April 27, 1926. **1,582,608**

E. R. HYDE

SECTIONAL GRINDING WHEEL

Filed April 28, 1924 2 Sheets-Sheet 1

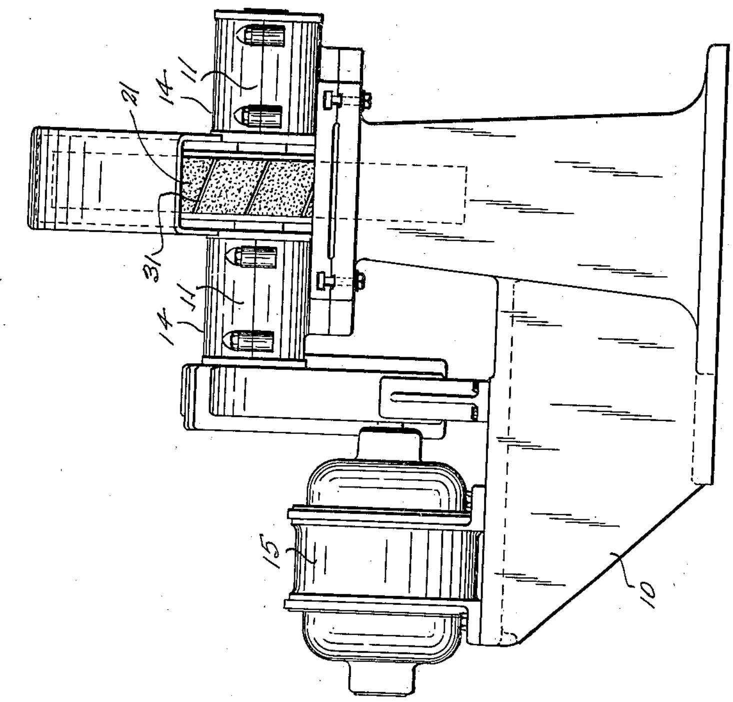

Fig. 2.

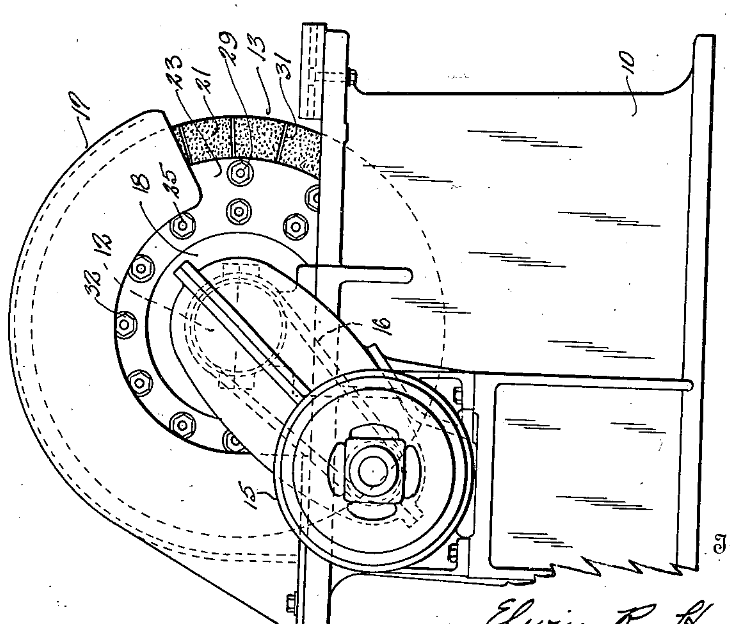

Fig. 1.

