

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN THE PROCESSES OF FORMING PATTERNS FOR EMBOSSING-ROLLS.

Specification forming part of Letters Patent No. 151,218, dated May 26, 1874; application filed February 3, 1873.

*To all whom it may concern:*

Be it known that I, CHARLES GRASSER, of Somerville, in the county of Middlesex and State of Massachusetts, have invented a process for making rollers or other surfaces to emboss imitation linen finish on paper or other fibrous material, of which the following is a specification:

The object of this invention is to prepare cylindrical or other surfaces to be used to produce perfect and positive imitations of linen, cloth, or other woven fabrics on paper or other fibrous material used for paper collars or similar goods.

By my invention hereinafter described, I am enabled to produce a roll for the above-named purpose of sufficient hardness to stand the necessary wear and pressure, and in particular to produce a roll made which is perfectly round and straight on its surface. This accurately-symmetrical form, so essential to the effective operation of such a roll, has not yet been obtained in rolls heretofore made for that purpose by means of casting or otherwise.

Many attempts have been made to cast such rolls out of hard alloys, and the molds used therefor have been made out of clay or plaster-of-paris, or similar material; but, although castings were obtained of great sharpness, the rolls so cast were not absolutely cylindrical and straight on the surface. Such failures have been caused in part by the warping of the molds in drying the same and from the excessive heat of the metal in the act of casting, and in part from the necessity of making such molds in sections, thereby producing seams on the cast roller, which could not be worked out so effectively as to prevent their effects being visible in the impression.

Rolls have been made of copper by means of the art of electrotyping, very nearly approaching the required roundness, but they are too soft for practical use.

I overcome these difficulties in either of the two ways hereafter described.

For illustration, I shall describe a certain and most desirable size of roll for the purpose, so as to be able to give some figures or measurement in the simple apparatus required.

Suppose the roll to be made is twenty-two

inches long and five inches in diameter. To work a roll of that size, I provide myself with a mold made of cast-iron or of some other hard melting or refractory metal. This mold is a simple pipe or cylinder composed of two halves parted lengthwise. It is firmly held together by means of screws, and bored out exact and true, of the size I wish to make the roll. It is also open at both ends. Then I take a sheet of the best pasteboard, (that known as "bristol-board,") and on one side of this bristol-board I paste a piece of linen, such as I wish to copy, attaching it either with some good flour paste or with shellac-varnish. The linen is well and uniformly pressed on, so as to present an even surface. This done, the prepared pasteboard is well dried to expel all moisture; then it is cut into exact shape and size to form a cylinder, snugly fitting into the iron cylinder above described, with the linen on the inside. If the pasteboard is carefully cut to the size and with perfectly straight edges by means of a sharp instrument, the joint where the end meets is hardly perceptible. The ends of the pasteboard are held together and in a cylindrical shape by pasting a strip of thin but strong paper over the joint on the outside. This pasteboard cylinder, with its linen surface inside, I place into the iron cylinder by taking it apart and fastening together again by means of the screws. This constitutes the mold to receive the metal out of which I make the roll, and it is now ready for that purpose. To proceed further I have to provide another vessel of a cylindrical shape, parting into two halves lengthwise, and with a bottom to it. This vessel or cylinder is about five feet in length, and of such a width as to receive the above-said iron mold inside, leaving a little room. This vessel is heated up to about the same heat which is required to melt the well-known babbitt-metal. When this is done, I have in readiness a mass of molten babbitt-metal of the best and hardest quality. With this metal I about three-fourths fill the heated vessel. Then, when this metal has cooled down somewhat, so that it will burn a strip of stiff paper immersed into it to a brown color, I take the iron mold lined with the pasteboard and linen, and gradually im-



merse the same into the metal and press it down to the bottom, where it is held until the whole mass has solidified. The great weight of the surplus metal on top produces a perfect impression of the linen on the metal. The gradual immersing of the mold heats the mold uniformly, thus preventing the warping of the same, and as the mold is open at its ends the air may freely escape, so that a solid roll may be produced. When cold, the outside vessel is taken apart, and the surplus metal surrounding the mold is cut away. The two halves of the iron mold may now be removed, and it will be found that the linen is a little singed or burned and adheres to a certain extent to the metal roll, but with a little care it may be easily removed, and a most perfect impression of the linen on the metal will present itself. This roll made of babbitt-metal is easily and cheaply constructed, and will give much more wear and resist more pressure than a roll made out of a shell or cylinder of copper produced by electrotyping, as it is one solid mass, and will not stretch under pressure like the rolls of copper, which must be backed or filled with some soft metal; but I make this roll still more durable, and this is an important point in my invention. When the roll is produced in the manner above described, I take it and deposit, by electrotype, a coating of nickel on its surface. This nickel deposit is very hard, as is well known, and if this coating is put on with care and of about the thickness of writing-paper, it will adhere very firmly and preserve all of the fine and delicate lines of the impression perfectly sharp. This coating makes the surface of the roll so hard that a sheet of copper may be passed under this roll without injury to the roll. When the roll is nickel-plated it is placed in a turning-lathe, and a hole of sufficient size is bored into and through its center to receive the shaft for running the roll in the housing or frame.

