H. B. NICHOLS.

METHOD OF PRODUCING AND OPERATING GRINDING WHEELS.

APPLICATION FILED JULY 20, 1910.

984,961. Patented Feb. 21, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

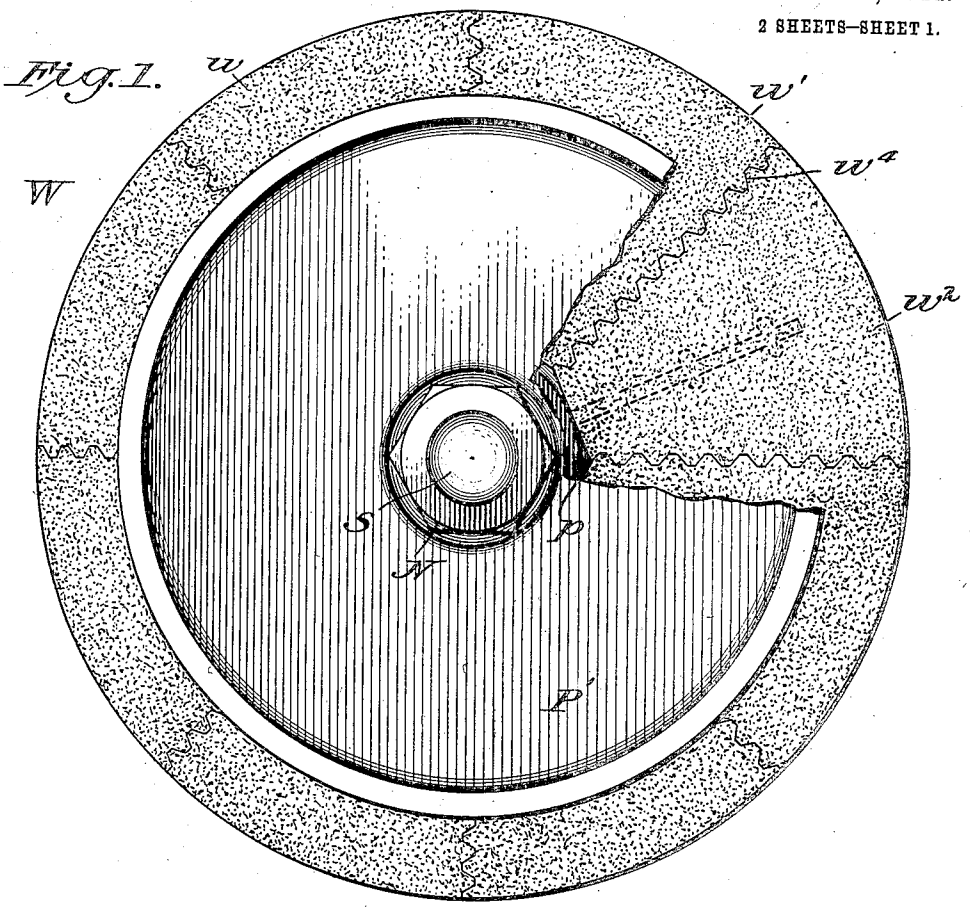
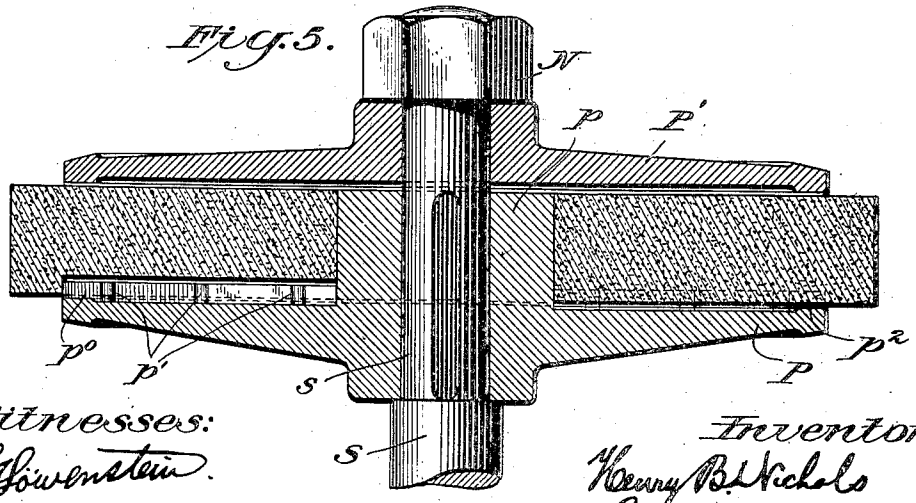


