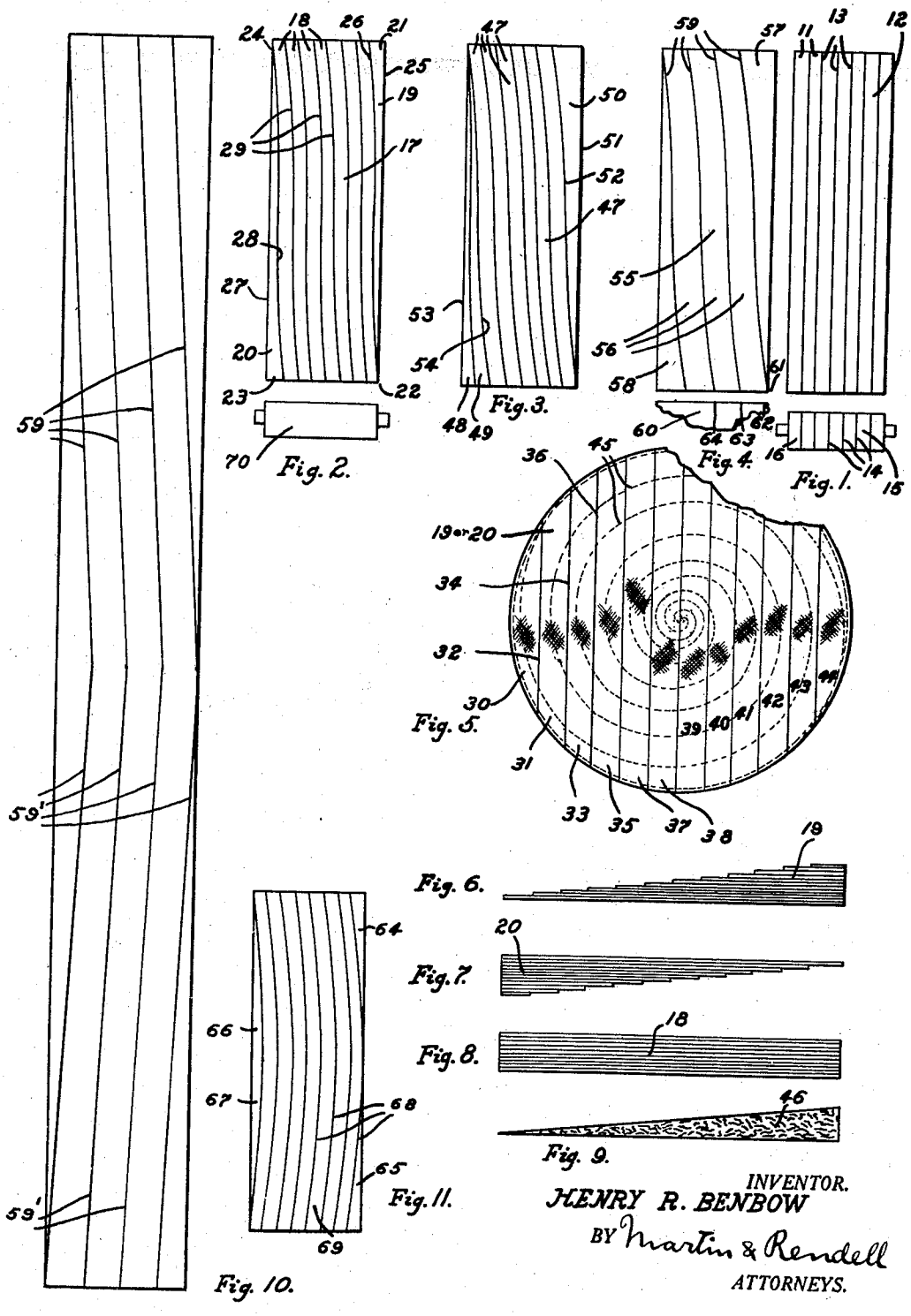
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POLISHING WHEEL

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POLISHING WHEEL

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My present invention relates to multiple sectioned polishing wheels where the disk-like sections are glued side to side and the periphery of the wheel is given a coating of abrasive held on by glue or the like.

