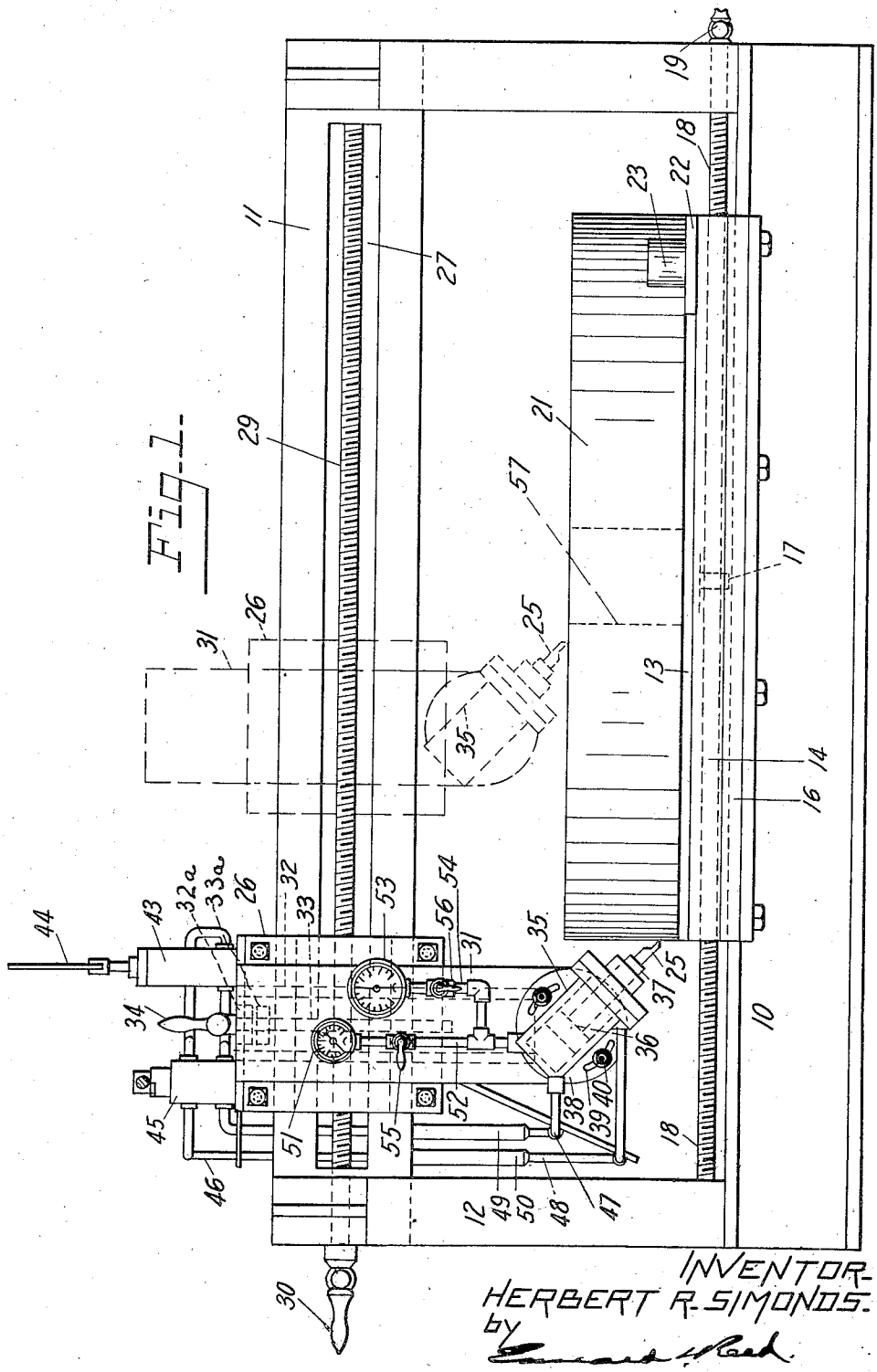
May 5, 1936. H. R. SIMONDS 2,039,563

METHOD AND APPARATUS FOR TESTING GRINDING WHEELS AND THE LIKE

Filed May 20, 1935 3 Sheets-Sheet 1



