H. B. NICHOLS.

GRINDING WHEEL.

APPLICATION FILED FEB. 3, 1910.

985,116.

Patented Feb. 21, 1911.

2 SHEETS—SHEET 1.

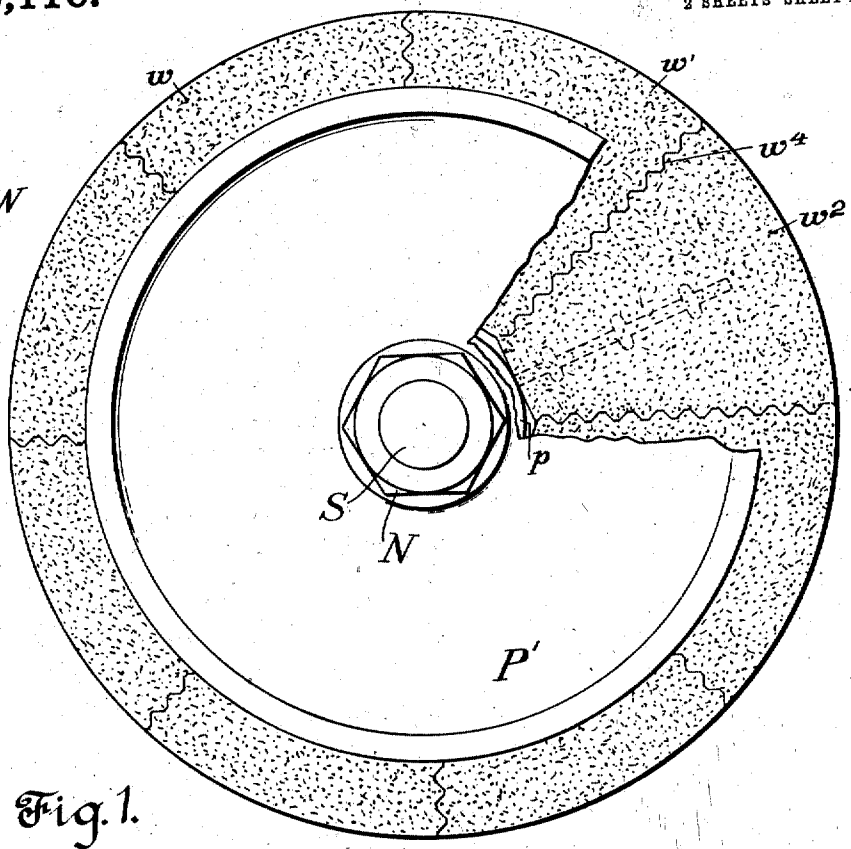

Fig. 1.

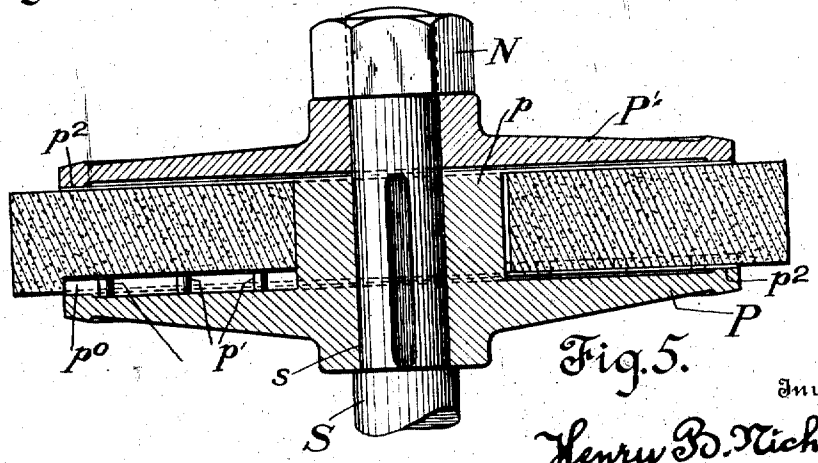

Fig. 5.

Witnesses

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2 SHEETS—SHEET 2.

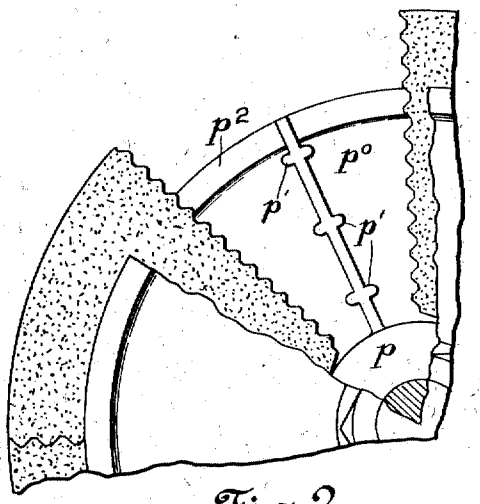

Fig. 2.

