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 PAPER STENCIL AND PROCESS OF PRODUCING SAME.
 APPLICATION FILED MAY 12, 1911.

1,045,934.

Patented Dec. 3, 1912.

Fig. 1.

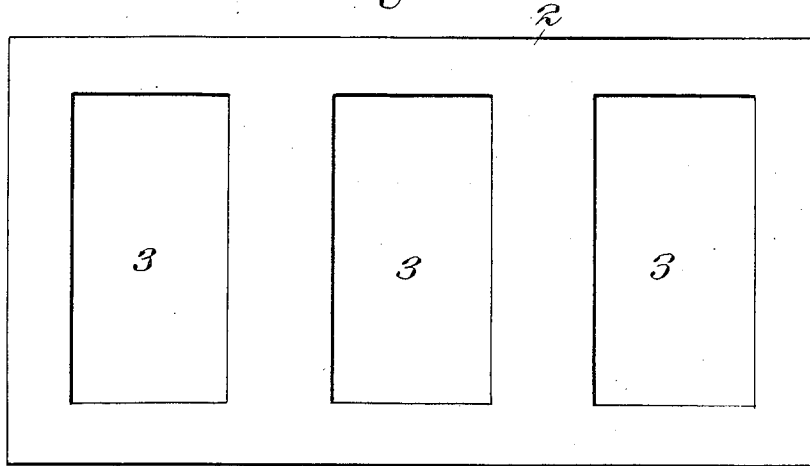


Fig. 2.

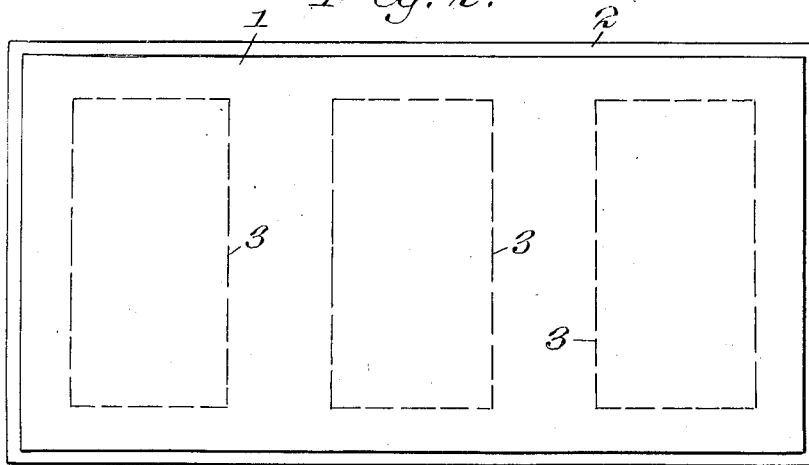
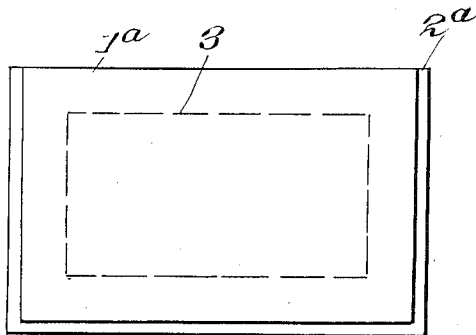


Fig. 3.



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UNITED STATES PATENT OFFICE.

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PAPER-STENCIL AND PROCESS OF PRODUCING SAME.

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To all whom it may concern:

Be it known that we, FRANK D. BELKNAP and EDWIN D. BELKNAP, citizens of the United States of America, residing at New York city, county and State of New York, and East Orange, county of Essex, State of New Jersey, respectively, have invented certain new and useful Improvements in Paper-Stencils and Processes of Producing Same, of which the following is a specification.

Our invention comprises an improved process for treating paper to form a stencil sheet or card and the resulting product of such treatment. When struck or stamped with a type or other block having a character or design formed upon it in raised portions the treated paper becomes a perfect stencil through which printing ink may be forced upon an underlying sheet of paper and produce a perfect facsimile of the original character or design appearing on the type, exactly as though the type or engraved block had been inked in the usual way and pressed upon the paper in an ordinary printing operation, or any ink ribbon used.