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METHOD AND APPARATUS FOR TESTING GRINDING WHEELS AND THE LIKE

Filed May 20, 1935 3 Sheets-Sheet 2

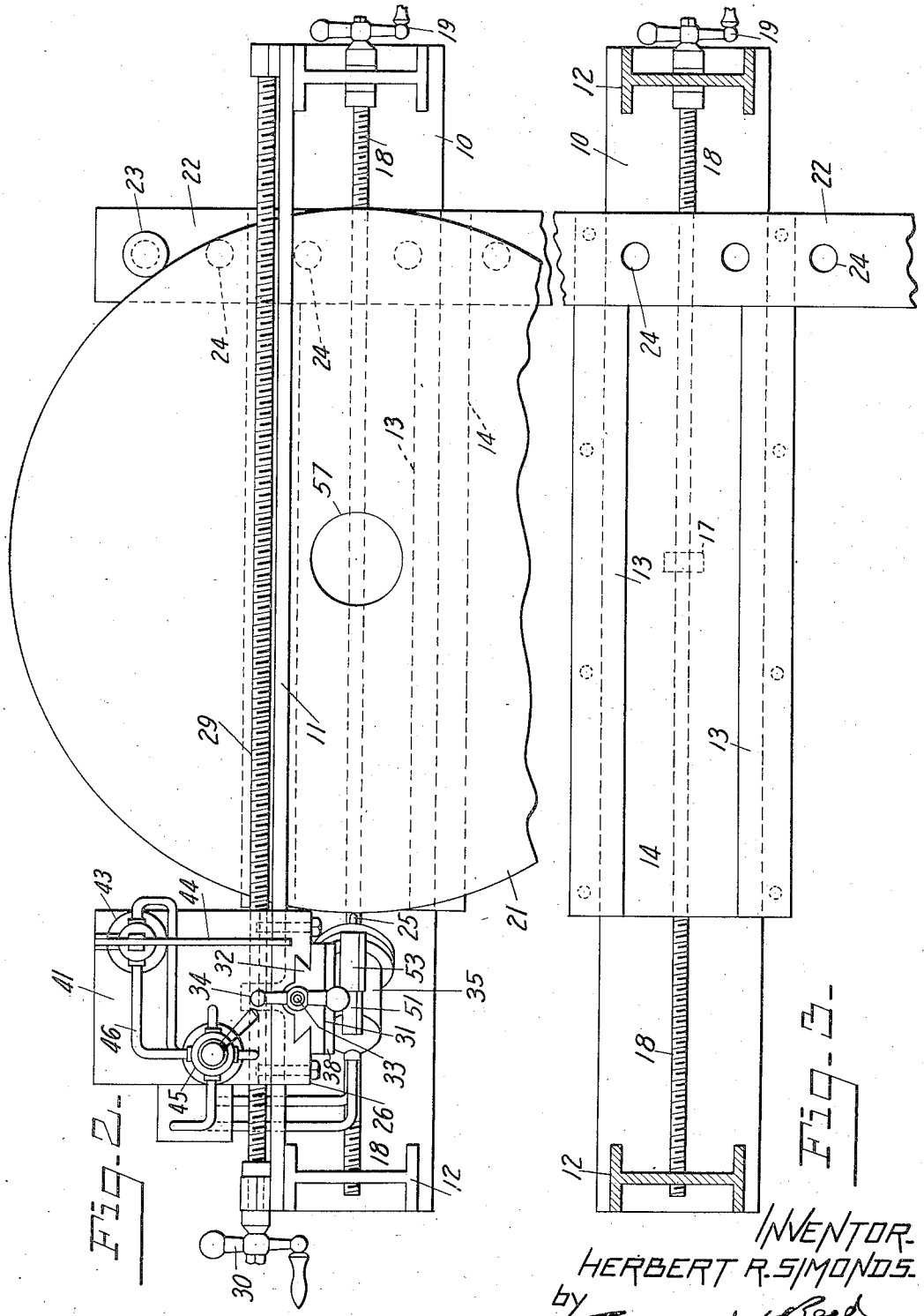


FIG. 2.

FIG. 3.