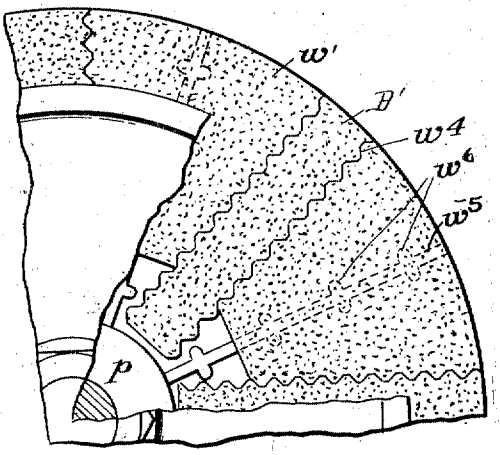

Fig. 3

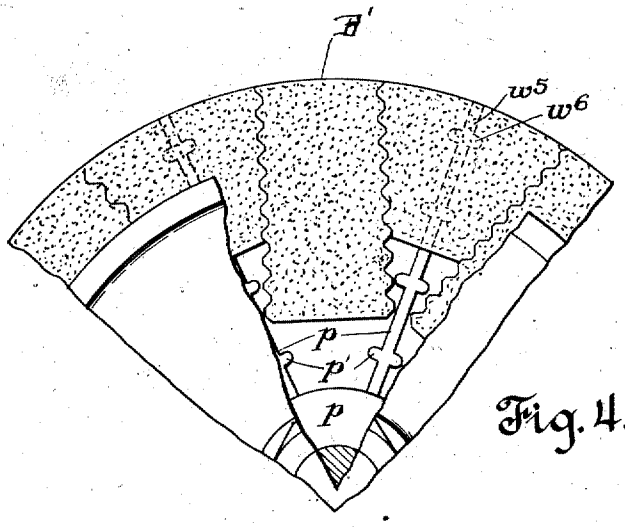

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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GRINDING-WHEEL.

985,116. Specification of Letters Patent. Patented Feb. 21, 1911.

Application filed February 3, 1910. Serial No. 541,851.

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 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 the 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.

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.

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 positions 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, en-

gages the next projection 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 $1\frac{1}{8}$″, 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 $\frac{1}{4}$″ 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 $\frac{1}{4}$″ 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 $1\frac{1}{4}$″ 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 $13\frac{1}{2}$″, 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. I believe myself to be the first to produce a successful wheel of this type, and I shall therefore claim the same broadly, desiring it to be distinctly understood that I contemplate all variations and departures from my present disclosure which fall fairly within the scope of the claims.

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

1. A grinding wheel composed of radially adjustable segments, means for maintaining continuity of the peripheral surface of the wheel for all positions of the segments, and means for clamping the same when adjusted, whereby wear may be compensated and a substantially constant grinding surface maintained, substantially as described.

2. A grinding wheel composed of radially adjustable segments of abrasive material, means for clamping the same when adjusted and abrasive members filling the spaces between the segments due to the adjustment, so as to preserve a continuous grinding surface, substantially as described.

3. A grinding wheel composed of separable radially adjustable segments of abrasive material, with interlocking means upon their edges, radial fillers with complementary interlocking means on their opposite edges, and clamping means for the segments and fillers, substantially as described.

4. A grinding wheel composed of separable radially adjustable segments of abrasive material having serrated edges, radial fillers having complementary serrations in their opposite edges, and clamping means for the segments and fillers, substantially as described.

5. A grinding wheel composed of separable radially adjustable segments of abrasive material, abrasive fillers for the intersegmental spaces, a spindle for the wheel, a flanged

plate fixed on said spindle, a parallel plate movable upon the spindle, and means for forcing the plates together so as to clamp the wheel segments and fillers in position between them, substantially as described.

6. A grinding wheel composed of a plurality of separable adjustable wedge-shaped segments, in combination with bricks having parallel edges, said bricks adapted to be inserted so as to fill the interstices between the segments after their separation by radial adjustment, the edges of both bricks and segments being provided with coöperating interlocking means, and clamping plates adapted to hold the segments and bricks together as a unitary mass with a continuous grinding surface, substantially as described.

7. A grinding wheel composed of alternate wedge-shaped segments, and bricks with parallel edges, in combination with clamping means for holding the segments and bricks together as a unitary mass, substantially as described.

8. A grinding wheel composed of radially adjustable segments each having a radial channel with a plurality of chambers or recesses in its face, a plate with radial ribs adapted to lie in said channels and projections or studs on each rib to lie in the said recesses, and a complementary plate adapted to clamp the segments against the first plate, whereby the segments are properly alined in adjustment and held against displacement by centrifugal force.

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

HENRY B. NICHOLS.

Witnesses:
GEO. B. TAYLOR,
CHAS. V. LOUDERT.