According to one example of our process we first dissolve $1\frac{1}{2}$ pounds of gelatin (preferably of the kind called Gold Label) in about 4 quarts of water. To this may be added a tablespoonful each of borax and ammonia for a purpose to be hereinafter explained, though these ingredients may be omitted. After a complete solution of the gelatin has been secured as can be obtained cold, it is heated to the boiling point and preferably we add a quart more of water which may also be heated. After the gelatin solution thus prepared has been boiled for about fifteen minutes 10 ounces of glycerin may be added. This solution is now ready for use in the first dipping of the paper, the solution being preferably maintained at a temperature of from 125 degrees to 130 degrees Fahrenheit during dipping to insure the requisite thinness and evenness of deposit on said paper. For this purpose we prefer to use Japanese dental paper, known as Yoshimo paper. The paper so dipped is preferably dried and afterward subjected to a second dipping as follows: A cold solution of $2\frac{1}{2}$ pints of glycerin and $\frac{1}{2}$ pint of formaldehyde is made in about 7 pints of water. To this solution may be

added an ounce of bichromate of soda, or other alkali or alkaline bichromate, but these minor ingredients may be dispensed with. The paper already treated in the first or warm solution is now dipped in this second or cold solution, and the surplus material removed. This removal of the surplus may be conveniently effected by first drawing the treated sheets across a knife edge or scraper, and then laying them on a glass plate and running a rubber roller over them. The treated paper is then dried and, if stencil cards are to be made of it, the paper is laid over suitable cardboard frames and cemented or otherwise fastened thereto. Before forming the stencil in the sheet or card by running the same through an ordinary typewriting machine it is necessary that the coating on the paper be softened by moistening the same if it has previously been allowed to dry. This can conveniently be done by running over the paper a wet brush or other instrument capable of delivering regulated quantities of water to the surface of the paper. This softens the coating of the paper so that if run through a typewriting machine before drying the type can easily push the coating to either side without cutting the fibers of the paper and so form a perfect stencil in said coating, the ink passing easily through the bared portions of the paper, but being stopped by the coated portions of the paper. If the paper is operated on by the typewriting machine when it is dry, the type cut or tear the fiber of the paper and produce a ragged stencil, or entirely remove the central portion of such letters as B, D, O, etc. We find that the small quantity of borax and ammonia added to the first solution tends to make the coating more ready to absorb water in this moistening process and therefore is advantageous to that extent. These substances may, however, be dispensed with if added care be used in the moistening operation. When it is commercially convenient to print the paper immediately after the dipping in the treating solution, and while it is still damp, this rewetting may be omitted and consequently the borax and ammonia also, but the intervening operations of forming the paper into cards usually prevent this. The point is that the film of material on the

paper must be moist enough to be soft when operated on by the type and hard enough when dry to withstand the stenciling operation, and impervious to oil and ink.

In the accompanying drawing, Figure 1 represents a piece of card board cut out to form a series of frames for a series of cards. Fig. 2 shows a sheet of treated paper fastened thereto, and Fig. 3 shows a detached card.

Throughout the drawings like reference numerals indicate like parts.

1 is the treated sheet of paper, 2 is the strip of cardboard cut out at 3, 3, to form the frames, and 1^a is the portion of paper and 2^a the portion of cardboard forming a single card.

The paper part 1^a of the card so formed is moistened before use, as above described, and in order to prevent the frame 2^a from warping by reason of absorbing a portion of the water it is necessary to make frame 2^a practically waterproof. To this end we employ the densest and most waterproof cardboard we can obtain and further protect the same with a coating of shellac. The shellac also serves as a cement for causing the paper and frame to adhere one to the other. The cards or sheets so formed may have the stencil characters formed in them by any suitable typewriting machine and are then run through any suitable stencil printing machine.

While the best results are obtained by use of all the materials and steps in the process above described, working results may be obtained by omitting some of them, though less satisfactory stenciling will be produced by any substantial departure from the formula above given.