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Filed May 20, 1935 3 Sheets-Sheet 3

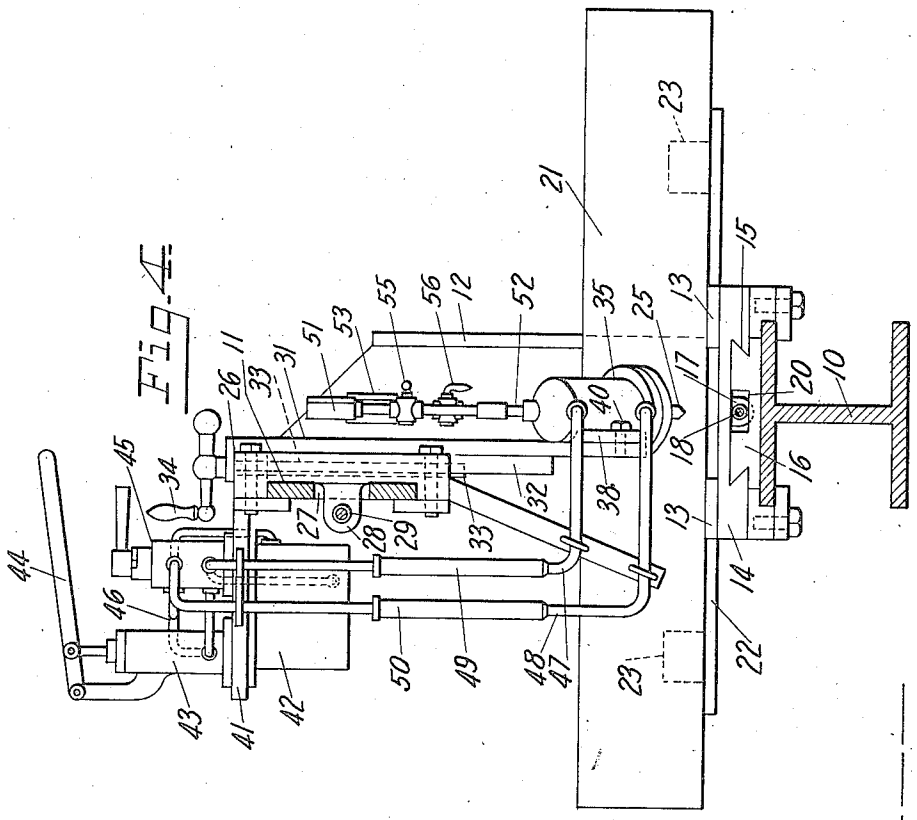


Fig. 4

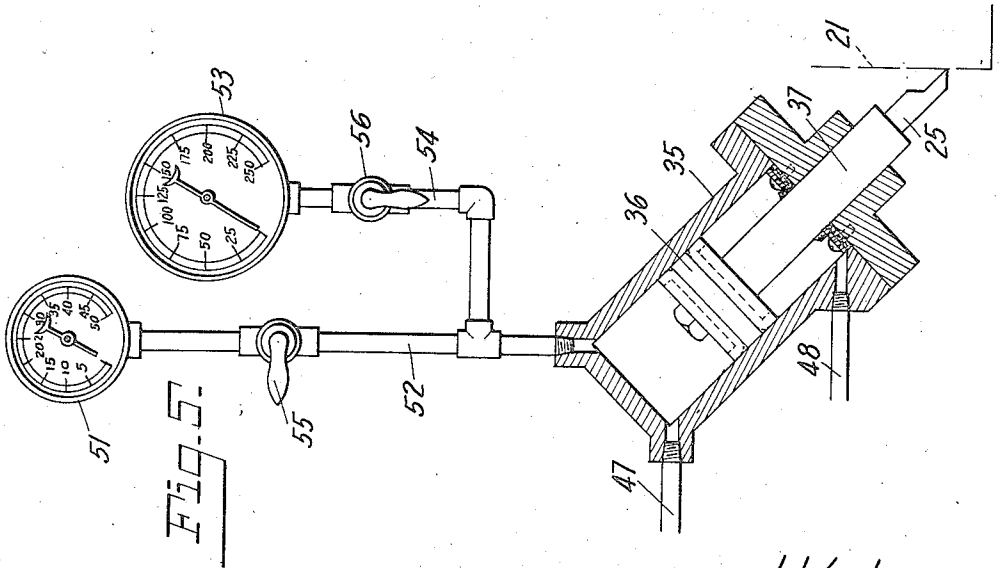


Fig. 5

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UNITED STATES PATENT OFFICE

2,039,563

METHOD AND APPARATUS FOR TESTING GRINDING WHEELS AND THE LIKE

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Application May 20, 1935, Serial No. 22,421

19 Claims. (Cl. 265—14)

This invention relates to a method and apparatus for testing grinding wheels and the like. Grinding wheels are usually formed from a plastic mass comprising a granular substance of extreme hardness and a binder. The mass is subjected to pressure to impart thereto the desired form and density and is then baked or otherwise treated to harden the binder and convert the plastic mass into a solid mass. The strength of the grinding wheel so formed depends in a large measure upon the sufficiency of the binder and the resistance which it offers to breaking strains. While the method and apparatus have been designed primarily for testing grinding wheels they may be utilized in testing other articles more or less similar in character and the term "grinding wheel" as herein used is intended to include any article capable of being tested in the manner herein described.

