

UNITED STATES PATENT OFFICE.

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MANUFACTURE OF LEAD-PENCILS.

SPECIFICATION forming part of Letters Patent No. 463,039, dated November 10, 1891.

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To all whom it may concern:

Be it known that I, BYRON BENJAMIN GOLDSMITH, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in the Manufacture of Lead-Pencils, of which the following is a specification.

My invention has reference to improvements in the process of manufacturing lead-pencils, and it is designed to and does overcome certain difficulties encountered in the process heretofore universally practiced, and it improves the article made under the new process in a variety of ways.

The advantages in the process itself are ease and comfort in the manipulation, great rapidity, and reduction of cost, and the advantages in the article produced by this process are, first, prevention of warping or bending of the finished lead-pencil; second, prevention of the cracking or breaking up of the lead within the wood covering, and, third, a highly-ornamental appearance of the lead-pencil.

To fully appreciate the advantages of my improved process it will be necessary to review the process now universally practiced, in order that its inherent defects may become clear. At one stage of the manufacture of lead-pencils the same are delivered from a machine with the lead or graphite embedded in wood. The wood itself is shaped cylindrically, hexagonally, or otherwise, and is made as smooth upon its surface as it can be made by the shaping-tools. The wood covering is made up of two longitudinal strips glued together and to the lead, or in the case of crayon-pencils glued together, but not to the crayon, which is merely clamped between the two wooden strips. If lead-pencils so far finished were placed upon the market for use, they would warp or bend under the influence of moisture of the air and of the hand of the user and would become unsightly in a very short time. For this reason lead-pencils are rarely put upon the market in this condition, but are now almost invariably varnished before they reach the user. This varnishing is done with the cheaper grade cylindrical pencils as follows: The wood is first stained to the color required, and the pencils are then

pushed by a machine through a cup containing rather thick shellac varnish and provided with wipers for removing the thick coat which would otherwise adhere to the wood. From this machine the pencils drop upon an endless belt and are passed along over heated pipes to dry. On examining these pencils after this first coat of shellac varnish it is found that the surface is rough, because the wood fiber has been raised by the varnish and because the varnish itself has cracked by irregularity of drying. In addition thereto a great many of these pencils are found to be bent or warped, since the two strips of which the wood cover is composed do not expand and contract alike. The pencils are then passed between revolving sapphire burnishers, and they are then again passed through varnish-cups and again between burnishers. In the very cheapest pencils two coats of varnish are applied before burnishing, so that there are four coats of varnish and two burnishing processes. In the better grades of machine-polished pencils the wood is first sandpapered and burnished and then seven coats of varnish are applied, and the pencils are passed three times through the burnishers. The burnishers exert considerable pressure upon the pencil, and this pressure is produced not upon the whole length of the pencil at once, but gradually upon successive portions of the same, and it very frequently happens that the graphite or lead is cracked and broken into a number of small pieces, of which the manufacturer has no notice and of which only the consumer becomes aware. In the finest grades of pencils the sandpapering, burnishing, and polishing are done by hand for two reasons: first, to obviate the cracking of the lead, and, second, because these pencils are very frequently made hexagonal or elliptical in cross-section, and there are no machines known that are adapted for burnishing them. The finishing of these fine-grade pencils, therefore, is very laborious, slow, and expensive.

All kinds of pencils, after they have been varnished and burnished in either of the manners described, receive the manufacturer's stamp and trade-mark either in gold or silver foil, and are then again coated with a fine layer of very thin varnish to protect the

stamp. Lead-pencils produced in this manner have a comparatively moderate and unequal gloss, which is still further impaired by handling, whereby the very brittle shellac varnish becomes scratched and cracked. This cracking also takes place spontaneously, so that lead-pencils that are stored away for future use or sale become shop-worn and unsightly. This is the state of the art which preceded my invention, which latter is designed to and does overcome all the difficulties and disadvantages hereinbefore pointed out.

By my improved process I secure a much higher gloss and finish than by the old process, prevent the warping or bending of the lead-pencil, the cracking of the lead, and avoid the numerously-repeated applications of varnish, and at the same time I dispense with all hand-varnishing and with all sandpapering and burnishing, either by hand or by machine, whereby the cost of manufacture is very greatly reduced. I accomplish all this by using a varnish the solvent of which is not only highly volatile, but is so peculiarly related to the solid ingredients of the varnish that it will escape from the same under ordinary temperatures with great rapidity, leaving behind a perfectly solid and dry film without raising the fiber of the wood, but, on the contrary, compressing the fiber, and thereby rendering all burnishing unnecessary. The use of such varnish enables me to apply the same by simply dipping the pencils into a receptacle containing the varnish and without the use of brushes or of wipers. The coat thus produced has then a glass-like smoothness and polish and is much more evenly distributed than can be done by the most artistic application of the brush.

I am aware that other articles than lead-pencils have sometimes been varnished by dipping; but these were always articles of a cheap kind, the structure of which was so massive and strong that they could be subjected a considerable time to the high temperatures of drying-chambers without injury and without regard to the warping and bending incident thereto. With lead-pencils, however, which are of a delicate structure the dipping process has never before been applied with success and could not be applied without destroying the pencil absolutely by the heat of the drying-chambers.

