E. & W. STONE.

CYLINDER GRINDING MACHINE.

APPLICATION FILED JAN. 24, 1910.

993,901.

Patented May 30, 1911.

4 SHEETS—SHEET 1.

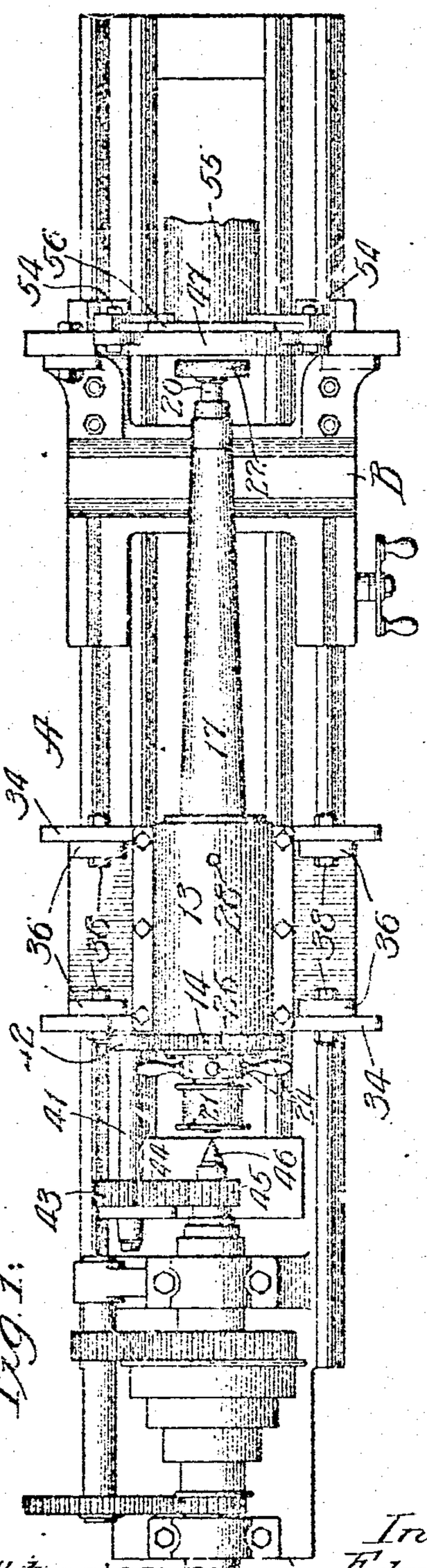

Fig. 1.

