a hardening bath, which may be formaldehyde. Either two per cent. by weight of formaldehyde may be added to the aforesaid coating solution, or (preferably) the formaldehyde may be added to the sheet after passing through

- One of the principal objects of the present invention is to provide for the softening or mollifying of a stencil sheet which is coated with a hardened gummy substance and which, in its original condition, is not suitable for being acted upon by a stylus or by the types of the writing machine, without decreasing the fitness of the sheet for subsequent use in a stenciling machine or a duplicator.
- Certain softening materials, such as glycerin for instance, if used upon a hardened gum-coated sheet (gelatin or other gum) will render the coat permanently soft, whereas, according to one feature of the present improvements, the coating is softened only temporarily and will harden again, so that its usefulness as a stencil sheet is not impaired by softening it preparatory to writing a stencil thereon.
- Another feature of the invention is the use of an emollient for temporarily softening a stencil, which will have the effect of making the sheet even harder, tougher and more impermeable than before.
- It has been proposed to use glycerin to soften the hardened coating of a Yoshino sheet, for the purpose of making a stencil (see U. S. patent to Zuccato, 548,116, British patent to Zuccato, 12,136 of 1894, and other patents cited in my application hereinafter mentioned). But where any gelatinous hardened coating is softened by such means, the coating is rendered permanently soft and objectionable. One of the features of my invention is a softener or emollient, which will not only render the gelatinous coating soft for typewriting purposes, but will permit the coating to re-harden; and in fact the mollifying agent may have such characteristics that it will make the stencil sheet harder, tougher, more durable and more impermeable than before. Furthermore, the new mixture may be used to harden a sheet upon which the stencil has already been written, even though the sheet

said solution. Other hardening materials well-known in the stenciling and photographic art are usable in the place of formaldehyde, as for instance hyposulfate of soda, chrome-alum, bichromate of potassium, etc.; reference being hereby made to said application for full particulars as to the process, construction, use, etc.

I employ an improved softener or emollient for this membranous stencil sheet, which enables the types to perforate the same, one of the results of the use of this softener being that when the sheet dries, it becomes harder and tougher than before it was softened, so that it becomes very durable and capable of stenciling an enormous number of copies and will withstand repeated washing, and rough handling, and is otherwise substantially improved.

The emollient for use with the previously hardened stencil sheets, to soften them for use on the typewriter preferably comprises sulfonated castor oil (Turkey red oil) one part; chemically pure glycerin two parts; distilled water four parts; and formaldehyde (5% solution) one part; the liquid being flavored with essential oils, *q. s.*

This mixture will temporarily soften the hardened coatings of paper or printing plates, so that they may be written upon by the typewriter or other means for making the stencils.

The foregoing mixture is extremely hygroscopic, which condition may be modified as desired, by reducing the proportion of glycerin, or varying the proportion of sulfonated oil. If a softening mixture is to be used for softening hardened sheets coated with ordinary animal gelatin, there should be an increase in the proportion of the sulfonated oil.

It will be understood that the fish-isinglass coatings require smaller proportions than animal gelatin coatings of both sulfonated oil and glycerin in the emollient, because such sheets are relatively slow to dry or set.

The foregoing emollient is especially useful in softening coatings of paper which have been hardened or rendered insoluble, among which coatings may be enumerated those having various essential bases such as gelatins composed of farinaceous or vegetable or animal substances, and including soluble and insoluble albumen. The emollient is valuable when the coating consists of isinglass made from fish (acepinas) and hardened; and is especially valuable where the sheet is coated with fish-isinglass made of the swimming bladder of the sturgeon.

The aforesaid emollient contains a hardening agent whose proportions may be varied according to the character of the coating of the stencil sheet which it is desired to soften. It will be understood that other hardening agents than formaldehyde may

be used, as for instance any of the re-agents well-known in the arts, such as bichromate of soda or of potash, hyposulfates, carbonates of ammonia, etc.; different substances being best adapted to accord with the different bases of the stencil coating, to re-act for the purpose of again hardening, or increasing the hardness and toughness of the stencil coat or film or membrane which has been mollified by a mixture in accordance with my invention. It will be found that the stencils will be rendered hard and impermeable, and in most instances more concrete than they were prior to the mollification process.

The invention is not limited to the exact substances of the foregoing formula, nor do I desire it to be understood that the proportions must be strictly adhered to, as there may be variations adopted in applying the mollification process to various components of coatings of sheets, or to produce any specially desired hygroscopic condition of the sheet. In some cases it may be desired to use a coating which will keep the sheets moist and ready for use for a long period; while in other cases it may be only desired to keep the sheet moist for the very short time needed while the stencil is being written on the typewriter or by other means.

