6 Sheets—Sheet 1.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

No. 195,010. Patented Sept. 11, 1877.

Fig. 1.

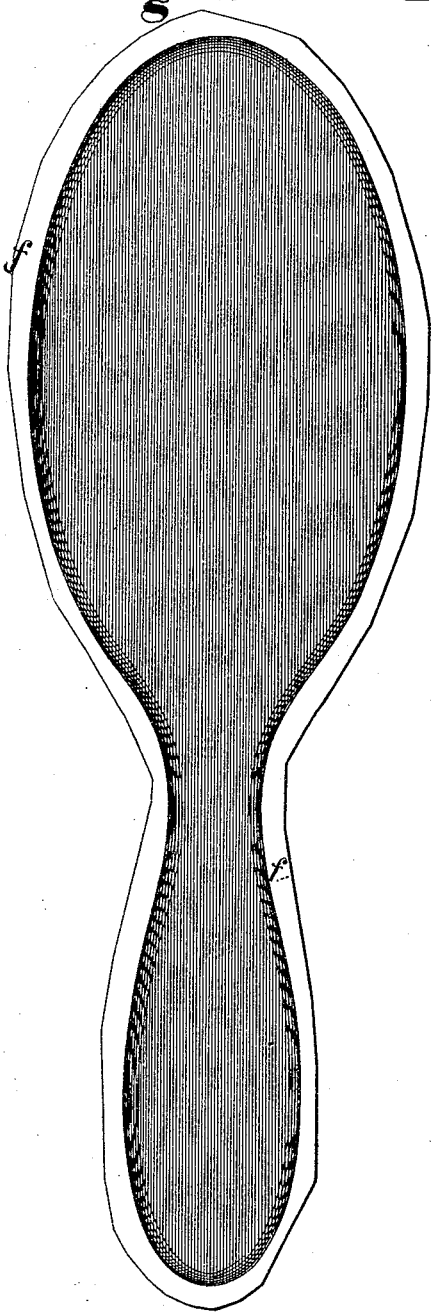


Fig. 2.

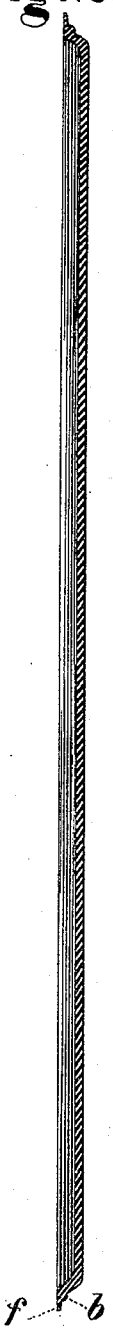
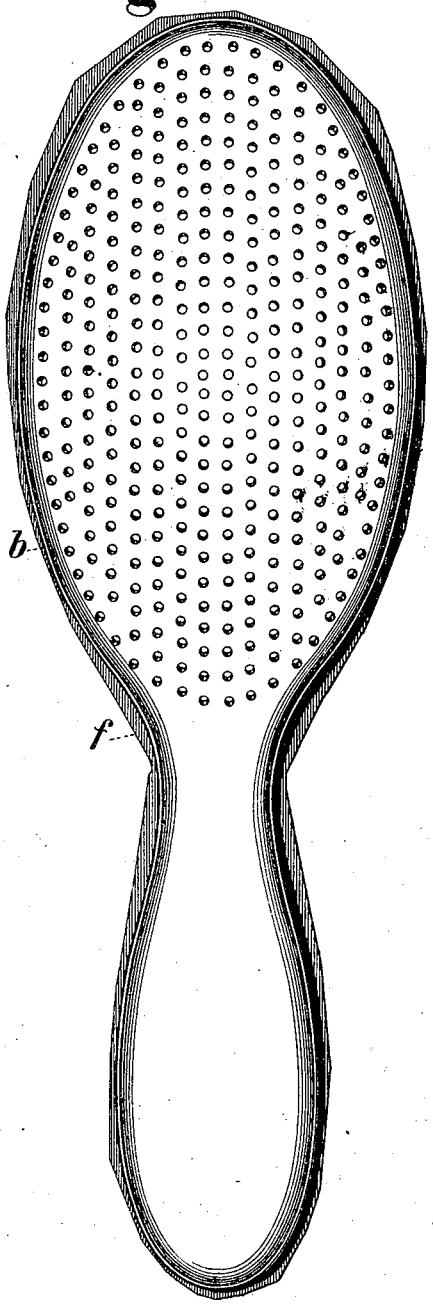


Fig. 3.



Witnesses.

J. Snowden Bell.

J. Walter Douglass.

Inventor.

Isaiah Smith Hyatt.

by Henry Baldwin Jr.

Atty.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

No. 195,010. Patented Sept. 11, 1877.

Fig. 4.

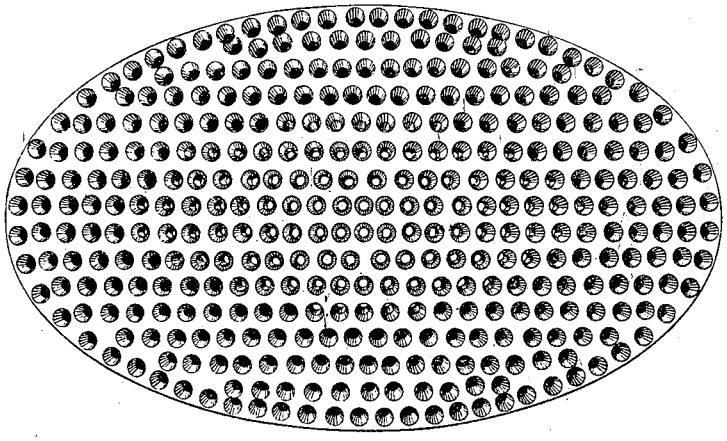


Fig. 5.

