

Nov. 30, 1948.

S. R. KELLER

2,455,065

ADJUSTABLE INTERNAL EXPANSION GRINDER

Filed April 17, 1945

5 Sheets-Sheet 1

Fig. 1a.

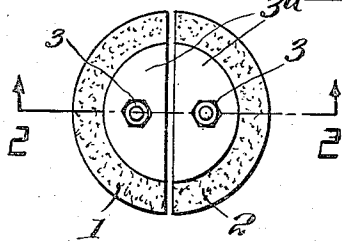
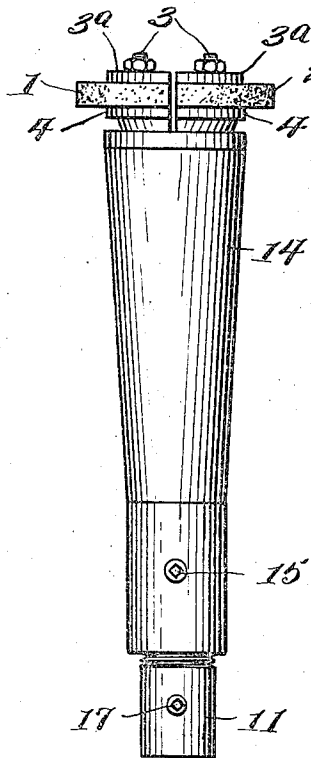


Fig. 1.

Fig. 4a.

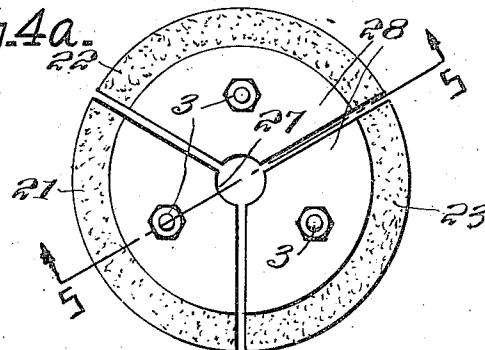
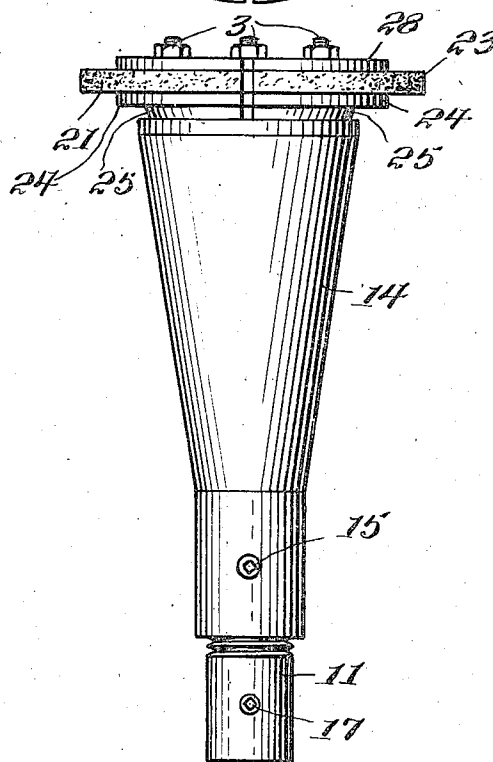


Fig. 4.

INVENTOR.
Spencer R. Keller;

BY *Victor J. Evans & Co.*

ATTORNEYS

Nov. 30, 1948.