In polishing wheels of this type the disk-like sections have heretofore been constructed with their opposite circular sides parallel to each other and so parallel to the main plane of the wheel all the way across. One of the very serious defects of this type of polishing wheel has been that ordinarily these wheels left streaks in the polished material. These streaks appear on the article being polished opposite the joints between the different sections of the polishing wheel. The reason is that the joints between the different disk-like sections of a polishing wheel form a line at the periphery of the wheel which is harder than the body of the sections themselves. Ordinarily the sections of this class of polishing wheels are composed of fabric or fibrous material which, even when the sections are pressed together very closely, still allow the fabric or fibrous mass of the different sections to have a slight flexibility, whereas the layer of glue between the adjacent sections has substantially no flexibility, but is so rigid that this layer of glue or other adhesive supports the coating of abrasive more rigidly than is the case with the abrasive on the surface of the sections of the polishing wheel itself.

As heretofore made these polishing wheel sections were constructed with their opposite circular flat faces parallel to each other and parallel to the opposite sides of the polishing wheel as a whole, and so parallel to the general plane of the wheel. It has been recognized by those skilled in the art that these streaks or microscopic grooves or ridges formed in the work being polished were formed or caused by the periphery of the layer of glue between the sections of the polishing wheel. As far as I am aware no successful means has been found to satisfactorily obviate these joint streaks in the work being polished.

The main purpose of this invention is to provide a polishing wheel that will not form these joint streaks and generally to provide a new and improved construction of polishing wheel and one where the sections are so constructed and so shaped and combined that these joint streaks will not be formed.

As already mentioned, the regular construction of these polishing wheels heretofore had been to use parallel sided sections and these parallel sided sections, when glued together, formed a line around the periphery of the polishing wheel, which line was harder than the rest of the surface of the periphery of the wheel, which balance of the periphery was formed by the regular buffing wheel material, whether fabric, fibrous material or other polishing wheel material. Due to the parallel sided construction of the sections it is obvious that this harder layer, represented by the glue joint between adjacent sections, was substantially all in one plane and so if the material being worked on was held for any appreciable time in one position relative to the periphery of the polishing wheel the part of the article being polished would be given a minute groove or streak opposite this glue-rigidified plane in the wheel. By observation and long study and experimentation I found that, by so making the polishing wheel that this glue-rigidified zone between adjacent sections of the polishing wheel did not travel in the same plane but so as to have each part thereof have a considerable sidewise or lateral travel as the polishing wheel was rotated, the joint streaks would not be formed. As a means of accomplishing this general result I have built buffing wheels where at least two of the sections were so built as to have their opposite circular surfaces or sides at an acute angle to each other and then have the desired number of regular parallel-sided sections placed between these angle-shaped sections, with the angle-shaped sections arranged with their thicker portions at diametrically opposite points on the periphery of the polishing wheel, so that a polishing wheel would be produced that would have its outer sides parallel to each other, and which wheel would run true and be in balance and yet the glue lines from the joints of all of the sections would, once in each rotation of the polishing wheel, travel laterally back and forth a distance represented by the thickness of the thicker part of the taper-shaped sections.

Other modified forms of accomplishing the general result of my invention will be described in the specification herein and the one above described construction is simply illustrative of my invention in its now understood preferred form but is not to be taken as limiting my invention to that precise construction.

Fig. 1 is a top or plan view of a conventional polishing wheel formed by gluing together sidewise a plurality of parallel-sided disk-like sections, the lines along the periphery of said polishing wheel indicating diagrammatically the

invisible joints between the several sections, and shown adjacent this plan view of a conventional polishing wheel is an article that has been polished by such a wheel, with the lines on the face of such article polished showing the streaks made by the joints of the said buffing wheel.

Fig. 2 is a top or plan view of a multiple-sectioned polishing wheel formed pursuant to this invention with the lines appearing along the periphery of the said polishing wheel, representing diagrammatically the invisible joints between the different sections and immediately adjacent this buffing wheel is an article 10 that has been polished by this polishing wheel and showing a plain or unstreaked face on the article, the unstreaked character of the said face of the article worked on being due to this polishing wheel being constructed according to my invention.

Fig. 3 is a top or plan view similar to Fig. 2 of a modified form of polishing wheel embodying this invention.

Fig. 4 is a top or plan view of a polishing wheel embodying this invention in a still further modified form, the sections, both parallel-sided and angular in shape being relatively thicker than the sections shown in the wheels of Figs. 1, 2 and 3.

Fig. 5 is a plan view illustrating one way of building up for my special exterior or endward sections a wedge-shaped or angle-shaped section in cross section by the use of segment-shaped pieces conveniently cut from disks or other available pieces of cloth, which segments of cloth are gradually and regularly reduced in size transversely of the chord edges of the segments.