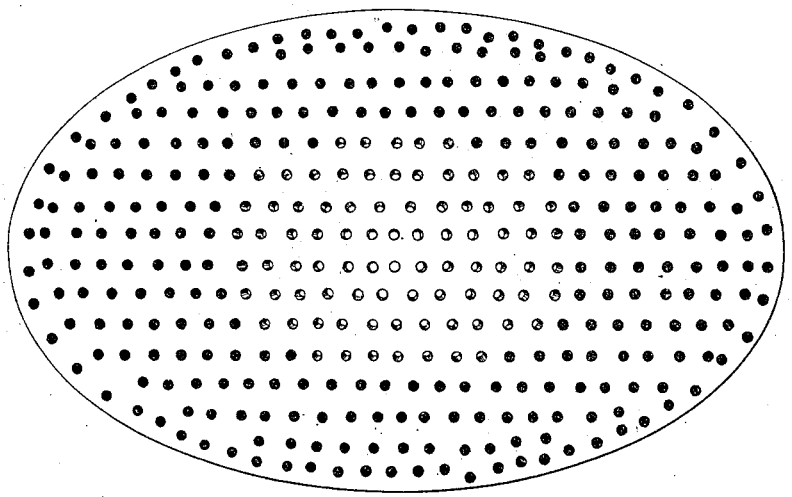
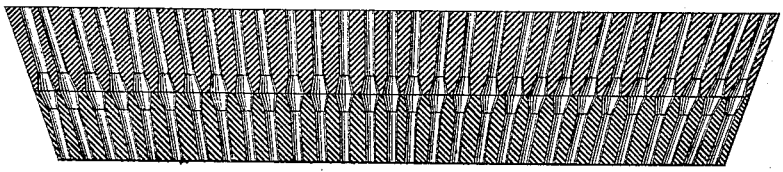


Fig. 6.



Witnesses.

J. Snowden Bell,

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6 Sheets—Sheet 3.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

No. 195,010. Patented Sept. 11, 1877.

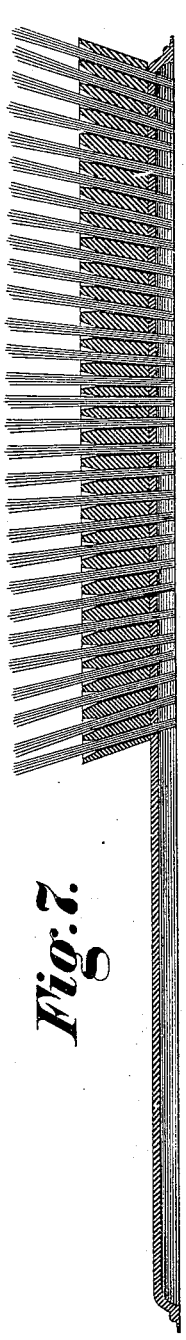

Fig. 7.

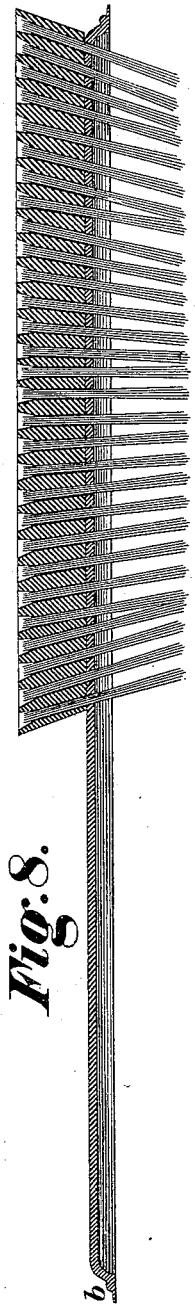

Fig. 8.

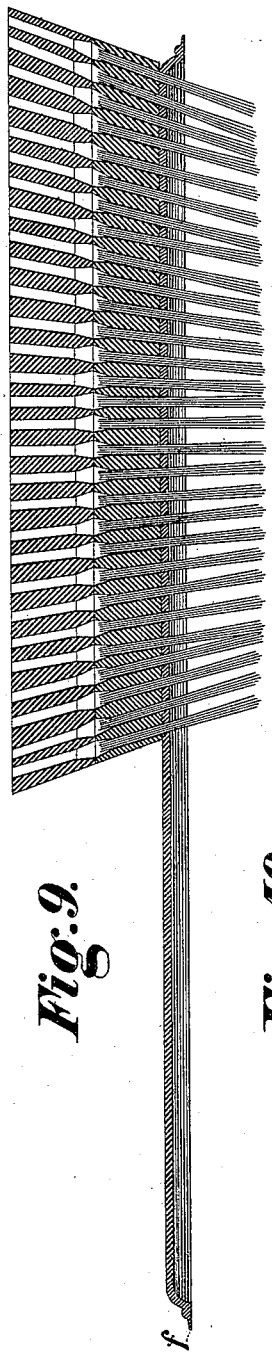

Fig. 9.

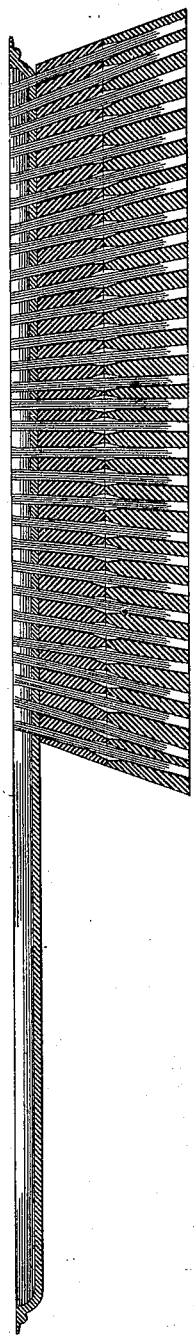

Fig. 10.

Witnesses.

J. Snowden Bell.

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6 Sheets—Sheet 4.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

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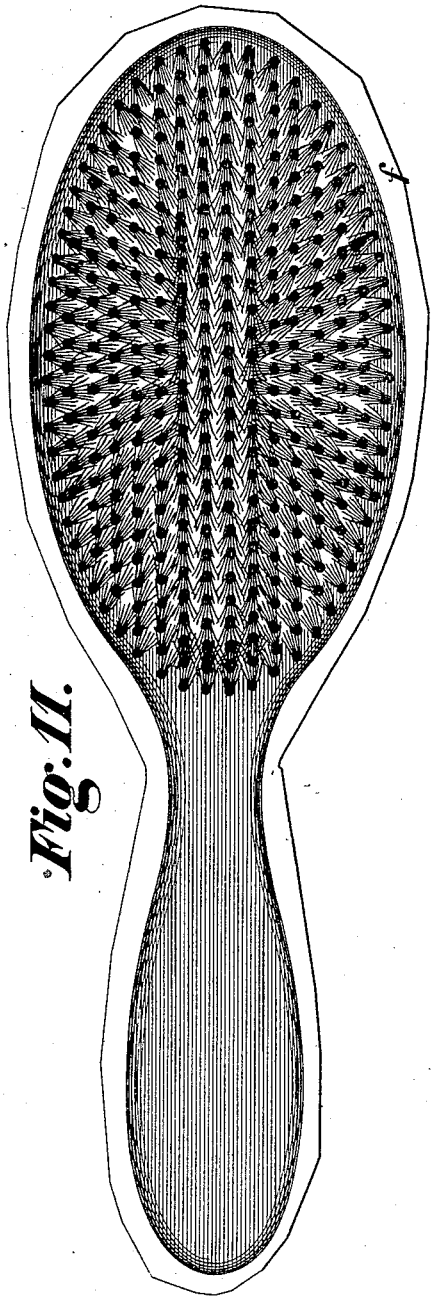

Fig. 11.