The invention is not limited to the exact conditions above set forth, nor is it restricted in all cases to its use or application for mollification purposes alone.

If desired, the emollient liquid or mixture herein described may be applied by a brush or sponge to both sides or surfaces of a stencil sheet, either preparatory to writing a stencil thereon, or for eventually hardening the same after the stencil has been written.

Another way to use the emollient is to moisten a bibulous or absorbent sheet of paper with the liquid preparation and employ the moistened sheet as an interleaving sheet or insert between the stencil sheet and the backing using for this purpose such paper as is commonly used for making letter-press copies, preferably of the grade designated as Soudanese, West India or India copying paper. The interleaving sheet is Arabian tissue, such as is commonly used for a base in making wax or paraffin stencil sheets for use in making hand-written stencils. This interleaving sheet absorbs the moisture of the emulsion or mixture, but does not freely exude the same, so that it does not get smeared over the typewriting machine on which the stencils are written. This paper is moistened with this oily, sapaceous or glycerinated mollifying hygroscopic liquid, and remains moist for a long time. This sheet so moistened may be inserted between the stencil sheet and a backing, for introduction into the typewriting

machine. The intermediate sheets may, before using, be pressed between blotters to take up the excess moisture. These intermediate sheets may be kept in piles or packs in a moist condition ready for use. The backing may have a waterproof or insoluble face, and may consist of a sheet of Manila paper or wood-fiber paper coated with varnish or other waterproof sizing, which may be of a dark color, so that the typewritten stencil will be legible to the operator; the intermediate moistened sheet being rendered transpicuous by the liquid.

In order, however, to avoid the trouble of using a third sheet, I have devised a method whereby the stencil sheet may be placed in the typewriter accompanied only by a hard backing sheet, and without the necessity of painting the stencil sheet on both sides.

I employ a backing of hard-faced paper such as Fourdrinier or rope manila, or wood paper, and such paper I coat on one side with a coating which may be composed of linseed oil varnish or the like; the oil being heated to the burning point, and allowed to burn until it becomes ropy and tacky to such a degree as will permit grinding it in with any of the well-known unctuous earthy substances, such as kaolin, pumice, magnesium, umber, barium sulfate, or the like.

After the earthy substance is incorporated with the oil, the same is applied to said backing sheet, to make it hard, stiff and practically impervious, so that the emollient or softening liquid may not be soaked up by the paper, thereby weakening the same, and so that the liquid may not be smeared over the typewriting machine. This coating is itself absorbent. If desired, the backing sheet may be tinted or colored for convenience in reading the type written stencil; and any of the well-known colors or pigments, as well as carbon or lamp black, may be ground in with the mixture.

After the backing sheet is coated and properly dried, it is rolled, calendered or smoothed, so as to present a dead face. The emollient is applied thereto with a brush. The coating on the backing sheet will be found to be readily absorbent, and will retain for a long time upon its surface sufficient moisture or emollient to soften the stencil sheet. The latter is laid upon the moistened backing, and becomes itself softened throughout. The liquid will be retained by the coating on the backing sheet for many hours, so that there is ample time in which to write a stencil on the typewriter. The stencil sheet may be laid smoothly down on the moist backing sheet, and any wrinkles may be brushed out with the aid of the edge of a blotter or other means; and then the two sheets may be introduced into the type writing machine for writing the stencil.

The moistened coating on the backing in-

sure a proper state of softness of the coating on the stencil sheet, so that the typewriting operation may proceed leisurely. One of the advantages of this method is that the stencil sheet, when removed from the backing, does not retain an excess of the emollient or moistening fluid, and may in fact without waiting to become dried, be placed directly upon the stenciling machine, so that the operation of stenciling may begin without loss of time. Said backing is of value in producing a perfect stencil upon the typewriter; and it is found that even a worn typewriter will produce acceptable results.

The herein described stencil sheet, when used in connection with the described backing and moistened as aforesaid, will be found useful not only for making typewriter stencils, but also for making long-hand stencils by means of a stylus. The stencil sheet may be very freely written upon, and of course will have the advantage that the writing will be perfectly legible as it proceeds, as the dye coating hereinafter referred to will be scored or pressed aside by the stylus, so that the light-colored backing can be seen where the stylus has written or marked. The earthy or powdery substance in the coating which is on the backing tends to make the same a little rough, and to that extent coöperates with the stylus in displacing the coating on the stencil sheet. Not only may writing be done, but lines can be easily ruled upon the stencil by means of the stylus. Forms may be ruled, and blanks therein filled up with writing by means of the stylus, or a form may be ruled by the stylus and the sheets may be inserted in the typewriter to fill up the blanks by use of the writing machine. The file plate or the like, which has heretofore been found necessary in preparing wax stencils by means of a stylus, may be dispensed with. A letter may be typewritten on the stencil, and the sheets removed from the typewriter, and the signature may be written at once upon the stencil by means of a stylus. The fibers of the sheet remain strengthened by the process of making it into a stencil sheet, so that it is practical to make a stencil without tearing the paper, even though the coating is temporarily softened as aforesaid.