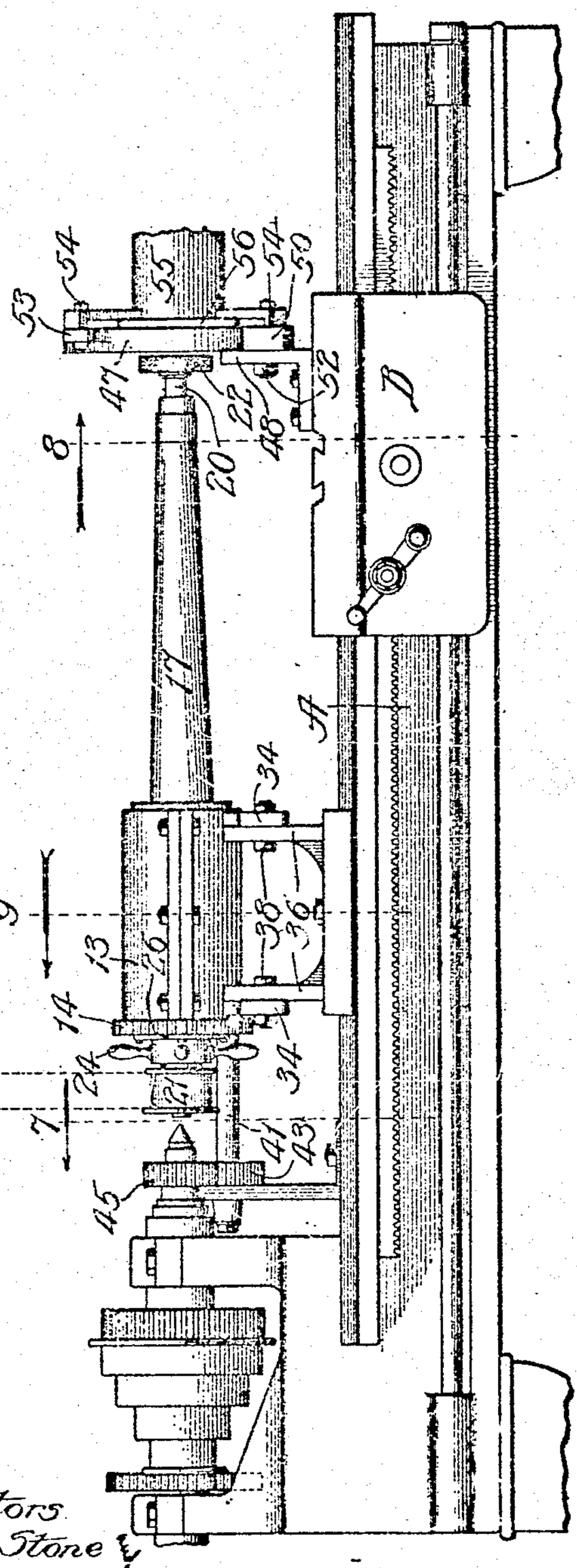

Fig. 2.

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Fig. 3.

