UNITED STATES PATENT OFFICE.

LOUIS E. FULLER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO A. B. DICK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

STENCIL-SHEET.

1,101,268. Specification of Letters Patent. Patented June 23, 1914.

No Drawing. Application filed January 25, 1910. Serial No. 540,078.

To all whom it may concern:

Be it known that I, LOUIS E. FULLER, a citizen of the United States, and a resident of the city of New York, county and State of New York, have invented certain new and useful Improvements in Stencil-Sheets.

My invention relates to stencil sheets so treated and prepared as to be impervious to ink until pressure has been applied thereto by means of type or raised figures, after which the portions of the sheets which have been pressed are pervious and the sheets are adapted to be used as stencils and to reproduce the type or characters impressed thereon.

My invention is an improvement on the stencil sheets now in general use, made of paper coated with wax or paraffin and used in connection with ordinary typewriting machines. These wax and paraffin sheets are objectionable among other reasons because the type must strike the wax or paraffin with sufficient force to entirely cut out or remove the same, and it is difficult with such sheets to obtain a clear and exact reproduction. Moreover, they are not durable and can not be used to reproduce a large number of copies, and are subject to changes in temperature.

The objects of my invention are to produce a stencil sheet which, when impressed by an ordinary typewriter or printing device, will give clear reproductions and will be durable, and which will not deteriorate from long usage or atmospheric and temperature changes. I accomplish these objects by means of the improved article hereinafter described.

In carrying out my invention, I first prepare a concentrated solution of gelatin, white sugar, glycerin, acetic acid, and water. The proportions of these ingredients may be reasonably varied, with the result that the compound will be thicker or thinner, and will possess certain characteristics more or less favorable for the practical and useful results, as will be herein described.

The solution which I have found to be the best and most useful is as follows: A colloidal substance, such as gelatin, one part, white sugar one part, glacial acetic acid pure one part, glycerin two parts, water two parts, all by weight; potassium dichromate in crystals enough to color the compound a deep yellow. The gelatin should first be broken into pieces of a convenient size and dissolved in the acetic acid and water, a gentle heat, such as a water bath, being applied, if it is desirable to effect solution in a shorter period of time. The sugar and glycerin are then added and the whole thoroughly mixed so that the ingredients are completely blended and dissolved. The potassium dichromate, preferably powdered crystals, is then added to the extent of as much as the solution will dissolve, or at least enough to color the compound a deep yellow. The whole is then filtered by suitable means. I then take sheets of an open lace-like material, such as Japanese Yoshino paper, for example, lay them on a smooth non-absorptive surface, as a plate of glass, and with a brush flow thereover the said material with the said solution, a dim light being desirable in this coating operation as in the operation of preparing the coating compound. The sheet is then suspended to dry, and when dry, is exposed to daylight or other suitable light. Within a shorter or longer time, dependent upon the intensity of the light, the sheet will change in color to a grayish green or lavender, such change being due to the reduction of potassium dichromate to chrome alum and coagulation of the gelatin. By such exposure and reduction, the compound is rendered non-plastic and made insoluble in water, hot or cold, except that it will soften slightly under the influence of moisture and is hygroscopic. It is also rendered proof against all neutral solvents and against concentrated alkaline and dilute acid solutions. It is also proof against oils and greases and all solvents of the same, this latter property being one, however, possessed by a simple compound of glycerin and gelatin alone upon gelatinization.

Should the glycerin and sugar be omitted from the solution herein described, the sheet of stencil material would be completely waterproof, and it would be impossible to render the sheet soft enough by application of moisture to afford proper stencilization by means of pressure applied. In any case, by such omission of glycerin and sugar, the sheet would be too hard and brittle to afford good results. The sugar and glycerin, or one of them, are therefore necessary to prop-

erly temper the composition. I have found that by adding the glycerin and sugar in greater or less quantities, the degree to which the stencil sheet will soften under the influence of moisture may be largely varied, so that I use a certain proportion of glycerin as hereinbefore set forth for producing a stencil sheet of desirable properties for the purposes described. Were the sugar omitted from my compound, it would be necessary to use a greater proportion of glycerin, with the result that the stencil sheet would be hygroscopic for most climates; still, the sheet thus made would be useful and durable, and would possess approximately the same properties and characteristics as when the sugar is used. I have found that if insufficient potassium dichromate is used, the stencil sheet will not be workable to a practical degree, on account of insufficient coagulation of the gelatin, so that it is desirable to dissolve in the compound all of the potassium dichromate that the solution will take up.

My sheet of stencil material is used by striking with a type or other character, such as a character in a typewriting machine, for example. According to the pressure applied, it is preferable in some instances to moisten the material with water, which softens it without perceptibly shrinking or swelling it. Such moistening is useful in the event of the said pressure not being relatively as great, and can be conveniently applied by storing the sheets in humidors.