S. R. KELLER

2,455,065

ADJUSTABLE INTERNAL EXPANSION GRINDER

Filed April 17, 1945

5 Sheets-Sheet 2

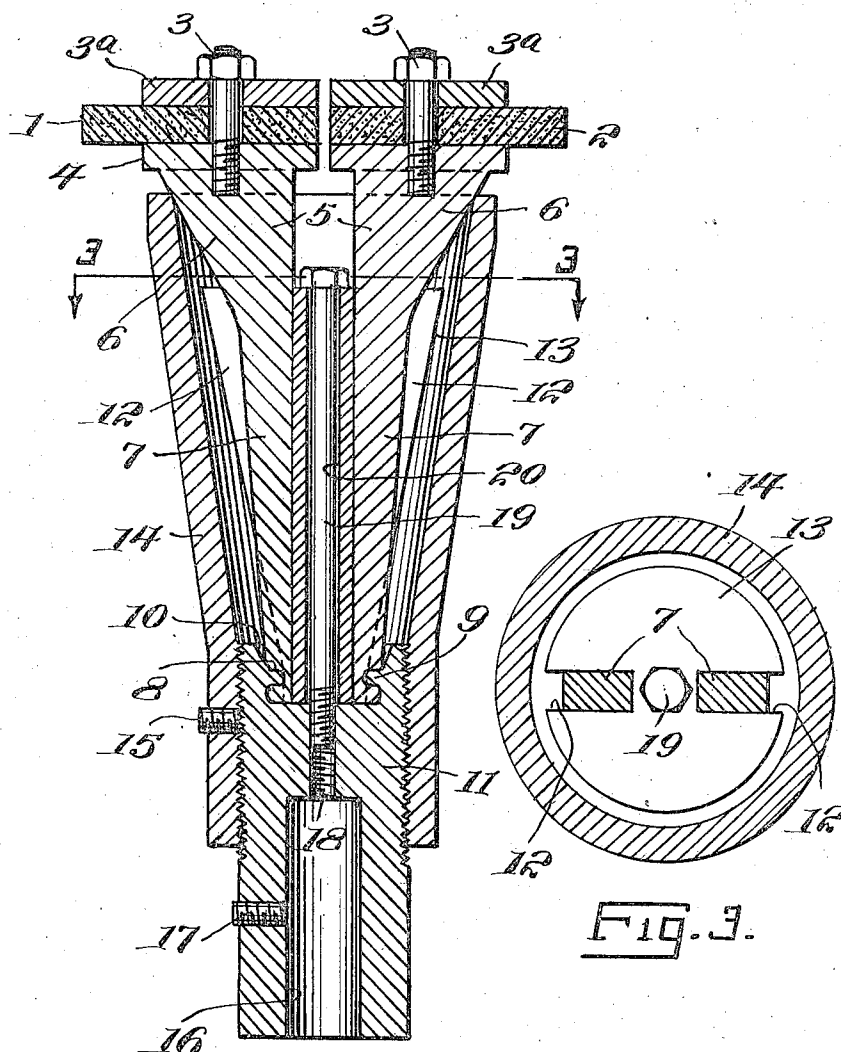


Fig. 2.

Fig. 3.

INVENTOR.
Spencer R. Keller;

BY *Victor J. Evans & Co.*

ATTORNEYS

Nov. 30, 1948.