Another reason why the dipping process could heretofore not be applied with success to lead-pencils is that the varnishes universally used formed a heavy and very unequal coat upon the pencil, which could not at all be tolerated, since such coat made the pencil unsightly by raising the fiber of the wood, and when it was attempted to cure this defect in part by repeated dipping the coat became so thick as to interfere with the sharpening of the pencil. In addition thereto the heavy coat of resin thus produced generally destroyed the marketable appearance of the

lead-pencils after they had been finished. These lead-pencils must be and are closely packed together for shipping and preservation and are wrapped with a paper covering. It then happens that in warm weather the thick resin coats become soft and the pencils stick inseparably together and to the paper covering, and large quantities of these articles thus become unmarketable. With lead-pencils varnished by my machine this particular cause of failure is not, or only in a slight degree, present, since the coats of varnish thus produced are very thin. When it was attempted to varnish lead-pencils by dipping in ordinary varnish, the subsequent drying in heated chambers, which could not be avoided, did generally loosen the lead or crayon within the wood, and more especially did this take place in the case of colored pencils, as experiments have shown. The reason why with the ordinary varnishes the dipping process cannot at all be practiced with crayons or colored pencils is that in the composition of these colored crayons wax is one of the constituents, and when the crayons, after having been dipped, are placed in the drying-chamber the wax is melted out and destroys the pencil absolutely.

The varnish which I employ and upon the use of which the practice of my invention depends is one which, either in whole or in part, consists of pyroxyline in solution.

I may use pyroxyline varnish pure and simple, which consists of collodion dissolved in a mixture of amylic acetate, benzine, wood-alcohol, and acetone, or I may use this pyroxyline varnish mixed with a resin varnish—such, for instance, as shellac dissolved in alcohol or ester lacquer dissolved in benzine—or I may mix the pyroxyline varnish with any other resin varnish.

While I prefer to use the varnishes mentioned, I am not confined to the use of the identical pyroxyline varnish above described, since any other pyroxyline varnish, and especially one containing camphor, may be used with advantage.

When a mixture of the two varnishes is used, I have found by experiment that I may vary the proportions within wide limits, using from one-third of pyroxyline varnish and two-thirds of resin varnish to two-thirds of pyroxyline varnish and one-third of resin varnish, and it is possible to expand the limits of these variations. The solvents of these varnishes are, as is well understood, highly volatile, and they are so related to the solids dissolved therein that they are not retained by the same under ordinary temperature and pressure, but evaporate very rapidly, leaving behind an absolutely solid and dry film which is very tenacious and is not brittle, and consequently does not crack and is not easily scratched. Accordingly I finish lead-pencils by dipping the same in the condition in which they come from the shaping-machines either in pyroxyline varnishes pure and simple or in

mixtures of pyroxyline and resin varnishes. The first coat of varnish is then allowed to dry, which in the case of pure pyroxyline varnish is accomplished in the open air and under
 5 ordinary temperature in from between ten minutes to one hour, and which in the case of a mixture of varnishes is accomplished in a couple of hours. The pencil is then quite smooth, the wood fiber not being raised, and
 10 no burnishing is required. The coat thus produced is rather thin, and the dipping is repeated twice, so that altogether there are produced three coats of varnish for the highest grade of lead-pencils. I have also found
 15 that if the first coat of varnish is or contains pyroxyline the subsequent coats may be made of resin varnish by dipping, since in this case the wood fiber cannot be raised, the same being tenaciously held down by the varnish containing pyroxyline, which is not perceptibly dissolved by momentarily dipping it in a thin resin varnish. The objectionable features of dipping in resin varnish are therefore avoided when the first coat consists of or contains py-
 25 roxyline.

By preference, as above stated, I apply three coats of varnish by dipping, as follows: First coat, the pencil is dipped, as it comes from the shaping-machine, in a vessel containing a mixture of two-thirds pyroxyline
 30 varnish and one-third resin varnish; second coat, the pencil is dipped into a vessel containing a mixture of two-thirds shellac varnish and one-third pyroxyline varnish; third
 35 coat, the pencil is dipped in a vessel containing two-thirds pyroxyline varnish and one-third resin varnish, it being understood that each coat is allowed to become perfectly dry before another coat is applied.

40 I have found by actual practice that the luster of pyroxyline varnish is greatly increased by the addition thereto of shellac or other resin varnish, without in any way or manner raising the fiber of the wood. There-

fore by thus mixing the two varnishes I com- 45
 bine the cheapness of the resin varnish with the property of the pyroxyline varnish to depress the fiber, and also enhance the ornamental effect of both.

The addition of shellac or other resin var- 50
 nish to the outer coat has another advantage: It admits of the application of the gilded stamp to the lead-pencil in the ordinary manner by heated dies, while if the outer coat is entirely of pyroxyline another and more dif- 55
 ficult process of applying this stamp has to be resorted to. I therefore apply the stamp in the ordinary manner.

Having now fully described my invention, I claim and desire to secure by Letters Pat- 60
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1. The method of finishing lead-pencils, which consists in producing upon the same a coat or coats of pyroxyline varnish by dipping, then drying the same, and then produc- 65
 ing thereupon a superimposed coat or coats of resin varish by dipping, substantially as described.

2. The method of finishing lead-pencils, which consists in producing upon the same 70
 by dipping superimposed coatings of pyroxyline varnish, resin varnish, and pyroxyline varnish in the order named, substantially as described.

3. The method of finishing wood-covered 75
 lead-pencils, which consists in shaping the wood cover by suitable tools, then producing upon the wood a coat or coats of pyroxyline by dipping, and then producing by dipping additional layers of varnish, substantially as 80
 described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BYRON BENJAMIN GOLDSMITH.

Witnesses:

MICHAEL J. CANNON,
 FREDERIC KOHLMAYER.