June 30, 1925. 1,544,332

F. A. MANCE

MEANS FOR DETERMINING THE RELATIVE HARDNESS OF ABRASIVE OR SIMILAR SUBSTANCES

Filed Jan. 18, 1922

Fig.-1

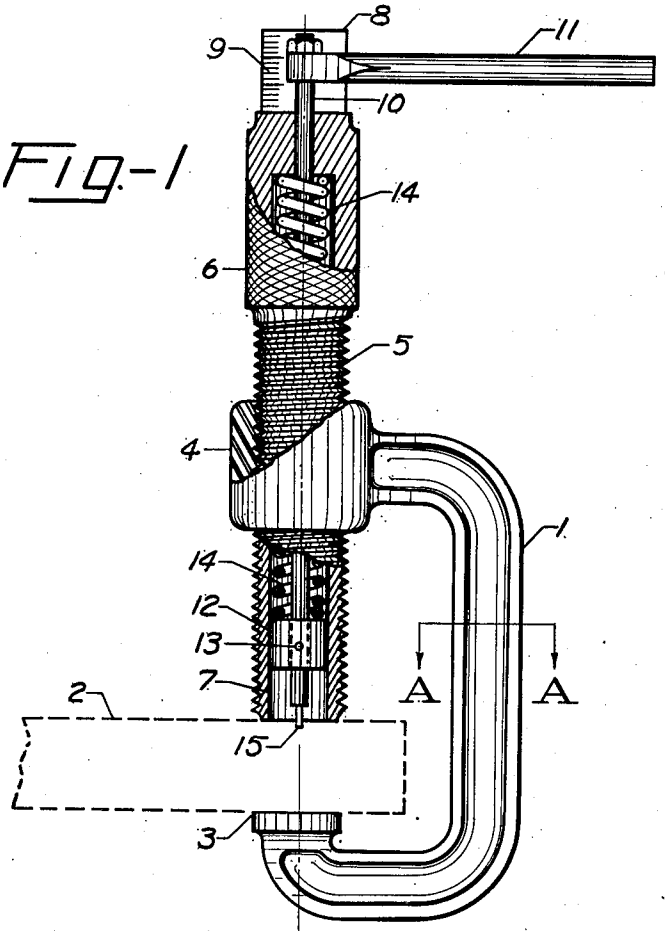


Fig.-4

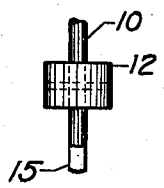


Fig.-2

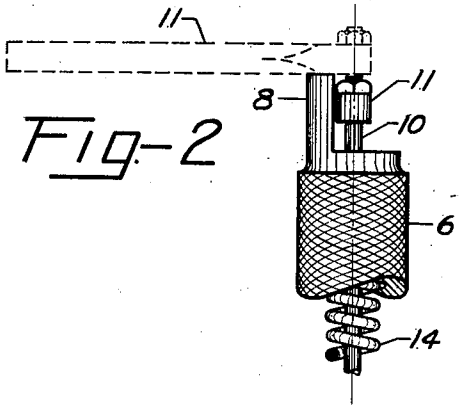
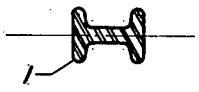


Fig.-3



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MEANS FOR DETERMINING THE RELATIVE HARDNESS OF ABRASIVE OR SIMILAR SUBSTANCES.

Application filed January 18, 1922. Serial No. 530,110.

To all whom it may concern:

Be it known that I, FRANK A. MANCE, a citizen of the United States of America, and resident of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Means for Determining the Relative Hardness of Abrasive or Similar Substances, of which the following is a specification.

This invention relates to means for accurately grading abrasive or grinding wheels according to their hardness.

Different metals and different operations on the same metal require grinding wheels of different grain size and hardness in order to secure the greatest economy in the cost of grinding. The grain of a wheel is determined by the grain size from which the wheel is made and is marked on the wheel by the maker. The hardness of the wheel however varies under different conditions and its determination is considerably more difficult.

Heretofore the only machines available for this purpose were used by the manufacturers of the grinding wheels for grading master wheels. Because of their relatively high cost the users of the wheels were unable to own one. In the absence of such a machine it has been the custom for the user to grade his wheels by hand and judgment by the so-called "master wheel" method. In such a case the procedure is for a workman to take a pointed tool, such as a screwdriver, and by pushing the point against the wheel and rotating the tool back and forth, work the point into the wheel. The relative penetration of the tool into this wheel as compared to a standard grade of wheel was the only basis of comparison the workman had, and was entirely a mental comparison. The workman may vary the pressure on the tool unconsciously and his judgment as to the penetration may vary in the same way. It is evident that this is a very unreliable way of testing wheels.