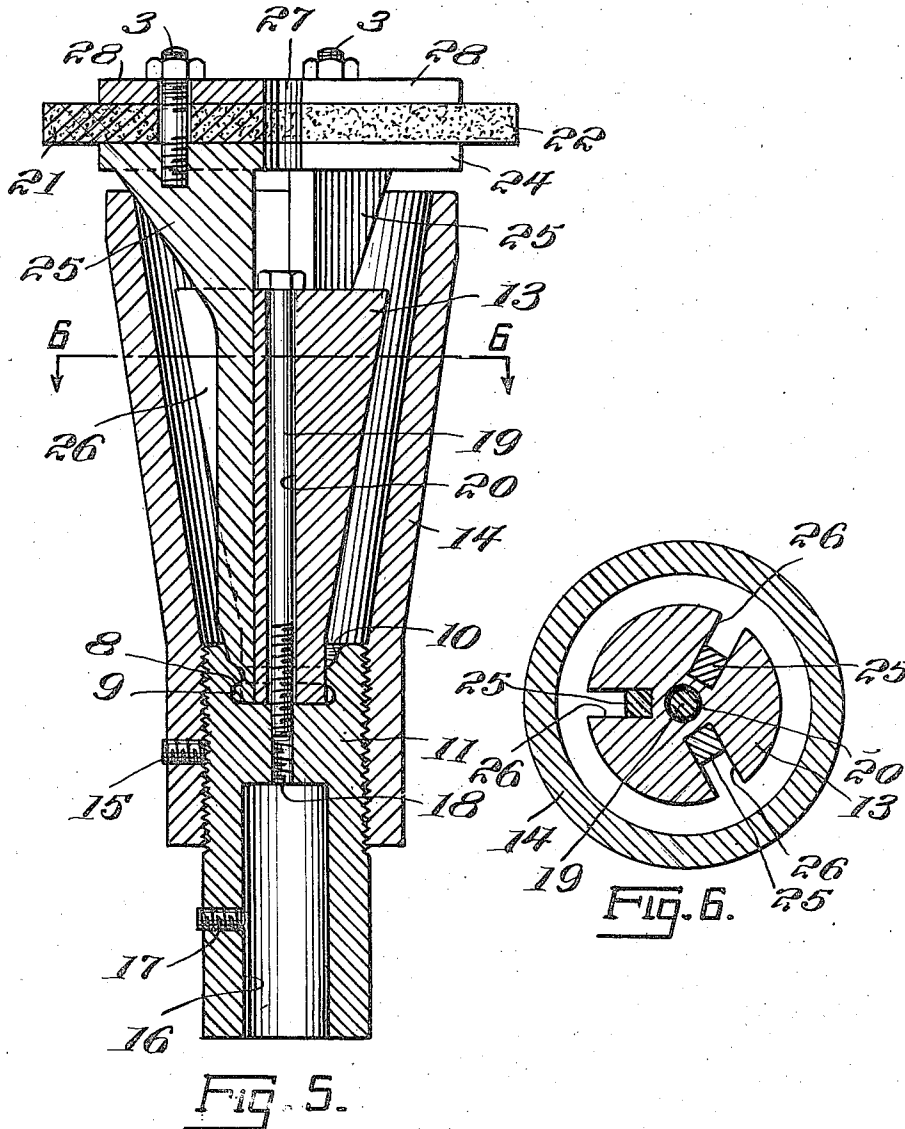
S. R. KELLER

2,455,065

ADJUSTABLE INTERNAL EXPANSION GRINDER

Filed April 17, 1945

5 Sheets-Sheet 3



INVENTOR.
Spencer R. Keller,
BY *Victor J. Enns & Co.*
ATTORNEYS

Nov. 30, 1948.