One object of the invention is to provide a simple and efficient method of testing the breaking strength of the binder and hence the strength of the wheel.

A further object of the invention is to provide such a method which will not seriously mar or destroy the usefulness of the wheel.

A further object of the invention is to provide a simple easily operated apparatus for performing such a method.

A further object of the invention is to provide an apparatus for applying progressively increasing pressure to a selected portion of the grinding wheel and for measuring and indicating the pressure so applied.

A further object of the invention is to provide such an apparatus which will be adjustable to enable it to act on different parts of a grinding wheel and to accommodate it to grinding wheels of different sizes.

Other objects of the invention will appear as the method and apparatus are described in detail.

In the accompanying drawings Fig. 1 is a side elevation of an apparatus embodying my invention; Fig. 2 is a plan view of such an apparatus showing a grinding wheel in position and partly broken away; Fig. 3 is a plan view of the wheel support, partly broken away; Fig. 4 is an end elevation of the apparatus with the main supporting frame in section; and Fig. 5 is a detail sectional view of the tool operating device.

The method, in its simplest form, comprises subjecting a portion of the grinding wheel, preferably an edge portion thereof, to pressure in a direction tending to break said edge portion from the body of the wheel and gradually increasing the pressure thereon until said edge portion breaks away from the body of the wheel or until it has withstood the predetermined pressure without breaking. The pressure applied to the tool is measured and indicated to inform the operator at all times as to the pressure on the wheel.

The apparatus for carrying out the method may take various forms and that here shown has been chosen for the purpose of illustration only. This particular apparatus is designed for testing wheels differing greatly in size and it is adjustable to accommodate it to wheels of different sizes and to enable the breaking tool to operate upon a selected portion of the wheel. It consists briefly of means for supporting the wheel to be tested in a fixed plane and for so supporting the breaking tool that it may be caused to engage a surface of the wheel at a point spaced from the edge thereof, and for applying pressure to the tool in a direction which will tend to break an edge portion of the wheel from the body thereof. It is preferable that the wheel should be supported in a substantially horizontal plane while it is being tested and that form of apparatus here illustrated comprises a main supporting frame having a lower frame member or beam 10 and an upper frame member or beam 11 arranged above and substantially parallel with the lower frame member and, in the present instance supported by upright standards 12. The wheel to be tested is supported on the lower frame member 10 which is provided with means for supporting the wheel in proper position thereon and for holding the same against movement during the testing operation. In order that wheels of different sizes may be supported upon the frame member and may be adjusted lengthwise thereof I have provided a wheel support which is mounted on the frame member 10 and is adjustable lengthwise thereof. In the construction shown this wheel support comprises two parallel members or bars 13 spaced one from the other and arranged lengthwise of the frame member. These bars may be rigidly connected one to the other and movably supported upon the frame member in any suitable manner and, in the present instance, they are rigidly connected one to the other by one or more transverse guide blocks 14 provided with a dovetailed groove 15 adapted to receive a dove-tailed block 16 which is rigidly secured to the frame member 10. Longitudinal movement may be imparted to the wheel support in various ways but preferably the guide member 14 is provided with a lug 17 depending therefrom and having a screw threaded aperture to receive a longitudinal

screw 18 mounted on the frame and provided at one end with an operating handle 19, the stationary guide block 16 being provided with a longitudinal groove 20 in which the screw 18 is located. The wheel support is provided at one end with means for limiting the movement of the wheel, which is shown at 21, lengthwise of the frame. Further, the longitudinal portion of the support, comprising the parts 13, is relatively narrow and in order to adequately support a wheel of large diameter thereon it is provided at one end with a cross bar 22 which projects beyond the respective sides thereof and forms part of the support for the wheel, as shown in Fig. 2. The means for limiting the movement of the wheel lengthwise of the support comprises a stop or stops projecting above the surface of the wheel support and arranged to engage the peripheral edge or face of the wheel and preferably there are two of these stops spaced apart to engage the periphery of the wheel on opposite sides of the center of the support, thus tending to prevent any twisting of the wheel as well as to prevent its longitudinal movement. As here shown, these stops are in the form of studs 23 mounted in the cross bar 22, the latter being provided with a plurality of openings 24 on each side of the center of the wheel support and the studs being removable so that they may be inserted in selected openings 24 to accommodate the same to the diameter of the wheel.

