Dec. 26, 1922. 1,440,338

E. BUSWELL.

METHOD OF FORMING OR TRUING UP THE PERIPHERIES OF GRINDING WHEELS.

FILED MAR. 4, 1919.

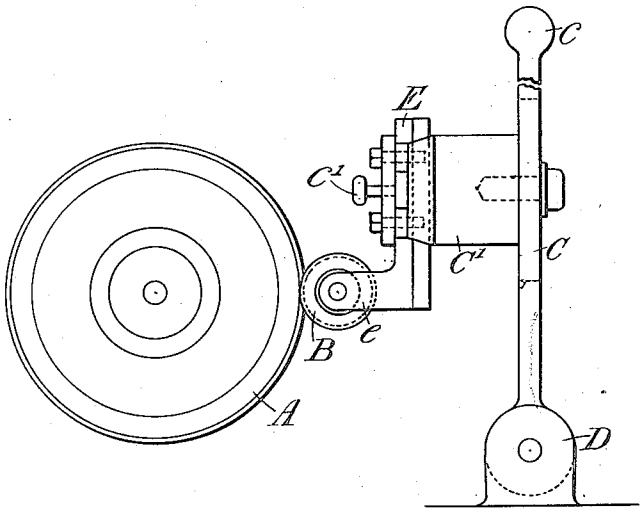


Fig. 1.

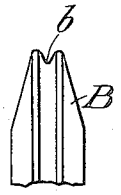


Fig. 2.



Fig. 3.

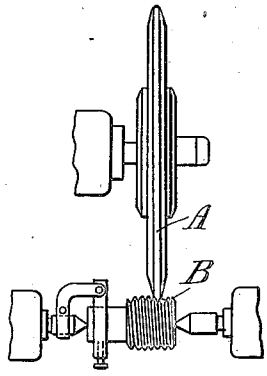


Fig. 4.

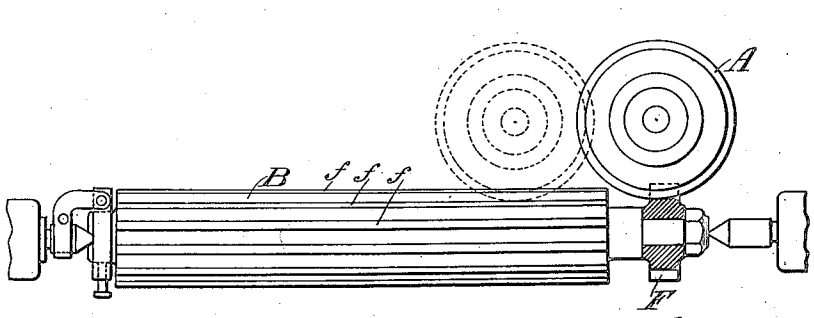


Fig. 5.

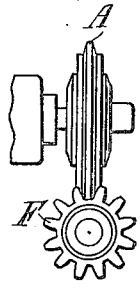


Fig. 6.

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UNITED STATES PATENT OFFICE.

EDWIN BUSWELL, OF BIRMINGHAM, ENGLAND.

METHOD OF FORMING OR TRUING UP THE PERIPHERIES OF GRINDING WHEELS.

Application filed March 4, 1919. Serial No. 280,558.

To all whom it may concern:

Be it known that I, EDWIN BUSWELL, a subject of the King of Great Britain, and residing at Birmingham, in the county of Warwick, England, have invented certain new and useful Improvements in Methods of Forming or Truing Up the Peripheries of Grinding Wheels, whereof the following is a specification.

According to this invention, the grinding surface of a grinding wheel of a type which is made of carborundum, or other hard abrading material, bonded by a medium which is capable of change of form under pressure, is formed by pressing against the periphery of such wheel a tool surface which is shaped to the reverse of the required grinding surface, the grinding wheel rolling against such surface of the tool. The character of the material of the grinding wheel ensures that the surface thereof which is pressed against by the tool will change to a shape corresponding to the shape of the bearing surface of the tool, but owing to slight resilience of the material of the grinding wheel the shape of the surface of this wheel which has been pressed against by the tool will not be the identical counterpart of the corresponding surface of the tool, and this must be allowed for in preparing such surface of the tool. The tool can be used also for truing up the grinding wheel after the same has become worn.