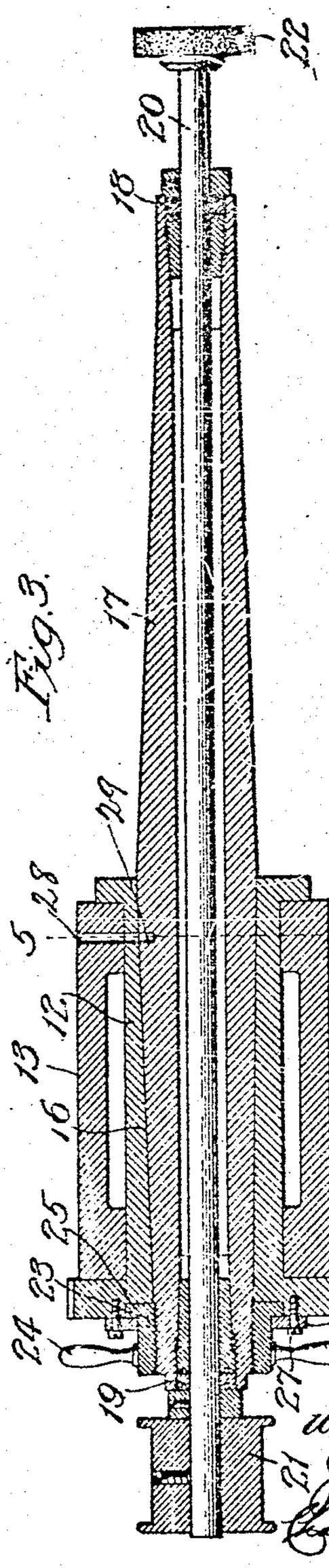


Fig. 4.

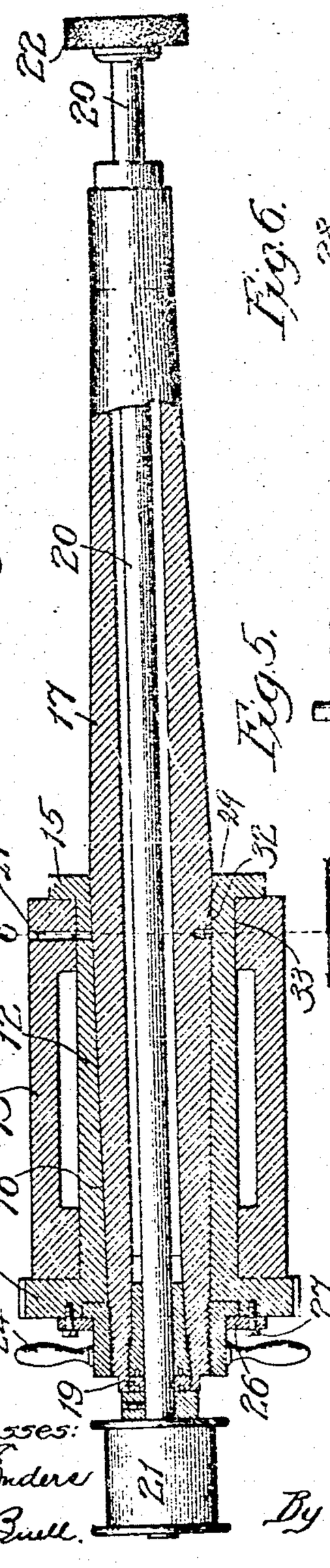
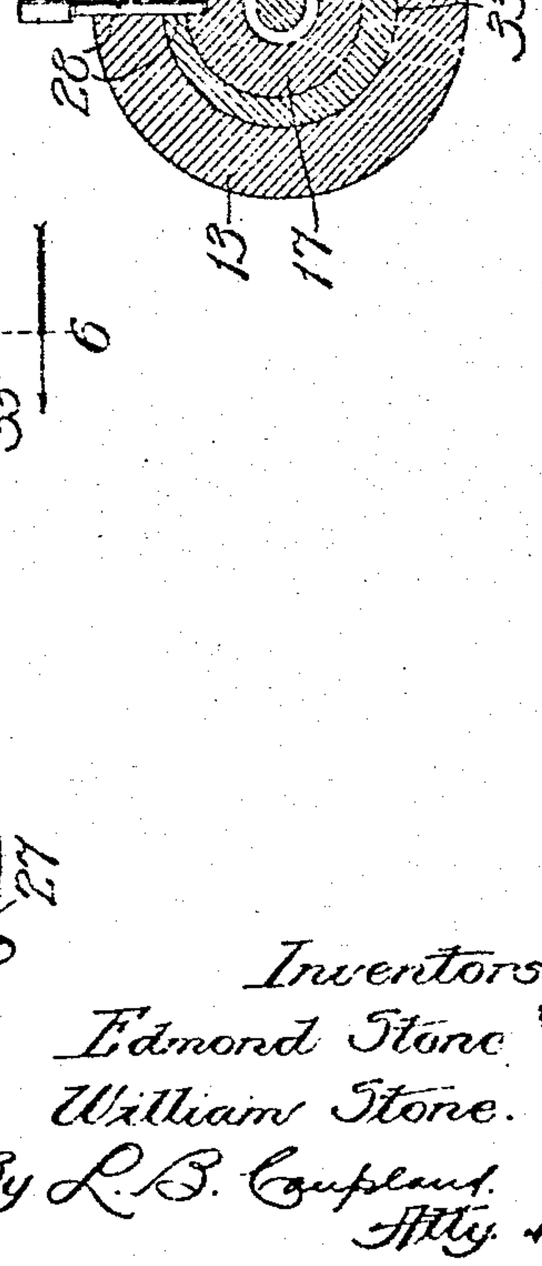