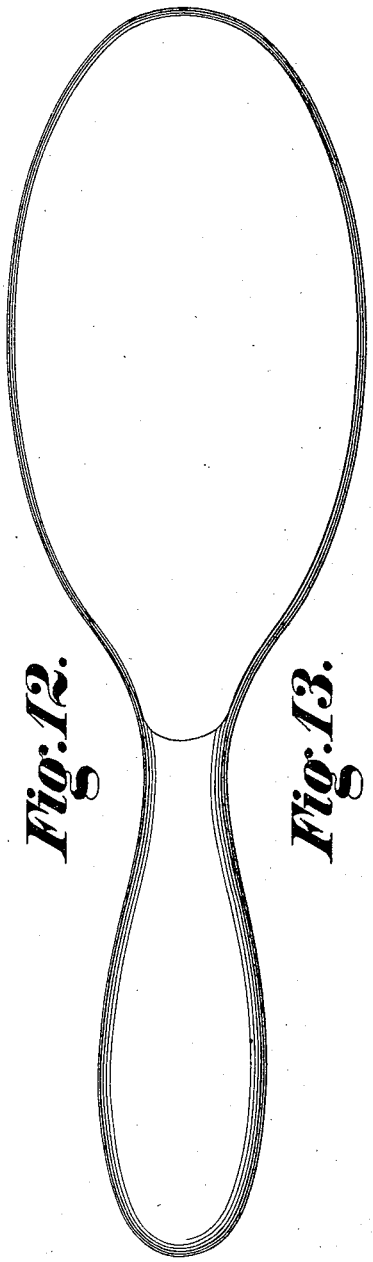

Fig. 12.

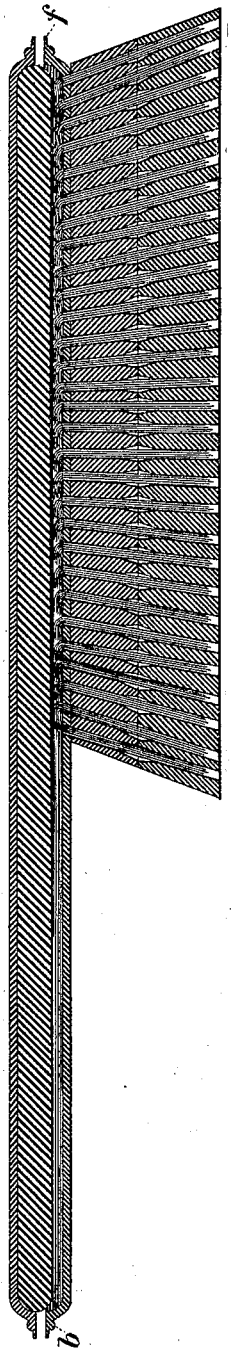

Fig. 13.

Witnesses.

J. Snowden Bell.

J. Walter Douglass

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Isaiah Smith Hyatt.

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6 Sheets—Sheet 5.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

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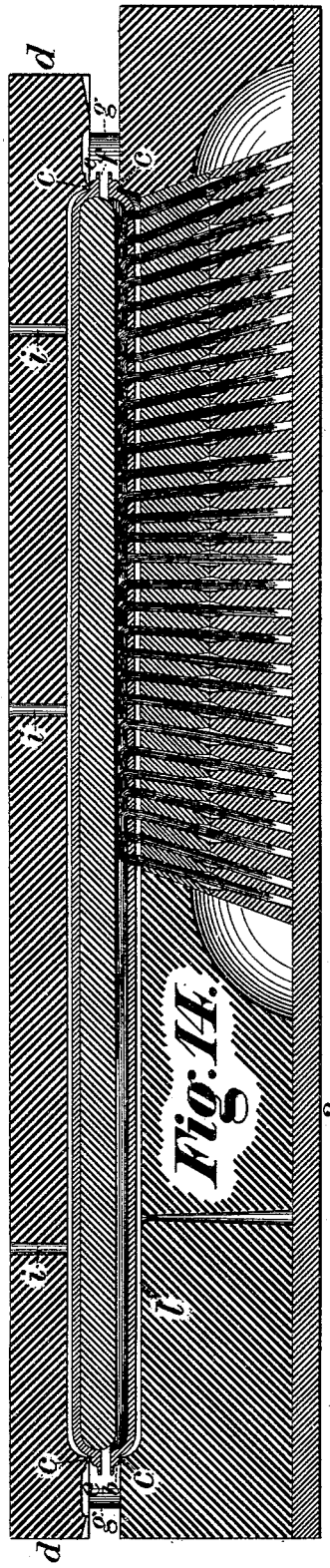

Fig. 14.