Fig. 6 is an edge view of the tapered section shown in Fig. 5 as seen from the near side thereof.

Fig. 7 is an edge view similar to Fig. 6 but of a section which tapers to be thicker at its left-hand side rather than at its right hand side.

Fig. 8 is a similar edge view of a regular parallel-sided disk-like section of fabric or of fibrous material or other polishing wheel material.

Fig. 9 is an edge view of a special tapered section such as may be made by skiving or cutting down a disk of felt or thick leather or other homogeneous material so as to make a section which is wedge-shaped if viewed diametrically across the section.

Fig. 10 is a developed view on a slightly enlarged scale of the periphery of the polishing wheel shown in Fig. 4, the slanted lines extending lengthwise of said view indicating diagrammatically the actually present but really unseen joint lines between the sections of the wheel.

Fig. 11 is a top or plan view similar to Fig. 2 of a polishing wheel embodying a modified form of my invention.

Referring to the drawing in a more particular description it will be seen that Fig. 1 is a top or plan view of a conventional polishing wheel of the general type to which this invention is particularly applicable, namely a polishing wheel formed of a plurality of substantially similar disk-like sections 11 formed or made with their circular sides parallel, and having their circular faces placed side by side and permanently secured together as by a layer of glue or other adhesive. These sections 11 may be formed of any of the conventional polishing wheel materials such as fabric, fibrous material, felt, leather or other suitable layers of material, the sections when formed of fabric or layers of fibrous material, are usually generally circular parts that form a section and are permanently secured together by one or more rows of stitches variously placed as desired, one common way being by stitches which are spirally arranged. As already suggested the layer of glue between the adjacent sections of the wheel 12 shown in Fig. 1 are more rigid or less flexible than the body of the sections 11 themselves and the lines 13 shown on this Fig. 1 are diagrammatical only because the joint lines in a wheel of this kind are not usually visible to the eye since the sections of the wheel 12 are so tightly compressed and the layer of glue is so thin that the glued joints between the sections 11 do not appear as visible lines, such as shown upon Fig. 1. But the coating of abrasive held on the periphery of the wheel by an adhesive along these joint lines is stiffer and less flexible or resilient than is the abrasive-covered face of the sections 11 themselves, and accordingly these joint lines, being continuous around the periphery of the wheel, form the lines 13 which are at spaced intervals and parallel to the exterior sides of the buffing wheel 12, and operate to form streaks 14 correspondingly placed upon an article 15 that has been polished by the wheel 12. These streaks 14 are usually minute grooves or upstanding ridges made in the otherwise equally polished plain, curved or circular face 16 of the article 15 that has been polished by the wheel 12. But these streaks are sufficient in size to be physically felt and especially to clearly appear to the naked eye because the slight surface variation that makes the streak lines 14, reflects the light in a different way or in a different direction than the regular surface 16, and so magnifies as it were the actual streaks 14 until they become serious disfigurations and defects upon the surface 16 of the article 15 that has been otherwise satisfactorily polished.

Fig. 2 is a top or plan view of a polishing wheel 17 which embodies the preferred form of my invention. This wheel 17 is formed to include a plurality of disk-like parallel-sided sections as already described with regard to the sections 11 of the wheel 12 shown in Fig. 1, and so with the sections 18 formed of any of the desired conventional polishing wheel materials such as, for example, whole circular pieces of cloth or circular pieces of cloth built up of strips or pieces of cloth, or of various forms of folded and pieced pieces of fabric or fibrous material or even leather or felt, with the pieces forming the sections 18 permanently fastened together by through stitches in any desired manner, the details of these stitches or of the particular material or arrangement of the pieces forming the sections 18 not being material to this invention and so not further described herein.

The particular variation in the wheel 17 of Fig. 2 over the wheel 12 of Fig. 1 is that this wheel 17 has two specially formed exterior or end sections 19 and 20. These sections 19 and 20 are wedge-shaped in diametrical cross section, or in other words have their opposite sides arranged or formed or made at an acute angle to each other. In the wheels 17 the two exterior sections 19 and 20 are similar but are arranged in diametrically opposite positions, that is the section 19 has its thick portion 21 at the farther portion of the wheel and its thin portion 22 at the near portion of the wheel, while the section 20 has its thick portion 23 at the near side of the wheel and its thin portion 24 at the farther side of the