I have devised a tool for grading grinding wheels which can be made at a comparatively low cost, whereby the human element is largely eliminated. Altho the same general scheme of relative penetration is used, my device is such that the pressure on the tool point is kept substantially constant by a spiral spring for all wheels and the penetration is read off directly on a scale.

My device consists substantially of the elements shown in the accompanying drawing in which:

Figure 1 is partially sectional side view of my device.

Figure 2 is a fragmentary view of the upper part of the screw member and accompanying parts turned ninety degrees from the view of Figure 1.

Figure 3 is a section of the yoke member taken on the line A—A of Figure 1.

Figure 4 is a fragmentary view of the cutting point and some associated parts turned ninety degrees from the view in Figure 1.

1 is a yoke or frame which is placed over a grinding wheel 2. The yoke 1 has a seat 3 upon which the grinding wheel 2 is placed. The upper end of the yoke 1 is provided with a nut 4 into which a screw member 5 is threaded. The screw member 5 is provided with a knurled portion 6 for convenience of manually operating the same. The screw member 5 has an opening 7 therein extending from the bottom to a point near the top, from which point a smaller opening passes up thru the top. The upper end 8 of the screw member 5 above the knurled portion 6 is machined off as shown in Figures 1 and 2 and is provided with a scale 9 as shown in Figure 1 for purposes which will be evident later.

A rod 10 capable of passing thru the small upper opening in the screw member 5 is inserted therein. At its upper end it has a handle or lever 11 fastened securely to it so as to be rotated thereby. Near its lower end it has a collar 12 fastened to it by a pin 13. The collar 12 fits the opening 7 freely, allowing movement of the collar 12, keeping the rod centered in the opening 7, and providing a seat for the expansion spring 14. The spring 14 surrounds the rod 10 and seats at the top of the large opening 7, and on the collar 12 as explained. The end of the rod 10 is provided with a cutting point 15, which is preferably replacable and which may be made any shape and of any material which may be deemed advisable altho I have shown but one construction in Figures 1 and 4. The screw member 5 with its related parts is assembled so that the spring 14 has an initial tension tending to cause the point 15 and rod 10 to protrude from the opening 7.

In operation the handle 11 is pulled outwardly against the force of the expansion spring 14 and is turned and seated on the end 8 of the screw member 5 as shown in dotted lines in Figure 2. A grinding wheel 2 is placed upon the seat 3 of the yoke 1 and the screw member 5 is threaded in nut 4 until its lower end seats on the grinding wheel 2 and holds the same firmly against the seat 3. The handle 11 is then turned until it slips off of the seat 8, the expansion spring 14 acting thru the collar 12 and rod 10, driving the point 15 against the wheel 2. This is done to establish an initial seat on the grinding wheel 2 for the point 15. The height of the handle 11 in relation to the screw member 5, which is identical to the relation of the point 15 to the wheel 2, is then read on the scale 9 as an initial reading. The handle 11 is then oscillated back and forth a specified number of times, the end 8 of the screw member 5 forming stops for the movement thereof, the point 15 being pressed against the wheel by the spring 14. This causes the point to penetrate the wheel 2. By again reading on the scale 9 the position of the handle 11 in relation to the screw member 5 as compared to the initial reading of the same, and by subtracting the one reading from the other, the penetration of the point 15 into the wheel 2 is obtained in the scale units. This penetration is then compared to the penetration on a set of master wheels due to an identical operation and the wheel allocated to its proper class of hardness. As the initial impinging force of the point 15 against the wheel 2, the resultant pressure of the point 15 against the wheel 2, and the arc of oscillation of the point 15 as determined by the stops offered to the handle 11 by the end 8 of the screw member 5, is identical in all cases, an extremely accurate comparison may be made between grinding wheels as to their hardness.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. A device for testing the degree of resistance offered by a substance to the operation of a cutting tool, which consists in the combination of a seat for the substance and a tool having a cutting surface; means for driving said tool into contact with said substance when supported on said seat with a predetermined degree and quality of driving force; means for gaging the extent of the penetration of the tool into the substance; means to maintain on said tool, after said initial operation, a constant and uniform pressure; means to cause said tool under such pressure to operate on said substance with a cutting action; and means for gaging the extent of the penetration of the tool under predetermined conditions and time of operation.

2. A device for testing the resistance of grinding wheels to the operation of a cutting tool, which consists in a suitable support for the substance to be tested, a cutting tool suitably mounted to be driven against the material, means for driving the tool against the substance with a predetermined force to cause the tool to penetrate the substance and means for measuring the degree of penetration of the tool into the substance, means for holding the tool in contact with the substance, and at the same time operating the tool to cut the substance for a predetermined time, and means for measuring the degree of penetration of the tool into the substance during such period of operation.