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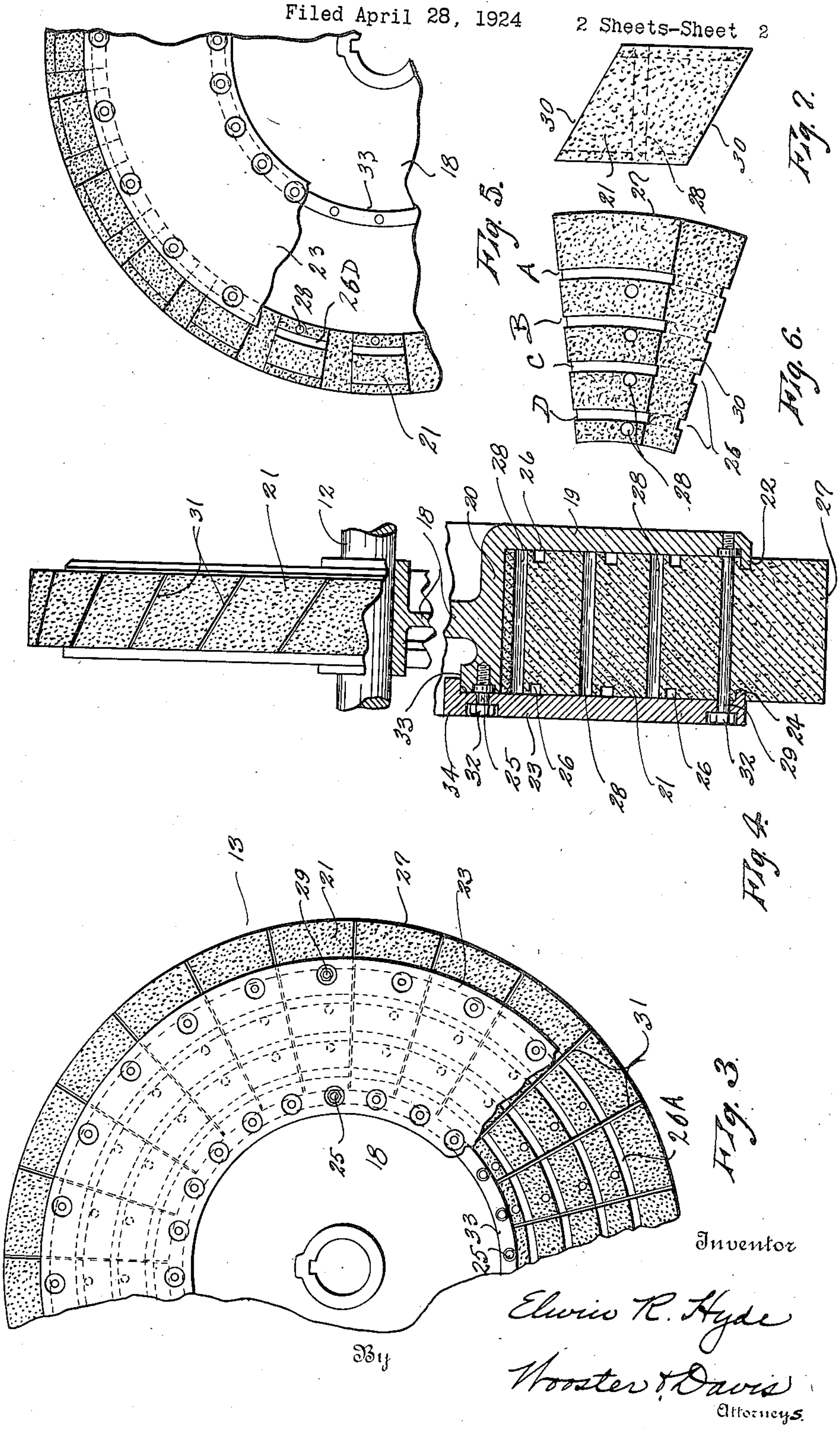

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UNITED STATES PATENT OFFICE.

ELWIN R. HYDE, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE BRIDGEPORT SAFETY EMERY WHEEL COMPANY, INCORPORATED, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF CONNECTICUT.

SECTIONAL GRINDING WHEEL.

Application filed April 28, 1924. Serial No. 709,446.

To all whom it may concern:

Be it known that I, ELWIN R. HYDE, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented a new and useful Sectional Grinding Wheel (Case A), of which the following is a specification.

This invention relates to grinding machines and especially to the grinding wheels therefor. It has for an object to provide a grinding wheel, especially of the type where the periphery is used as the grinding surface in which the proper surface speed may be maintained as the wheel wears down without increasing the speed of rotation of the wheel.

It is also an object of the invention to provide a wheel of this type which may be maintained at substantially the same diameter. It is a further object of the invention to provide a grinding wheel which may be renewed without removing the wheel shaft or spindle from the machine and so may be renewed and placed in grinding condition in a shorter time and with less expense, and it is a still further object of the invention to provide a grinding wheel in which a very small part of the grinding material is wasted, which wheel can be built of practically any diameter desired, and will operate much more economically and efficiently than the wheels now generally employed.

With these and other objects in view I have devised the construction illustrated in the accompanying drawings forming a part of this specification. In order to carry out the functions expressed and secure the objects enumerated I make the wheel of a plurality of independent blocks of grinding material and so mount these blocks that they may be adjusted radially of the wheel and secured in adjusted positions.

