July 8, 1924.

E. LAUER-SCHMALTZ

1,500,401

GRINDING MACHINE

Filed June 23 . 1920

6 Sheets-Sheet 1

Fig. 1.

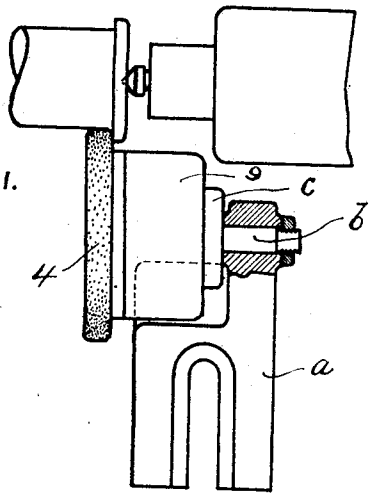


Fig. 2.

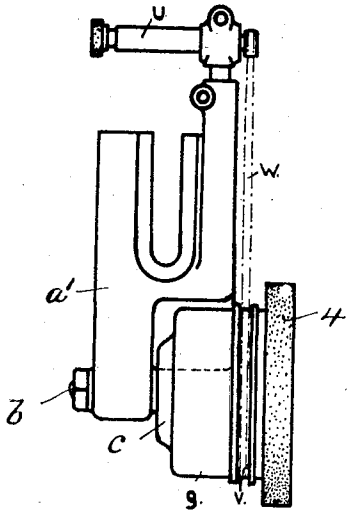
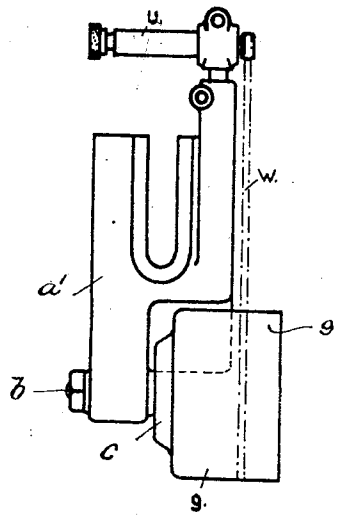


Fig. 3.



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GRINDING MACHINE

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6 Sheets-Sheet 2

Fig. 4.

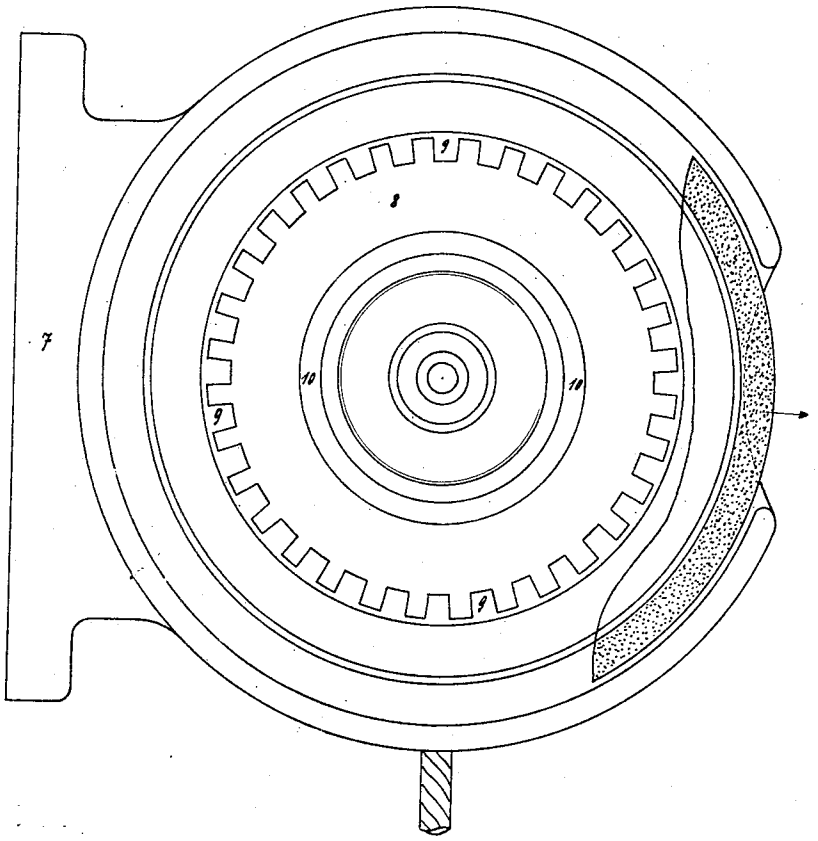
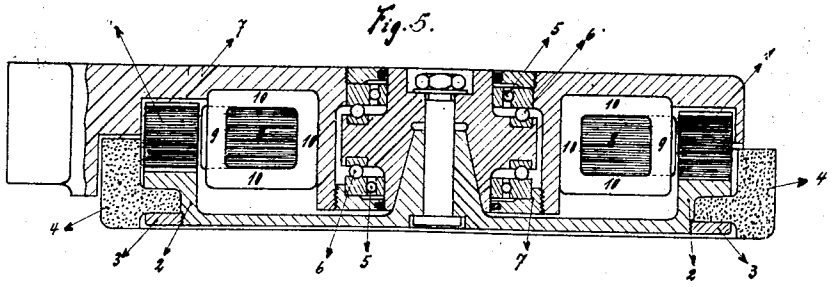


