F. SCHMALTZ.

APPARATUS FOR GRINDING TWIST DRILLS, BORERS, AND THE LIKE.

APPLICATION FILED SEPT. 13, 1909.

965,952. **Patented Aug. 2, 1910.**

3 SHEETS—SHEET 1.

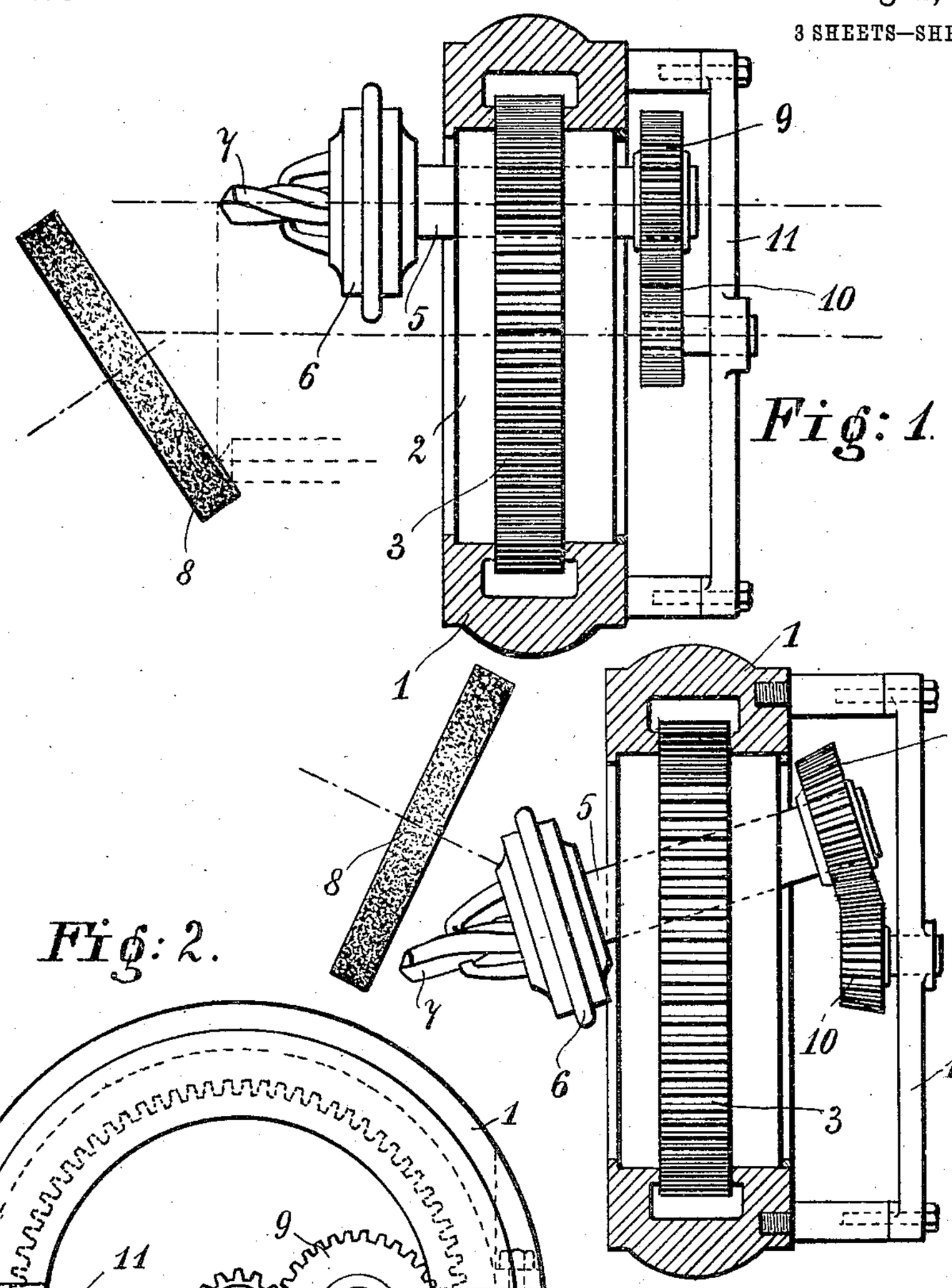
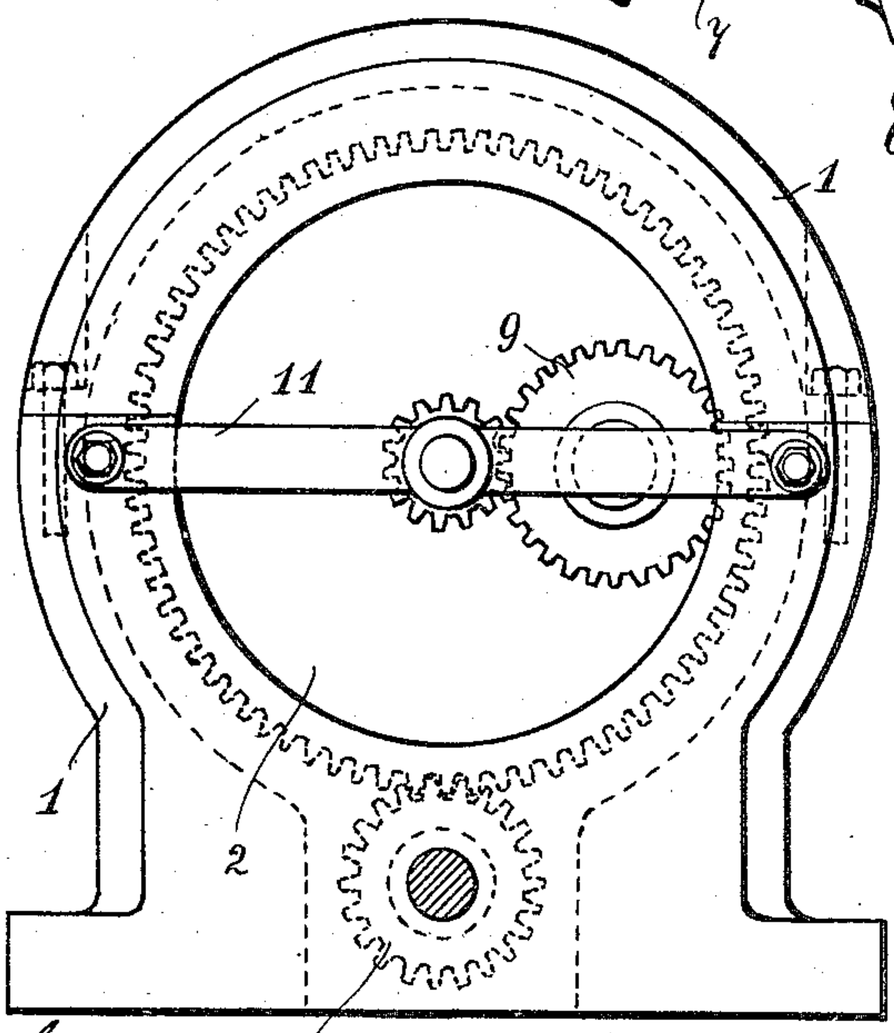