wheel. The two large or circular sides 25 of the section 19 and likewise the more or less large or circular sides 27 and 28 of the special section 20 form an acute angle, although in Fig. 2 the inner sides 26 of section 19 and the inner face 28 of section 20 are shown as having slight curves. These curves are due to the fact that Fig. 2 is showing in top or plan view a thick circular disk wherein not only the line represented by the inner surface 26 of section 19 and the line represented by the inner surface 28 of section 20, but all of the other joint lines 29 of the adjacent regular parallel-sided sections 18 would slant regularly on straight lines if this polishing wheel were shown in diametrical section. In other words the joint lines of this whole polishing wheel 17, as seen in an edge view of the wheel, will have the appearance of very light or slow screw threading. The actual wedge-shape formation of the sections 19 and 20 of the wheel 19 will appear more clearly from an examination of Figs. 5 to 7 or of Fig. 9.

Fig. 5 is a plan view of one method of building up the special wedge sections 19 and 20 of Fig. 2, and this plan view is still further explained by an examination of Figs. 6 and 7, which are edge views of Fig. 5 seen from its near edge. In other words the wedge-shaped or angle-shaped section 19 or 20 shown in Fig. 5 is built up by first placing one or more circular pieces 30 on a suitable support with the pieces registering with each other, and then placing flat thereon a suitable number, as two, three or four segment-shaped pieces registering with each other, as 31, which are nearly complete circles except that they have at their left-hand side as shown in this view a straight line or chord 32; and then placing flat thereon a suitable number, as two, three or four similar segment-shaped pieces 33, but with larger segments cut therefrom as through said pieces 33 having a straight or chord line 34 at the left substantially parallel with the straight line or chord 32 which is at the left of the pieces 31. On top of the pieces 33 are placed one or more registering segments or pieces 35 which are proportionately less than the pieces 33 as by having cut therefrom a larger segment, leaving the chord line 36 at the left. This process goes on until a series of lesser sized pieces 37, 38, 39, 40, 41, 42, 43 and 44 have been placed in this step-like relation as shown very plainly in side elevation in Fig. 6. Obviously as this process goes past center the segment-shaped pieces that have been cut off of the earlier pieces may be used to form the segment-shaped pieces that are to be located to the right of the center of the polishing wheel.

With these pieces 30, 31, 33, 35 and 36 to 44 in this over-lapping relation they will be sewed together permanently by one or more curved rows of stitching 45 preferably arranged in a spiral manner. Even where this special section 19 or 20 is built up in this way by even more than one piece of material at the different steps, the wedge thus formed will have a more acute angle than is suggested in Fig. 6, for the obvious reason that layers of fabric will be thinner than can be fairly clearly shown in a drawing such as Fig. 6. It will be seen also that the construction of Fig. 6 produces a section which is wedge-shaped in diametric cross-section across the chords or straight lines indicating the straight boundaries of the pieces used in building the section shown in Fig. 5. It will be understood also that when a section of this sort is placed in a polishing wheel the general result of the wedge-shaped section mentioned will be obtained and the very small steps at the straight edges of the different pieces will be inconsequential.

In Fig. 7 is shown a similar but complementarily arranged section which in practice will be formed as the section shown in Figs. 5 and 6, but will then be turned over. The section shown in Fig. 6 corresponds to the wedge-shaped section 19 shown at the right of the polishing wheel 17 in Fig. 2 and the section shown in side elevation in Fig. 7 may be said to correspond to section 20, which is placed at the left-hand side of the polishing wheel shown in Fig. 2. Fig. 8 shows a side elevation similar to Figs. 6 and 7 of a regular or parallel-sided section 18 shown as composed of a number of circles of fabric or fibrous material.

Fig. 9 is a side elevation of a wedge-shaped section 46 that may be made by skiving or cutting on the slant a circular disk of felt, thick leather or the like so as to form a one piece angle-shaped or wedge-shaped section that will operate similarly to sections 19 and 20 in Fig. 2.

Fig. 3 is an edge view of a polishing wheel 47, formed in the main by a plurality of parallel-sided sections 47 similar to the sections 18 of Fig. 2, but combined with two non-parallel-sided or wedge-shaped sections 48 and 49, each substantially like the wedge-shaped sections 19 and 20, these sections 48 and 49 being placed at the left-hand side of the wheel as shown in Fig. 3.

