

F. E. GARDNER.
 PROCESS FOR PRODUCING ABRASIVE DISKS FOR DISK GRINDERS.
 APPLICATION FILED MAR. 20, 1914.

1,209,831.

Patented Dec. 26, 1916.

FIG. 1

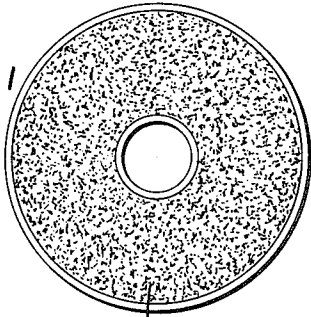


FIG. 3

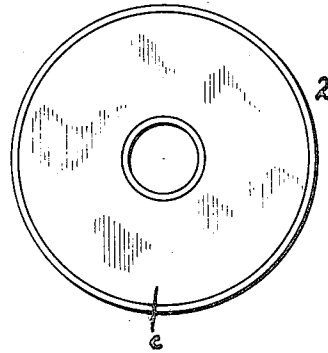


FIG. 2

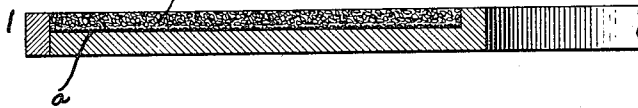


FIG. 4

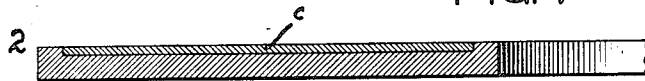


FIG. 5

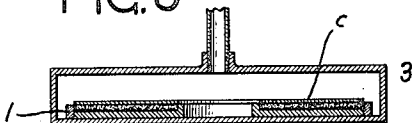


FIG. 6

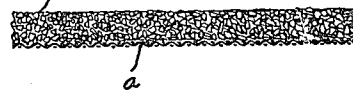
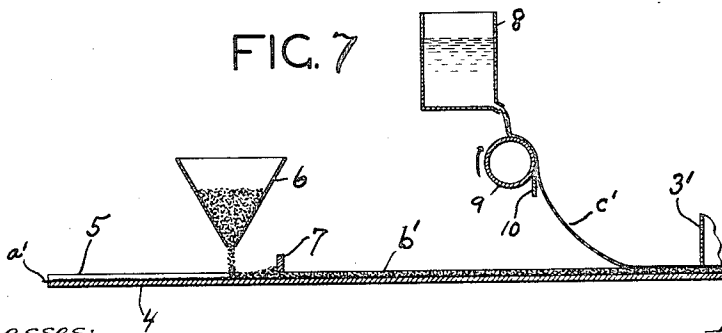


FIG. 7



Witnesses:

J. C. Devick.
 W. G. Heilman.

Inventor:

Frederic E. Gardner.
 By Miller & Chindahl
 Attys

UNITED STATES PATENT OFFICE.

FREDERIC E. GARDNER, OF BELOIT, WISCONSIN, ASSIGNOR OF ONE-HALF TO LOUIS WALDO THOMPSON, OF BELOIT, WISCONSIN.

PROCESS FOR PRODUCING ABRASIVE DISKS FOR DISK GRINDERS.

1,209,831.

Specification of Letters Patent.

Patented Dec. 26, 1916.

Application filed March 20, 1914. Serial No. 825,960.

To all whom it may concern:

Be it known that I, FREDERIC E. GARDNER, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Processes for Producing Abrasive Disks for Disk Grinders, of which the following is a specification.

This invention relates to the production of disks of abrasive material adapted to be cemented to the disk wheel of a disk grinder. Heretofore such disks have been made by cutting them out of a sheet or strip of sandpaper, emery cloth, or similar material. It will be evident that in this process of manufacturing abrasive disks a considerable portion of the sheet, namely, that intervening between successive disks, is wasted.