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 2

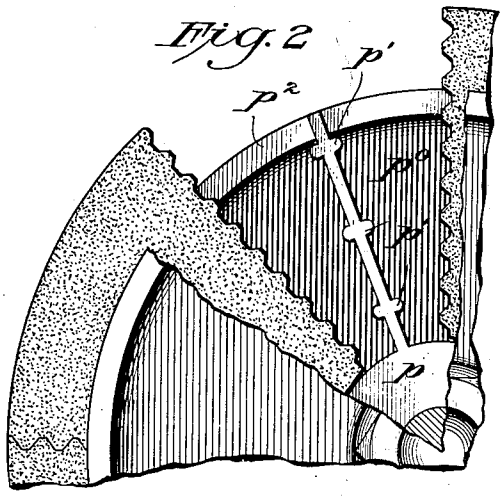


Fig. 3.

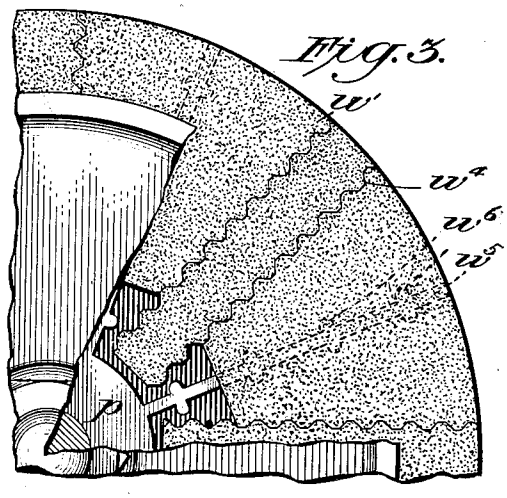
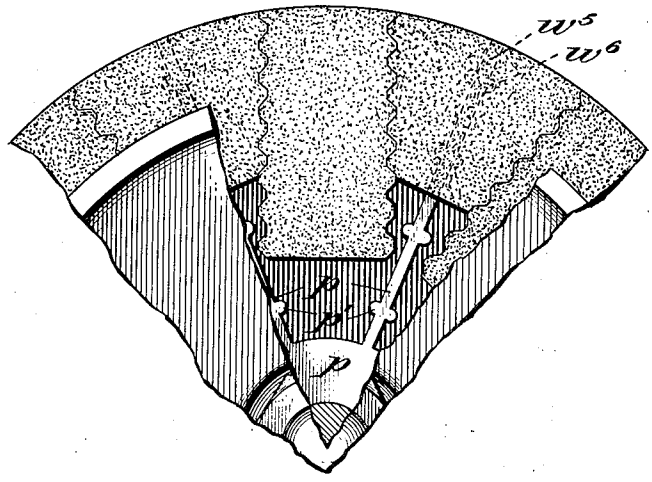


Fig. 4



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UNITED STATES PATENT OFFICE.

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METHOD OF PRODUCING AND OPERATING GRINDING-WHEELS.

984,961. Specification of Letters Patent. Patented Feb. 21, 1911.

Application filed July 20, 1910. Serial No. 572,910.