It will be seen that an open porous sheet such as Yoshino, (or bolting cloth in some cases) is filled or coated with a solution of a concrete substance of fish ichthyocolis or animal matter, or both, such coating being incorporated with an astringent to render it hard and impermeable, producing (in the case of fish substance) a flexible parchment or membraniform stencil sheet or printing plate; the coating being of such consistency when oiled or moistened or softened with an emollient as to permit its being pressed aside

to expose the pores of the sheet by means of a stylus or typewriting machine, for stenciling purposes, without cutting, lacerating or abrading the fibral construction of the sheet or removing or extracting any of the coating; said coating being capable of being re-hardened after the making of the stencil, by means of an astringent incorporated with the emollient, so as to reinforce and replace the hard face of the stencil sheet and correct any impairment of the same during the operation of preparing the stencil.

The emulsion may be termed a saponaceous emollient with an astringent, and it works upon a membrane, consisting preferably of Yoshino coated with fish-isinglass and hardened at the time of manufacture in the manner set forth in my said application. The emollient as a result of having both oily and saponaceous qualities, appears to have a decided lubricating effect on the sheet. The coating on the Yoshino sheet is a membranous coating, which is softened by the emollient, and the astringent in the emollient emulsion finally closes up the fine pores, to make the same impervious to the stenciling ink, or substantially so.

Although the emollient contains glycerin and oil, nevertheless, owing to the use of the formaldehyde therewith, the stencil sheet becomes stronger and better than before using the emollient. The formaldehyde solution or other astringent or hardening agent may be applied if desired without the castor oil or the glycerin, merely for hardening and toughening the sheet after the stencil is written.

This emollient can be applied to either of the before-described sheets, one of which consists of a Yoshino sheet coated with fish-isinglass, while the other is of harder and tougher texture, owing to the original hardening treatment thereof by formaldehyde or other substances. My emollient is not limited in all cases to the use of the exact stencil sheets described in said specification.

It will be apparent that stencil sheets which may or may not have been originally treated with a hardening agent, may be typewritten or otherwise formed into stencils, and then the complete stencils may be moistened with a liquid according to my invention for the purpose of rendering them hard, insoluble, tough, durable, etc.

It will also be perceived that where the stencil was originally prepared with or without a hardening agent, it may be softened by water or other means preparatory to writing a stencil thereon, and that after the stencil is written, and either while the stencil remains soft or after it has dried and set, it may be subjected to the action of a liquid or mixture prepared according to my invention, and thereby eventually rendered harder and more durable, etc. The invention is ca-

pable of hardening and toughening a stencil sheet, but may be employed for the purpose of temporarily softening a stencil sheet preparatory to writing a stencil thereon.

Stencils are apt to be ruined by the action thereon of the grit and hard foreign matter in the work sheets, which it will be understood are pressed forcibly against the stencil. Where extraordinary long runs are wanted, I coat the top margin of the stencil, where it is attached to the cylinder of the duplicator, with a solution of alcoholic shellac; and preferably this protection is extended around the side and bottom margins. Incidentally this will close up any small accidental punctures or openings due to improper manufacture of the paper or other causes. One of the advantages of the fish-isinglass coated stencils set forth herein and also in my said application, is that shellac will stick to the said coating, whereas it is not adapted for use with a gelatin stencil. In making a correction in a gelatin stencil, it would be necessary to cut out that part of the stencil which contains the mistake, and then to stick on a new piece of paper, upon which the word or letters may be newly written. When the stencil has a fish-isinglass coating, however, the shellac or the like may be readily applied to paint out the wrong word or words, which may then be at once correctly re-written, thus saving much labor and conducing to long life of the stencil and good appearance of the stenciled work-sheets. The use of glycerin or a glycerinated emollient with a gelatin coated sheet makes it difficult to paint the same with shellac, because the moisture is more or less incompatible with the use of shellac. The shellac will not adhere satisfactorily to the glycerin-softened gelatin-coated sheet. But upon the new membranous hardened coating, shellac has a different effect; and not only can the margins be coated with the shellac, but whole words and lines may be painted out.