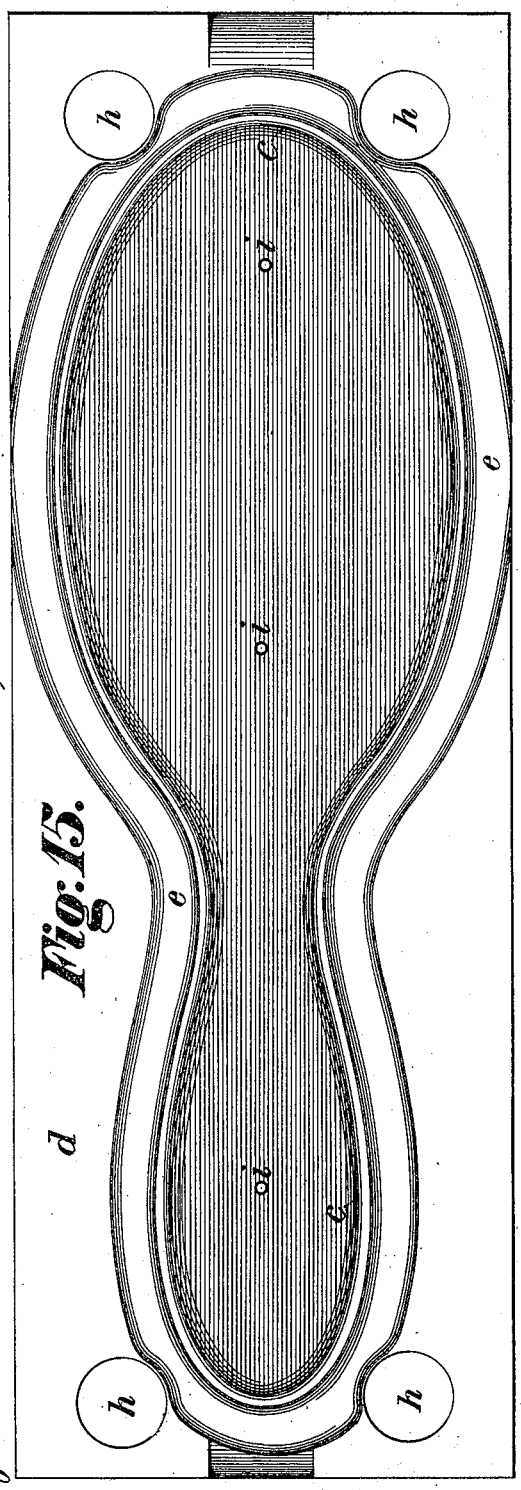

Fig. 15.

Witnesses.
J. Snowden Bell.
J. Wallis Douglass

Inventor.
Isaiah Smith Hyatt.
by Henry Baldwin & Atty.

6 Sheets—Sheet 6.

I. S. HYATT.

MANUFACTURE OF BRUSHES.

No. 195,010. Patented Sept. 11, 1877.

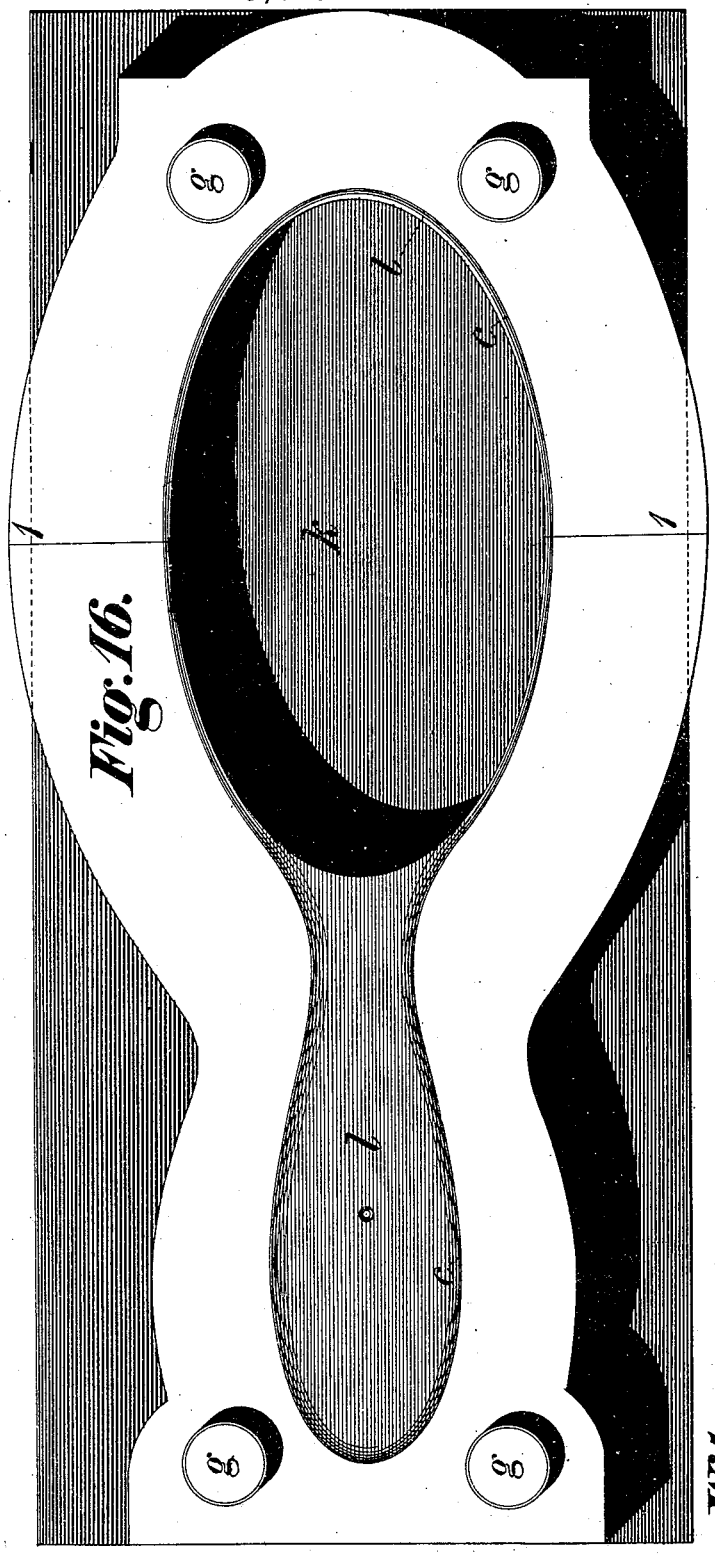

Fig. 16.

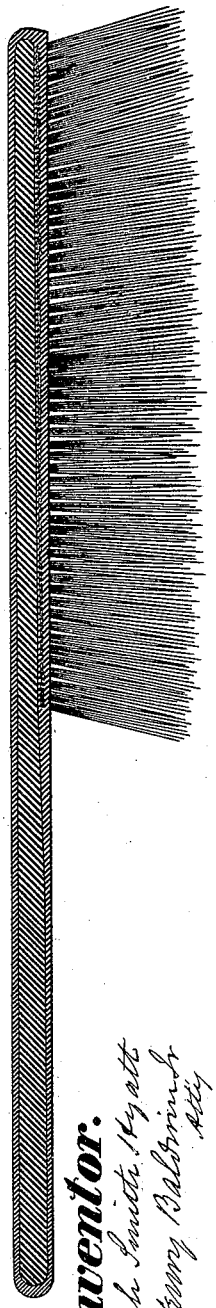

Fig. 17.