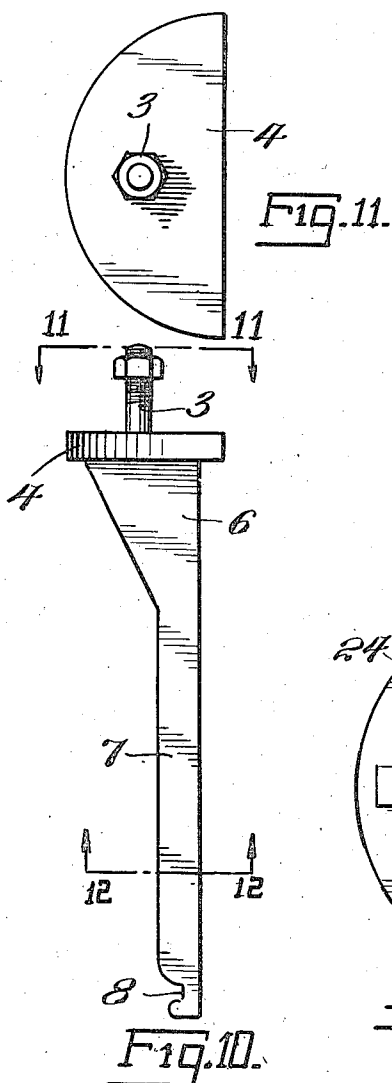
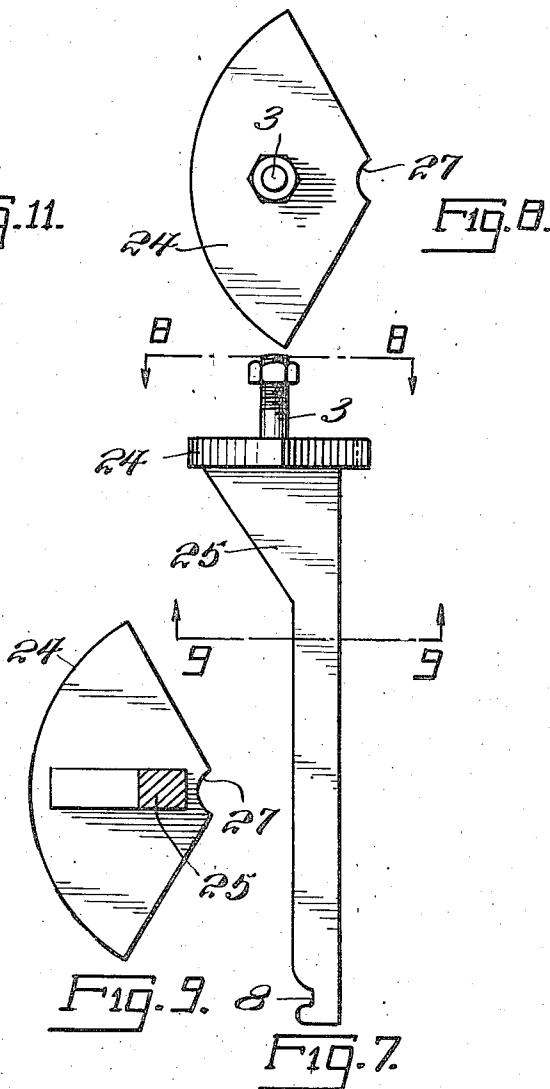
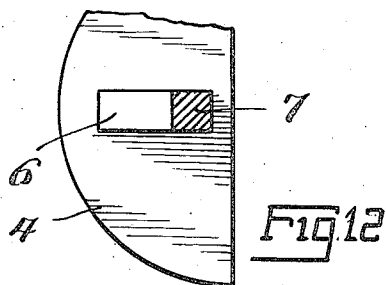
S. R. KELLER

2,455,065

ADJUSTABLE INTERNAL EXPANSION GRINDER

Filed April 17, 1945

5 Sheets-Sheet 4



INVENTOR
Spencer R. Keller,
BY *Victor J. Enns & Co.*

ATTORNEYS

Nov. 30, 1948.

S. R. KELLER

2,455,065

ADJUSTABLE INTERNAL EXPANSION GRINDER

Filed April 17, 1945

5 Sheets-Sheet 5

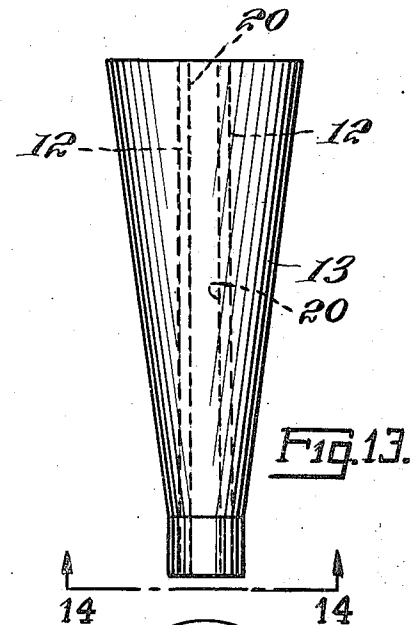


Fig. 13.

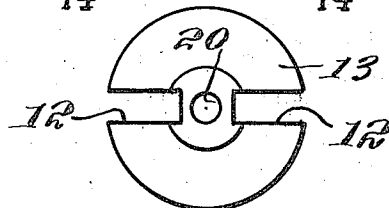


Fig. 14.

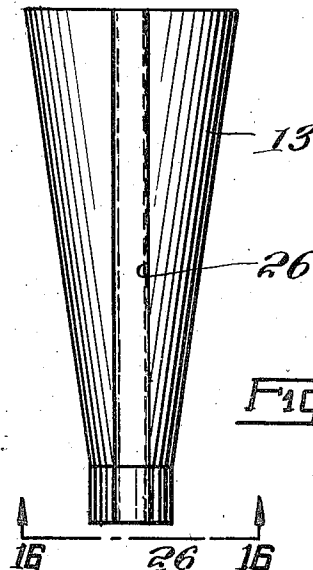


Fig. 15.