In these drawings,

Fig. 1 is an end elevation of a grinding machine showing my improved wheel applied thereto.

Fig. 2 is a front elevation thereof.

Fig. 3 is a side elevation of a portion of the wheel with portions broken away to more clearly show the construction.

Fig. 4 is a partial edge elevation and a partial section through the wheel, the section being on an enlarged scale to more clearly show the construction.

Fig. 5 is a side elevation of a portion of the wheel illustrating how practically the entire block may be utilized.

Fig. 6 is a side elevation of the block removed from the wheel, and

Fig. 7 is a view looking from the outer end thereof.

In grinding wheels as at present employed made in one piece only a certain portion of the wheel may be used for grinding purposes because after it is worn down the surface speed may be maintained only by increasing the rate of rotation of the wheel and this can be practically done only to a certain limit. It then becomes necessary to discard the wheel, which comprises a large block of the center of the original wheel, and mount a new wheel in the machine. This obviously requires waste of a large amount of grinding material. Furthermore, in large wheels it is difficult to make them sufficiently strong to resist the centrifugal forces involved in rapid rotation of the wheel, and in artificial wheels due to the large mass involved in a wheel made in one piece it is difficult to secure a wheel of uniform hardness because of the difficulty of uniform heating throughout the mass in the burning operation, and due to this non-uniform heating a large percentage of the wheels are broken in the kiln and are thus entirely useless. Also in the use of solid wheels they are usually mounted on a shaft by means of plates clamped to the outer sides thereof adjacent the centers so that the wheel is held only near the center and at considerable distance from the grinding surface.

Furthermore, when a solid wheel is used, in renewing it the entire wheel, including the shaft or spindle on which it is mounted, must be removed from the machine, a new wheel applied to the shaft and then remounted in the machine. The aligning of this shaft and the wheel is a delicate operation which requires considerable time, and especially is this true where ball or roller bearings are employed as is now common practice.

To obviate these difficulties I construct the wheel of a plurality of independent blocks of grinding material, the mass of any individual block being relatively small, and so mount these blocks that they may be adjusted radially of the wheel and secured in adjusted positions.

In Figs. 1 and 2, I have shown in outline a desirable form of mounting for grinding wheels comprising a base or pedestal 10 carrying suitable bearings 11 for the shaft or spindle 12 carrying the grinding wheel indicated as a whole at 13. As is the usual construction there is a bearing at each side of the wheel and these bearings may be either plain or of the ball or roller type, and are usually provided with caps 14 so that by removing these caps the wheel and shaft may be lifted vertically from the machine. In the present illustration the wheel is driven by an electric motor 15 mounted on the base and having driving connection with the wheel shaft 12 by any suitable driving means, such as a chain 16. The wheel is usually provided with a guard 17 to protect the operator. The specific construction of the wheel is shown in Figs. 3 to 7.

Mounted on the shaft or spindle 12 is a metal body member 18 which I call a plate although strictly speaking it is not a plate except that the outer portion 19 thereof which carries the grinding blocks is in effect a plate. This plate portion 19 extends in a plane substantially at right angles to the shaft and is a continuation of the rim portion 20 concentric with the shaft. The individual grinding blocks are indicated at 21 and they are so constructed as to be adjustable radially of the wheel toward and from its axis of rotation to maintain the proper diameter of the wheel. I have shown a simple and effective construction for doing this although other constructions may suggest themselves to those skilled in the art. For this purpose the plate 19 is provided with a laterally projecting flange or rib 22 on the inner wall thereof and preferably closely adjacent the outer periphery of this plate. Another plate or ring 23 is provided on the opposite sides of the grinding blocks 21 and has a similar flange or rib 24, and this plate is secured to the opposite side of the rim portion 20 by suitable bolts or studs 25. This plate or ring may be made in one piece or of a plurality of sections as desired. The heads of these bolts are preferably countersunk into the plate so that they will not project beyond the surface thereof to leave projections which might catch the clothing of the operator or other objects.