Witnesses.
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J. Walter Douglass.

Inventor.
Isaiah Smith Hyatt
by Stevens Babbinton
Atty

UNITED STATES PATENT OFFICE.

ISAIAH SMITH HYATT, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN MANUFACTURE OF BRUSHES.

Specification forming part of Letters Patent No. **195,010**, dated September 11, 1877; application filed February 7, 1877.

To all whom it may concern:

Be it known that I, ISAIAH SMITH HYATT, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes for Manufacturing Brushes and in Apparatus for the Practice of such Processes, of which improvements the following is a specification:

My invention appertains to that class of processes and apparatus in and by means of which brushes are made with tufts of bristles secured in the body of the brush, which body is composed, either wholly or partly, of a substance or material susceptible of being rendered plastic by heat; but my improvements are substantially different from the processes and apparatus heretofore employed in this branch of manufacture, so far as I have any knowledge, and I have invented them only after a long and continued series of experiments, which I found necessary in the course of my efforts to make brushes of this class from the substance, material, or composition known by specific designation as "celluloid," and composed of the ingredients and by the process described in Letters Patent of the United States, Reissue No. 5,928, issued under date of June 23, 1874, to the Celluloid Manufacturing Company, of New York city, assignees of myself and John W. Hyatt, Jr., to whom the original of said reissued Letters Patent was granted under date of July 12, 1870.

I contemplate using celluloid, and shall describe my invention in this specification as applied in the use of that material; but I also contemplate using any other substance or material which has, in common with celluloid, the characteristics of the requisite hardness for the preliminary, for some of the intermediate, and for the final conditions of the manufacture, and the requisite capability of being softened and rendered plastic in the primary and in some of the intermediate stages of the process of manufacture, as hereinafter more fully specified; and I claim my invention in its application to all such substances or materials.

My improvements in the process of manufacturing such brushes as are above indicated con ist in for ing the material, by means of suitable molds, into two parts, which I designate as "half-shells;" perforating one of these molded half-shells with a series of holes for the tufts or bristles, (these holes being in number and relative arrangement such as are conformable to the shape and purpose of the particular brush to be made;) tufting the bristles in the perforated half-shell; giving the tufted bristles the proper inclination and relative protrusions on the respective sides of the perforated half shell; securing the inner ends of the bristles by matting or ironing them down upon the under side of the perforated half-shell; superimposing upon the matted ends of the bristles a thin sheet of plastic material, which shall further secure the bristles and keep them in place and in position; covering this sheet of plastic material with a wooden core, which extends also into the handle of the brush and imparts strength, (at less expense than would attend the use of a solid mass of the plastic material;) again covering this wooden core with the other (unperforated) half-shell, which forms the back of the brush, and subjecting all these parts to heat, and pressure in a die, so as to mold and compress the superimposed sheet upon and about the matted or ironed ends of the bristles, to compress and condense the two half-shells upon and about the superimposed sheet and wooden core, and to weld the superimposed sheet and the shells together, as well as to compact and more effectually close the holes in the perforated half-shell about the tufts of bristles, the bristles being thoroughly supported and protected throughout the process.

I thus obtain, as the product of my improved process, and without molding the material upon the bristles by hand, a strong, cheap, durable brush, in which there are no seams or joints to open in the course of its use, no cement to crumble and admit moisture, which would induce disintegration, and no threads or wires to break off or rust out, and thereby loosen the bristles.

I am also enabled by my improvements to give to the outer ends of the bristles, in a better manner than heretofore, that unevenness of surface which is requisite to insure their proper penetration in use.

In the apparatus involved in this process I

have made various improvements, some of which, perhaps, do not constitute patentable inventions, being adaptations of known means; but I specify as part of my improvements claimed herein, and as an invention rendering the above-indicated process and product practicable and attainable, the construction and use of a sectional tufting-block, which has a depth greater than the length of the bristles above the surface of the brush, and is provided with a series of peculiarly-adapted holes corresponding in their number, in their inclination, and in their relative arrangement with the holes in the perforated half-shell, thereby determining the number, the inclination, and the relative arrangement of the tufts of bristles in the finished brush, and also supporting and protecting the bristles during the process of the manufacture.

This tufting-block I make in two horizontal sections, the lower section having its under surface and the perforations through it corresponding with the convex surface of the perforated half-shell and with the perforations through it.

The holes in this lower section are inclined outwardly from bottom to top conformably with the inclinations or angles of divergence desired to be given to the tufts of bristles in the finished brush, and are chamfered out on the upper surface for purposes to be presently described.

The upper section of this tufting-block has an under surface to correspond with the upper surface of the lower section, and the holes through it are inclined from bottom to top conformably with the holes through the lower section and through the perforated half-shell.

The holes through this upper section of the tufting-block are chamfered on its lower surface to correspond with the chamfered holes in the upper surface of the lower section, and thus, when the two sections are in position one upon the other, the holes through the tufting-block are inclined from top to bottom, each at the desired angle of divergence for the respective tufts of bristles in the finished brush, and coincident with the perforations through the half-shell.

These holes through the tufting-block are small at the upper and lower surfaces of the block.

The purposes of the enlargements or chamfers in the middle of the block, as above stated, will presently be described.

The outline of the upper section of this tufting-block is a continuation of the outline of the lower section, both conforming to the intended outline to be imparted to the bristles in the finished brush.

Some further features of my improvements in the apparatus for the practice of my improved process will be particularized hereinafter.

In the accompanying drawings, which form part of this specification, I illustrate the process by which I make a hair-brush of celluloid.

Figure 1 is a plan of one of the half-shells, which is inverted to show its concavity and the surrounding upright flange or wall. (More distinctly shown in Fig. 2, which is a longitudinal section of Fig. 1.)

The irregular outline *f* seen in Fig. 1 and the thin *f* projections shown in Fig. 2 indicate the fin or strip of surplus material which is forced out between the halves of the mold in which the half-shell is formed, which mold has bearing-surfaces (instead of cutting-edges) to insure the back pressure essential in molding celluloid, as is well understood by those skilled in the manipulation of that or similar material.