A sheet of Yoshino paper may be treated with any mucilaginous or gelatinous material, which may or may not contain a hardener, and which may or may not be subsequently hardened by formaldehyde or the like, and the sheet may then be coated with a paraffin or wax compound, to make a stencil sheet, which would be stronger than waxed sheets heretofore used.

The coating may be applied in various degrees, from a simple saturated fiber up to a fully coated impervious sheet.

The sheet may be originally treated with a saturated solution of either isinglass or gelatin or any mucilaginous substance susceptible of responding to hardening processes well known in the photographic and stenciling arts.

In another way of carrying out the pres-

ent improvements as to certain features thereof, a sheet of ordinary carbon paper (such as used for typewriting or other purposes) is placed in the typewriter, together
 5 with the fish isinglass-coated and hardened stencil sheet; the carbon sheet being preferably attached to an ordinary backing sheet of hard paper, and the stencil sheet being preferably attached at one end to the back-
 10 ing sheet. Then the stencil sheet is moistened with the emollient emulsion herein described, the same being applied only to the top surface of the stencil sheet. Then the same is introduced into the typewriter and
 15 written upon; and the carbon or other pigment on the carbon or backing-sheet will adhere to the stencil sheet where the same is struck by the types, thus rendering the written matter on the stencil legible to the
 20 operator. The carbon sheet may be much narrower and shorter than the stencil or the backing sheet; and it may be of a size to agree closely with the body of the written matter on the stencil; and in such a case it
 25 will serve, when fixed upon the backing sheet, as a gage or guide for aiding the operator in locating his sheets in the typewriting machine, showing where the margins should be.

30 There exists a demand for a class of work in which printed forms are to be used, containing numerous blanks, which are to be filled in by stenciling. It has been the practice to print such a form upon a closely-
 35 woven tissue sheet, then to coat the printed sheet with wax or paraffin to transform it into a stencil sheet, and then to use a stylus to write upon the wax, thereby changing the sheet into a stencil; the waxed form being
 40 laid upon a file plate while the stylus is being used for writing thereon.

In carrying out certain features of my present improvements in one way, a great advantage is gained in the matter of form
 45 stenciling. In the first place, the form is printed by means of an ordinary printing-press directly upon the stencil sheet, which as aforesaid, is fully coated with fish-isinglass, which is preferably hardened.

50 It will be understood that a Yoshino sheet is so toughened and hardened by formaldehyde or other agent, that it will successfully withstand the operation of being printed upon in a printing press, this, of
 55 course, being done when the sheet is dry. This feature of the invention is not limited to the use of a fish-isinglass sheet having a form printed thereon by a printing-press. The form having thus been printed, the sheet
 60 is softened by means of the emollient, and is introduced into a typewriting machine, and the blanks are all filled in by means of the typewriter. It will be understood that the type impressions do not need to cross the
 65 previously printed lines. Then the stencil,

thus completed, is placed in the stenciling machine, and stencil copies made in the usual way; the work sheets in such a case being of course originally printed with forms to correspond with that one which was originally
 70 printed upon the stencil sheet. It will be understood that the printed form on the stencil sheet is to guide the operator in writing the various entries thereon, so that they will appear at appropriate points on the
 75 finally stenciled form sheets. Thus the very best class of stencil copying can be cheaply and readily performed by means of a stencil which will last through thousands of im-
 80 pressions; whereas according to prior practice for form stencil work, the best that could be done was to make a rough, hand-written stencil on a perishable wax sheet.

Yoshino paper has never been deemed suitable for autographic stencil work, because
 85 of the liability of the sharp-pointed writing instrument catching in the fibers and tearing the same; so that it has been the practice to employ a closely-woven tissue sheet as a
 90 base for a wax or paraffin stencil sheet for autographic purposes. But a Yoshino sheet may be coated with fish-isinglass (or in some cases with other gummy substance) and subsequently coated on one side with wax, and
 95 then the gum-coating can be softened, and the whole will be found suitable for autographic purposes. The stylus does not tear this sheet. The fiber is so strengthened by
 100 fish-isinglass, (especially if a hardening agent is originally used) that there is no liability of the point of the stylus tearing the same. The wax used for this purpose should be of a very hard variety.