The individual grinding blocks 21 are provided on their opposite sides with a plurality of transverse grooves 26 spaced from each other and inwardly from the outer end 27 of the block. It is preferred to provide these grooves on both sides of the block as that will give a more secure fastening, but it may be found sufficient to provide them on one side only. These grooves are adapted to receive flanges or ribs 22 and 24 and the grooves are, therefore, made of the same radius as the flange. It is preferred to make these grooves and flanges curved as shown though of course, they may be made straight if found practical or desirable. The blocks are also provided with a plurality of openings 28 spaced radially thereof for passage of a securing and clamping bolt 29 which also is secured to the plates 19 and 23. It is preferred that the edge walls 30 extend substantially radially of the wheel and that they also be inclined to the plane of the side plates so that the joint 31 between two adjacent blocks will be oblique to the plane of the wheel, as shown in Fig. 4. The outer end 27 of the blocks are curved and form the periphery of the wheel which in the present case is used as the grinding surface. The blocks are made of such a width as to leave a space between the individual blocks at the joint 31 as the wheel operates better with this construction, the space at the joint forming a clearing space to allow chips to enter leaving the grinding surface free and unobstructed. To assist the bolts 25 and 29 to secure the plate 23 and hold the grinding blocks under centrifugal force, the rim portion 20 is provided with a shoulder 33 which is engaged by a flange 34 carried by the plate 33.

In operation it is intended that the wheel will be built up with the blocks in the position substantially as shown in Figs. 3 and 4, that is, the plate 23 is removed by loosening the nuts 32 and then the blocks are placed against the plate 19 with the flange or rib 22 in the outer groove 26 indicated as groove (A). The plate 23 is then placed in position with its flange or rib 24 in the corresponding groove (A) on the opposite side of the block and is clamped in position by the nuts 32. The wheel is now ready to be dressed and prepared for operation. When the projecting portions of the blocks have worn down to substantially the periphery of the plates 19 and 23 the plate 23 is again removed and the grinding blocks moved outwardly radially of the wheel with the flanges or ribs 22 and 24 in the next grooves (B), the clamping bolts 29 passing through the next opening 28. It will then be apparent that another section of each block is projected beyond the peripheries of the plates and the wheel is of practically the same diameter as it was when originally built. When the wheel again wears down to practically the peripheries of these plates the operation is repeated until the flanges or ribs 22 and 24 are in the inner groove (D), as shown in Fig. 5. Then after the projecting portions of the blocks are worn down the remainder is discarded and new blocks are mounted in the wheel.

It will be apparent that with this construction practically the entire amount of grinding material may be employed for the grinding operation, and that only a small portion thereof must be discarded or wasted. Also that the diameter of the grinding surface of the wheel is maintained substantially constant so that there is very little variation of the surface speed and it is not necessary to provide means for speeding up the wheel as it wears down to maintain the proper surface speed. This is of especial importance where individual electric drives are employed as is the tendency in modern practice. A. C. motors for sixty cycle electrical power supplies can be secured only in windings which give speeds of 900, 1200, 1800 or 3600 R. P. M. with none in between. Thus if a solid wheel is used, when it wears down we do not get the surface speed required.

It is further to be noted that the grinding blocks are held closely adjacent the grinding surface so there is very little danger of the wheel breaking as is the case where they are held only at a point adjacent the center of the wheel, which in a large wheel is at a considerable distance from the grinding surface. As the individual grinding blocks are of a relatively small mass it is a comparatively simple operation to make them of uniform hardness, as because of this relatively small mass a uniform heating may be secured in the heating operation. With this uniform heating there is very little breakage and, of course, if one block is broken in the kiln it is not necessary to discard the whole wheel as is the case where the wheel is made in one piece. This wheel can be built to practically any diameter desired, which is also a valuable feature. It is not practical to build solid emery wheels of too large a diameter for the reasons above noted. A diameter of about 30 inches is the limit.

Still further this construction simplifies the renewal of the wheels in the grinding machine, thus greatly reducing the time in which the wheel must be out of operation for this purpose. The renewing operation is a very simple one merely involving the removal of the plate 23, removal of the worn blocks, the insertion of new blocks, and then the replacing of the plate, all of which may be done without removing the wheel or its shaft from the machine, and thus no realigning of the shaft is required.