The bead *b* seen in Fig. 2 is provided for the purpose of affording the perforated half-shell a suitable support in the finishing-die, as will be hereinafter explained.

The mold being, as usual, a mere counterpart of the half-shell to be formed in it, will, of course, vary in its internal shape according to the form of the brush to be made. It must be made in two parts, and have the usual provision for the escape of surplus material, such as a groove or bevels outside of the bearing-surfaces, as is well understood by those who make or use such molds.

Fig. 3 is a plan of a half-shell with its convex side uppermost, and perforated with holes, the number and relative positions of which determine the number and position of the tufts of bristles in the finished brush.

These half-shells are molded as are other forms of celluloid—that is to say, an approximate form of the material is cut out of a sheet or mass of the proper thickness, and placed between the two halves of the mold above described, and the mold thus "packed" is subjected to heat under suitable pressure, both the heat and the pressure being gradually applied as the material becomes plastic, until the two halves of the mold are brought together, or as nearly together as is possible, with the fin of surplus material between them, and at this point the shaping of the half-shell is completed, as shown in Fig. 1. The heat is then shut off, but the pressure maintained while the mold is cooled, when it is removed from the press, and the half-shell with its fin *f* and bead *b* is ready to be used as a top piece or back, or to be perforated and tufted with bristles.

The half-shell intended for the face of the brush is, while cold and hard, placed upon a die of a form corresponding with that of the concavity in the half-shell, and perforated conformably with the holes to be made in the shell, the convex side of the half-shell being uppermost, while its concave side fits over, and rests flat upon, the perforated die, and a series of punches, corresponding in number and relative arrangement with the number and relative arrangement of the holes in the die and of the tufts of bristles to be put in the brush, is brought down upon the shell, perforating it at one operation, as shown in Fig. 3,

with the required number of holes in the required relation to each other.

To give these holes the desired inclination to be imparted to the bristles in the finished brush, I have invented, and contemplate using, an improved multiple punch and die, which forms no part of the invention herein claimed, but for which I am about to make application for Letters Patent. Meanwhile I have shown the perforations in the half-shell as punched with such inclinations.

The insertion of the bristles is the next step in the process, and for this operation the perforated half-shell is placed with its convex side uppermost upon a flat surface, and upon this upper surface of the perforated half-shell is placed the lower section of the tufting-block, already referred to.

Fig. 4 shows a plan of this lower section, the holes through which are chamfered on its upper surface, as shown in this figure, while on its under surface these holes are small, and not chamfered, as is seen in Fig. 5, which is a plan of the upper surface of the upper section of the tufting-block. The holes through this upper section of the block are, as is seen, small and not chamfered on its upper surface, while on the under surface of this section these holes are chamfered, to correspond with the chamfers on the upper surface of the lower section of the block.

When in the course of the process the upper section, Fig. 5, is placed upon the lower section, Fig. 4, the holes through the two sections will coincide, the entire series extending through the block, and these holes, while at the top of the upper section and at the bottom of the lower section, of only about the size of the intended tufts of bristles, will be, at the central part of the block, considerably enlarged for a short distance each way, as is seen in Fig. 6, which is a section through the block when its two parts are in the position described.

As already mentioned, the depth of these holes through the block must be somewhat greater than the distance to which the longest bristles will reach in these holes, so that the bristles will be supported and protected during the various stages of the process. These sections of the tufting-block are not, however, both placed at once in this position; but, on the contrary, after the perforated half-shell has been placed upon the flat surface, the lower section alone is placed upon the convex surface of the half-shell, as already stated, with its chamfered surface uppermost, the series of holes in the half-shell coinciding in number and in relative arrangement with the holes in the block.

It will be seen, by referring to Fig. 7, which is a section through the perforated shell, the lower section of the tufting-block, and the tufts of bristles, that the bristles can readily be inserted in the chamfered holes in the block-section, and through this section into and through the holes in the half-shell, the enlargements of the holes at the top of the block-section facilitating the insertion, while the smaller continuations of the holes through the section and through the half-shell give a slight pinch upon the tufts, which suffices to hold the bristles temporarily in position.

To prevent accidental displacement of the lower section of the block, or of the half-shell beneath it, a pin is dropped through one of the holes at each end of the section and half-shell, and when the greater part of the holes have been filled with bristles these pins are removed, they being no longer necessary, and the holes through which the pins had been inserted are tufted with bristles.

In preparing the bristles I avail myself of an improvement which, while forming no part of the invention herein claimed, very materially diminishes the expense generally involved in this item of the cost of materials used in such manufacture, and which at the same time results in a practical advantage heretofore generally attained only by extra labor and attended with waste of bristles.

It is well understood that the surface of the bristles in a hair-brush must be uneven to secure the taking hold, or, as it is technically termed, the "penetration," of the bristles when the brush is being used.

Now, as by means of my sectional tufting-block, I am enabled, as will be presently seen, to make the outer ends of the bristles uneven, while the inner ends are even, and therefore each bristle is equally secured in the brush. I prepare the bristles for my improved process by cutting them into three or more different lengths, adapted to the desired variations in the surface of the brush, and mixing these lengths together, so that the quantity taken up from the mixed mass for each tuft will comprise more or less of each of these lengths, and there will consequently be no waste from having to trim them off at any stage of the process nor after the brush is finished.

For a more particularly description of this feature of improvement, I refer to Letters Patent No. 156,355, granted, under date of October 27, 1874, to myself and John W. Hyatt, Jr.

The bristles are inserted by a hand using a pair of gaged nippers, to insure substantial uniformity in the number of bristles in the several tufts, and taking care to fill each of the holes so full as to prevent the bristles from slipping.

As the holes are filled the bristles which project above the block-section, as shown in Fig. 7, are gently beaten down with the fingers until their lower ends are made about even on the flat surface underneath the half-shell.

The figure (7) last referred to shows the position of the half-shell, the lower section of the block, and of the bristles at the completion of the stage of the process just described,

the upper ends of the bristles in each tuft being uneven, as it is desirable they should be in the finished brush.

At this point the half-shell, with the lower section of the block upon it and the bristles tufted in, as above set forth, is lifted by the operator from the table or flat surface far enough to permit the bristles, while the shell is held horizontal, to be gently further beaten down with the fingers or with the palm until the upper ends of the bristles are about even with the plane of the upper surface of the block-section, and within the chamfered holes in this upper surface, the lower ends of the bristles now protruding below the flange of the half-shell.

