My invention relates to abrasive devices, more particularly to grinding devices of screw thread form, the outer working portions of which are of abrasive substance and are utilized in the grinding of the teeth of gear wheels.

It is among the objects of my invention to provide an abrasive device of composite structure which shall be of relatively simple construction, which shall be inexpensive to manufacture and which shall consist of a minimum number of parts.

It is a further object of my invention to provide a method of assembling sections of abrasive material to form a substantially cylindrical body in a manner that shall require very little preliminary trimming or dressing of the working surface thereof before it is ready for use.

In a pending application, Serial No. 671,142, filed Oct. 27, 1923, I have disclosed an abrasive device comprising a hub or supporting spider having the abrasive material, comprising insert members, secured in grooves provided in the outer periphery of the supporting member.

My present invention is directed to an improved method of assembling and securing the abrasive sections with greater accuracy and with the assurance of uniformity of quality and workmanship. To accomplish this purpose, I provide an assembly fixture or jig for securing the abrasive sections and the supporting hub member in proper alinement and I employ a cementitious material to secure the respective co-operating members, after which they are removed from the fixture.

In the accompanying drawing constituting a part hereof and in which like reference characters designate like parts,

Fig. 1 is an end elevational view of an assembly jig containing an abrasive device assembled therein in accordance with the principles of my invention,

Fig. 2 is a view thereof partially in cross-section and partially in elevation,

Fig. 3 is a cross-sectional view of a fragmentary portion of an abrasive device utilizing a modified hub design.

Referring to Figs. 1 and 2, the structure therein illustrated comprises a matrix 1 built up of a plurality of split portions joined by bolts 2 secured at the radially projecting flanged edges 3. The matrix is provided with an upper, a lower and a center flange 4, 5, and 6, respectively, to provide rigidity without necessitating a heavy bulky structure. The matrix 1 is adapted to set in a depression 7 of a base plate 8 which is further provided with an annular central projection 9 for alining a hub member 10, which may be of tapered or cylindrical shape.

I assemble a plurality of strips of abrasive material 11 contiguously uniformly to the inner periphery of the matrix 1 with their longitudinal sections parallel to the axes of the matrix. The abrasive sections are provided with toothed faces 12 of such angularity as to constitute a single helix or a plurality of helices when assembled in the matrix. The inner surfaces 13 of the abrasive sections 11 are flat and constitute an inner face in the form of a prism with its cross-section a regular polygon, when assembled as shown in Fig. 1, and the depth of the abrasive material is such as will provide a space 14 between the inner face thereof and the hub member 10. The bottom portion of the matrix 1 is provided with an angular ledge portion 15 making a complete turn on the inner circumference at a lead angle corresponding to the lead of the helical teeth of the abrasive section.

The abrasive sections being of uniform design, are assembled, with their lower teeth resting on the ledge 15 to uniform advance the teeth so that their profiles lie in a single helical plane, and this advancement of the teeth of the respective sections necessitates projecting the same as shown by the dotted upper edge 16 (Fig. 2) so that the difference in the upper edges of the first and the last section assembled in the matrix will be approximately equal to the lead of the teeth which is equivalent to their pitch for a single thread helix.

The space 14 between the abrasive sections and the hub is filled with a cementitious material 17 adapted to solidify and firmly hold the abrasive sections as a unitary structure with the hub 10. Any suitable quick setting substance which sets by chemical reaction or in any other manner without trapping gases or establishing internal pressures detrimental to the strength and accuracy of the finished product may be employed. The substance must also be elastic under pressure and insoluble in cooling liquids employed in grinding. I have found that a cement consisting of litharge and glycerine is very appropriate.
for this purpose but any material having similar characteristics will suffice.

The cementitious substance is preferably of a plastic nature which is adapted to flow to fill the interstices, if any, between the sections and the space provided by the stepped ends 16 of the sections at the top of the assembled structure.

When the cementitious substance is set, the assembly matrix may be removed by loosening the bolts 2 and splitting the same, which permits lifting the abrasive structure and the hub member 10 from the base plate as a unitary structure.

In the modification illustrated in Fig. 3, I utilize a hub or spider 18 and assemble the abrasive sections 11 therearound. The hub 18 is provided with slots 19 which are adapted to receive keys or wedges 20 of a pair of end rings 21 which are mounted on the hub. A metal liner 22 is wrapped around the sections 11 in the bottom of the tooth spaces and one or more layers of banding wire 23 may be wrapped around the liner 22 to secure the sections 11 in position. A slip of cementitious material 17 is then poured in at the other end of the hub member to fill in the space 14 between the abrasive sections and the hub.

Another end ring 21 is then mounted on the end of the hub and secured by a key 19 and the assembled structure may then be further reinforced by winding banding wire 23 in the bottom of the grooves to provide against destruction by the centrifugal force on the abrasive structure at the high speed at which it operates.

The strands of wire may be anchored to the rings 21 in a suitable manner as by clamping them thereon or projecting them through openings 25 therein.

The abrasive sections 11 will be of varying lengths to properly aline the teeth as in Fig. 2. The end space 24 between the edge of the abrasive and the end ring 21 is filled with the cementitious material 17 which is confined by the liner 22.

In these constructions the cementitious material has a function of providing a uniform seating and supporting surface for the abrasive sections and also to fill in the interstices between the successive segments and the end rings of the hub.

It is evident from the above description of my invention that abrasive devices made in accordance therewith are of simple and compact construction and of sufficient rigidity and strength to adapt them to the grinding of gear teeth. My method of assembling and securing the abrasive material permits of a variety of constructions which materially reduces the cost of commercializing this process of gear grinding.

Although I have described several embodiments of my invention, it will be obvious to those skilled in the art that various modifications may be made in the details of construction, such as the manner of securing the several co-operating members, and in the use of a binding composition, without departing from the principles herein set forth.

I claim as my invention:—

1. An abrasive device comprising a hub, a plurality of abrasive members each having a gear tooth face, said members being angularly disposed to constitute a cylinder with the teeth constituting helices, a plurality of strands of band wire helically wound in the tooth spaces and means for securing the bands to said hub.

2. An abrasive device comprising a hub, a plurality of abrasive members each having a gear tooth face, each member being angularly disposed to constitute a cylinder with the teeth constituting helices, a plurality of strands of band wire helically wound in the tooth spaces, liners disposed between the wire and the bottom of said spaces and means for anchoring said strands.

3. A method of constructing abrasive devices which comprises assembling a plurality of abrasive members of substantially prismatic shape in a cylindrical matrix with the flat surfaces of the members disposed inwardly to provide an enclosure of polygonal cross-section, disposing a hub in the center thereof to provide a space adjacent to the abrasive members, pouring a slip of cementitious material in said space and removing said matrix.

4. An abrasive device comprising a hub, a plurality of abrasive members each having a hob face and constituting substantially a segment of an annulus, said members being disposed about the hub to constitute a gear-grinding hub, and a plurality of turns of banding wire for securing said abrasive members to the hub.

5. A hob for grinding gear teeth comprising a plurality of identical abrasive segments having hob teeth on the working faces thereof, said segments being assembled to constitute substantially a cylinder with the teeth aligned to constitute helices and joined by a cementitious substance to constitute a unitary member.

6. The method of constructing gear-grinding hobs comprising shaping a plurality of identical abrasive segments having hob teeth on their working faces, assembling the segments in a cylindrical matrix in such manner that the teeth are aligned to constitute helices, disposing a hub in the center thereof, pouring a cementitious material between the hub and the segments and removing the matrix.

In testimony whereof, I have hereunto subscribed my name this 1st day of November, 1925.

GEORGE M. EATON.