Fig. 5.



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Filed June 23, 1920

6 Sheets-Sheet 3

Fig. 6.

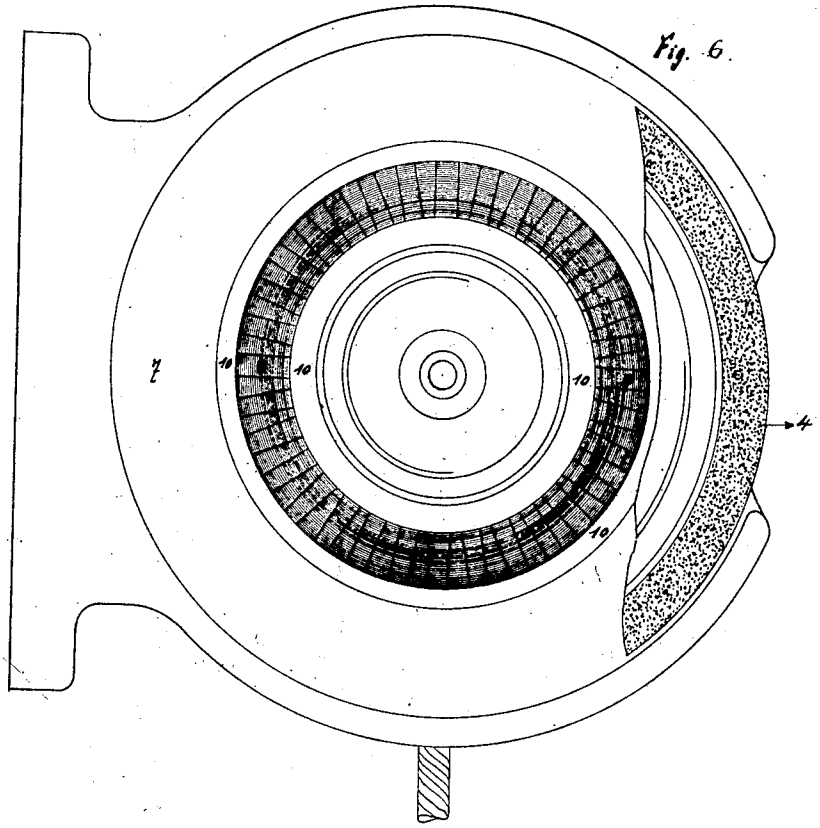
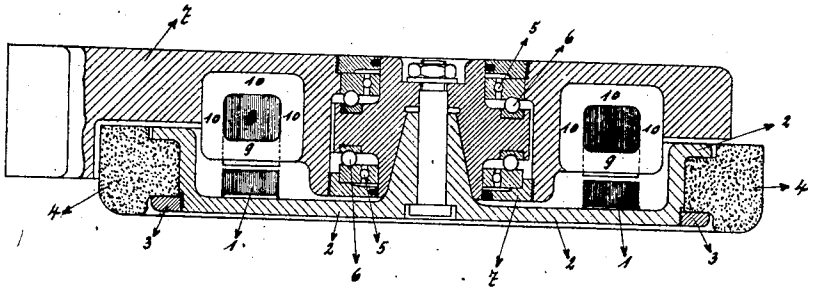


Fig. 7.