The invention is more particularly described with reference to the drawings herewith, of which:—

Figure 1 shows in elevation a forming tool applied to the periphery of a grinding wheel in accordance with this invention, the view being taken as looking towards one side of the forming tool and grinding wheel, and showing the means by which the forming tool may be pressed towards the periphery of the grinding wheel and moved back therefrom.

Figure 2 is an enlarged edge view of the upper portion of a forming tool which is adapted to form the edge of the grinding wheel to the sectional shape suited for grinding the root of a screw-thread.

Figure 3 is a corresponding view to Figure 2, but shows the periphery of the forming tool to be of a sectional shape for forming the periphery of the grinding wheel to the sectional shape required for grinding the crest of a screw-thread.

Figure 4 is a plan view of an application of the invention in which the forming tool is formed with its operative surface as a spiral or screw-thread.

Figure 5 is a front elevation of an application of the invention in which the grinding wheel is used for grinding out the roots of the teeth of a pinion; and,

Figure 6 is an end view of the parts shown by Figure 5, with the poppet and back centre shown by Figure 5 omitted.

Referring first to Figure 1, A is a grinding wheel, and B a revolving tool or spinning wheel which is used to give the required sectional shape to the periphery of the grinding wheel. C is a lever, the lower end of which is pivotally connected with a fixed support D and the upper end of which is formed with a handle *c*. A block C′ projects from the forward face of the lever, and a vertical slider E may be slidden into any desired position vertically within guides at the front of the block C′ and then be clamped tightly to the block, such as by a screw *c*′. The lower end of the slider E is formed with a pair of jaws *e* between which is mounted the spinning wheel B. The grinding wheel A revolves in a suitable grinding lathe, and the spinning wheel B is brought up against the periphery of the grinding wheel by moving the lever C forwards towards the grinding wheel.

In Figure 2 the periphery of the spinning wheel B is shown to be formed with a groove *b*, and this groove is of a shape in transverse section to form the periphery of the grinding wheel of the required V-shape for grinding the root of a V-shaped thread, or the root and the slopes of such a thread; and in Figure 3 the periphery of a spinning wheel is shown to have a V-shaped formation *b*′ which will form in the periphery of a grinding wheel a V-shaped groove suitable for grinding the crest of a V-shaped thread. As above indicated, however, the slight resilience of the material of the grinding wheel must be allowed for in shaping the periphery of the forming wheel.

Referring now to Figure 4, A is the grinding wheel, and B a spinning wheel the periphery of which is formed as a spiral thread of which the section of the space between the spirals is such as to give to the periphery of the grinding wheel the required sectional shape for grinding out the root, or the slopes and root, of the screw thread which it is re-

quired to grind. The grinding wheel A may be driven in a lathe and drag round the spinning wheel B, but, preferably, the spinning wheel is itself driven and drags round the grinding wheel, and in either case the grinding wheel or, preferably, the spinning wheel, is automatically moved endwise so as to ensure that the thread of the spinning wheel will constantly maintain the same relation to the periphery of the grinding wheel, that is to say, either the grinding wheel or the spinning wheel will move endwise the pitch of the thread for each revolution of the spinning wheel; and, of course, there must be maintained sufficient pressure between the grinding and spinning wheels to ensure that the periphery of the grinding wheel will fill into the space between the coils of the thread. This last-mentioned requirement is most conveniently accomplished by mounting the spinning wheel in a carriage which is movable towards the grinding wheel. It will be obvious that the thread of the spinning wheel may be formed and utilized in pressing into the periphery of the grinding wheel to form a groove therein of a section which will adapt it to grind the crest of a screw-thread, instead of the root, or slopes and root, of a screw-thread. By forming the operative surface of the spinning wheel as a spiral the wheel may be made of quite small diameter and yet provide an operative surface running thereround which is as long or longer than the entire circuit of the periphery of the grinding wheel, thereby combining the advantage of a wheel of small diameter, in respect of the bearing against the periphery of the grinding wheel, with the advantage, in respect of wear, of a wheel of large diameter of which the length of the circumference is not less than that of the circumference of the grinding wheel. The spiral around the spinning wheel B may commence at one end slightly less than its full size in section or diameter and gradually increase to its full size or diameter towards the other end, whereby the formation of the periphery of the grinding wheel is effected more gradually than would otherwise be the case; but if thus formed there should be a sufficient length of it of full formation to act against the periphery of the grinding wheel throughout not less than an entire revolution of such wheel.