The second way, by means of which I may produce a perfect and true roll, is the following: I proceed in exactly the same manner as above described; but, instead of babbitt-metal, I take what is known as soft or tinman's solder, and make a roll of it by going through the same manipulation. This soft-metal roll is unfit for use as a roll, but I use it as a pattern to form a mold from, which mold is of such a nature as to receive a metal that is of greater hardness, and which melts at a much higher temperature than babbitt-metal; it would, therefore, burn linen.

I shall now give a description of the mode of making this hard composition: Eleven pounds of zinc, two pounds of copper, five ounces of cast-iron borings or chips, and two ounces of lead are melted together in this way; moisten the iron borings with muriate of zinc; take some of the zinc and melt it; when at a red heat, add some borax to prevent evaporation; then put in the iron borings, which are soon absorbed by the red-hot zinc; have the copper melted in another pot, and add in

a fluid state with the melted zinc and iron. This done, the balance of the zinc is gradually added, and, at last, the lead, when it is poured out into ingots, and is now ready for remelting and further use. In remelting, it is perfectly fluid at a low red heat, and when cold possesses hardness nearly equal to cast-iron, and the same resistance for crushing pressure.

The above-said soft-solder roll, with an impression of linen on its surface, is coated with nickel by the well-known process of nickel-plating. This nickel coating I make about one-sixty-fourth of an inch in thickness. Then I remove it from the bath, and melt the soft-solder roll out of this coating, by placing the whole into a suitable oven or furnace of uniform and sufficient heat. When the roll is melted out I have a light cylinder of nickel with a fac-simile impression of linen inside. This cylinder of nickel is now my mold, and possesses the peculiar property which I have discovered, and which consists in this: If a sheet or piece of nickel produced by the galvanic process is coated with tin or soft solder, and some of the above-described hard composition, in a molten state, comes in contact with it by pouring it on, it unites very easily with it, and seems to form a well-united mass; but on close examination it will be found that the nickel may be separated from the composition quite readily, and a perfectly sharp impression of the finest hair-line will be left on the composition. This property I turn into use in making my rolls. The pouring of the molten metal into this nickel mold cannot be done without getting it out of shape and warping the same; therefore I resort to this manner, which I find works admirably. I provide myself with two similar vessels of such a size as to admit the nickel mold to be placed inside and having some room left. One vessel may be made of one piece; the other must be made so that it may be taken apart. Then I fill the first vessel with molten tin, and at the same time the other vessel is filled with the hard composition in a fluid state. This being done, the nickel mold is taken and gradually immersed into the fluid tin and withdrawn, which leaves a thin coating of metal on the mold. The nickel mold is now immersed into the molten hard composition in the other vessel, and kept there until solidified and cold. The vessel is then taken apart, and the surplus metal surrounding the nickel mold and roll which has been formed by this operation is cut away from the outside of the mold. This being done, the nickel mold may be torn from the roll inside, which will present a perfect copy of the mold. The roll so made may be used after finishing the same on the turning-lathe, as above indicated, without having another nickel coating on its surface, like the babbitt-metal roll, as it is very hard; but a nickel coating on its surface will improve it and make it still more durable.

Now, I am aware that I use a principle analogous to the art of stereotyping; but I apply this known principle to a new purpose,



and with such modifications as are required for the purpose, and I do not wish to claim it, broadly.

What I claim as new is—

1. The herein-described process of producing embossing or pattern rolls, by casting the same in soft metal, directly on linen or other fabric to be copied, in an open-ended cylindrical mold, which is immersed in the molten metal until the latter solidifies, substantially as specified.

2. The supplemental process of nickel-plating a soft metal pattern-roll, then melting out the soft-metal, and then coating the nickel shell with tin to produce a mold for casting a hard-composition embossing-roll, substantially as herein described.

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Witnesses:

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