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1,500,401

GRINDING MACHINE

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6 Sheets-Sheet 4

Fig. 8.

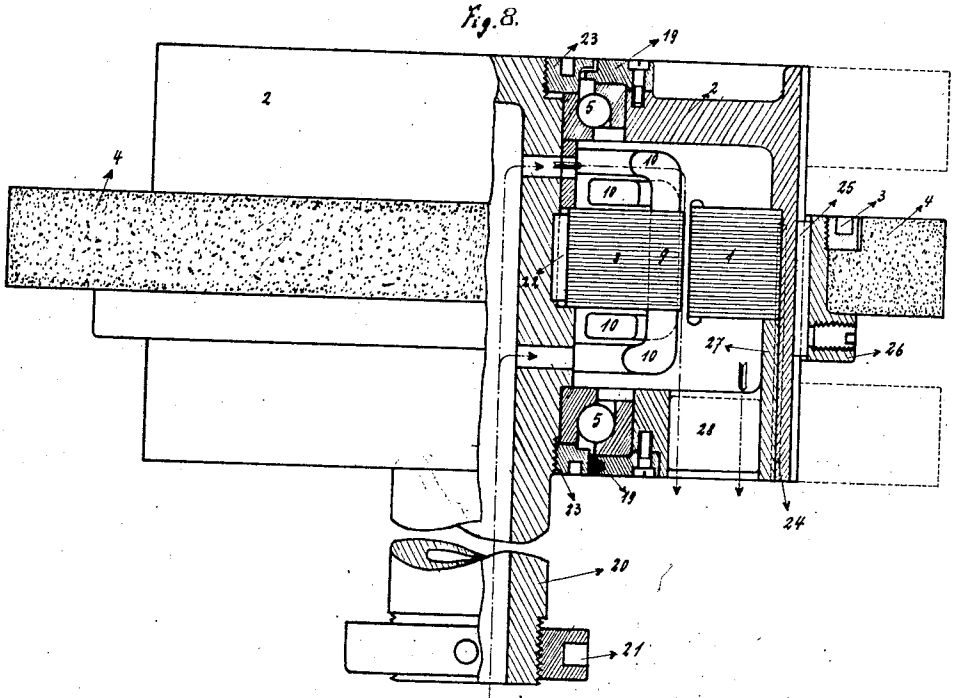
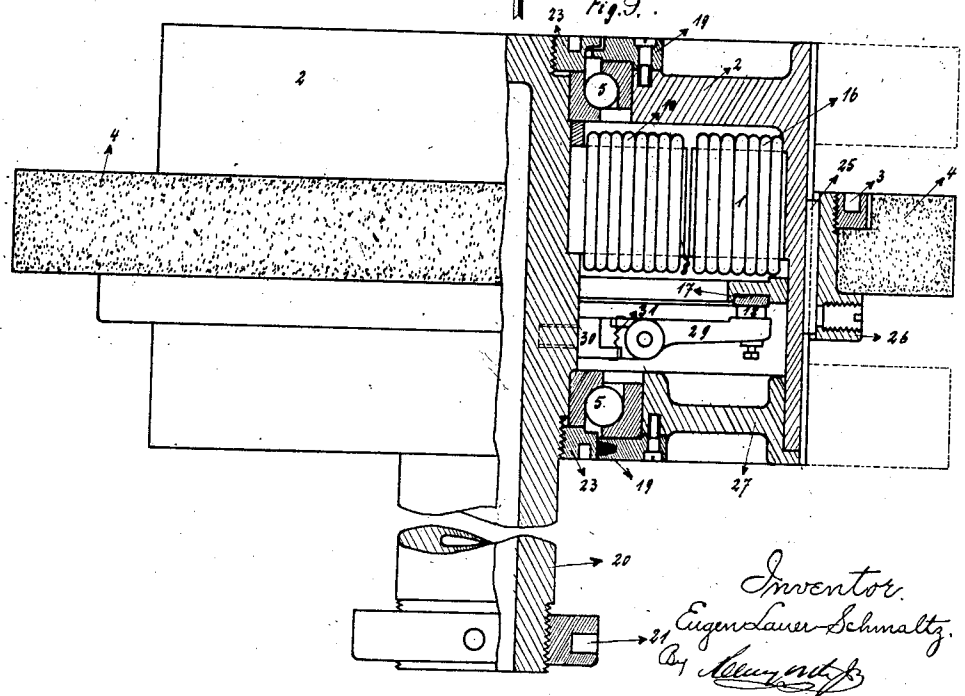