Fig: 1.

Fig: 2.

Fig: 3.



Witnesses
M. H. Darg
L. A. Pike

Inventor
Friedrich Schmaltz
By Wm. E. Boulter
attorney

F. SCHMALTZ.

APPARATUS FOR GRINDING TWIST DRILLS, BORERS, AND THE LIKE.

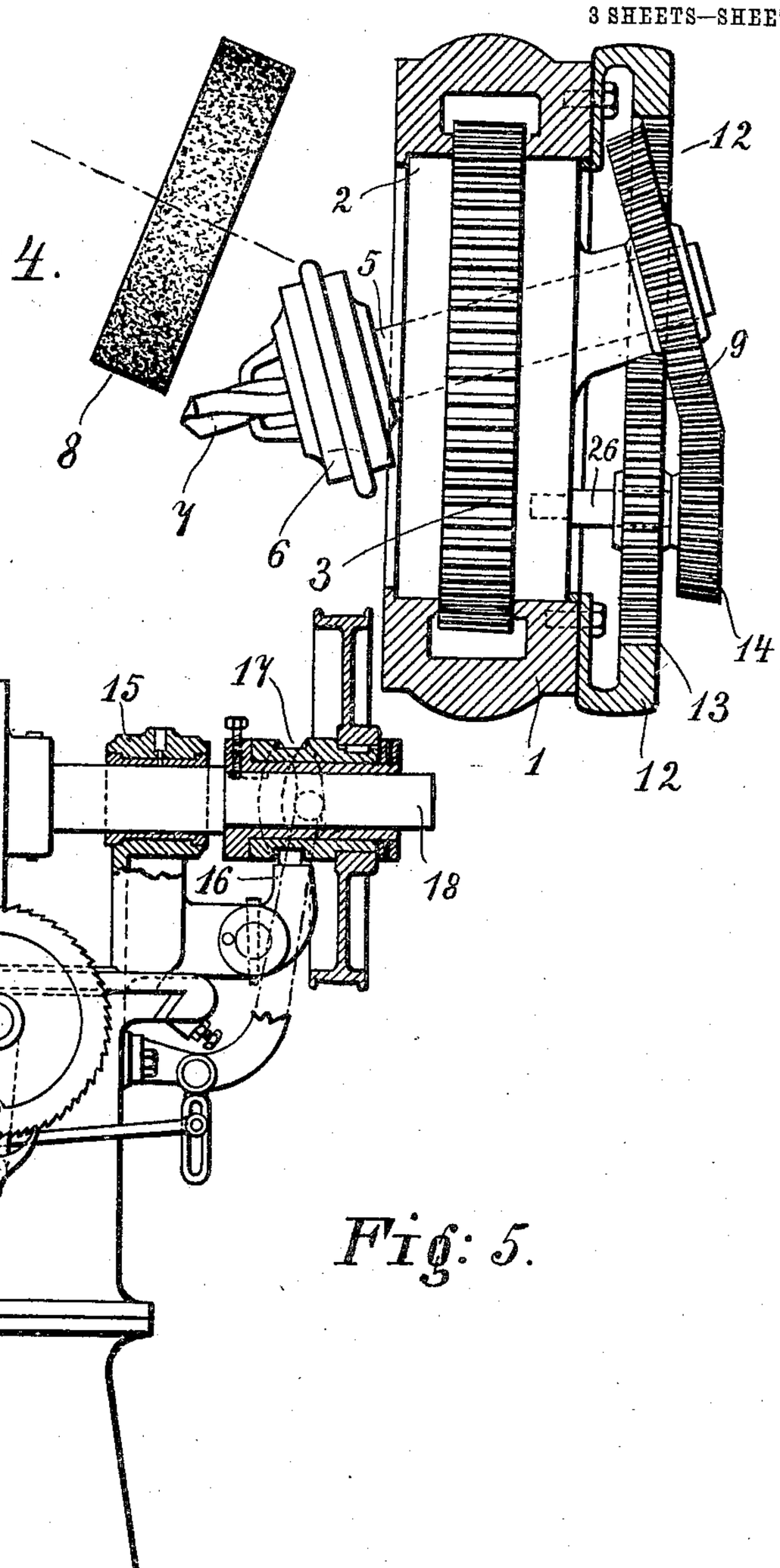
APPLICATION FILED SEPT. 13, 1909.

965,952.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 2.

Fig: 4.