Fig. 5.



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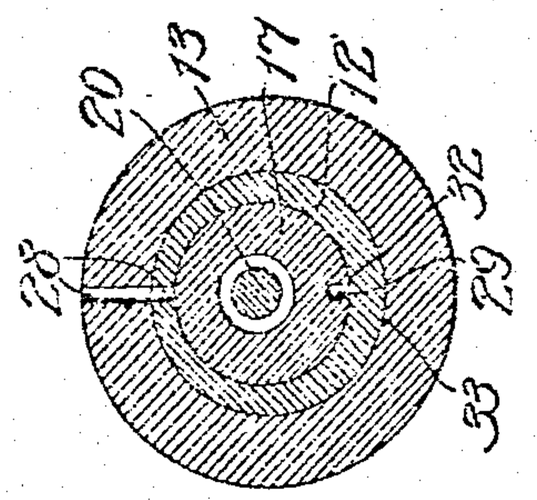

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4 SHEETS—SHEET 3.

Fig. 7.

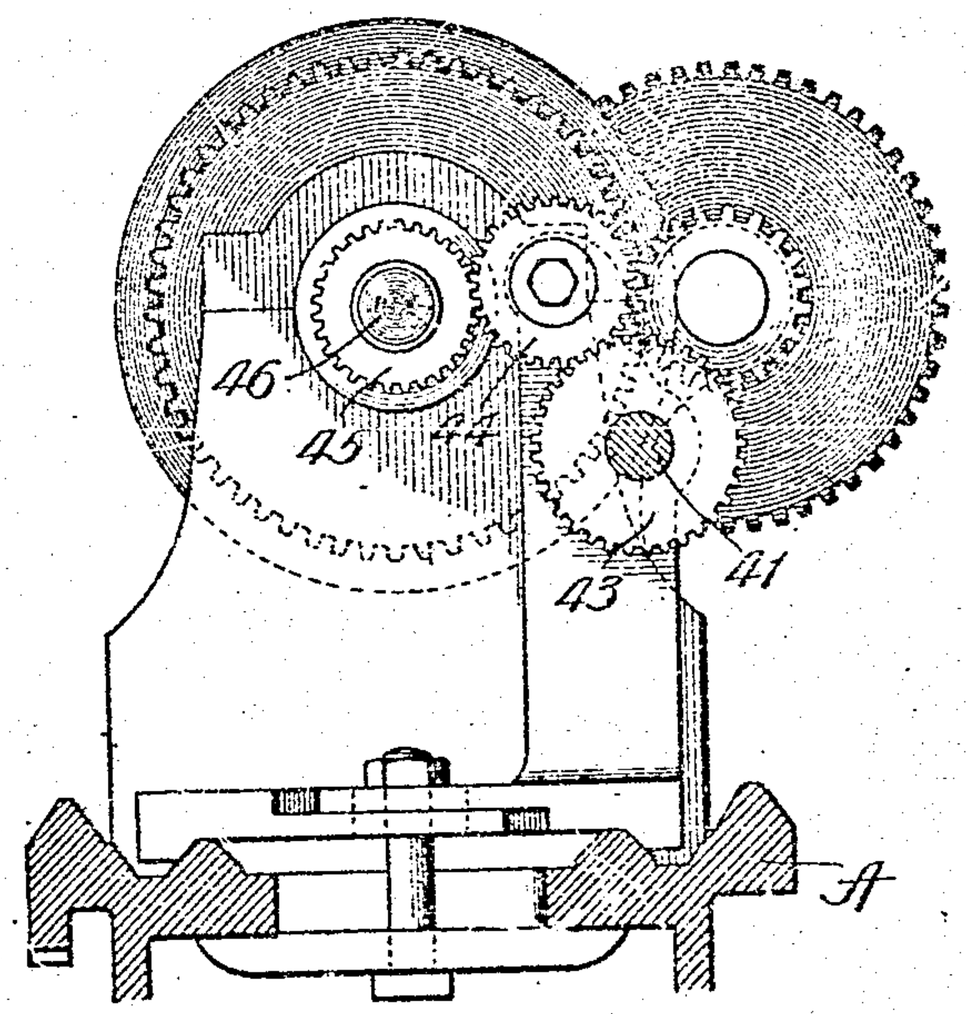
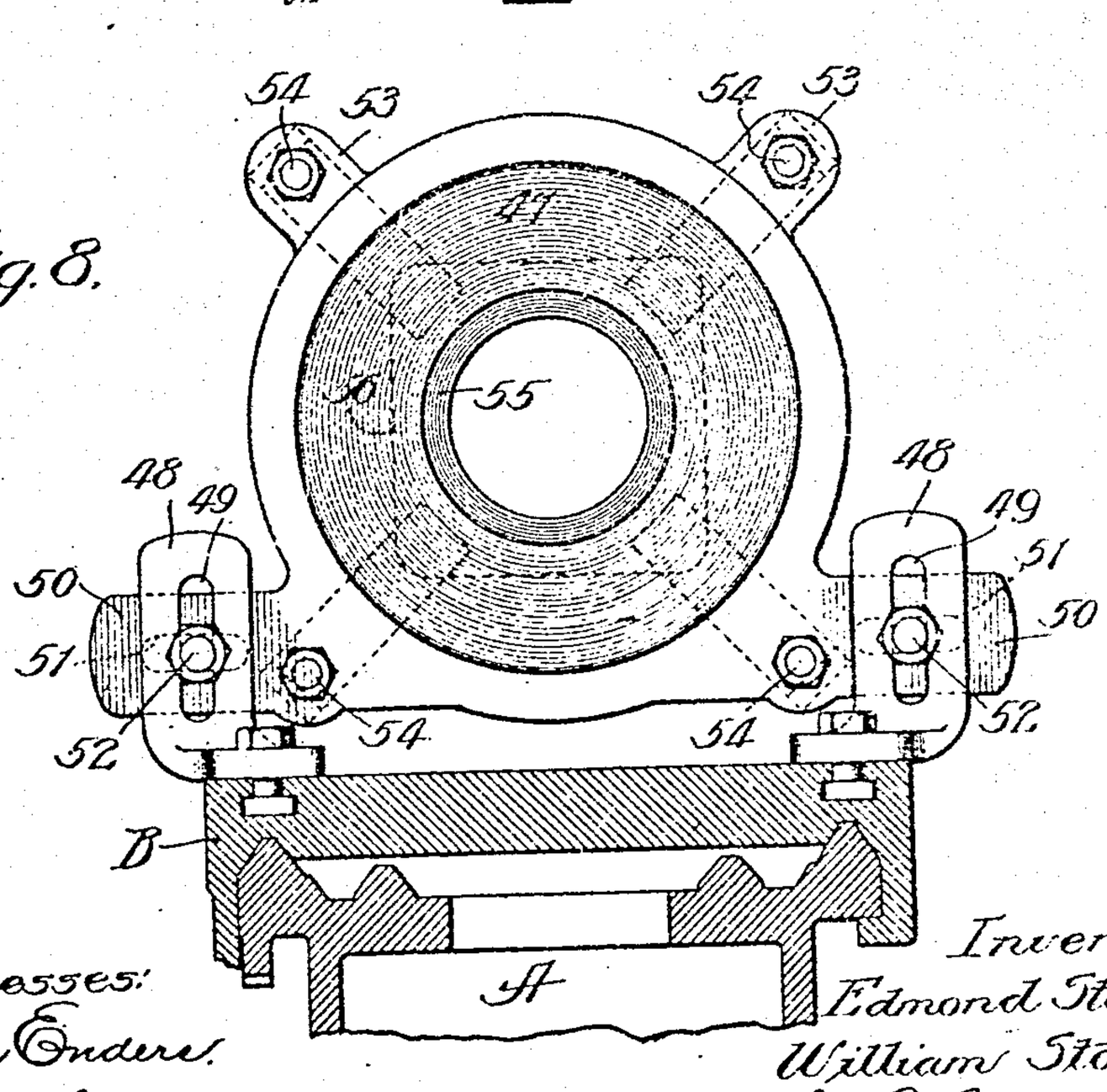