To all whom it may concern:

Be it known that I, HENRY B. NICHOLS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Producing and Operating Grinding-Wheels, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to the art of grinding and cutting by means of abrasives, and has for its object the production of a grinding body in which a relatively large per cent. of the abrasive material may be usefully employed, with a relatively small per cent. of waste.

An additional object is the provision of means and the method of operation for maintaining the surface speed of the grinding body approximately constant. In grinding wheels especially, the constant wear at the cutting edge, by constant reduction in the diameter produces a corresponding variation in peripheral speed.

The principle involved in my invention is that of constantly feeding or advancing the material of the body toward the cutting line to compensate for wear, and in the embodiment which I shall herein describe, I make a grinding wheel of separate sections, which when the wheel is new are in immediate contact with each other, and are interlocked along radial lines, being held by clamping plates which can be opened for purposes of adjustment. After wear the separate blocks or sections of the wheel are adjusted by moving them out from the center, and the resulting radial interstices are filled with special interlocking bricks made for the purpose. After the several sections have become so worn as to be useless, the filling bricks, having parallel edges, although worn can still be employed for other wheels.

I shall not claim herein the apparatus described because this forms the subject matter of my prior application, Serial No. 541,851, filed February 3, 1910.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a side view of a new wheel, Fig. 2 is a quadrant thereof with parts broken away, Fig. 3 shows a portion of a wheel after one adjustment, Fig. 4 shows a similar portion after two adjustments, and Fig. 5 is a diametral section of Fig. 1.

My present invention may be practiced by means of the apparatus claimed in my prior application aforesaid; and in describing it, I shall find it convenient to do so in terms of the said apparatus.

Referring first to Figs. 1 and 4, the wheel, as a whole, is designated by W, its spindle as S, the fixed clamping plate as P, and the movable clamping plate as P′. The plate P is carried on a flanged sleeve p, which is keyed on a reduced or shouldered portion s of the spindle S. The movable plate P′ is fitted to slide freely on the shaft or spindle, and is held in place by a clamping nut N, having a left hand thread, in order to avoid any danger of its being unscrewed during rotation of the wheel. The plate P has set into its inner face along radial ribs p^0 extending from the sleeve ring to its periphery, a set of projections p', for a purpose presently to be described; and both plates P and P′ are concaved on their inner faces, or provided with peripheral flanges p^2, for the purpose of insuring a tight grip on the wheel sections.

Referring now in particular to Fig. 1, it will be observed that the wheel sections w, w', w^2, w^3, etc., have their adjacent edges interlocked on sinuous lines of radial direction, as indicated at w^4. This mutual engagement of the sections is only possible when the wheel is new, as each block or segment is then clamped into its innermost position contiguous to the sleeve p. Besides the teeth on its opposite edges, which are intended to resist the action of centrifugal force, each block or segment is provided with a radial channel w^5 and enlargements w^6 at intervals along its length. The channel w^5 is to serve as a guide in adjusting, and receives rib p^0 of plate P, and the enlargements or transverse chambers w^6 are to receive the projections p' on the rib, which thus afford additional security against the action of centrifugal force.

The drawings herewith are taken from a 16″ wheel, and it will be noted that there are eight sections or blocks originally making up the wheel, all locked together by their toothed edges and clamped between the plates P, P′. The wheel thus complete is used in the ordinary manner, the surface

speed for which it is designed being 6,000′ per minute, or 1581 revolutions per minute. The first use can safely continue until the edge has been worn down about 1¼″ or to within about ¼″ of the edge of the flanges p^2 on the clamping plates. The wheel is then stopped, unlocked by loosening the nut N, and the bricks or segments w, w', w^2, w^3, etc., are moved out in radial directions into the position shown in Fig. 3. It will be observed that the transverse enlargements w^6 in the radial grooves, also the projections p' on the fixed plate P, are set 1½″ between centers. Each enlargement, therefore, engages the next projections in order toward the circumference of the plate, the outermost recess in the brick lying outside the periphery of the plate as indicated at w^{60}.