In using a gummy substance merely to strengthen a wax or paraffin stencil sheet,
 105 first dip an unsized Yoshino sheet into a solution comprising 75% of water and 25% of fish-isinglass, to which is added a 2% solution of formaldehyde. The fibers are impregnated by this solution, which greatly
 110 strengthens them; but the pores of the sheet are not filled up. Then the sheet, after drying, receives a wax or paraffin coating, and is then ready for use on the typewriter to make a stencil; and it will be found that the
 115 life of the sheet in running through the stenciling machine is prolonged far beyond that of an ordinary wax or paraffin stencil.

Preferably for ordinary work the coating composition comprising fish-isinglass, glycerin and water, is colored by means of a dye,
 120 as for instance, nigrosin, which makes the stencil sheet itself black or of a dark hue. A stencil may be laid upon the herein described backing containing the unctuous
 125 earthy substance, and dampened by the emollient, the backing sheet with its coating of earthy substance being light colored, and when the stencil is written in a typewriter, the types in pressing aside the coating, will
 130

make the sheet transpicious, and the light colored backing will make the typewriting appear in light letters on the dark stencil sheet. Moreover, when the stencil is removed from the backing, it can be also easily read.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with fish-isinglass, to fill the pores thereof; and thereafter treating the coated sheet with an emollient containing a hardening agent, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing.
2. The herein-described process of forming and preparing stencils, which consists in subjecting a sheet of loose texture, previously coated with fish-isinglass and hardened, to the action of a solution containing an emollient to temporarily soften the coating preparatory to writing the stencil thereon, and also containing a hardening agent to re-harden it after writing to a greater degree than when first hardened.
3. The herein-described process of forming and preparing stencils, which consists in successively coating a sheet of loose texture with fish-isinglass, to fill the pores thereof; treating the coated sheet with a hardening agent; and subjecting the sheet so treated to the action of a solution containing an emollient to temporarily soften the coating preparatory to writing the stencil thereon, and also containing an agent to re-harden it after writing to a greater degree than when first hardened.
4. The herein-described process of forming and preparing stencils, which consists in subjecting a sheet of loose texture, previously coated with fish-isinglass and hardened, to the action of a solution containing sulfonated castor oil, glycerin, water, and a hardening agent, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing to a greater degree than when first hardened.
5. The herein-described process of forming and preparing stencils, which consists in subjecting a sheet of loose texture, previously coated with fish-isinglass and hardened, to the action of a solution containing sulfonated castor oil, glycerin, water and formaldehyde, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing to a greater degree than when first hardened.
6. The herein-described process of forming and preparing stencils, which consists in successively treating a sheet of loose texture

with fish-isinglass, to fill the pores thereof; treating the coated sheet with formaldehyde to harden and toughen it; and subjecting the sheet so treated to the action of a solution containing an emollient to temporarily soften the coating preparatory to writing the stencil thereon, and also containing an agent to re-harden and toughen it after writing to a greater degree than when first hardened and toughened.

7. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with fish-isinglass combined with coloring matter; and thereafter treating the coated sheet with a saponaceous emollient containing a hardening agent, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing.

8. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with fish-isinglass combined with coloring matter; and thereafter treating the coated sheet with a saponaceous emollient containing formaldehyde, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing.

9. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with a gelatinous substance; and thereafter treating the coated sheet with a solution containing sulfonated castor oil, glycerin, water and a hardening agent, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing.

10. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with fish-isinglass; subjecting the coated sheet to the action of an emollient containing a hardening agent, to temporarily soften the coating preparatory to writing the stencil thereon, and re-harden it after writing; and applying to said coating a coating of alcoholic shellac.

11. The herein-described process of forming and preparing stencils, which consists in coating a sheet of loose texture with a gelatinous substance; and thereafter treating the coated sheet with a solution containing a saponaceous, mollifying agent to temporarily soften the coating preparatory to writing the stencil thereon, and also containing an agent to re-harden it after writing.

12. The herein-described process of forming and preparing stencils, which consists in successively coating a sheet of loose texture with a gelatinous substance; treating the coated sheet with a hardening agent; and subjecting the sheet so treated to the action of a solution containing an agent to temporarily soften the coating preparatory to writing the stencil thereon, and also con-

aining an agent to re-harden it after writing to a greater degree than when first hardened.

13. The herein-described process of forming and preparing stencils, which consists in successively coating a sheet of loose texture with a gelatinous substance; treating the coated sheet with a hardening agent; and subjecting the sheet so treated to the action of a solution containing a saponaceous, mol-

lifying agent to temporarily soften the coating preparatory to writing the stencil thereon, and also containing an agent to re-harden it after writing to a greater degree than when first hardened.

WILLIAM G. FUERTH.

Witnesses:

F. E. ALEXANDER,
TITUS H. IRONS.