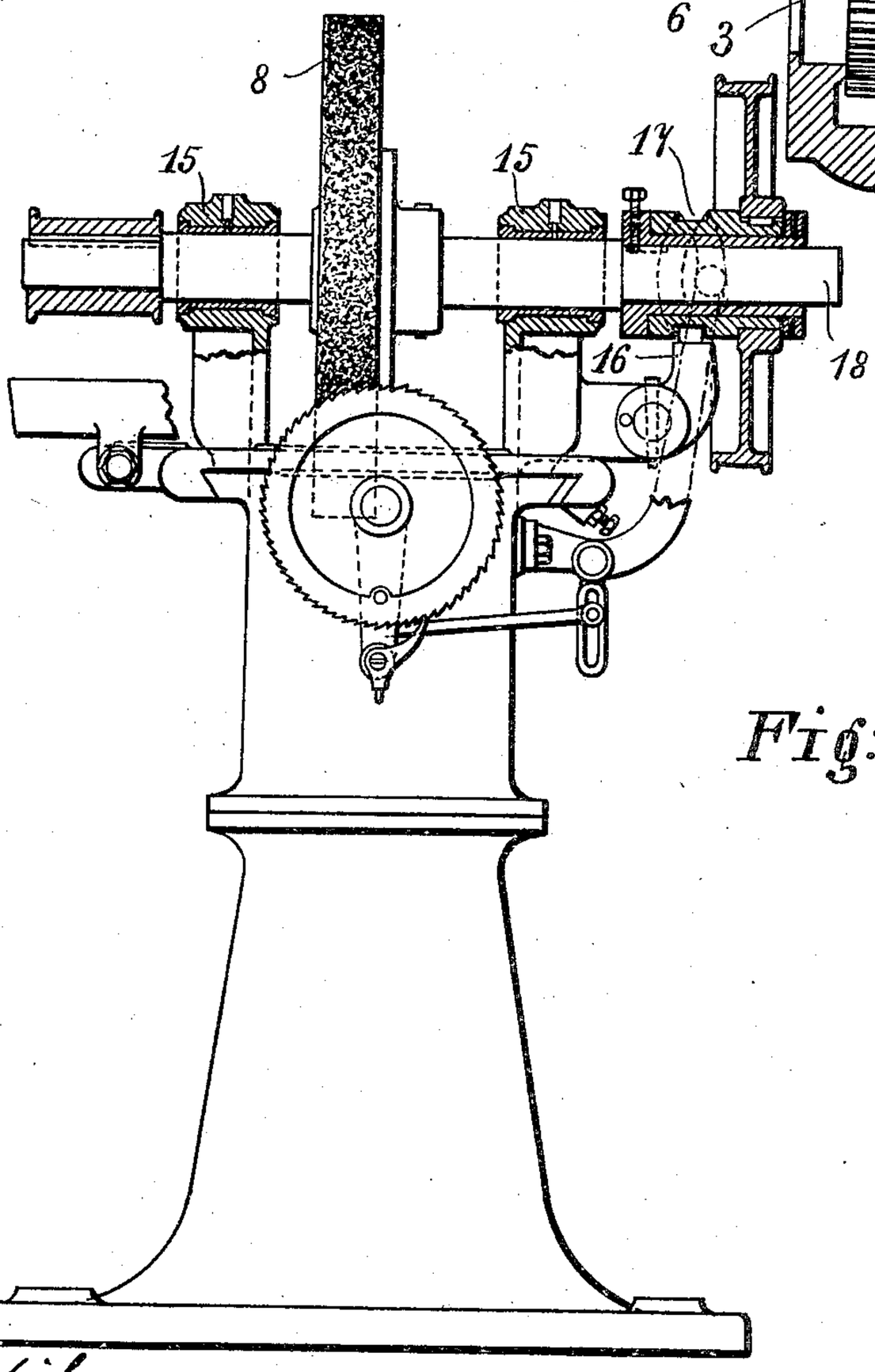


Fig: 5.