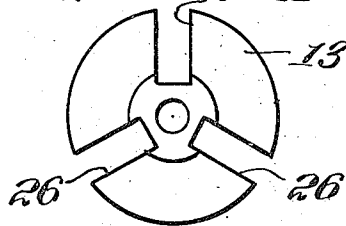


Fig. 16.

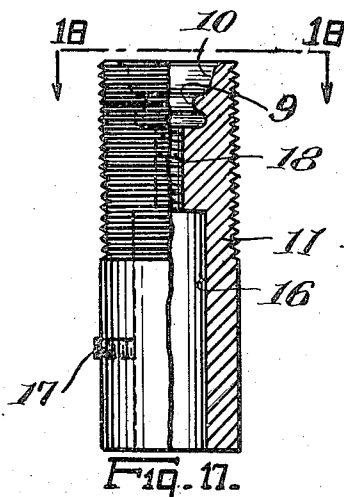


Fig. 17.

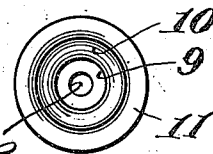


Fig. 18.

INVENTOR.

Spencer R. Keller,

BY Victor J. Evans & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE

2,455,065

ADJUSTABLE INTERNAL EXPANSION
GRINDER

Spencer R. Keller, Handley, W. Va.

Application April 17, 1945, Serial No. 588,736

15 Claims. (Cl. 51—184.1)

1

My present invention, in its broad aspect, has to do with improvements in internal grinding tools, and may be used for any kind of inside grinding as for instance, in tuning up the walls of cylinders and the like, and in accomplishing the various advantages and objects for which my invention is characterized I provide an adjustable grinder which is designed to be operated at high speed to urge the grinding stones against the surface to be ground by centrifugal force. It is one of the main advantages of my invention that the internal surface to be ground does not have to be a perfect circle in cross-section, for instance, if a bushing is worn or mashed out of its circular conformation, my invention may be used to grind the bushing to a precision fit on a perfect circle conformation. My grinding elements are quickly and accurately adjustable, and broken or worn stones can be quickly replaced, and all parts are simple, sturdy and unlikely to become deranged or broken, and the grinder can be used with any power element and in operation the action of the grinding stones is similar to that of a solid grinding wheel. Furthermore, my device can be quickly taken apart and set-up, and will operate equally well in grinding small diameter surfaces as larger ones.

Other and equally important objects and advantages of my invention will be apparent from the following description and drawings, and it is pointed out that changes in form, size, shape, materials and construction and arrangement of parts is permissible and within the purview of my invention and the scope of the appended claims.

In the drawings, wherein I have illustrated a preferred form of my invention:

Figure 1 is an elevational view of one form of my grinder adapted for use in grinding small diameter objects, the grinding element being constituted by two stone sectors;

Fig. 1a is a top plan view of Figure 1;

Figure 2 is a longitudinal section on the line 2—2 of Figure 1a (top plan view);

Figure 3 is a transverse section on the line 3—3 of Figure 2;

Figure 4 is an elevational view of another form of my grinder adapted for use in grinding large diameter objects, the grinding element being formed by three stone sectors;

Figure 4a is a top plan view of Figure 4;

Figure 5 is a longitudinal section on the line 5—5 of Figure 4 (top plan view);

Figure 6 is a transverse section on the line 6—6 of Figure 5;

2

Figure 7 is a detail view of one of the arms used in mounting a stone section in a three-stone wheel;

Figure 8 is a top plan view of the arm shown in Figure 7; and is taken on the line 8—8 of Figure 7;

Figure 9 is a section on the line 9—9 of Figure 7;

Figure 10 is a detail view of one of the arms used in mounting a stone section of a two-stone wheel;

Figure 11 is a top plan view of the arm shown in Figure 10, and is taken on the line 11—11 of Figure 10;

Figure 12 is a section on the line 12—12 of Figure 10;

Figure 13 shows the supporting guide and anchor for the arms of a two-stone wheel;

Figure 14 is a top plan view of the element shown in Figure 13;

Figure 15 shows the supporting guide and anchor for the arms of a three-stone wheel;

Figure 16 is a top plan view of the element shown in Figure 15;

Figure 17 the mounting sleeve and socket for the arbor of a power element such as an electric grinder (not shown), and

Figure 18 is a top plan view on the line 18—18 of Figure 17.