In moving the bricks out from the center along the line of the radial grooves, they obviously separate, and in the case of a 16″ wheel with eight bricks, this first separation amounts to 1⅛″, or to $1\frac{5}{16}$″ over the ends of the teeth. The interstitial space due to this separation I fill by inserting a special, long, narrow brick marked B, having its edges serrated to match the serrations in the main wheel segments, but parallel in their general direction. Having set the segments and inserted the bricks B, the plate P′, is again set up against the wheel by tightening the nut N, after which the edge must usually be trued up somewhat; but this is a trifling operation, involving the removal of material to a maximum depth of only about $\frac{3}{32}$″, which is done very quickly. The wheel is then ready for further use. After being thus reset, when the wheel a second time becomes worn to the permissible limit, that is to say about ¼″ from the peripheries of the clamping plates, the bricks are again reset, as shown in Fig. 4. The operation is the same as before, but it will be observed that each brick or segment is now so worn that only two of the transverse recesses w^6 remain, one of which lies within the peripheries of the clamping plates, and the other without. In this second resetting, the segments become separated by an interval of $2\frac{5}{16}$″, and this space is filled by another size of special brick shown in Fig. 4 and marked B′. This brick is similar to the brick B in that it has parallel serrated edges, and is inserted in the same manner. The plates P P′ being again clamped together on the wheel, and the circumference brought to a true curvature, further use is possible, until the resulting wear has caused the grinding edge to again approach to within the limiting distance of ¼″ of the outer edges of the plates. The segments w w' may now be regarded as worn out but it will be observed that there is very little left of each segment to be thrown on the scrap pile. In fact, each piece of waste material will be found only 1¾″ long, and wedge-shaped. This saving becomes much more pronounced in larger wheels as will be immediately apparent upon figuring dimensions.

After the wedge-shaped segments w w' are entirely worn out the bricks B and B′ are still of use, and can be employed with new segments or in another wheel. Besides being slightly concaved, or flanged at p^2, so as to grasp the bricks firmly near their outer edges, the plates P and P′ are provided with a cushion of some yielding substance, such as blotting paper. In the present case, I prefer to use a very thin rubber packing.

In addition to the great economy effected by my invention a very important advantage gained is that of being able to run the wheel at practically a constant speed. The maximum diameter (for the size taken as an illustration) being 16″, the minimum diameter is never less than 13½″, hence very little variation in the surface speed is produced by the wear permitted between adjustments.

It will be apparent to those skilled in the art that numerous changes in matters of detail can be made without departing from the principle of my invention, and without sacrifice of the essential features thereof. Thus, the matters of the radial channel w^5, the serrated edges w^4, the locking means, etc. are all subsidiary features, and so long as their functions are performed by equivalent elements they may be changed without altering the invention or effecting the identity of the process.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. The method of compensating for wear in a grinding wheel which consists in (1) dividing the wheel body into sections; (2) moving each section away from the center toward the periphery as the latter is reduced; (3) inserting fillers of abrasive material between the then separated sections; (4) clamping the sections and fillers together as a unitary mass; and (5) cutting the new peripheral surface of the body to a true circular curvature on the desired radius produced by the previous steps.

2. The method of producing a constant grinding surface and compensating for wear on a grinding body, which consists in (1) dividing the body into sections; (2) advancing said sections toward the cutting line as the surface wears; and (3) inserting fillers of similar material between the sections to maintain the continuity of the cutting surface.

3. The method of producing a constant grinding surface and compensating for wear on a grinding body having a curved surface, which consists in (1) dividing the body into

sections; (2) advancing said sections step by step toward the line of cut as the surface wears; (3) inserting between the sections at each step fillers of sufficient size to produce continuity of mass; and (4) clamping the sections together after each step, to maintain said continuity of mass while grinding.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY B. NICHOLS.

Witnesses:
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