Having thus set forth the nature of my invention, what I claim is:

1. A grinding wheel comprising spaced side plates, a plurality of grinding blocks mounted between said plates and having convex outer ends forming the periphery of the wheel, coacting means carried by the plates and blocks for securing said blocks at different distances from the axis of rotation of the wheel, and means for clamping the plates against the sides of the block comprising a bolt for each block secured to the plates adjacent the peripheries thereof and extending through the block, each block having a plurality of transverse openings for said bolt spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

2. A grinding wheel comprising spaced side plates having circular flanges on the opposed walls thereof, a plurality of grinding blocks mounted between said plates and provided with spaced grooves on the side walls thereof to receive said flanges to determine the position of the blocks relative to the axis of rotation of the wheel and hold them in different radial positions, and means for clamping the plates against the sides of the blocks comprising a bolt for each block extending through the block and secured to the plates adjacent the peripheries thereof, each block having a plurality of transverse openings for said bolt spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

3. A grinding wheel comprising a side plate having a circular flange on one of the side walls thereof, a plurality of grinding blocks having a plurality of grooves in a side wall thereof and spaced from each other radially of the wheel, said grooves being of substantially the same radius as said flange, and means for clamping said blocks against the sides of the plate with said flange in one of the grooves.

4. A grinding wheel comprising spaced side plates having a circular flange on the opposed side walls thereof, a plurality of grinding blocks mounted between said plates and provided with a plurality of grooves in the side walls thereof spaced radially of the wheel, said grooves being of substantially the same radius as the flanges, said blocks being also provided with a plurality of holes extending laterally therethrough and spaced radially of the wheel, and bolts extending through some of said holes and the plates to clamp the plates against the sides of the blocks.

5. A grinding wheel comprising spaced side plates each having a circular flange on the opposed side walls thereof, a plurality of grinding blocks mounted between said plates and provided with a a plurality of grooves on the opposite side walls thereof spaced radially of the wheel and of substantially the same radius as said flanges, the outer ends of the blocks being convex and forming the periphery of the wheel, the opposite edge

walls of the blocks being inclined to the plane of the wheel, and means for securing the plates together and clamping them against the side walls of the blocks with the flanges in certain of said grooves.

6. A grinding wheel comprising a side plate, a plurality of grinding blocks, each block being provided with a plurality of transverse grooves on a side wall thereof spaced from each other radially of the wheel, said plate being provided with a laterally extending flange adapted to extend in said grooves to hold the blocks in different radial positions on the plate, and means for clamping the blocks to the plate with the flange in any groove desired comprising a bolt for each block secured to the plate adjacent the periphery thereof and extending through the block, each block having a plurality of transverse openings for said bolt spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

7. A grinding wheel comprising a side plate having a circular flange on one of the side walls thereof, a plurality of grinding blocks having a plurality of grooves in a side wall thereof and spaced from each other radially of the wheel, a plate on the other side of the blocks, and means for clamping the blocks between the plates with said flange in one of the grooves, said means comprising a bolt extending through each block and secured to the plates adjacent the outer peripheries thereof, the blocks being each provided with a plurality of transverse openings spaced from each other radially of the block for passage of the bolts in different positions of the blocks, the outer opening being in a section of the block which is eventually worn off in use.

8. A grinding block forming a section only of a circular wheel, whose outer end is a convex curve, the edge walls of which extend substantially radially of the curve, and which is provided with a plurality of transverse grooves in a side wall thereof spaced from each other radially of the said curve, said block being provided with a plurality of transverse bolt openings therethrough spaced from each other radially of the curve and with the outer opening in a section of the block which is eventually worn off in use.

9. A grinding block whose outer end is a convex curve and which is provided with a plurality of curved grooves in a side wall thereof spaced from each other radially of said curve, and which grooves have substantially the same radius.

10. A grinding block whose outer end wall is a convex curve, whose edge walls extend substantially radially of said curve, and whose side walls are provided with a plurality of transverse grooves spaced from each other radially of said curve, said block being provided with a plurality of transverse bolt openings therethrough spaced from each other radially of said curve and with the outer opening in a section of the block which is eventually worn off in use.

11. A grinding wheel comprising spaced side plates, a plurality of grinding blocks mounted between said plates and having convex outer ends forming the periphery of the wheel, coacting means carried by the plates and blocks for securing said blocks at different distances from the axis of rotation of the wheel, and means for clamping the plates against the sides of the blocks comprising bolts secured to and extending between the plates adjacent the peripheries thereof.

12. A grinding wheel comprising spaced side plates having circular flanges on the opposed walls thereof, a plurality of grinding blocks mounted between said plates and provided with spaced grooves on the side walls thereof to receive said flanges to determine the position of the blocks relative to the axis of rotation of the wheel, and means for clamping the plates against the sides of the blocks in different radial positions comprising bolts secured to and extending between the plates adjacent the peripheries thereof.

In testimony whereof I affix my signature.

ELWIN R. HYDE.