Fig. 8.



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4 SHEETS—SHEET 4.

Fig. 10.

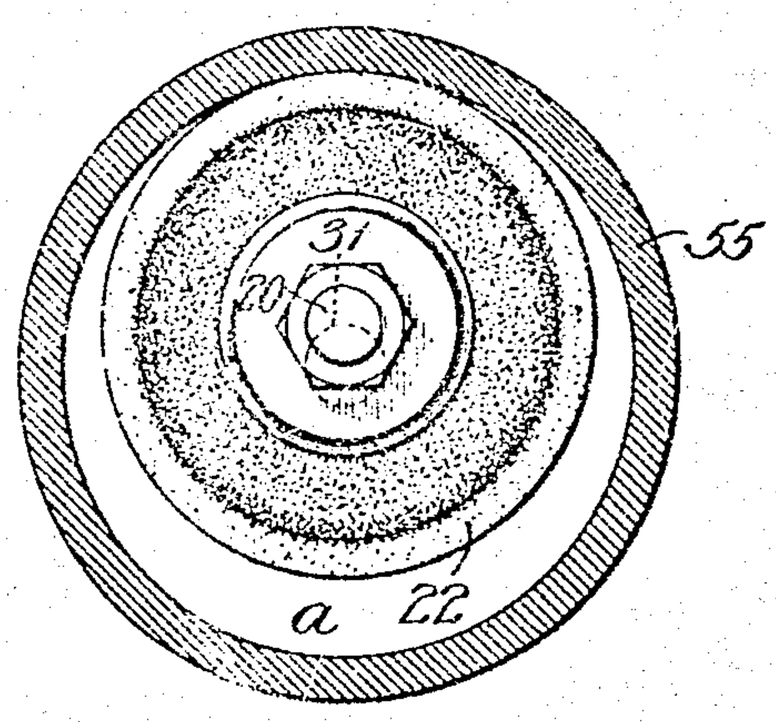


Fig. 11.