Witnesses
M. H. Darg.
L. A. Pride

Inventor:
Friedrich Schmaltz
By Wm. C. Boulter,
Attorney

F. SCHMALTZ.

APPARATUS FOR GRINDING TWIST DRILLS, BORERS, AND THE LIKE.

APPLICATION FILED SEPT. 13, 1909.

965,952.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 3.

Fig: 6.

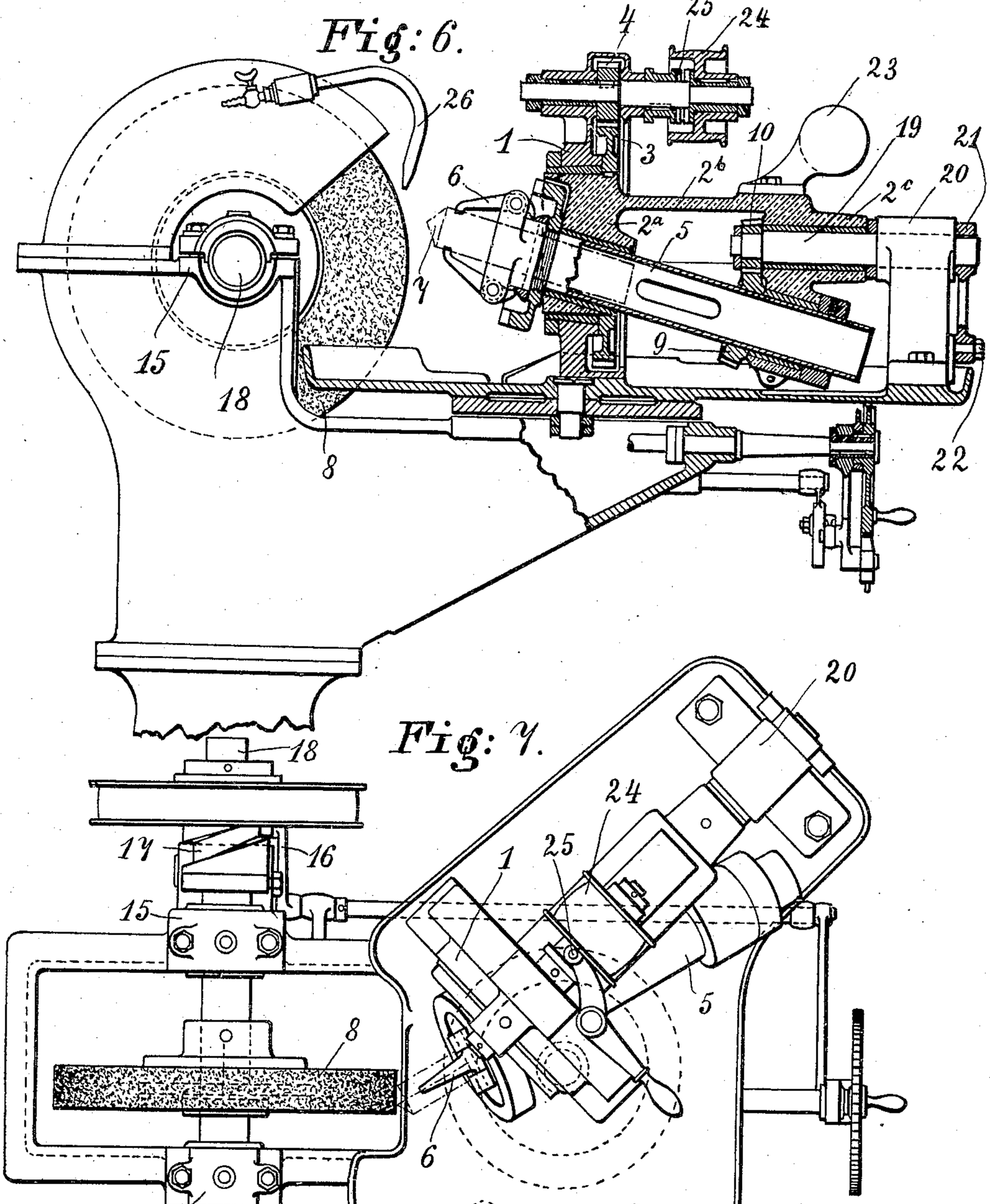


Fig: 7.