In the drawings, wherein like characters of reference are used to designate like or similar parts throughout the several views:

The numerals 1 and 2 designate a pair of semi-circular grinding stones of suitable material designed to form a two-stone grinding wheel for small diameters. Each stone is attached by a bolt and nut 3 and semi-circular washer 3a to a semi-circular foot 4 on a stone supporting arm 5. The arms have angular heads 6, and tapered shanks 7, the ends of which are notched at 8. The notched ends of the arms 5 engage internal flanges 9 in the beveled end cavity 10 of the mounting sleeve and socket 11. The arms are seated in slots 12 in the arm supporting guide and anchor 13 which is also tapered, and the small end of which fits back of the notched ends 8, thus pivotally anchoring the ends in the mounting sleeve. The sleeve 11 is threaded for engagement with the internally threaded hollow conical arm and stone adjusting member 14 which is adjusted up and down on the arm heads 6 to move the arms and stones together, or to permit their movement (under the action of centrifugal force) outwardly. A locking set screw 15 is provided to hold the adjusting member 14 in adjusted

position. The mounting sleeve and socket 11 has an axial socket 16 to receive the arbor of a grinding machine (not shown) and a locking set screw 17, and the socket communicates with a threaded bore 18 to receive the assembling bolt 19 which extends through the bore 20 in the supporting guide and anchor 13. To take my device apart, it is merely necessary to remove the bolt 19 and screw back the adjusting member 14, and since my device is designed to be rotated at high speed, the stones 1 and 2 are urged outwardly by centrifugal force and function to grind small diameters after the manner of a solid grinding wheel.

As shown in Figures 4, 5, 6, 7, 8, 9, 15 and 16, I show a similar construction in all respects for grinding larger diameters, and which is modified to carry three grinding stones 21, 22 and 23 attached to the feet 24 of the arms which are 120 degrees segments of a circle as are also the stones. There are three stone supporting arms 25 instead of two, and these are set in three slots 26 set 120 degrees apart in the arm supporting guide and anchor. It will be noted that the stones have arcuate recesses 27, as also have the feet and the washer 28 to form a center opening.

From the foregoing, it is believed that the operation and advantages of my invention will be apparent, but it is again pointed out that interpretation of the scope of my invention should only be conclusive when made in the light of the subjoined claims.

I claim:

1. An adjustable internal grinding device, comprising a segmental disk-like grinding wheel, supporting arms on which the segments of the grinding wheel are mounted, a sleeve, means pivotally mounting said arms on said sleeve whereby said arms are adapted to move the segments of said grinding wheel away from the center of the wheel when rotated, an arm supporting guide and anchor member for the arms mounted on said sleeve to prevent detachment of the arms from said sleeve, said arms having angular heads, the sleeve for pivotally mounting said arms having a socket in the outer end thereof for attaching the grinding device to the arbor of a power element, and a hollow cone-shaped sleeve on said first mentioned sleeve and engaging the arms to adjust the outward movement of the arms and segments of the grinding wheel.

2. The invention as defined in claim 1, wherein the segments of the grinding wheel are mounted to move outwardly in a radial direction from a common axis and the arms on which each of the respective segments is mounted are each provided with a foot having an attaching bolt and washer for mounting the segments.

3. The invention as defined in claim 1, wherein the hollow cone-shaped sleeve is threaded on the sleeve, for pivotally mounting the arms, whereby movement of said cone-shaped sleeve will adjust and limit the outer radial movement of the segments and the arms.