Fig. 9.



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1,500,401

GRINDING MACHINE

Filed June 23, 1920

6 Sheets-Sheet 5

Fig. 10.

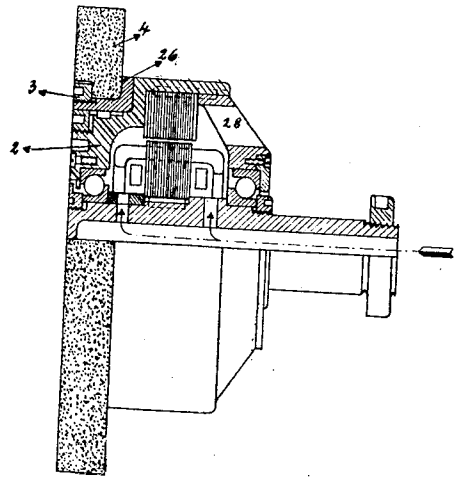
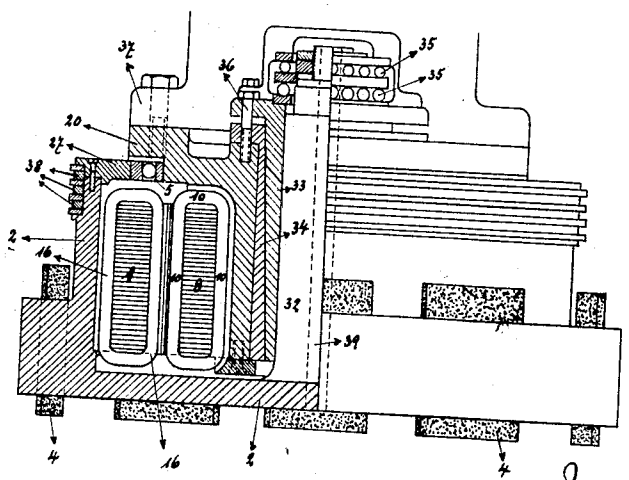


Fig. 11.



