G. A. FRIESS.

CYLINDER GRINDING MACHINE.

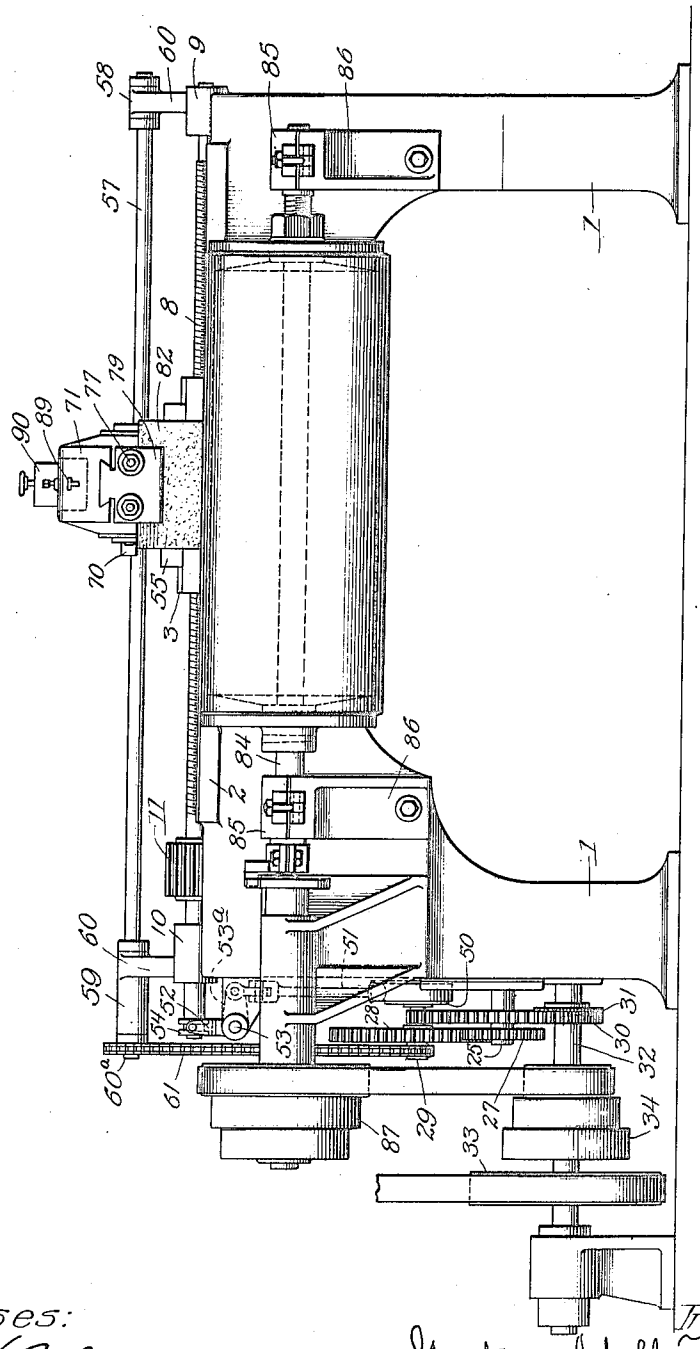
APPLICATION FILED NOV. 23, 1916.

1,227,775.

Patented May 29, 1917.

5 SHEETS—SHEET 1.

Fig. 1.




Witnesses:

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Inventor.

Gustav Adolf Friess

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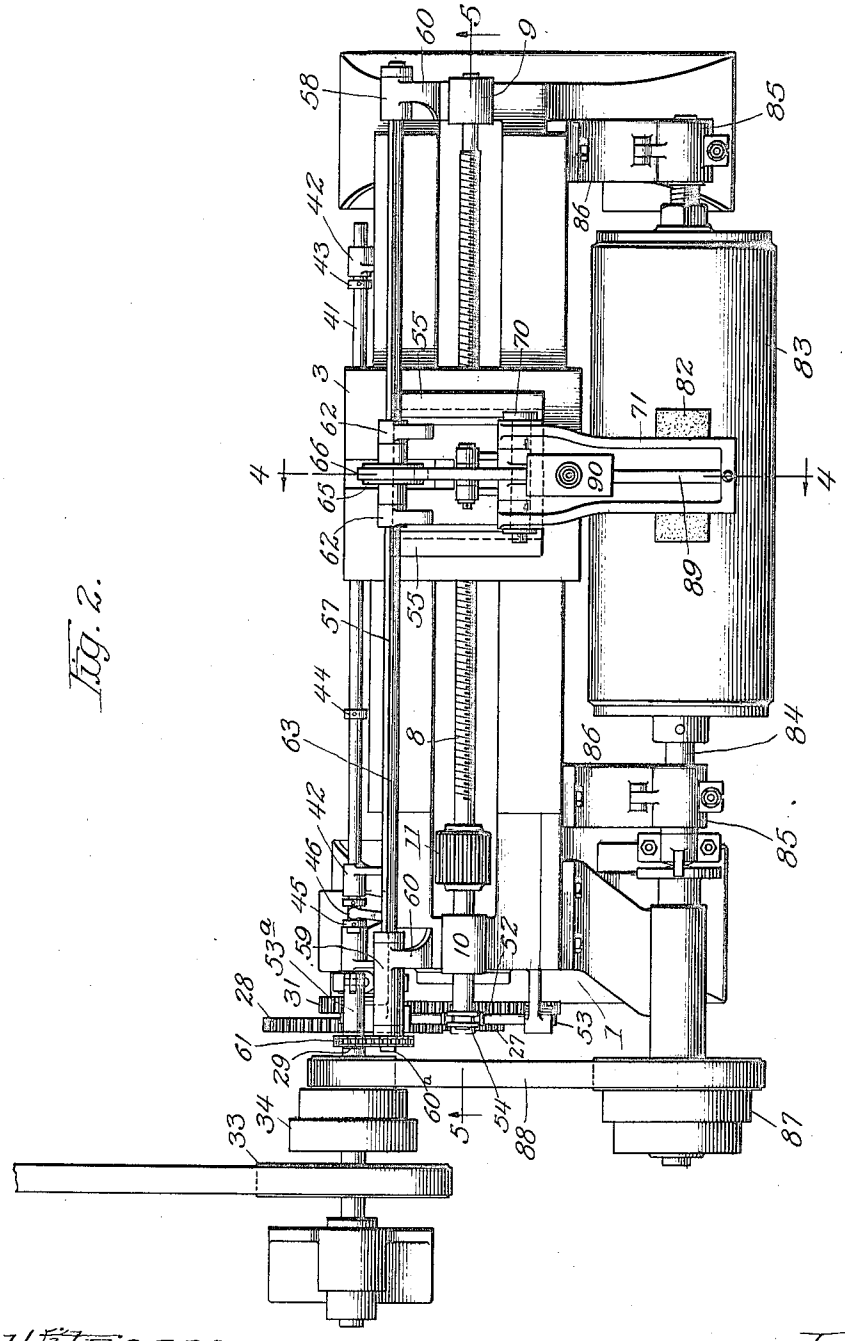