It is desirable that the amount of abrasive material in the disk be as large as possible, in order that the disk may be used for a correspondingly long while, and thus obviate some of the loss of time resulting from the frequent removal of worn-out disks and their replacement with new disks. Attempts have been made to produce extra-thick disks by applying an extra-thick layer of glue or other adhesive material to the web of paper or cloth as it passed through the sandpaper-making machinery, and depositing an extra amount of granular abrasive material on the layer of glue. The objection, however, to this method of producing extra-thick disks is that the abrasive material does not settle to the bottom of the layer of glue. Consequently, in the finished disk there is a relatively thick layer of glue next to the paper or cloth backing, and the grains in the lower part of the layer of abrasive material are embedded in the solid glue, the grains so embedded and the excess of glue being wasted. Attempts have also been made to produce double-thick disks by applying to the paper or cloth web, first, a layer of glue; second, a layer of granular abrasive material; third, another layer of glue; and fourth, another layer of granular abrasive material. In carrying out this process the second layer of glue settles to the bottom and forms a dense layer of glue and abrasive which is ineffective in the grinding operation.

For the most economical results in grinding various materials, it is necessary to use various kinds of abrasive materials in a

number of different sizes of grains, and in layers of differing thicknesses. For grinding a given kind of material a certain kind of abrasive, in grains of a certain size, produces the best results, while for grinding another kind of material some other abrasive, in grains of suitable size, gives the most economical results. In the production of abrasive disks from sheets or webs it is obviously necessary first to manufacture sheets or webs of the proper characteristics; and considerations of expense require that a considerable quantity of material of a given character be produced upon the sandpaper-making machinery during a given run. It is therefore, difficult for a dealer in abrasive disks to obtain from the manufacturer relatively small quantities of disks of different characteristics, or to obtain even larger quantities promptly. Moreover, under the old processes of manufacture, one-sixteenth of an inch was about the maximum thickness of abrasive disk obtainable, and different portions of the disks were sometimes of different thickness.

Among the objects of this invention are to avoid the waste of abrasive material and bonding material incident to the cutting of disks from a sheet; to avoid waste of abrasive and bond by obtaining a proper distribution of the bond through the layer of abrasive material; to increase the thickness of the disk beyond that heretofore obtainable; to insure uniformity of thickness in the individual disks; and to produce a process of manufacture which shall be so flexible that any number of disks of a given character may be made at any time.

In the accompanying drawings, Figure 1 is a plan view of a mold containing a backing disk and a layer of granular abrasive material. Fig. 2 is a fragmental transverse central section through the parts shown in Fig. 1. Fig. 3 is a top plan view of another mold containing bonding material. Fig. 4 is a fragmental transverse sectional view through the parts illustrated in Fig. 3. Fig. 5 illustrates the step of applying heat in the process of manufacturing the disk. Fig. 6 is a fragmental sectional view of an abrasive disk embodying the features of my invention. Fig. 7 is a diagrammatic view illustrating an alternative method of manufacturing disks embodying my invention.

In Figs. 1 and 2 the numeral 1 denotes a

mold for use in carrying out my improved process. The interior of the mold is of annular form corresponding to the form of the abrasive disk to be produced. The depth of the mold corresponds to the thickness to be imparted to the disk. In carrying out the process, a disk of suitable backing material such as paper or cloth *a* is placed in the mold 1, and the mold is then filled with granular abrasive material *b* of the desired character. The layer of abrasive material may be made uniform in thickness in any suitable way, as by scraping off the surplus by means of a straight-edge drawn across the top of the mold.

In Figs. 3 and 4, 2 indicates a mold adapted to form a disk *c* of glue, the diameter of the disk of glue being substantially equal to the diameter of the backing disk and the layer of abrasive material in the mold 1. The depth of the mold 2 is preferably equal to the thickness which it is desired to impart to the disk of glue.

Melted glue may be deposited in the mold 2 by any suitable means and, if desired, the mold may be warmed so that the glue shall not congeal immediately upon contact with the mold. After the mold 2 has been filled with glue it is allowed to stand until the glue has congealed to the proper extent, or, if desired, the filled mold may be subjected to any suitable cooling means. When the glue has congealed until it possesses a soft flexible rubber-like consistency, the disk of glue is stripped from the mold 2 and placed upon the layer of abrasive material *b* contained in the mold 1. The contents of the mold are then subjected to a degree of moist heat sufficient to melt the glue and cause it to percolate through the layer of abrasive material. The thickness of the disk of glue is so proportioned to the thickness of the layer of abrasive material that there shall be just sufficient glue to properly cement the grains of abrasive material to each other and to the backing. I prefer to apply the moist heat by placing the mold 1 and its contents in a suitable chamber 3, and admitting to said chamber steam of a suitable degree of saturation. After the glue has percolated through the layer of abrasive grains, the mold 1 is removed, and the contents of the mold dried, either by permitting the mold to stand at room temperature for a suitable length of time, or by placing the mold in a suitable drying apparatus. When the glue has set, the completed disk is removed from the mold 1.