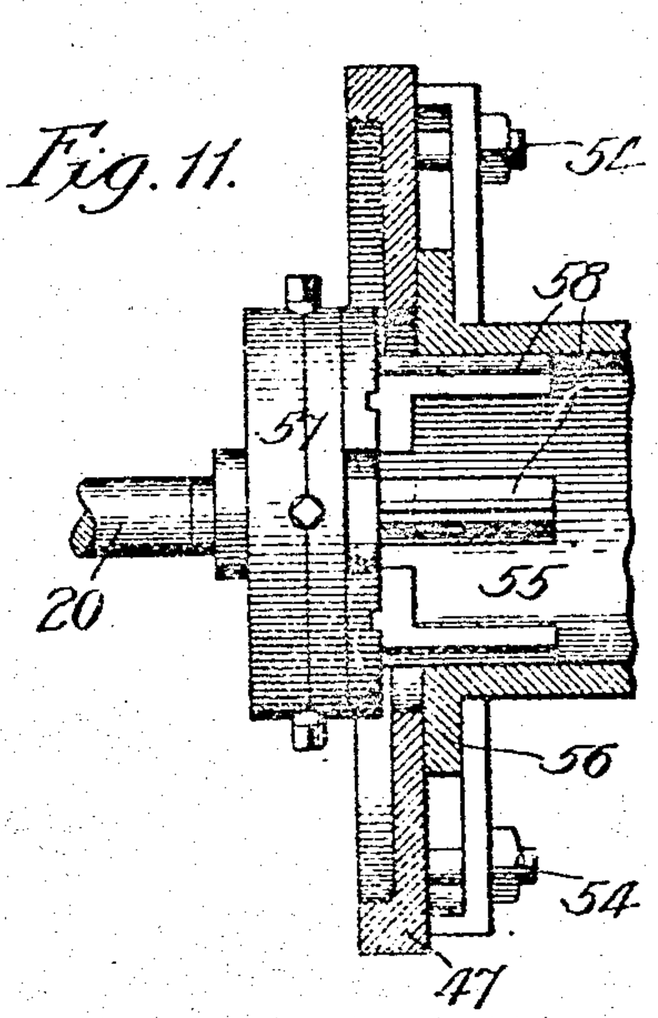
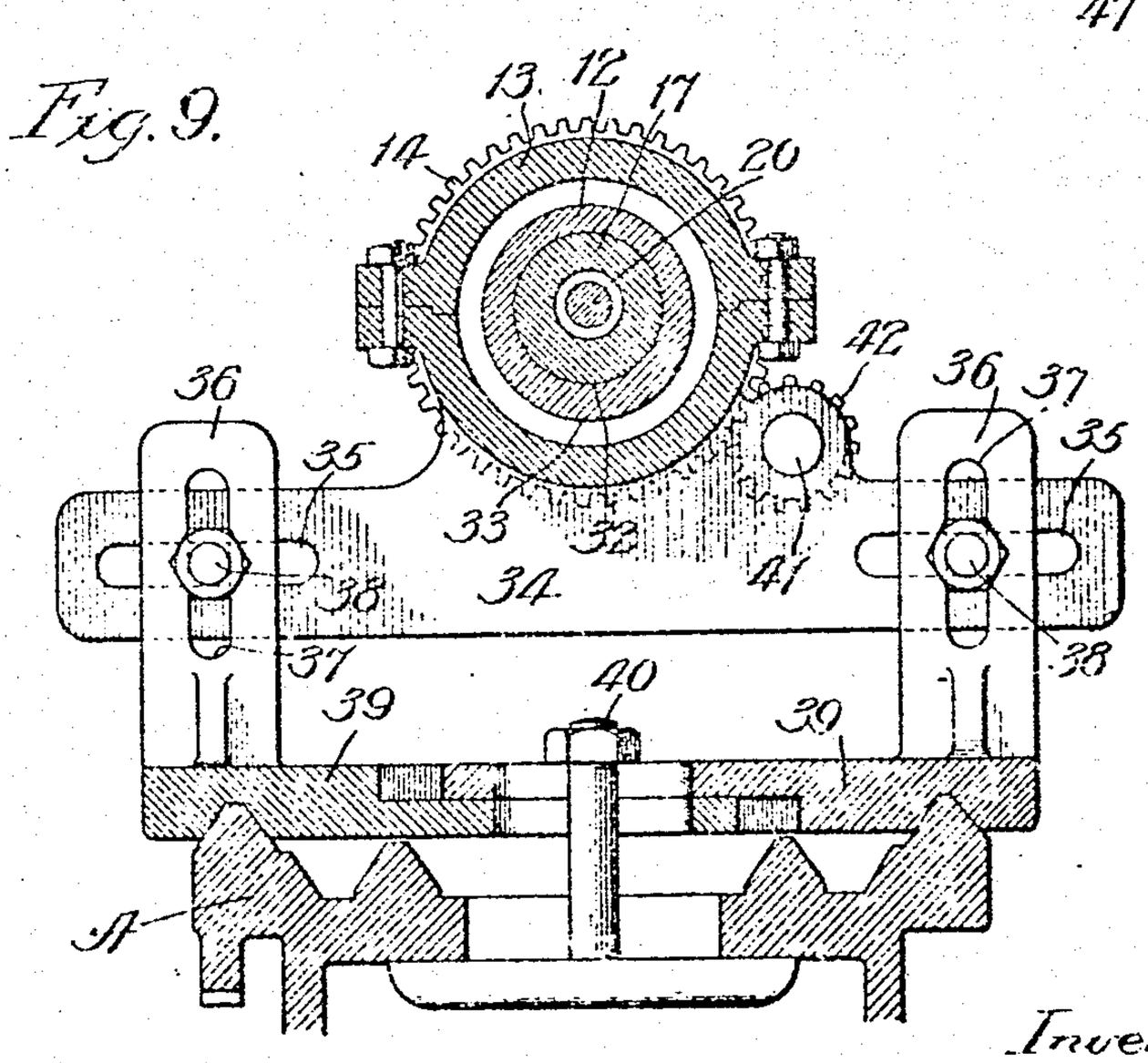


Fig. 9.



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UNITED STATES PATENT OFFICE.

EDMOND STONE AND WILLIAM STONE, OF CHICAGO, ILLINOIS.

CYLINDER-GRINDING MACHINE.

993,901. Specification of Letters Patent. Patented May 30, 1911.

Application filed January 24, 1910. Serial No. 539,813.