The tool is so mounted with relation to the wheel support that it may be caused to engage the surface of the wheel at a selected distance from the edge thereof and means are provided for exerting pressure on this tool at an inclination to said surface and toward said edge. The tool, one form of which is shown at 25, may be of any suitable character which will tend to break the binder rather than to cut the same and the means for operating the tool may take various forms but I prefer to employ a fluid operated device for this purpose. In the present construction the tool and its operating device are mounted for adjustment with relation to the wheel support and are supported by a carriage 26 which is slidably mounted on the upper frame member 11, the latter being here shown as a flat bar arranged edgewise and provided with a longitudinal slot 27. A lug 28 extends rearwardly from the carriage through the slot 27 in the frame member and is provided with a screw threaded aperture to receive a screw 29 extending lengthwise of the frame member and provided at one end with an operating handle 30, whereby the carriage and the parts carried thereby may be adjusted lengthwise of the frame member. Mounted on the carriage is a tool support which, in the present instance, is vertically adjustable and is shown as a plate 31 having a dove-tailed guide 32 slidably mounted in a correspondingly shaped groove in the face of the carriage 26. The guide 32 is provided with a lug 32*a* having an aperture to receive a vertical screw 33 which is held against longitudinal movement in the lug and is mounted in a nut 33*a* rigid with the carriage. The screw has at its upper end an operating handle 34 whereby the tool support 31 and the parts carried thereby may be adjusted transversely to the plane in which the grinding wheel 21 is supported.

Both the breaking tool 25 and its operating mechanism are mounted on this tool support and in the construction illustrated the fluid operated device which actuates the tool comprises a cylinder 35 having mounted therein a piston 36 and a piston rod 37 which extends through one end of the cylinder and to the outer end of which the tool 25 is secured. This cylinder is supported at an inclination to the plane in which the grinding wheel 21 is supported, so that the pressure applied to the piston will move the tool in a line oblique to that surface of the wheel with which it is in contact and toward the edge of that surface. Thus the edge portion of the wheel which is engaged by the tool will be subjected to pressure tending to break the same from the body of the wheel. The cylinder is adjustable to vary the angle of its inclination and for this purpose the cylinder is rigidly secured to a disk 38 having in opposite sides thereof arcuate slots 39 to receive bolts 40 carried by the tool supporting plate 31.

The cylinder 35 may be connected with any suitable source of supply of fluid under pressure and the supply of fluid to the cylinder may be controlled in any suitable manner. However, the present apparatus is self-contained and I have shown the source of fluid supply and the means for controlling the same as supported by the tool carriage 26, so that the tool and the whole of its operating and controlling mechanism constitute a single unit which is adjustably supported on the upper frame member 11. In the arrangement here illustrated a bracket 41 is rigidly secured to and extends rearwardly from the carriage 26. Mounted on this bracket and, in the present instance, arranged beneath the same is a reservoir 42 adapted to contain a suitable fluid, such as oil. A pump 43 is mounted on the bracket 41 and is here shown as a hand operated pump provided with a handle 44 for manipulating the same. This pump may be connected with the reservoir 42 and with the cylinder 35 in any suitable manner but, in the present instance, the fluid pressure is used to retract the tool 25 as well as to supply pressure thereto and I have interposed between the pump and the cylinder a reversing valve 45 which is also mounted on the bracket 41. The pump is connected with the reversing valve by conduits 46 and is connected with the upper end of the cylinder by a conduit 47 and with the lower end of the cylinder by a conduit 48, the arrangement being such that when the valve is in one position the operation of the pump will force liquid through the conduit 47 into the upper end of the cylinder and the liquid in the lower portion of the cylinder will be exhausted through the conduit 48 back to the reservoir 42. When the valve is in the other position the liquid will be delivered through the conduit 48 to the lower end of the cylinder, to retract the piston, and the liquid above the cylinder will be exhausted through the conduit 47. The conduits 47 and 48 are of such a character as to permit of the vertical adjustment of the cylinder with relation to the carriage 26 and, in the present construction, they are provided with telescoping portions 49 and 50 which permit them to be extended or contracted when the cylinder is adjusted vertically. The pump 43 and reversing valve 45 may be of the usual or any suitable construction and it is not necessary to here illustrate or describe the same in detail.