As the solutions above described are not applied to the paper all in one bath, but by dipping the paper in separate baths, the relative proportions of the respective materials actually existing in the films formed on the paper cannot be determined from the proportions of the materials going into the different baths. By noting the amount of each bath consumed in treating 500 sheets of paper, however, we have been able to determine the proportions of the various materials present in the treated sheet. According to this determination the average proportions by weight of the various solid ingredients in the films on the treated paper are as follows: glycerin, 85 parts; gelatin, 70 parts; formaldehyde, 10 parts; bichromate, 1 part. It is also evident that, while our preferred procedure as above set out is to apply the various materials in two baths, dipping the sheets in these successively, this procedure might be varied.

The main advantage of our invention resides in the fact that we produce a sheet coated or saturated with a solution which,

when dry, is impervious to the action of the oils which constitute a large part of ordinary printing inks, but which is absorbent of water to an extent which softens and renders it displaceable by the pressure produced by an ordinary type when operated in a typewriting machine in the usual way. This displacement of the saturating or coating material leaves exposed the loosely felted fiber of the paper which is easily penetrated by the ink, but does not cut or tear said fiber. The films of material left on other portions of the sheet are also capable of being quickly dried by ordinary exposure to the air and then become not only impervious to printing ink, but sufficiently hard and tough to withstand many operations in a stencil printing machine, and without cracking or disintegrating. When this sheet is fastened to a frame of stiff, waterproof construction to form a stiff card, the most useful form of our invention is produced.

One of the important functions of the formaldehyde embodied in our composition is its action as a preservative on the glycerin and gelatin. The latter materials being of animal origin are of course subject to decay and disintegration with age, especially when subjected to frequent applications of printing ink. The stencil cards produced according to our invention are often kept in sets forming mailing lists which are used once a week or once a month and must remain in usable condition for months and years. The formaldehyde preserves the cards in their original condition without in any way interfering with the formation of the stencil therein. It also acts on the gelatin of the composition as a coagulating agent thus performing the dual important function of fixing the oil proof coating on the paper as well as preserving it against decay. The result of the process is the production of a dry but hygroscopic sheet adapted to be stenciled by ordinary pressure of the type of any standard typewriting machine when said sheet is first temporarily moistened by water for the purpose of rendering the incising films displaceable by the type blow without breaking or cutting the fine fibers of the paper base.

Having, therefore, described our invention, we claim:

1. As an article of manufacture, a dry but hygroscopic stencil sheet for use in producing duplicate copies of typewritten matter which consists of a thin sheet of paper of loose texture treated with solutions of gelatin, glycerin and formaldehyde and having the characters to be reproduced indented in the film of treating solution carried by said paper, but the paper being left intact.

2. As a new article of manufacture, a sheet for use in making typewritten sten-

cils which comprises a thin sheet of paper of loose texture treated with solutions of gelatin, glycerin, borax and ammonia.

5 3. The process of forming a stencil out of a thin sheet of paper of loose texture which comprises the following steps: first, treating the sheet with solutions of gelatin, glycerin and formaldehyde, and second, stamping the same with raised type while
10 moist.

4. The process of forming a stencil out of a thin sheet of loose texture which comprises the following steps: first, treating the sheet with solutions of gelatin, glycerin and formaldehyde; second, drying the treated sheet
15 to form hygroscopic films incasing the paper; third, moistening the sheet with water; and fourth, stamping it with raised type while moist.

20 5. The process of forming a stencil out of a thin sheet of paper of loose texture which comprises the following steps: first, treating the sheet with solutions of gelatin, glyc-

erin, an alkaline bichromate and formaldehyde, and second, stamping the same with
25 raised type while moist.

6. The process of forming a stencil out of a thin sheet of paper of loose texture which comprises the following steps: first, treating the sheet with solutions of gelatin, glycerin, borax and ammonia, and second, stamping
30 the same with raised type while moist.

7. The process of forming a stencil sheet which consists in treating a sheet of paper of loose texture with solutions of gelatin, glycerin, borax and ammonia.
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8. A dry but hygroscopic stencil blank formed of a thin sheet of loose texture saturated with solutions of gelatin, glycerin, formaldehyde and an alkaline bichromate.

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