To all whom it may concern:

Be it known that we, EDMOND STONE and WILLIAM STONE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cylinder-Grinding Machines, of which the following is a specification.

This invention relates to grinding mechanism for grinding and dressing the interior surfaces of hollow cylindrical bodies, such as engine cylinders and the like; and has for its object to provide a means whereby the work may be accomplished with the greatest facility and accuracy.

In this instance, the invention is shown as an attachment for and is used in connection with an ordinary machine shop lathe.

Figure 1 is a plan of a lathe having the attachment mounted thereon. Fig. 2 is a side elevation of the same. Fig. 3 is a longitudinal section of the grinding or boring mechanism. Fig. 4 is a similar view with some parts in a relatively different position. Fig. 5 is a transverse section on line 5, Fig. 3. Fig. 6 is a transverse section on line 6, Fig 4. Fig. 7 is a transverse section on line 7, Fig. 2. Fig. 8 is a transverse section on line 8, Fig. 2. Fig. 9 is a transverse section on line 9, Fig. 2. Fig. 10 is a transverse section of a cylinder, showing a grinding wheel in its relative working position. Fig. 11 is a side elevation, showing a universal chuck and means employed in clamping a cylinder in position to be operated upon.

A represents the bed of an ordinary lathe, and B the traveling carriage which is operated automatically in the usual manner.

A rotatable sleeve 12 is mounted in a journal or bearing-box 13, as best shown in Figs. 3 and 4. This sleeve has a gear-wheel 14 formed on one end thereof and is provided with a flange 15 on the opposite end, both of which overlap the respective ends of the journal-box. The sleeve 12 has a taper eccentric bore 16 therethrough, as best shown in Figs. 5 and 6. The rear end of a hollow shaft 17 is eccentric in cross-section and is made tapering to correspond to the taper eccentricity of the inclosing sleeve, and has a close fit therein. Companion tubular bearing-plugs 18 and 19 are threaded in the respective ends of the hollow-shaft 17, as best shown in Fig. 3. A shaft or spindle 20 is inserted through the hollow-shaft and the plugs 18 and 19 which provide a journal-bearing therefor. The ends of shaft 20 project from the ends of the hollow-shaft and has a band-pulley 21 mounted on the rear end thereof. A belt will connect this pulley with the driving motive power. A suitable grinding-wheel 22 is mounted on the front end of shaft 20. The hollow-shaft and its sleeve rotate together, as a unit at a very low speed, making about ten to fifteen turns per minute. The shaft 20 runs at a very high speed and in the opposite direction from that of the hollow-shaft.

A lock-nut 23, provided with a number of handles 24 for manually manipulating the same, is threaded on the rear end of the hollow-shaft 17. This nut is provided with a flange 25 recessed in the gear 14, as best shown in Figs. 3 and 4. A collar 26 bears against the outside of the nut-flange 25 and is secured to the gear 14 by a number of stud-bolts 27. This permits of the lock-nut turning in place but preventing a lateral movement. The functions of this nut is to lock the hollow-shaft and its sleeve tightly together for rotation and also to impart a slight forward endwise movement to the hollow-shaft and loosen the same in the sleeve, so that the former may be turned by hand in changing the relative eccentricity of the hollow-shaft and sleeve in increasing or diminishing the throw of the grinding-wheel on shaft 20.

It will be noted that the contacting surfaces of the hollow shaft and its inclosing sleeve taper in opposite directions, and both being eccentric, in cross-section, has the effect of imparting to the front end of shaft 20 and the grinding wheel mounted thereon, an orbital movement and thereby causing the grinding-wheel to travel in a circular path around the interior wall of the cylinder or work, in the operation of grinding and truing the same. The relative contact and working position of the grinding-wheel and engine cylinder being shown in Fig. 10. It will be noted that but a part of the periphery of the grinding-wheel is in contact with the work at the same time. The space *a* between the out of contact surfaces is somewhat exaggerated, but it will be understood that grinding-wheels of different diameters will be used in accordance with the diameter of the work and confining the orbital movement or throw within practical limits.