In this further beating down the bristles will be made about even on their upper ends, the unevenness being transferred to their lower ends. This stage of the process is shown in Fig. 8, which is a section similar to that shown in Fig. 7.

Still holding the half-shell (with the block-section and the bristles in the position shown in Fig. 8) horizontal, the operator now places the upper section of the tufting-block upon the lower section, as shown in Fig. 9, the chamfered holes in the two sections of the tufting-block being brought into coincidence, as shown in Figs. 6 and 9, and the upper ends of the tufts of bristles in the lower section being directly under the chamfered holes in the lower surface of the upper section. The operator, now holding the two sections of the block and the half-shell together, turns them over and places them, with the upper surface of the upper section of the block, downward upon the table; or he may first lay the upper section of the block upon the table with its chamfered surface uppermost, and turn over the lower section upon the upper section, carefully keeping the sections, the half-shell, and the bristles from being displaced.

The two sections of the block being brought together, he now beats with a flat paddle upon the ends of the tufts of bristles protruding through the concave surface of the half-shell, forcing the lower ends of the bristles gradually into the holes in the lower surface of the upper section of the block, (the chamfering of which holes facilitates the entrance of the tufts,) until the protruding upper ends of the tufts of the bristles are about level with the plane of the flange around the concave side of the half-shell, as seen in Fig. 10, which is a longitudinal section through the tufting-block, the half-shell, and the tufts of bristles at the completion of this stage of the process, the lower ends of the bristles in each tuft as they now rest in the upper section of the block being as uneven as they need be in the finished brush to secure penetration, while the upper ends are about even.

As is seen in the drawings, the bristles are up to this point held in place by the pinch afforded by the holes in the half-shell and in the block.

The next stage of the process consists in transferring the block, the bristles, and the half-shell, without disturbing their relations, as shown in Fig. 10, to a table, upon which they are placed in the same position, and where the even-protruding ends of the tufts of bristles are bent or matted down upon the half-shell with a hot iron by an operator, who carefully turns these ends away from the flange or wall around the half-shell, until these ends of the bristles are permanently flattened and matted or felted together, and lie within the concavity, and below the plane of the flange or wall of the half-shell, leaving a clear margin all around between the bristles and the walls of the half-shell, as shown in Fig. 11. The iron used should not be hot enough to scorch or weaken the bristles, or to melt or burn the plastic material.

The next stage of the operation consists in taking a wooden core, of shape conformable to that of the concavity of the half-shell, only of so much less size as will admit of its lying snugly within that concavity without pressing against or distending the flange in any direction, (and for such core I find poplar-wood very suitable by reason of its lightness and compressibility and its sufficient strength,) and in cementing on one side of this wooden core a thin sheet of celluloid, or of other plastic materials, cut to an approximate shape conformable to that of the wooden core, and not extending into the handle, or much beyond the line of the bristles in that direction, in the instance shown, though it may extend the entire length of the core, if found desirable.

This supplemental sheet I designate as the inside sheet, and, to prevent its being displaced in the further progress of the manufacture, it is secured upon the wooden core by the application of ether, alcohol, or a solution of camphor, or by any other liquid solvent or cement of the plastic material. The wooden core with this inside sheet secured upon it is shown in Fig. 12.

Placing the wooden core (with the inside sheet underneath) upon the matted bristles, and within the concavity of the half-shell as it rests upon the tufting-block, it only remains to cover the wooden core with the other half-shell, which is to form the back of the brush, and which corresponds with the first-described half-shell before it was perforated, (see Fig. 1,) and we have the parts of the brush all together, and all supported in or upon the tufting-block, the handle extending beyond the block, as is seen in Fig. 13, which is a longitudinal section through these parts at this stage of the process, when they are ready to be placed all together in the finishing-die, taking care not to disturb their positions or to displace the bristles.

I find it better, in practice, to place the tufting-block, and the perforated shell with the bristles matted down, in the die before laying the wooden core with the inside sheet upon the bristles in the perforated half-shell, and

before putting on the upper half-shell or top piece.

Fig. 14 of the drawings is a longitudinal section through the packed finishing-die, showing the tufting-block with its upper section face downward, resting on the bottom plate *a* of the die.

The tufts of bristles are shown matted or ironed down within the concave of the perforated half-shell, which perforated shell rests with its bead *b* upon the cutting-edge *c* in the die-block; the superimposed inside sheet of the plastic material is shown resting upon the matted ends of the bristles; the wooden core is in place, extending the entire length of the interior of the concaved shell; and the half-shell, which is to form the back of the brush, is seen fitting over the wooden core.

The ends of the half-shell on top and of the perforated half-shell coincide, as shown, with each other, and the same relative position is established between the upright flange or wall of the perforated half-shell and the depending flange of the other half-shell or top piece.

The projecting fins *f* and beads *b* around the edges of both the half-shells are also shown in this figure, and over all is placed the top plate *d* of the finishing-die.

This top plate is countersunk in the usual manner of the upper half of a die, and has plain surfaces, though the surfaces may be ornamented as desired.

I prefer, however, to make the brush-back perfectly plain, in order to get a better finish, and to afterward attach such medallions, figures, beadings, or other ornamentation as may be desired. Such ornaments can be molded separately, in the well-known ways, and then cemented upon the finished brush back or handle, or upon both, by the application of alcohol, ether, or other solvent or cement, as is well understood.

A plan of the top plate is shown in Fig. 15. This top plate *d* of the finishing-die is provided with a groove, *e*, or recess, or with a bevel, to admit of the escape of the surplus material, and also has a cutting-edge, *c*, coinciding with the cutting-edge *c* in the die-block, and with the desired edge of the finished brush, as is shown in Fig. 14.

To insure a thorough welding together of the flanges of the two half-shells, the surfaces of these flanges are softened with ether, alcohol, or other solvent before the upper half-shell is finally put in place in the die, and the die thus packed, with the top plate in position, is now placed in a press, in which heat also is applied, and an initial pressure, comparatively slight, brought down upon the die, so that the beads *b* are caught and held between the cutting-edges *c c*.

Under this incipient pressure the die, which is not yet entirely closed, is left for a short time, or until it has become heated sufficiently to soften the plastic material.

As this heating and softening continue, the initial pressure is gradually supplemented until the top plate has been forced entirely down upon the die-block, the surplus material being severed between the cutting-edge *c* of the top plate and the corresponding cutting-edge *c* around the die-block, of which die-block Fig. 16 is a plan.