On the right-hand side of this wheel however is the single section 50 which corresponds substantially to the combined shape and angle of sections 48 and 49 in that the outer side 51 and the inner side 52 of this wedge-shaped section 50 are at an angle substantially equalling the angle between the outer face or line 53 of the wedge-shaped section 48 and the inner line or face 54 of the wedge-shaped section 49. This illustrates one construction of polishing wheels embodying my invention and shows that the desired slanting relation of the joint lines of the whole wheel may be accomplished by an odd number of slanting sections, as long as these slanting sections are arranged in oppositely disposed positions but with the total angle of the sections of one set equalling the total angle of the other set, which may be one wedge-shaped section, as 50, or might be three wedge-shaped sections each having only a third of the angle of section 50.

Fig. 4 is a top view of polishing wheel ,5 embodying my invention, where the parallel-sided sections 56 are relatively thicker or fatter than those shown in Figs. 1 to 3, both inclusive, and also the wedge-shaped sections 57 at the right of this wheel, and 58 at the left-hand side of this wheel, are relatively more obtuse angles or steeper wedge-shaped pieces. When these several sections of Fig. 4 are assembled substantially as indicated and pressed closely together and finally glued or otherwise cemented together between the opposite faces of adjacent sections, the parallel-sided sections 56 will be forced into a slightly slanted position as seen in Fig. 4, which shows one edge of this polishing wheel, and accordingly the joint lines 59 between adjacent sections of this polishing wheel really slant toward the right as they extend forwardly on the visible side of this wheel, or would slant in the reverse direction, that is to the left, if this wheel were turned bodily about without rotation or were rotated 180 degrees.

It will be understood that these joint lines 59 are not actually visible in a well-made polishing wheel of sections of similar material or similar color, but the lines 59 are shown on this view and several others of the drawing, as being diagrammatical lines that indicate the actual joint lines between the sections and are illustrated primarily for the purpose of explaining the construction of the polishing wheel.

Fig. 10, being a developed view on a slightly enlarged scale of the periphery of the polishing wheel shown in Fig. 4, shows in its upper half the joint lines 59 that have already been mentioned as placed upon Fig. 4. As this Fig. 10 is a developed view or a pattern view of the periphery of the wheel shown in Fig. 4, these joint lines 59 are straight lines and appreciably longer in proportion than the lines 59, which were shown as slightly curved on account of the wheel of Fig. 4 being shown as a top plan view, and the curves are produced necessarily, due to seeing these screw-thread-like lines that are actually on a slant.

In the lower half of Fig. 10 the joint lines, here called 59', between the same different sections, are properly shown as slanting now in straight lines towards the left.

For the purpose of explanation and showing the operation of a polishing wheel embodying my invention it will be assumed that the article 60 to be polished, shown closely adjacent but not touching the near part of the wheel 55 of Fig. 4, is advanced to the near part of said wheel, as of course in practice the part 60 would be advanced more or less in a horizontal line towards the near side of the wheel. Assuming then that the article 60 is advanced to make working contact with the wheel 55, the point 61 where the most right-hand joint line 59 would engage the work 60 would be at a point 62 close to the right-hand end of the work 60. As the wheel 55 is rotated from its farther side up and then down toward the work 60, the hard grinding line of this hard glued joint, impregnated with the abrasive as already explained, would not continue to engage the work at point 62 but, in an obvious manner, as the right-hand line rotates against the work 60, the point of engagement will move to the left along the edge or surface being ground or polished on the work 60, until the most left-hand portion of this right-hand line 59 reaches a point approximately at 63 on the work 60. As obviously this right-hand joint line 59 on the back or other edge of the wheel 55 is exactly in reverse position to that shown for it in Fig. 4, the contact point of this hard line 59 will then move to the right, gradually arriving back at point 62.

Similarly it will be seen that the second joint ine 59, counting from the right on this wheel 55, will begin its engagement at substantially point 63 on the work and when the wheel makes a half rotation this second-from-the-right joint line 59 will have advanced to the left across the work 60 until it reaches approximately the point 64, and on the next half rotation of the wheel this second joint line 59 will move backward to the right along the engaged face of the work 60 until the point of engagement is approximately at point 63.

Without continuing this demonstration in detail any further it will be obvious that by the use of these wedge-shaped or angle-shaped special exterior sections, causing all of the regular sections to be arranged at a slant, the several joint lines, not only those next to a wedge-shaped section, but also the joints lines adjacent all of the parallel-sided sections, will be at a slant and will not engage one fixed point on the work during a whole rotation of the polishing wheel as in the old style wheels but the point of engagement will travel back and forth across the face being polished.