Witnesses
M. H. Darg
L. A. Price

Inventor
Friedrich Schmaltz,
By Wm. C. Boulter,
Attorney

UNITED STATES PATENT OFFICE.

FRIEDRICH SCHMALTZ, OF OFFENBACH-ON-THE-MAIN, GERMANY.

APPARATUS FOR GRINDING TWIST-DRILLS, BORERS, AND THE LIKE.

965,952. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed September 13, 1909. Serial No. 517,413.

To all whom it may concern:

Be it known that I, FRIEDRICH SCHMALTZ, a subject of the German Emperor, residing in Offenbach-on-the-Main, in the Empire of Germany, have invented certain new and useful Improvements in Apparatus for Grinding Twist-Drills, Borers, and the Like, of which the following is a specification.

This invention relates to improvements in grinding machines for twist drills, borers and similar tools for automatically grinding all the cutting edges exactly uniformly, and relates more particularly to that class of machines in which the drill-holder is inserted in a cylinder or even in a cone, and in addition to a rotation on its own axis by means of this cylinder or cone, is also moved around in a circular path and thereby carried against a grinding disk in such a way that the latter can always grind one cutting edge of the drill after the other. In such machines the drill-holder was rotated on its own axis, ratchet mechanisms being formerly employed to prevent the drill-holder rotating during a given period. By this invention the ratchet mechanism is replaced by peculiar combinations of toothed wheels, which convert the intermittent movement of the drill holder into a constant and uniform one and thereby enable the work of the machine to be done with certainty and accurately and also save the machine.

In machines of the type in question in order to always enable another cutting edge of the drill to be brought against the grinding disk, there are three possibilities: 1. The rotation of the drill-holder on its own axis is accelerated in such a way that during one revolution of the cylinder the drill makes $1\frac{1}{2}$ revolutions. 2. The rotation of the drill-holder in the cylinder is retarded in such a way that it only makes half a revolution during one entire revolution of the cylinder. 3. A separate reverse or retrograde movement relatively to the cylinder is directly imparted to the drill-holder.

In the accompanying drawings several examples of construction of the invention hereinbefore set forth are shown in Figures 1–4 in purely diagrammatic representations. Figs. 1 and 2 show diagrammatically in horizontal section and rear view respectively one form of construction; Figs. 3 and 4, horizontal sections of two slight modifications; Fig. 5 is a sectional elevation of a portion of a machine embodying the invention. Fig. 6 is a similar view of another portion of the machine. Fig. 7 is a plan view of the parts seen in Fig. 6.

In all these examples of construction 1 is a fixed bearing in which a cylinder 2 is revolubly arranged. This cylinder 2 is set in constant uniform rotation by any suitable means, and in these examples this is done by means of a toothed ring 3 which is provided on the cylinder 2 and rotated by a toothed pinion 4 arranged in any suitable way. The drill-holder 5, which retains the drill 7 by means of any suitable clutch mechanism 6, is inserted in the cylinder 2. The drill-holder 5 thus receives by the rotation of the cylinder 2 a circular course which moves the point of the drill during a given time along the grinding disk 8 and thereby allows of the grinding of the cutting edges of the drill. Now if the drill-holder 5 were fixed in the cylinder 2, at each revolution the same cutting edge of the drill would be conveyed to the grinding disk. It is therefore necessary that at each revolution of the cylinder 2 the drill-holder 5 should receive also a separate rotation on its own axis.