3. In a device for determining the relative hardness of an abrasive substance or the like, a yoke having a seat thereon for said substance, a screw member threaded in said yoke opposite said seat and substantially perpendicular to it capable of holding said substance firmly on said seat, a rod in said screw member having a cutting point at one end thereof and a handle at the other end securely fastened thereto for maunally causing movement of said rod and cutting point, spring means for causing said point to press against said substance, and means for determining the amount of penetration of said point into said substance.

4. In a device for determining the relative hardness of an abrasive or similar substance, a surface affording a seat for said substance, a member capable of securely holding said substance on said seat, a rod having a cutting point at one end thereof positioned within said member and capable of axial and angular movement, means whereby axial or angular movement may be given to said rod, means for providing an initial seat for said cutting point on said substance, spring means for pressing said cutting point against said substance, and means whereby the amount of penetration of said cutting point into said substance may be determined.

5. In a device for determining the relative hardness of an abrasive or similar substance, a yoke having a seat thereon for said substance, a nut on said yoke opposite said seat having its axis substantially central with and perpendicular to said seat, a screw member capable of being threaded into said nut and capable of holding said substance on said seat, a rod positioned in said screw member having a cutting point at one end thereof normally pressing against said substance and capable of axial or oscillatory

movement, a handle on said rod for causing axial or oscillatory movement thereof, spring means for driving said cutting point against said substance, said spring means driving said cutting point against said substance with an equal force in all cases, and scale means for determining the relative position of said cutting point in relation to said substance.

6. In a device for determining the relative hardness of an abrasive substance or the like, a yoke having a seat thereon for said substance, a nut on said yoke, a screw member threaded in said nut capable of holding said substance on said seat, a rod positioned in said screw member capable of axial and rotatable movement, having at one extremity a detachable cutting point and at the other end thereof a handle for causing movement of said rod, stops positioned to limit the rotation of said rod, a seat on said screw member to hold said cutting point away from said substance when said device is not in operation, spring means to drive said cutting point against said substance when said handle is turned off of said seat on said screw member and to press said cutting point against said substance, and a scale positioned to show changes in position of said cutting point.

7. A device for testing hardness comprising a seat for the substance; a cutting tool; means for holding the tool out of contact with the substance or releasing said tool; means for causing the tool to maintain uniform pressure upon the substance when released; means by which to actuate the tool to cut the substance; and means for gaging the penetration of the tool into the substance.

8. A device for testing hardness comprising a seat for the substance; a cutting tool; means for holding the tool out of contact with the substance; means for causing the tool to maintain uniform pressure upon the substance; means by which to actuate the tool to cut the substance; fixed stops for limiting the movements of the actuating means; and means for gaging the penetration of the tool into the substance.

9. A device for testing hardness comprising a seat for the substance; a cutting tool; means for holding the tool out of contact with the substance; means for causing the tool to engage the substance with a predetermined impact and, while cutting, to maintain uniform pressure upon the substance; means by which to actuate the tool to cut the substance; and means for gaging the penetration of the tool into the substance.

10. A device for testing the hardness of substances, comprising a frame having a rigid seat and an adjustable jaw for clamping the substance to the seat, a cutting tool, and means to force said cutting tool into contact with said substance, means to actuate said tool in contact with the substance, and means for gaging the penetration of the tool into the substance.

11. A device for testing the hardness of substances, comprising a frame having a rigid seat and an adjustable tubular jaw for clamping the substance against the seat, a cutting tool mounted within said tubular jaw, and means to press said cutting tool into contact with the substance to establish an initial seat for the tool upon the substance, means by which to actuate the tool to cut the substance, and means for limiting the movement of the tool, and means for gauging the penetration of the tool into the substance.

12. A device for testing hardness comprising a rigid frame having a seat for the substance; an adjustable, hollow jaw operating in the frame for clamping the substance upon the seat; a cutting tool having an elongated stem operating within and through the jaw; a spring within the jaw and surrounding the stem for forcing the tool upon the substance for an initial seat and for yieldingly holding the tool, while cutting, upon the substance; and means for holding the tool elevated and limiting the movement of the tool while cutting including a handle for manipulating the tool.

13. A device for testing hardness comprising a rigid frame having a seat for the substance; an adjustable jaw operating in the frame for clamping the substance upon the seat; a cutting tool having an elongated stem; a spring surrounding the stem for forcing the tool upon the substance for an initial seat and for yieldingly holding the tool, while cutting, upon the substance; and means for limiting the movement of the tool while cutting including a handle for manipulating the tool.

Signed by me at Detroit, Michigan, U. S. A., this 10th day of January, 1922.

FRANK A. MANCE.

Witnesses:
ELMER L. MCINTYRE,
HODGSON S. PIERCE.