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1,500,401

GRINDING MACHINE

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6 Sheets-Sheet 6

Fig. 12

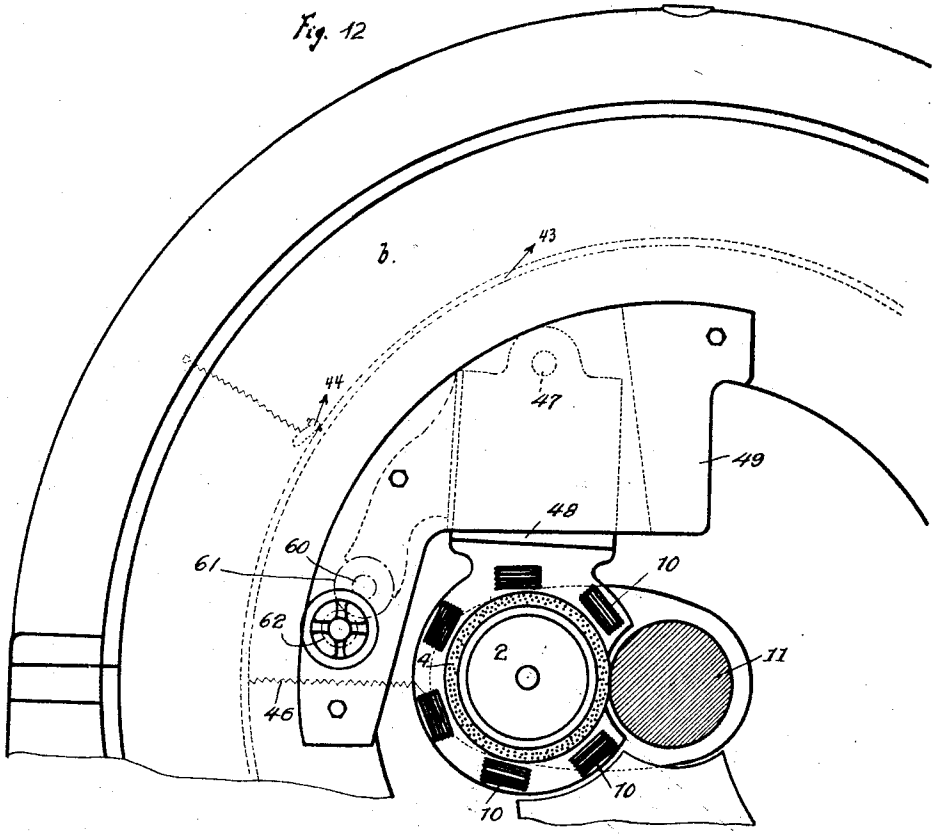
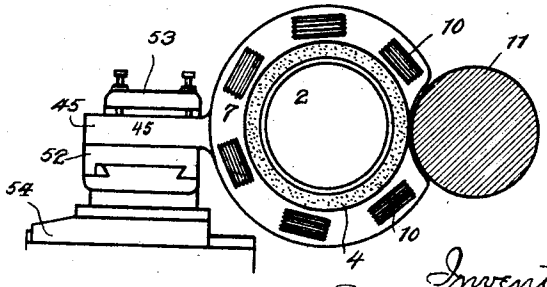


Fig. 13.



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Patented July 8, 1924. 1,500,401

UNITED STATES PATENT OFFICE.

EUGEN LAUER-SCHMALTZ, OF OFFENBACH-ON-THE-MAIN, GERMANY.

GRINDING MACHINE.

Application filed June 23, 1920. Serial No. 391,241.

To all whom it may concern:

Be it known that I, EUGEN LAUER-SCHMALTZ, a citizen of Germany, and a resident of Offenbach-on-the-Main, Germany, have invented certain new and useful Improvements in Grinding Machines, for which I have filed applications for patents in Germany Sch. No. 50,970, January 15th, 1917, and Sch. 54,619, February 26th, 1919, and of which the following is a specification.

My invention relates to grinding machines, and comprises the mounting of the grinding wheel or disc directly on the external rotor element of an electric motor, and the combination of parts substantially as hereinafter described and claimed.

In the accompanying drawings, in which like parts are similarly designated,

Figure 1 is an elevation of a grinding machine having a motor with bell-shaped armature;

Fig. 2 is an elevation of a modified form of grinding machine;

Fig. 3 shows the external rotor casing, with grinding disc removed and operating as a driving pulley;

Fig. 4 is a three-phase short-circuited motor having a disc-shaped cage armature;

Fig. 5 is a cross-section of the same;

Fig. 6 is a three-phase short-circuited motor with a different arrangement of disc-shaped cage armature;

Fig. 7 is a cross-section of the same;

Fig. 8 is a cross-section of a three-phase short-circuited motor having a ventilated bell-shaped armature;

Fig. 9 is a cross-section of a continuous or alternating current motor and its commutator or collector;

Fig. 10 is a view partly in longitudinal section of a special construction of the motor according to Figs. 8 and 9, in which the grinding wheel is fastened to the armature rotor;

Fig. 11 is a like view of a three-phase current segment motor with bell-shaped contact ring-armature;

Fig. 12 shows a motor in the rotating casing of crank shaft grinding machines and its current supply;

Fig. 13 illustrates a portable motor that can be attached to different kinds of machine tools.

In all the constructions shown the rotor or armature of the motor carries the grinding tool, and is on the outside of the stator or field structure, and the grinding tool has sufficient space to operate even when of disc shape.