In Figs. 1 and 2, 1 is a bearing in which the cylinder 2 is mounted. This cylinder has a ring of teeth 3, with which a toothed pinion 4 arranged at any suitable place, gears, and thereby imparts to the cylinder 2 a continuous rotary movement. The drill-holder 5 is mounted in the cylinder 2, and holds the drill 7 in a vise head 6. On the rear end of the drill-holder 5 a toothed wheel 9 is mounted, which gears with a toothed pinion 10. The latter is mounted in any suitable way, for instance, by its being arranged on a cross bar or bridge piece 11. The ratio of gearing between the pinion 10 and the toothed wheel 9 is as 1:2. While in this arrangement the cylinder 2 makes one revolution, the drill holder 5 also makes this revolution with it, but in addition also receives a further half revolution on its own axis, and has thus made $1\frac{1}{2}$ revolutions and thereby in continuous working, the other cutting edge of the drill 7 always encounters the grinding disk 8.

Fig. 3 shows a form of support in which the drill holder 5 stands at an inclination with the axis of the cylinder 2. In this case the toothed wheels 9, 10, are bevel wheels (see Fig. 3). The construction is almost ex-

actly the same when the axis of the drill holder is obliquely inclined to the axis of the cylinder.

Exactly the same effect as in the constructions hereinbefore described may be attained if, as shown in Fig. 4, in place of the fixed toothed pinion 10 a ring 12 with internal teeth is mounted on the bearing 1. In this case the bridge piece 11 is dispensed with, and a toothed pinion 13 gears with the teeth 12, which pinion runs loosely on a pin 26 fixed in a rotating cylinder 2. This pinion is firmly connected with the bevel wheel 14, which again is in engagement with the bevel wheel 9. By the traveling of the pinion 13 on the ring of teeth 12, the ratio of gearing will correspond to that of the bevel wheel 14, and thereby the drill holder 5 is moved by the wheel 9.

In the example shown in Fig. 4, the ratio of gearing of the toothed wheels 12 and 13 to the toothed wheel 9 is again as 1:2, and they thus produce an acceleration of the drill-holder 5 to the extent of a half revolution over the rotation of the cylinder.

By a suitable alteration of the ratio of gearing, the drill-holder, as previously mentioned, may be caused to rotate also on its own axis in such a way that it each time lags to the extent of a half revolution relative to the revolution of the cylinder 2. The object sought after is also thereby attained.

In the forms of construction hereinbefore described of the invention, the drill point always traverses a circular course and a given small part of this course touches the grinding disk. According to the angular position which the drill assumes at the commencement of the grinding, that is to say at the commencement of its contact with the grinding disk, the position of this circular course to the grinding disk will be altered. The more acute the angle with the grinding disk is which the drill assumes at the commencement of the grinding the deeper will be the backed off grinding. Now this angular position may be very easily altered by making the fixed toothed gear 10 displaceable. Then according as it is displaced more to one side or the other, the drill will come in contact with the grinding disk earlier or later in the course of its circular course and thus form a more or less acute angle with the grinding disk during the grinding period, and thereby the backed off grinding will be correspondingly altered. A pointer or index may also be combined with the toothed wheel 10 to directly indicate the degree of adjustment.

While in the figures hereinbefore described, the principle of the invention is explained by means of various diagrammatic representations, Figs. 5, 6 and 7 show in all their parts a complete grinding machine ready for practical use. Only those parts of it are however, here described which lie within the scope of this invention. Here again, there is a grinding disk 8 mounted in bearings 15, and moved to and fro in the ordinary way, so that no unequal wearing of the grinding surface can take place. The mechanisms employed for this purpose are well known; in the present case an arm 16 provided with a small guide roller is provided, which arm engages in an oblique nut 17 and thereby moves the grinding disk shaft 18 during its rotation slowly axially to and fro. The grinding disk is preferably incased as far as possible and provided with a water-sprinkling device 19.