As a result of the blow of the type, an opening is formed in the sheet corresponding to the lines of type impact, and through such opening ink may readily be passed in manner well understood in connection with the use of stencils as heretofore operated. For illustration, a roller charged with ink of suitable consistency being passed over the portion where the pressure has been applied, readily produces an imprint of the conformation of the type or other character. When operating my stencil sheet, it is not necessary that the pressure of the type or character actually produce what would be termed a true stencil opening, although such is desirable. It would be sufficient in many cases if the stencil sheet were merely bruised or crushed at the place corresponding to the conformation of the type or other character, the material at such point being made porous and capable of passing ink.

My improved stencil sheets are particularly adapted to the reproduction of names and addresses, it being possible after a stencil has been written on a typewriting machine, for example, to reproduce the written matter many times, and at varying intervals, by the use of an ink roller or a properly devised printing machine.

By means of my new stencil, certain matter or business forms may be stencilized on a typewriter, and at long or short or varying intervals many copies may be made from it. The original may thus be preserved, as in the case of an electrotype, stereotype or other original printing plate or block.

Stencil sheets made in accordance with the foregoing specification are proof against temperature changes within wide limits, and do not melt at any temperature. Nor do they deteriorate under duration of time, and, moreover, are chemically inert and very cleanly.

Any suitable protein may be used for my improved stencil, and various modifications may be made in my improved process without departing from the spirit of my invention. Instead of acetic acid as a solvent in the compound described, I may use any suitable solvent, such as ethyl or methyl alcohol, chloral hydrate, acetone, or any solvent having a tendency to defer gelatinization of the compound. I could also dispense with any solvent except water, using a larger proportion of the same, with the result that the compound would have to be used warm or hot. This method, however, I have found to possess certain disadvantages which would make good results uncertain. For the Yoshino or Japanese fiber paper, any material of a similar nature, absorptive, open or lace-like and possessing necessary characteristics, may be utilized if found suitable.

In preparing the gelatin compound aforesaid, instead of potassium dichromate, any substance which has the power to coagulate or harden gelatin may be used, such as a preparation containing tannin or tannic acid. Chrome alum may also be used with good results. In some cases, as for instance with tannic acid, a subsequent exposure of the stencil material to light is unnecessary, coagulation taking place as soon as all volatile solvents are evaporated and the stencil sheet is in what would be termed a dry state. I have found, however, that the best results are obtained with the stencil sheet made of Japanese fiber paper and the coagulative compound of gelatin and glycerin, the stencil material thus made being oil and grease proof, as would be necessary when using an oily ink, and is also waterproof, although capable of being softened by water, yet not swelling or shrinking unduly, as occasion requires it to be moistened with water before applying the aforesaid pressure of the type or other character. Such moistening would be necessary or not according to the amount of pressure to be applied.

Any good glue may be used in place of gelatin, an extra amount of water being added according to whether the glue is relatively hard or soft compared with gelatin. In place of gelatin or glue, gum arabic may be used, but is not as durable. In place of

glycerin, either molasses, sugar, dextrin, glucose, syrup, or any suitable substance which will mix with gelatin, glue or gum arabic, and tend to cause the gelatin, glue or gum arabic to assume and retain a soft jelly-like condition when set, may be used. It will be understood in this connection that where the term sugar is used in the claims I intend the same to cover any or all of the equivalent substances above mentioned as substitutes for glycerin. In other words I refer to sugar as a chemical composition rather than the product usually understood by the layman.

In place of gelatin or glue, one part by weight of gum arabic and one part by weight of glue or gelatin may be used, but possesses no special advantage over glue or gelatin alone and has a tendency to increase the cost of the stencil material.

My new material is not only useful for stencil purposes, but I have found it to be very useful in many ways, especially in cases where a substance is required that must be water and oil proof and proof against all neutral solvents of oils, greases or resins, and where the flexibility must not change appreciably under extreme conditions of heat or cold, moisture or dryness, and where it must be tough and not easily injured, torn, or broken.

What I claim is:

1. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material impregnated with a coagulated colloidal substance, substantially as described.

2. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material impregnated with a coagulated colloidal substance and a tempering agent, substantially as described.

3. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material impregnated with a fully coagulated protein, substantially as described.

4. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material impregnated with a fully coagulated protein and a suitable tempering agent, substantially as described.

5. A stencil blank capable of being stencilized after moistening, consisting of a dry but hygroscopic sheet of fibrous material impregnated with a fully coagulated protein and a suitable tempering agent, substantially as described.

6. A stencil blank capable of being stencilized, consisting of a sheet of fibrous material treated with protein and a coagulating agent in chemical combination with said protein, substantially as described.