In my machines, motors for continuous current with disc-shaped armature require a displacement of the field winding outside the grinding wheel limit, and the poles must be arranged out of the symmetrical radius so that the grinding tool has enough space to attack the object to be ground. In order not to change the efficiency of the motor the ends of the pole-shoes are kept as far as possible in symmetrical arrangement, and the pole shoe space is made as narrow as possible.

In special constructions, for instance in grinding apparatus for unusually thick journals, it is also permissible either to omit one pole or to make it smaller, and the efficiency of the motor is accordingly decreased.

The disc-shaped and bell-shaped armature arrangement permits the use of any current, but it is necessary, as with large types for three-phase current with contact ring-armature, to arrange the parts so that the commutator or current collector, or contact rings, are capped dust-tight on the inside of the rotor to prevent short-circuiting by the grinding dust.

With a bell-shaped armature the grinding tool may be either fixed or adjustable on the armature. The whole construction is then held by a bolt or a flange-shape elongation of the drum-shaped pole-holder, and the latter is held in an iron casing.

In Fig. 1 I have shown a frame a in which is secured the bolt or pin b on the stator c which is enclosed in the bell-shaped rotor 9, carrying the grinding wheel or disc 4. The disc is shown operating on the end of a shaft. Fig. 2 shows a similar construction, the frame a' having the bolt b of stator c mounted therein, the bell-shaped armature 9 enclosing the stator and carrying the grinding disc 4. This armature is provided with peripheral ribs v forming a pulley between which a belt w may run to drive an auxiliary spindle u carrying a grinding disc. Fig. 3 is a similar view omitting the disc 4 and showing the armature without grooves, but acting as a driving pulley.

The simplest form of motor is the three-phase motor Figs. 4 and 5, with squirrel-cage armature (short-circuited armature), the windings of which are arranged at the

inside surface of the grinding ring on the disc flange that carries the grinding ring, so that the outside grinding wheel surface and one side surface is free for grinding. In this case the rotor 1 and the grinding ring 4 are carried by the hub flange 2, or the flange is made in one piece with a hub as shown. The grinding ring 4 is held in place by the removable ring flange 3. The rotor is mounted on ball-bearing 5, Fig. 5, and is secured against side movement by thrust ball bearings 6. The ball bearings 5 are held in the stator casing 7, which is made plate-shaped in order to reduce the width of the construction. The stator casing holds the ring-shaped laminated iron core 8 through the grooves of which any kind of current is passed. The space for this winding is seen at 10.

In order to get a construction that is more compact in diameter, the three-phase motor may be built as shown in Figs. 6 and 7. In this case the rotor 1 is made as a disc armature and assembled with the disc 2 that carries the grinding ring. The remainder of the construction is the same as in Figs. 4 and 5, except that the ring-shaped iron core 8, which is made of strap iron, has its active face on the side.

A three-phase motor with bell-shaped armature, shown in Fig. 8 has the bolt like stator holder 20 preferably hollow and fastened with the nut 21. The stator iron 8 is attached to the bolt 20 by a wedge or feather 22, and carries the three-phase field winding 10 in the grooves or slots 9. The bell-shaped rotor casing 2 is mounted on the bolt 20 by ball-bearings 5, secured to the bolt by ring nuts 23, and covers all the electrical parts, and has in its inside the short-circuited armature 1 which is fixed thereto by a wedge or feather 24. The armature iron is laminated and the bell 2 carries on the outside the grinding disc-ring 26 with the grinding wheel 4, thereon and the securing nut 3. The ring with the wheel thereon is movable in axial direction, as indicated by the dotted line positions, but secured against turning by feather or cotter 25. The bell 27, in smaller types of machines, may be made with ribs or ventilating wings 28, Fig. 8 and can be built into the ring space. A good cooling of the electrical system is obtained if the air stream passes through the interior of bolt 20 in the direction of the arrow, so that, when grinding no water spray can penetrate into the inside of the motor against this air stream issuing at 28. Packing rings for dust and water-spray are built in front of the bearing at 19.