Suitable means are also provided for measuring and indicating the pressure to which the tool is subjected and, in the present apparatus, a suitable pressure gauge 51 is provided for this purpose and is connected with the upper end of

the cylinder by a pipe **52**. Grinding wheels vary greatly in their density and, of course, the pressure required for the test of a relatively soft wheel is much less than that required to test a very hard wheel and to facilitate the indication of the pressures I prefer to provide two pressure gauges, one of which is a low pressure gauge and is calibrated for low pressure readings and the other of which is a high pressure gauge and is calibrated accordingly. In the arrangement shown the gauge **51** is the low pressure gauge and the high pressure gauge is shown at **53** and is connected by a pipe **54** with the pipe **52** which leads to the upper end of the cylinder. The pipe **52** is provided with a cut off valve **55** and the pipe **54** is provided with a cut off valve **56**, so that either gauge may be disconnected from the cylinder while the other gauge is in use.

In the operation of the apparatus to test a grinding wheel the wheel to be tested is placed upon the wheel support in engagement with the stops **23** and the tool is brought into operative engagement with a surface thereof and pressure then admitted to the fluid operated device to actuate the tool. The tool may be caused to engage the wheel at the desired point by adjusting either the tool support or the wheel support or by adjusting both of these members. When the several parts are adjustable as here shown the wheel support is moved to a suitable position to receive the wheel and need not be further adjusted. The carriage **26** is adjusted to bring the tool into a position adjacent to and preferably in light contact with one surface of the wheel. As shown in full lines in Fig. 1, the tool is in contact with the peripheral surface or face of the wheel. After it has been brought into close proximity to this surface the tool supporting member **31** is adjusted vertically to position the tool at the desired distance from the lower edge of the peripheral face of the wheel, this distance being determined in any suitable manner, as by means of a gauge block, not here shown. It is, of course, important that the tool should engage the wheel at an exact predetermined distance from the edge thereof as the breaking pressure required will vary with the size of the piece which is to be broken from the wheel. When the tool has been properly engaged with the wheel the pump is manipulated to subject the piston **31**, and hence the tool **25**, to pressure and this pressure is gradually increased until the edge portion of the wheel breaks away or until that gauge which is in use indicates a pressure which shows that the wheel has the desired strength. It will be noted that the point at which the tool **25** engages the wheel is directly above the space between the two side members **13** of the wheel support and that that portion of the wheel which is being subjected to breaking pressure is unsupported.

The several adjustments here illustrated are not always necessary and a satisfactory apparatus can be produced without any adjustment of the tool support. For example, the tool support may be permanently mounted in the position shown in Fig. 1, or other suitable position, and the tool adjusted with relation to its support to position the same at the desired distance from the wheel support, this being accomplished by retracting or advancing the tool in its inclined path, as by admitting fluid to the cylinder on one side or the other of the piston. When the tool has been properly adjusted the wheel support is adjusted to move the wheel into contact with the tool and pressure is then applied to the tool, as above described. Likewise it will be obvious that the wheel support could be stationary and the tool brought into proper relation with the wheel by adjusting the tool support only.

When the test is applied to the peripheral surface or face of the wheel and an edge portion of that surface broken away the wheel is not seriously marred as the portion broken away is of narrow width, usually not in excess of one-eighth of an inch, and, if desired, the wheel may be dressed down to reduce its thickness and eliminate the notch thus formed. However, it is sometimes preferred to make the test on the lateral surface of the wheel adjacent to the spindle opening **57** in the wheel, as shown in dotted lines in Fig. 1. This may be accomplished by elevating the tool support **31** to raise the tool above the level of the upper surface of the wheel, then moving the carriage lengthwise of the frame member **11** to position the tool above the wheel, the tool support being adjusted to bring the tool into contact with the wheel at the desired distance from the edge of the opening. Otherwise the operation is the same as that above described.

While I have described my method and have shown and described one form of apparatus for performing the same I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

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

1. The method of testing a grinding wheel or the like for strength which comprises subjecting one surface of said wheel to pressure at a point adjacent to but spaced from an edge thereof and at an acute angle to said surface and toward said edge, whereby the pressure toward said edge will tend to break away a corner of said wheel, and gradually increasing said pressure until said corner portion breaks or until it withstands a predetermined pressure.