4. The invention as defined in claim 1, wherein each arm has an anchoring slot engaging an internal annular flange in a hollow cavity in the end of the sleeve for pivotally mounting the arms, and wherein the arm supporting guide and anchor member engages the arms back of the slots to anchor the same on the flange.

5. The invention as defined in claim 1, wherein a bolt detachably connects the arm supporting guide and anchor member with the sleeve for pivotally mounting the arms, and wherein the supporting guide and anchor member has radial

slots and is generally cone-shaped in conformation.

6. The invention as defined in claim 1 wherein the disk-like grinding wheel has a pair of semi-circular segments.

7. The invention as defined in claim 1 wherein the disk-like grinding wheel has three segments each 120 degrees of a circle, and wherein there are three pivoted arms operating in three slots in the arm supporting guide and anchor member and all disposed at 120 degrees of a circle.

8. The invention as defined in claim 9, wherein a locking set screw is provided on the hollow cone-shaped sleeve for holding this sleeve in adjusted position on the sleeve for pivotally mounting the arms, and wherein this sleeve has a locking set screw in the socket formed in the end thereof to attach this sleeve to the arbor.

9. An adjustable internal grinding device comprising a driving sleeve, an arm supporting guide, means securing said guide to said driving sleeve, said guide being provided with diametrically opposed slots, centrifugally responsive supporting arms slidable in said guide slots, grinding sectors secured to said supporting arms and forming a segmental disk-like grinding wheel of variable diameter, means pivotally connecting said supporting arms to said driving sleeve, a hollow cone-shaped sleeve longitudinally adjustable on said driving sleeve and engaging said arms for controlling the extent of centrifugally responsive movement of the same whereby the effective diameter of the disk-like grinding wheel may be adjusted.

10. The combination of claim 9 wherein said diametrically opposed guide slots extend longitudinally and radially of said supporting guide and wherein each supporting arm is guided by one of said slots.

11. The combination of claim 9 wherein said supporting arms and said cone-shaped sleeve have cooperating tapered surfaces.

12. The combination of claim 9 wherein the means pivotally connecting said supporting arms to the driving sleeve includes a beveled end cavity in said driving sleeve, an annular internal flange in said cavity, and said supporting arms provided with notch portions engaging said flange whereby the end portions of said supporting arms are anchored against longitudinal movement and the remaining portions of said arms are movable in response to centrifugal force.

13. The combination of claim 9 wherein the pivotally connecting means includes notched portions in said arms and an internal flange on said driving sleeve, and said guide maintains the notched portions of said arms in interlocking engagement with said internal flange.

14. The combination of claim 9, wherein the driving sleeve is provided with a beveled end cavity, an annular flange in the same, the arm supporting guide being of substantially frusto-conical shape with the smaller end portion of the same fitted in said cavity and within said flange, said smaller end portion maintaining the means pivotally connecting said arms with said driving sleeve in operative relationship.

15. An adjustable internal grinding device comprising a driving sleeve, a radial flange secured to said driving sleeve and extending toward the axis thereof, a plurality of centrifugally responsive arms having notched portions engaging said flange, a guide member maintaining the notched portions in engagement with said flange, said guide member having radial

5

slots for guiding the swinging movement of said arms in response to centrifugal force, means securing said guide member to the driving sleeve, a grinding sector secured to each arm, said sectors forming a segmental disk-like grinding wheel of adjustable effective diameter, and control means surrounding said arms for limiting the swinging movement thereof, said means being adjustably secured to said driving sleeve whereby the former may be adjusted longitudinally of the latter to control the outward movement of said arms upon rotation of said driving sleeve to thereby control the effective diameter of the disk-like grinding wheel.

SPENCER R. KELLER.

15

6

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
735,413	Schellenbach	Aug. 4, 1903
879,167	Hicks	Feb. 18, 1908
1,382,552	Scherer	June 21, 1921
1,511,564	Karstens	Oct. 14, 1924
1,550,807	Heon	Aug. 25, 1925
1,898,786	Musheno	Feb. 21, 1933
2,229,314	Solbrig	Jan. 21, 1941