The continuous or alternating current motor, Fig. 9 is in all parts exactly as the above-described motor, and the same reference characters are used for the corresponding parts. The difference between the construction of Figs. 8 and 9 is, that in the latter on the armature iron 1 is placed a winding 16, that is in connection with the commutator or collector 17, and that a brush-holder 29, with brushes 18 is pivoted in a fork-shaped bolt 30, which is solidly connected with the central bolt 20. The brush-holder 29 is urged against the commutator or collector by the spring 31.

Fig. 10 shows a special construction of the motor the parts of which are limited to narrow dimensions. Here the grinding wheel 4, which is held by the flange 26 and the nut 3, is tightly held at one side of the armature, and the ventilating arrangement 28 is beveled off a little on one side so that it is easier to work between collars.

In the before described constructions ball-bearings are used for the armature. It is also possible to use the motor with journal-bearings of any kind of construction.

In the following described vertical arrangement of a grinder of large capacity, Fig. 11, the armature casing 2 has a hollow bearing-journal 32, which runs in a split bushing 34. The bearing-journal 32 is secured against vertical movement by a double-thrust ball-bearing 35. The adjustment of the bearing construction is effected by screws 36. The motor is otherwise of the same type as the one before mentioned, and the parts are correspondingly numbered. In place of the holding bolt we have a stationary pole-holder casing 20, which is flanged-connected to the machine head 37. The contact rings 38 which are in conductive connection with the armature winding 16, are on the upper outside of the armature 2, not on the inside, and may be capped so that splash-water will not reach the electrical parts. Through the central bore 39 of the bearing-journal 32 the water is supplied centrally to the grinding head and to the segments 4, which may be attached in any manner desired.

The assembling of a motor with a disc-shaped armature in a crank-shaft grinding machine is shown for example in Fig. 12. In the latter figure we see that no gear and belt drives are necessary for operating the grinding wheel, but only the contact-rings 43, which are electrically connected with the motor, and are capped dust-tight in the encircling grinding wheel holder.

In Fig. 12, *c* designates the stationary housing that contains the usual rotating ring *b*, carrying a guard 49. Mounted on a pin 47 in the guard 49 is the holder or support 48 for the stator casing 7. On the hub flange 2 is the grinding disc 4, and on the support are the field magnets 10. The work is indicated by 11. The pivoted support 48 carries, a gear segment 50 which meshes with a pinion 60. The pinion 60 is carried by a gear wheel 61 and the gear

wheel 61 meshes with a gear wheel on a spindle operated by a hand wheel 51.

By operating the hand wheel 51 in one direction the grinding disc 4 is moved toward the work, and by operating the hand wheel in the opposite direction the grinding disc 4 is moved from the work.

The current is supplied to the contact 44 mounted in the housing *c;* current passes to the ring 43 and is taken from said ring 43 by the conductor 46.

The ring *b* in rotating carries the guard 49 along with it.

A portable grinding machine for use on different machine tools, such as lathes, planers, rolling-mills and other such machines, is shown in Fig. 13. The motor holder 45 is adapted to the kind of machine to be used.

In this figure, 7 designates the stator casing; 2 the hub flange; 4 the grinding disc; 11 the work and 10 the field windings. The stator casing has a radial shank 45 by which it is secured or mounted in any desired machine tool. The machine tool here shown, in part, is a lathe having a cross slide 54. Mounted on the cross slide 54 is a slide 52 at right angles to the cross slide. The shank is held in a tool clamp 53 on the slide 52.

I claim:

1. The combination with a field member and a supporting pin therein: of a bell-shaped armature enclosing said field member, a grinding tool directly mounted on the exterior cylindrical portion of said armature, and means on said armature for the reception of a driving belt.

2. The combination with a field member having a hollow supporting pin, of a bell-shaped armature enclosing said field member, a tool directly mounted on the exterior cylindrical portion of said armature, and means to permit the adjustment of the tool across the face of said cylindrical portion of the armature.

3. The combination with a bell shaped armature, of a stator enclosed in the armature, a central hollow supporting pin passing through the field member, bearings between the field member and armature at each end thereof, a tool, and means to permit the adjustment of the tool across the outer cylindrical face of said bell shaped aramature.

EUGEN LAUER-SCHMALTZ.