It will be apparent that my process as above described permits of the production of abrasive disks without any waste of abrasive material or glue; that the glue is distributed throughout the layer of abrasive material so as to perform its function most effectively; and that the thickness of the

layer of abrasive material may be made as great as the strength of the glue and the stresses to which the disk is subjected during the grinding operation will permit. I have found it practicable to produce abrasive disks of twice the maximum diameter heretofore attainable. The disks being formed by means of individual forms, it will be evident that small lots of disks of any desired characteristics may be conveniently produced at any time. The thickness of the layer of abrasive material being determined by means of a mold, it will be apparent that all portions of a given disk will be of uniform thickness.

If desired, disks embodying my invention may be produced by the continuous process illustrated in Fig. 7, wherein 4 indicates a table over which a web *a'* of suitable backing material is continuously drawn. At the sides of the table 4 are rails 5 of a height corresponding to the thickness of the disks to be formed.

6 is a hopper from which granular abrasive material is continuously discharged on the moving web.

7 is a stationary scraper-bar, by means of which the granular material deposited on the web is smoothed out into a layer *b'* of the thickness determined by the height of the rails 5.

8 is a vessel containing melted glue, the glue flowing from said vessel in the form of a sheet onto a rotary cylinder 9. Said cylinder may be cooled in any suitable way, so that the glue deposited on said cylinder shall congeal to the desired extent. The sheet *c'* of congealed glue is scraped from the periphery of the cylinder 9 by means of a ductor blade 10. The sheet of congealed glue is deposited upon the layer *b'* of abrasive material, and is produced at a speed corresponding to the speed of travel of the web *a'*. In the continuing travel of the backing web, abrasive material and glue, they enter a chamber 3', wherein they are subjected to moist heat of suitable degree and duration to cause the glue to melt and penetrate the layer of abrasive material. After the sheet thus formed has been sufficiently dried it may be cut into disks of the desired diameter.

While I have herein referred to the bonding material as glue, I would have it understood that any suitable bond may be employed. Thus shellac and rubber may, if desired, be used in carrying out the process herein disclosed. When the bonding material is shellac, dry heat may be used to melt the bond.

I claim as my invention:

1. The process of producing abrasive disks, consisting in forming a layer of abrasive material on a backing sheet, forming a distinct layer of bonding material, placing

the layer of bonding material on the layer of abrasive material, and melting the layer of bonding material, thus allowing the bonding material to percolate through the layer of abrasive material, the abrasive material remaining in a layer upon the upper side of the backing sheet.

2. The process of producing abrasive disks, consisting of placing a disk of backing material in a mold, depositing abrasive material on said backing disk, to produce a layer of the form of the mold, placing bonding material on the top of said layer of abrasive material, and allowing the bonding material to percolate through the layer of abrasive material, the abrasive material remaining in a layer upon the upper side of the backing sheet.

3. The process of producing an abrasive sheet, consisting in producing a layer of partially congealed glue, placing said layer

upon a layer of abrasive material supported upon a backing, and melting the glue.

4. The process of producing abrasive disks, consisting of superposing a layer of abrasive material and a layer of glue upon a backing, subjecting the whole to action of moist steam, and thereafter causing the glue to set.

5. The process of producing abrasive disks, consisting of superposing a layer of abrasive material and a layer of bonding material upon a backing, heating the whole to cause the bonding material to melt, and thereafter allowing the bonding material to set.

In testimony whereof, I hereunto set my hand in the presence of two witnesses.

FREDERIC E. GARDNER.

In the presence of—

H. W. ADAMS,
C. G. KENZIE.