Referring now to Figures 5 and 6, A is the grinding wheel, which is shown in position grinding through between two of the teeth of a pinion F. The pinion is fixed upon a mandrel B within the surface of which, and running lengthwise thereof, are sunk a number of parallel grooves *f*, which are pitched apart exactly as are the spaces between the teeth of the pinion and are, respectively, in alignment with such spaces and are each of a transverse section which, if the periphery of the grinding wheel is rolled along therein, will form such periphery to the shape required for grinding out metal from between two of the teeth of the pinion. The mandrel and pinion may be together moved endwise to engage one of the grooves *f* of the mandrel with the periphery of the grinding wheel and cause such wheel to roll along the groove while the grinding wheel is pressed against the mandrel or the mandrel is pressed against the grinding wheel. The grinding wheel is shown by a broken circle Figure 5, as having entered some distance along one of the grooves *f*. After the periphery of the grinding wheel has been truly formed by one of the grooves *f*, it may be moved into position in which it is clear of such groove and of the pinion, and then the mandrel and pinion may be turned an angular distance corresponding to a common pitch of the pinion teeth and the grooves *f*, to enable the grinding wheel to grind through another space between teeth and to be trued up by the groove *f* which will be in alignment with such space, and so on for all the remaining spaces between teeth of the pinion. The mandrel must, of course, be of such length as to allow the whole periphery of the grinding wheel to be truly formed as it rolls along a groove *f*, and conveniently the mandrel is travelled axially to cause the grinding wheel to roll along a groove. The mandrel may carry a number of pinions which have the same diameter and pitch of teeth; and the form of the invention described with reference to Figures 5 and 6 may be applied to forming or truing up grinding wheels for grinding articles of an analogous character to pinions.

It will now be obvious that a length of mandrel or bar having a single forming surface, or a plurality of forming surfaces, formed therealong, may be used for truly shaping the periphery of a grinding wheel used for grinding articles other than pinions and articles analogous thereto.

The forms of the invention described with reference to the drawings are given simply by way of example.

Having fully described my invention, what I claim and desire to secure by Letters Patent, is:—

1. The method of forming or truing up after wear the periphery of a grinding wheel of which the substance consists of hard abrading material, bonded by a medium which is capable of change of form under pressure, according to which the said periphery is caused to roll under pressure against a prepared surface which is substantially the reverse in cross section of the required periphery of the grinding wheel.

2. A method of forming or truing up after wear the periphery of a grinding

wheel which is to be used for grinding a screwthread and of which the substance consists of hard abrading material bonded by a medium which is capable of change of form under pressure, according to which the said periphery is caused to roll under pressure against a spinning wheel which has a spiral periphery of the pitch of the thread to be ground and formed as a reverse in cross section of the periphery of the grinding wheel, said spinning wheel during the rolling operation being caused to move axially in relation to the grinding wheel.

In witness whereof I have hereunto signed my name this 12th day of February 1919, in the presence of two subscribing witnesses.

EDWIN BUSWELL.

Witnesses:
SYDNEY J. YOUNG,
KATHLEEN M. THOMPSON.