The material thus thrown off by the cutting-edges is forced into the groove *e* in the top plate *d*, Figs. 14 and 15.

This die-block is a heavy piece of metal, divided transversely, as at 1 1, Fig. 16, and provided at each of its corners with dowel-pins *g*, (or other mitering devices,) fitting into the corresponding holes *h* in the top plate, Fig. 15, and in the bottom plate *a*, Figs. 14 and 16. The die-block and top plate are provided with perforations *i i* for the escape of air.

By thus dividing the die-block the tufting-block and tufted half-shell can be placed in the die without disturbing or deranging those parts.

The die-block is recessed, so as to receive and hold snugly the tufting-block, with the outline of which the outline of this recess *k*, Fig. 16, corresponds, as seen in Fig. 14, and this recess is of such depth that when the tufting-block is in place its surface next to the perforated half-shell will be below the plane of the top of the die-block, and far enough below this plane to admit of a groove, *l*, being provided around the recess *k*, in which groove the perforated half-shell will first lie, as seen in Fig. 14, and in which it will ultimately be shaped and outlined. The longer section of the die-block has an extension of this groove *l*, to receive and form the handle of the brush.

The groove *l* around the die-block is so formed as to give a cutting-edge, *c*, coinciding with the cutting-edge *c* in the top plate, as already described, and between these cutting-edges the beads and fins will be severed from the body of the half-shells.

As soon as the top plate has been brought down upon the die-block, and the die thus entirely closed, the process is completed, and it only remains to shut off the heat, cool the die while still under pressure, and when cooled remove it from the press. The upper section of the tufting-block is then carefully lifted off from the bristles, and the lower section next carefully removed. The edge of the brush is then trimmed, its surfaces polished, and, if desired, it is ornamented, as already described.

As the result of this process I obtain a seamless, jointless brush, with a homogeneous body of material, re-enforced by a wooden core, and in which the bristles are held without threads or wires, more uniformly, more securely, and more permanently than heretofore, the inside sheet being molded upon the matted ends of the bristles, so as practically to hold each bristle independently, and also having filled up the margin between the bristles and the walls of the perforated half-shell, and having become united with the walls of the perforated half-shell, so that it prevents any access of moisture to the wooden

core, thus insuring it against swelling, and the two shells are not only compressed and condensed, but thoroughly welded together entirely around the peripheries of the back and handle, and the perforations in the face of the brush are closed about the tufts of bristles, so as to exclude moisture and to insure a firm support to each tuft.

Fig. 17 is a longitudinal section through the finished brush, showing the transitions occurring in the molding stages of my improved process from the conditions and relations of the same parts as shown in Fig. 14.

I am not aware that, prior to my above-specified invention, a brush had ever been made by shaping a plastic material into what I have shown and described as a half-shell, or that such a half-shell had ever been perforated, or the bristles tufted directly into a perforated half-shell, or so tufted in and matted down upon one side of the half-shell, or a tufted half-shell subjected to the process hereinbefore set forth.

Neither am I aware of any prior process by which a wooden core could be inclosed in a brush the body of which was composed of a plastic material, and a diaphragm of the material interposed between the wooden core and the inner ends of the bristles, as is done in my improved process.

I also believe that I am the first to devise my above-described sectional tufting-block for tufting the bristle in the half-shell, and, in short, the entire process hereinbefore set forth I believe to be new, and only practicable in connection with a material (such as celluloid) which, while plastic under heat, is hard enough at ordinary temperatures to admit of the manipulations described. Therefore,

Having thus set forth the nature and objects of my improvements, what I claim herein as new, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, the half-shell of plastic material for brushes, substantially as hereinbefore described, and shown in Figs. 1 and 2 of the accompanying drawings.

2. As a new article of manufacture, the perforated half-shell of plastic material for brushes, substantially as hereinbefore described, and shown in Fig. 3 of the accompanying drawings.

3. A tufting-block composed of horizontal sections, with holes extending through the sections and chamfered at the middle part of the block, substantially as described, and as shown in Figs. 4, 5, and 6 of the accompanying drawings, for the purposes set forth.

4. The combination of the perforated half-shell and the sectional tufting-block, substantially as and for the purposes described.

5. The process, substantially as herein described, of tufting the bristles into a perforated half-shell, and into a tufting-block divided into horizontal sections, as shown in Figs. 7, 8, 9, and 10 of the accompanying drawings.

6. The method, substantially as herein described, of securing the inner ends of the tufted bristles by ironing or matting them down upon the inside of the half-shell, as shown in Fig. 11 of the accompanying drawings.

7. The combination, with a wooden core, of an inside sheet of plastic material, substantially as and for the purposes described, and as shown in Fig. 12 of the accompanying drawings.

8. The combination of the perforated half-shell, the matted ends of the bristles, the wooden core, and the inside sheet interposed between the bristles and the core, for the purposes described, and substantially as shown in Figs. 13 and 14 of the accompanying drawings.

9. The combination of a tufting-block, tufts of bristles with matted inner ends, a perforated half-shell, a wooden core, an interposed sheet of plastic material between the bristles and the core, and a half-shell for the back of the brush, substantially as and for the purposes described, and as shown in Fig. 14 of the accompanying drawings.

10. The process of forming a half-shell, perforating the shell, tufting the bristles in the shell and in the tufting-block, matting the inner ends of the bristles upon the inside of the shell, interposing an inside sheet of plastic material, superimposing a wooden core, covering the wooden core with a half-shell of plastic material, and uniting these parts under heat and pressure, substantially as and for the purposes described.

11. As a new article of manufacture, a brush the body of which is composed of a plastic material inclosing a wooden core, the bristles being supported and secured entirely in plastic material, and plastic material being interposed between the bristles and the wooden core, substantially as and for the purposes described, and as shown in Fig. 17 of the accompanying drawings.

12. The process, substantially as herein described, of molding the half-shells, tufting the bristles in the perforated shell, and uniting the two half-shells in a die under heat and pressure.

13. The combination, in a die, of a top plate, a bottom plate, and a transversely-divided die-block, all of these parts being separable, substantially as and for the purposes described, and as shown in Figs. 14, 15, and 16 of the accompanying drawings.

14. The combination of a transversely-divided die-block and a sectional tufting-block, substantially as and for the purposes described.

ISAIAH SMITH HYATT.

Witnesses:
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