7. A stencil blank capable of being stencilized, consisting of a sheet of fibrous material treated with protein and a coagulating agent in chemical combination with said protein, and a suitable tempering agent, substantially as described.

8. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material treated with protein and a coagulating agent in chemical combination with said protein, substantially as described.

9. A stencil blank capable of being stencilized, consisting of a dry but hygroscopic sheet of fibrous material treated with protein and a coagulating agent in chemical combination with said protein and a suitable tempering agent, substantially as described.

10. A stencil blank capable of being stencilized by pressure, consisting of a sheet of fibrous material impregnated with protein coagulated by a chromic coagulating agent, substantially as described.

11. A stencil blank capable of being stencilized by pressure, consisting of a sheet of fibrous material impregnated with protein coagulated by a chromic coagulating agent and softened by a suitable tempering agent, substantially as described.

12. A stencil blank capable of being stencilized by pressure, consisting of a sheet of fibrous material impregnated with protein coagulated by a chromic coagulating agent and softened by a suitable tempering agent whereby the same is rendered hygroscopic, substantially as described.

13. A non-plastic stencil blank, capable of being stencilized, which consists of a sheet of fibrous material impregnated with coagulated protein, substantially as described.

14. A non-plastic stencil blank, capable of being stencilized, which consists of a sheet of fibrous material impregnated with coagulated protein and a tempering agent, substantially as described.

15. A non-plastic stencil blank capable of being stencilized after moistening, which consists of a sheet of fibrous material impregnated with coagulated protein, substantially as described.

16. A non-plastic stencil blank capable of being stencilized after moistening, which consists of a sheet of fibrous material impregnated with coagulated protein and a suitable tempering agent, substantially as described.

17. A dry but hygroscopic stencil blank capable of being stencilized, consisting of a fibrous sheet treated with protein insoluble in glycerin, substantially as described.

18. A dry but hygroscopic stencil blank capable of being stencilized, consisting of a fibrous sheet treated with protein insoluble in glycerin, and a suitable tempering agent, substantially as described.

19. A stencil blank consisting of a fibrous sheet treated with coagulated protein, said

blank being normally dry but hygroscopic and capable of being stencilized after moistening, substantially as described.

20. A dry, hygroscopic stencil blank, comprising a sheet of fibrous material impregnated with a coating compound including in its constituents gelatin, glycerin and potassium dichromate, substantially as described.

21. A stencil blank capable of being stencilized by pressure, comprising a sheet of fibrous material impregnated with a compound of gelatin, sugar, glycerin, glacial acetic acid, potassium di-chromate and water, substantially as described.

22. A stencil blank capable of being stencilized by pressure, comprising a sheet of fibrous material impregnated with a compound consisting of protein one part, sugar one part, glacial acetic acid one part, glycerin two parts, and potassium di-chromate sufficient to coagulate the compound when exposed to light, substantially as described.

23. A stencil blank capable of being stencilized by pressure, consisting of a fibrous sheet impregnated with protein, treated with a mineral coagulant, substantially as described.

24. A stencil blank capable of being stencilized by pressure, consisting of a fibrous sheet impregnated with protein treated with a mineral coagulant and a tempering agent, substantially as described.

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

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

27. As a new article of manufacture, a stencil sheet for use in producing duplicate copies of typewritten matter which consists of a thin sheet of paper of loose texture treated with a solution of gelatin, glycerin and bichromate of potash and cut in such form as to be adapted to be placed in a typewriter.

Signed at New York, this 24th day of January, 1910.

LOUIS E. FULLER.

In the presence of—
LAURA T. SHAW ERISMAN,
M. A. MODER.

Disclaimer in Letters Patent No. 1,101,268.

DISCLAIMER.

1,101,268.—*Louis E. Fuller*, New York, N. Y. STENCIL-SHEET. Patent dated June 23, 1914. Disclaimer filed December 4, 1916, by the assignee, *A. B. Dick Company*.

Enters its disclaimer as follows, to wit:

1. It disclaims that portion of said specification which is in the following words, viz:

"My new material is not only useful for stencil purposes, but I have found it to be very useful in many ways, especially in cases where a substance is required that must be water and oil proof and proof against all neutral solvents of oils, greases or resins, and where the flexibility must not change appreciably under extreme conditions of heat or cold, moisture or dryness, and where it must be tough and not easily injured, torn, or broken."

2. It disclaims, as the base of the patented stencil-sheet, all fibrous material except open, lacelike material, such as Japanese Yoshino paper or its equivalent.

3. It disclaims all stencil blanks or sheets except such as, employing the said improvements, are used, or adapted or intended to be used, for conversion into stencils by impact or pressure, such, as for example, as the action of the type of a writing-machine.

[*Official Gazette, December 12, 1916.*]