An aperture 28 extends through the journal-box 13 and the sleeve 12. An aperture 29 opens into the hollow-shaft and stops therein. When these apertures register in line, as shown in Figs. 3 and 5, a pin 30 may be inserted therein which will lock the parts together against turning. In this locked relation of the hollow-shaft and its sleeve, the grinding-shaft 20 is in its normal central position as indicated by the dotted circular line 31 in Fig. 10. In this position the grinding-wheel is held away from contact with the work and which permits of the convenient removal of the same to be replaced by other work. When the grinding wheel is to be brought into contact with the surface of the work the pin 30 is removed and the hollow-shaft turned to bring the grinding-wheel against the surface of the work, as shown in Fig. 10. It will be understood that in the operation of moving the grinding-wheel away from and toward the work, the lock-nut 23 must be turned in the right direction to impart a slight forward endwise movement to the hollow-shaft so that it may be easily turned independent of its surrounding sleeve in securing the required adjustment. When the parts are properly positioned, the lock-nut 23 is turned in the opposite direction and the hollow-shaft drawn back into close engagement with its sleeve. The throw of the orbital movement is increased or diminished by turning the hollow-shaft independently of its sleeve so as to bring the high part 32 of the eccentric cap of the hollow-shaft and the corresponding high part 33 of the sleeve, in different relative positions. By this arrangement the grinding-wheel may be accurately set to take anything from a light to a heavy cut as may be required. The adjustment is positive and cannot fail to dress the cylinder to a true circle.

The journal-box 13 is provided with companion transverse plates 34 arranged vertically and having horizontal slots 35 therein. The plates 34 are secured to standards 36, provided with vertical slots 37, by means of bolts 38 inserted through said slots and permits of the journal-box being adjusted both laterally and vertically. The standards 36 rise from a base 39 which is movable on the bed of the lathe and is secured in any position to which it is moved by a clamping bolt 40.

A counter-shaft 41 is provided with suitable journal-bearings and has a pinion 42 mounted on the forward end thereof which engages gear 14 on sleeve 12, as shown in Figs. 1 and 2. A pinion 43 is mounted on the opposite end of shaft 41 and which in turn engages a pinion 44, the latter pinion engaging a pinion 45 mounted on spindle 46 of the lathe head-stock, as shown in Figs. 1, 2 and 7. The necessary motion is transmitted to the spindle 46 in the usual manner and which in conjunction with the train of gearing described, transmits the required motion to gear-wheel 14 on sleeve 12.

A face-plate 47 is adjustably secured to the carriage by companion angle-plates 48, as shown in Figs. 1, 2 and 8. These angle-plates are provided with vertical slots 49 and the integral arms 50 of the face-plate with horizontal slots 51 through which the clamping bolts 52 are inserted in providing for the required adjustment in setting the face-plate 47 in accordance with the work.

The face-plate 47 (Fig. 11) carries a number of clamping bars 53 adjustably secured thereto by bolts 54. The purpose of these bars is to rigidly secure the work in place on the face-plate. In this instance the work shown in place, is an engine cylinder 55, the inner ends of the bars 53 overlapping the edge of the cylinder end flange 56 in locking the cylinder against the face-plate. The cylinder is set in alinement by means of a universal chuck 57, the jaws 58 of which are expanded to bear against the inner circumferential wall of the cylinder. During this operation the chuck is mounted on the end of shaft 20 from which the grinding-wheel has been temporarily removed. When the cylinder is centered the clamping-bars 53 are tightened and the cylinder firmly locked in place. The chuck is then removed and the grinding-wheel remounted in its working position.

Under the ordinary arrangement it sometimes takes hours to properly set and center a cylinder to be bored out. By the present arrangement this operation may be accomplished in a few minutes, insuring accuracy and saving much valuable time.

In this instance the work is fed to the grinding-wheel in the line of its axis, but it is obvious that this operation may be reversed by connecting the carriage B with the base supporting the journal-box 13.

One of the important features of this invention, is the orbital movement, and in practical working it will be understood that the diameter of the circle described gradually grows less from the grinding-wheel to the vanishing point at the rear end of the grinding-wheel shaft which occupies practically a fixed center. Thus the movement must always be positive and the grinding-wheel made to travel in the path of a true circle and doing the work accurately with all mechanical precision.

A reamer or other tool may be used as an auxiliary to the grinding-wheel when necessary, and can be mounted on either the hollow shaft or grinding shaft 20, which will impart the proper feed movement to such tool.

What we claim is—

1. In mechanism of the class described, a

revoluble sleeve having a tapering bore therethrough, a hollow-shaft inserted therein and tapered exteriorly to conform to said bore, and means for imparting an endwise movement to said shaft independent from that of said sleeve.

2. In a machine of the class described, a sleeve rotatably mounted and having an eccentric bore therethrough, a hollow-shaft having the rear part thereof inserted in said sleeve, the exterior surface of said shaft tapering eccentrically in the opposite direction with reference to said sleeve, and means associated with said shaft whereby the same may be locked in said sleeve to rotate therewith, or loosened to be turned independently thereof.

In testimony whereof we affix our signatures in presence of two witnesses.

EDMOND STONE.
WILLIAM STONE.

Witnesses:
L. B. COUPLAND,
J. B. DONALSON.