2. The method of testing a grinding wheel or the like which comprises applying a breaking tool to one surface of said wheel at a point adjacent to but spaced from an edge thereof, exerting pressure on said tool in a direction oblique to said surface and toward said edge of said surface which will tend to break away a portion of said wheel, gradually increasing said pressure and measuring the pressure to determine the resistance of said wheel to the breaking action of said tool.

3. In an apparatus for testing a grinding wheel or the like, means for supporting a wheel to be tested, a breaking tool, means acting on said tool in the normal operation of said apparatus to cause said tool to engage a surface of said wheel adjacent to but spaced from an edge thereof and to press said tool against said wheel in a direction toward said edge to cause it to break an edge portion of said wheel from the body thereof, and means for measuring the pressure exerted by said tool on said wheel.

4. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel to be tested, a breaking tool mounted for normal operative movement into engagement with a surface of said wheel at a point adjacent to but spaced from an edge thereof, means acting on said tool to press the same against said surface with a

breaking pressure and in a direction toward said edge, and means for measuring said pressure.

5. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel in a fixed position, a tool support mounted adjacent to said wheel supporting means, a breaking tool mounted on said tool supporting means for normal operative movement into engagement with a surface of said wheel at a point adjacent to but spaced from an edge thereof, means acting normally on said tool to press the same against said surface and toward said edge with a breaking pressure, and means for measuring the pressure exerted by said tool on said wheel.

6. In an apparatus for testing a grinding wheel or the like, means for supporting a wheel to be tested, a breaking tool, means for supporting said tool in a position to engage one surface of said wheel at a point adjacent to but spaced from an edge thereof and for movement toward said edge at an acute angle to said surface, means operating normally to cause said tool to exert continuous pressure on said surface and toward said edge, and means for indicating the amount of pressure to which said tool is subjected.

7. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel to be tested, a breaking tool mounted for normal operative movement toward a surface of said wheel in a direction oblique to said surface and toward an edge thereof, means for causing said tool to engage said surface at a point adjacent to but spaced from said edge and to exert breaking pressure on a corner portion of said wheel, and means for measuring said pressure.

8. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel to be tested, a breaking tool, means for supporting said tool for normal operative movement toward a surface of said wheel and at an acute angle to said surface, one of said supporting means being adjustable to bring said wheel and said tool into relative positions which will permit said tool to engage said surface at a point adjacent to but spaced from one edge thereof, means for pressing said tool against said surface and toward said edge to subject an edge portion of said tool to breaking pressure, and means for measuring said pressure.

9. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel to be tested, means for supporting a tool, means for adjusting said tool supporting means with relation to said wheel supporting means to locate said tool adjacent to a surface of said wheel and at a point adjacent to but spaced from an edge of said surface, a breaking tool mounted on said tool supporting means for normal operative movement with relation thereto in a direction oblique to said surface and toward said edge, means for moving said tool toward said surface and causing the same to exert breaking pressure on an edge portion of said wheel, and means for indicating the amount of pressure to which said edge portion is subjected by said tool.

10. In an apparatus for testing a grinding wheel or the like, means for supporting a wheel to be tested, means for supporting a tool, means for adjusting said tool supporting means with relation to said wheel supporting means to locate said tool adjacent to a surface of said wheel and at a point adjacent to but spaced from an edge of said surface, a breaking tool mounted on said tool supporting means for normal operative movement with relation thereto in a direction oblique to said surface and toward said edge, means carried by said tool supporting means for moving said tool into engagement with said surface and for causing the same to exert breaking pressure on an edge portion of said wheel, and a pressure indicating device carried by said tool supporting means.

11. In an apparatus for testing a grinding wheel or the like, a structure having a supporting surface to receive the wheel and a stop to limit the movement of the wheel in one direction on said surface, a breaking tool, means carried by said structure to support said tool for normal operative movement on a line extending at an acute angle to the plane of said supporting surface and toward said stop, means for adjusting said tool supporting means to cause said tool to engage a surface of said wheel at a selected point adjacent to but spaced from the edge of said surface, means acting on said tool in the normal operation of said apparatus to cause said tool to exert breaking pressure on an edge portion of said wheel, and means for measuring the pressure exerted by said tool on said wheel.

12. In an apparatus for testing a grinding wheel or the like, a wheel support having a stop to limit the movement of the wheel in one direction, a breaking tool, means to support said tool for normal operative movement in a line extending at an acute angle to a surface of a wheel on said support and toward said stop, means for adjusting said tool to change the angle of said movement, means acting on said tool in the normal operation of said device to cause said tool to engage said surface of said wheel at a point adjacent to but spaced from an edge thereof and to exert breaking pressure on said wheel in the direction of its movement, and means for measuring said pressure.

13. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a breaking tool mounted for normal operative movement into engagement with a surface of said wheel at a point adjacent to but spaced from one edge thereof and in a direction oblique to said surface and toward said edge, fluid operated means acting normally on said tool to move the latter in said direction and to cause the same to exert breaking pressure on an edge portion of said wheel, and means for measuring said pressure.

14. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a tool supporting device mounted adjacent to said wheel support and adjustable with relation thereto, a fluid operated device carried by said tool supporting device, a tool connected with said fluid operated device for movement thereby into engagement with a surface of said wheel at a point adjacent to but spaced from an edge of said surface and in a direction oblique to said surface and toward said edge, and means for connecting said fluid operated device with a source of supply for fluid under pressure and for controlling the admission of fluid to said device to cause said tool to exert breaking pressure on a corner portion of said wheel in a direction to break the same from the body of said wheel, and means connected with said fluid operated device to measure the pressure exerted thereby on said tool.

15. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a tool supporting device mounted adjacent

to said wheel support, a cylinder carried by said tool supporting device, a piston in said cylinder, a rod connected with said piston and projecting beyond an end of said cylinder, a tool connected with said piston rod, said cylinder being adjustable to position said tool for normal operative movement toward a surface of the wheel at a selected point adjacent to but spaced from an edge thereof and in a direction oblique to said surface and toward said edge, means for connecting said cylinder with a source of supply for fluid under pressure and for controlling the admission of fluid to said cylinder to cause said tool to exert breaking pressure on an edge portion of said wheel, and means for measuring the pressure so exerted on said wheel.

16. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a tool supporting device mounted adjacent to said wheel support, a cylinder carried by said tool supporting device, a piston in said cylinder, a rod connected with said piston and projecting beyond an end of said cylinder, a tool connected with said piston rod, said cylinder being adjustable to position said tool for normal operative movement toward a surface of the wheel at a selected point adjacent to but spaced from an edge thereof and in a direction oblique to said surface and toward said edge, a pump connected with a source of fluid supply, means for connecting said pump with one end of said cylinder to exert substantially continuous pressure on said tool toward said wheel and for connecting the same with the other end of said cylinder to retract said tool, and means for measuring the pressure exerted on said tool.

17. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a carriage mounted for adjustment with relation to said wheel support, a fluid pressure operated device supported by and movable with said carriage, a tool connected with said fluid operated device for movement therewith to a position adjacent to but spaced from an edge of one surface of a wheel on said support and for normal operative movement thereby obliquely to said surface and toward said edge thereof, a pump supported by and movable with said carriage, means for connecting said pump with a source of fluid supply, means for connecting said pump with said fluid operated device to cause said tool to exert breaking pressure on an edge portion of said wheel, and means for measuring the pressure of the fluid on said tool.

18. In an apparatus for testing a grinding wheel or the like, a support for the wheel to be tested, a carriage mounted for adjustment on a line substantially parallel with said wheel support, a supporting member mounted on said carriage for adjustment transversely to said wheel support, a fluid operated device carried by said supporting member, a tool operatively connected with said fluid operated device and so arranged that in the normal operation of the apparatus it will be pressed by said fluid operated device against one surface of the wheel on said support at a point adjacent to but spaced from an edge of said surface and in a direction oblique to said surface and toward said edge thereof, means carried by said carriage to supply fluid under pressure to said fluid operated device and cause said tool to exert breaking pressure on an edge portion of said wheel, and means for indicating the amount of pressure exerted by said tool on said wheel.

19. In an apparatus for testing a grinding wheel or the like, means for supporting the wheel in a substantially horizontal position, a frame member arranged above and substantially parallel with said wheel supporting means, a carriage mounted on said frame member, means for adjusting said carriage lengthwise of said frame member, a supporting member mounted on said carriage, means for adjusting said supporting member vertically with relation to said carriage, a fluid operated device supported by said supporting member, a breaking tool operatively connected with said fluid operated device and so arranged that in the normal operation of the apparatus it will be pressed by said fluid operated device against one surface of the wheel on said support at a point adjacent to but spaced from an edge of said surface and in a direction oblique to said surface and toward said edge thereof, means carried by said carriage to supply fluid under pressure to said fluid operated device and cause said tool to exert breaking pressure on an edge portion of said wheel, and a device to measure the pressure exerted by said tool on said wheel.

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