In the diagrammatic representations of the first figures, the cylinder 2 is simply shown as a short cylindrical body. In practice, however, this form of construction would not be the best. For this reason in this improved machine, the cylinder 2 is so arranged that it is mounted and guided at two points. In this manner a peculiarly shaped body results, which only at its front part 2^a has the form of a cylinder or cone, the middle at 2^b being recessed or hollowed out, and its rear part 2^c mounted on a pin 19^a. This entire body, however, in every respect is quite similar in its action to the cylinder or cone 2 shown diagrammatically in the first described figures. It carries the drill-holder 5, which receives the drill 7 and holds it fast by means of claws or clutches 6. The axis of the drill-holder 5 stands at an acute angle to the axis of rotation of the rotary body 2^a 2^b 2^c. A toothed wheel 9 is mounted on the drill-holder, as was the case in the diagrammatic Figs. 1–4, which wheel gears with the toothed wheel 10. The latter is firmly mounted on the pin 19 and this is carried in a bearing 20 in which it may turn. In order to allow this turning, which never reaches a complete revolution, to take place, the pin 19 is slightly prolonged to the rear and a lever 21 is mounted on this prolongation. This lever 21 has on its lower free end a screw pin 22, and by means of this screw pin the lever 21 is fixed in any suitable position. If it be desired to give the pin 19 another position, the screw 22 is slackened, then the lever of the pin 19 is turned into the desired position, and finally the screw is again tightened up.

A counterweight 23 is provided on the rotary body 2^a 2^b 2^c for the purpose of balancing it, and may also serve as a handle.

A ring of teeth 3 with which the toothed pinion 4 engages and thereby sets the body 2^a 2^b 2^c in uniform rotation, is mounted on the part 2^a of the rotary body. The pinion 4 is operated by means of a belt pulley 24, which may be suitably thrown into and out of action by means of a clutch coupling 25.

The apparatus hereinbefore described operates in all its parts exactly as described in

connection with the principle of the invention shown in the first figures.

When the body 2^a 2^b 2^c rotates, the gear 10 is stationary, the drill-holder 5 is thereby caused to slowly rotate, and with the ratio of gearing hereinbefore selected, describes a half revolution on its own axis in the time in which the rotary body 2^a 2^b 2^c has made one revolution. In this way in continuous working, another edge of the drill always comes against the grinding disk.

The machine shown in the drawings also has a series of devices which serve for the adjustment of the drill and for adapting it to various kinds and sizes of drills, but all these devices do not form an essential feature of the invention and are already known in similar constructions and therefore do not require to be here further described.

I declare that what I claim is:—

1. In machines for grinding twist-drills, borers and similar tools with uniform cutting edges, a drill-holder, a rotary body, carrying said drill-holder, means for rotating the rotary body, and toothed gearing for rotating the drill-holder on its axis independently of and relative to said rotary body.

2. In machines for grinding twist-drills, borers and similar tools with uniform cutting edges, a drill-holder, a rotary hollow body carrying said drill-holder, means for rotating the said body, a bearing carrying the front end of said body, a shaft carrying the rear end thereof, toothed gearing on the end of the drill-holder, and toothed gearing on the said shaft for rotating the drill-holder independently of and relatively to the rotary body.

3. In machines for grinding twist-drills, borers and similar tools with uniform cutting edges, a drill-holder, a rotary body supported at both ends carrying the drill-holder, means for rotating said body, toothed gearing on the rear support of the rotary body for rotating the drill-holder independently, and means for adjusting the position of the said toothed gearing to enable the backing off grinding to be altered.

In witness whereof, I have hereunto signed my name the 2d day of September, 1909, in the presence of two subscribing witnesses.

FRIEDRICH SCHMALTZ.

Witnesses:
L. KETTNER,
E. FREUND.