When it is borne in mind that these polishing wheels are rotated very rapidly, always several hundred rotations a minute and often into the thousands of rotations a minute, it will be seen that the point of engagement of any hard joint line will be moved very rapidly across the face of the work and will not engage any one point of the face of the article being worked upon long enough to make a decided or visible streak. The fleeting engagement of any one part of a joint line will be averaged up with the much longer engagement of the regular, somewhat flexible face of the body of the different sections. In other words it will be seen that with a polishing wheel embodying this invention I have produced a construction that avoids the streak lines heretofore produced by parallel-sided sections which have their joint lines at all times parallel to the outer sides of the polishing wheel.

It will be obvious that the same mode of operation takes place in the polishing wheel shown in Fig. 2 where more acute-angled or sharper wedge-shaped special sections are used at the sides of the polishing wheel, the only variation being that the joint lines of the sections of this wheel will have less lateral travel than occurs in the wheel shown in Fig. 4 or the wheel shown in Fig. 3, which is mechanically the equivalent of the wheel shown in Fig. 4.

In Fig. 11 I have shown a modification of my invention in that instead of having one wedge unit occupy the extent of the entire diameter of a wheel, I have provided two wedge-shaped parts 64 and 65 in the right-hand section and two wedge-shaped parts 66 and 67 in the left-hand section, although in this left-hand section the thick portions of the wedge-shaped units 66 and 67 abut against each other. The effect of this modification is to make every part of a joint line 68 of this wheel 69 travel laterally of its zone twice in each rotation of the wheel.

It may be stated that in polishing wheels made to embody this invention, as in conventional polishing wheels, after the sections are assembled and permanently fastened together, the wheels are placed on an arbor in a lathe and their outer peripheral faces are cut down to be true and accurate to diameter.

It will be noted particularly that polishing wheels may be made embodying this invention with very little or no additional cost, either in material or work. The making of the wedge-shaped sections is the only new step that involves any labor and that is very slight in cost.

It will be further noticed that all forms of my invention produce a polishing wheel of uniform density in the whole width of the face and in all parts of the wheel because the counterbalancing arrangement of my special wedge-shaped parts supplies an equal amount of material at every transverse point through the wheel, and produces a wheel having smooth and parallel outside surfaces and a wheel that is in accurate balance.

The slanted arrangement of my sections further operates to prevent the pressure of the article being worked on from spreading or separat-

ing the sections or layers thereof that sometimes occurs on wheels having only parallel-sided sections.

My invention can be applied with equal advantage to so-called contour-faced wheels as well as to the regular flat-faced wheels shown in the drawing.

I claim:

1. A polishing wheel comprising two sets of exterior sections and therebetween a plurality of interior sections, all said sections being composed of several layers of polishing wheel material laid face to face, each of the exterior sections being circular and composed of a whole disc of said material and of a plurality of segment-shaped pieces of said material having a similar circumference and with their chords parallel but with the segments of progressively less width measured transversely of their chords, said exterior sections being wedge-shaped in section transversely of the chords, the two sets of exterior sections being arranged to have their thicker portions at diametrically opposite parts of the wheel, all the sections being fastened closely together so that all the faces between adjacent sections are parallel plane surfaces at acute angles to the exterior surfaces of the wheel.

2. A polishing wheel comprising two exterior sections and therebetween a plurality of interior sections, all said sections being composed of several layers of polishing wheel material laid face to face, each of the exterior sections being circular and composed of a whole disc of said material and of a plurality of segment-shaped pieces of said material having a similar circumference and with their chords parallel but with the segments of progressively less width measured transversely of their chords, said exterior sections being wedge-shaped in section transversely of the chords, the two exterior sections being arranged to have their thicker portions at diametrically opposite parts of the wheel, all the sections being fastened closely together so that all the faces between adjacent sections are parallel plane surfaces at acute angles to the exterior surfaces of the wheel.

3. The process of making a multiple-sectioned polishing wheel having the peripheral lines marking the contact of adjacent sections at an acute angle to the exterior surfaces of the wheel which consists in building up exterior sections each composed of a whole disc of material and a plurality of segment-shaped pieces of material with a similar circumference, the segments being progressively smaller with their chords substantially parallel so that said sections are wedge-shaped in cross section when measured transversely of the chords, fastening said layers of each exterior section together and arranging the exterior sections with their thick edges at diametrically opposite parts of the wheel, placing between said exterior sections a number of parallel-sided interior sections composed of a plurality of discs of polishing wheel material having all parts of their opposite faces in a single plane, and pressing and fastening all said sections together.

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