Fig. 2.

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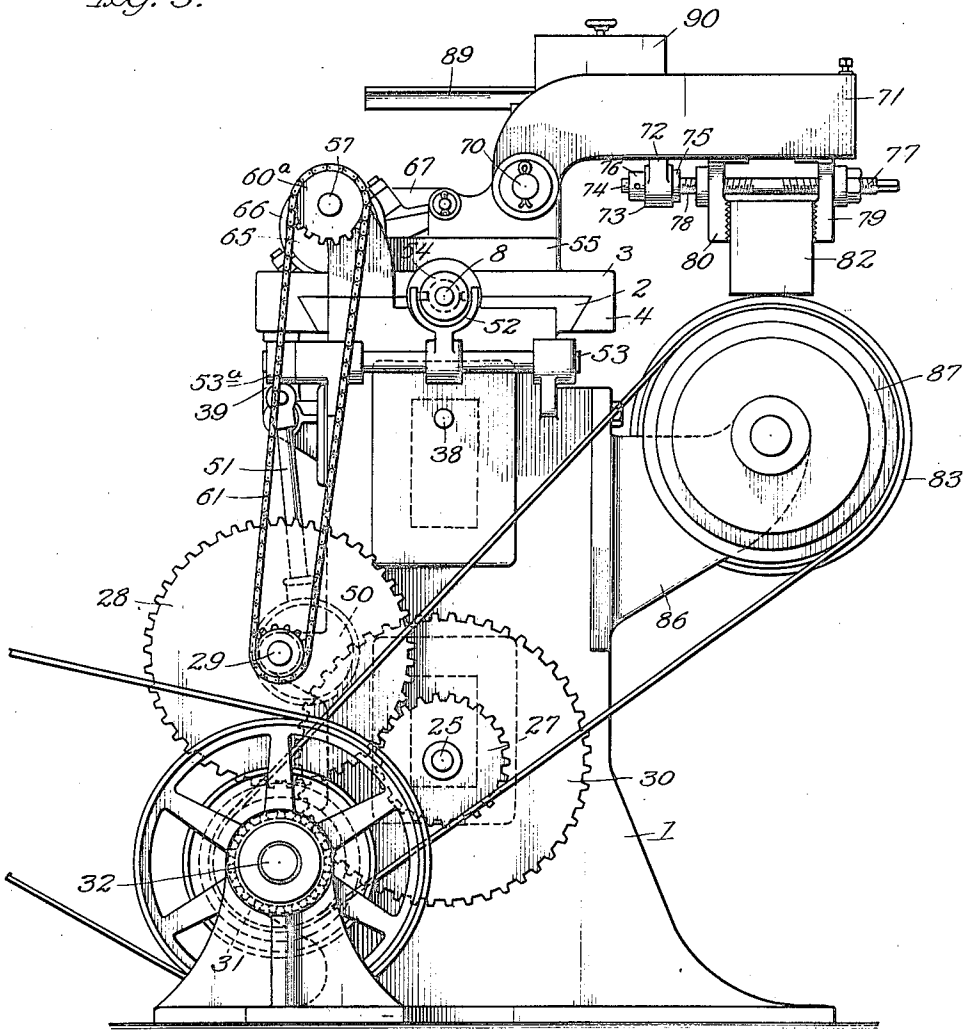
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5 SHEETS—SHEET 3.

Fig. 3.




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5 SHEETS—SHEET 4.

Fig. 4.

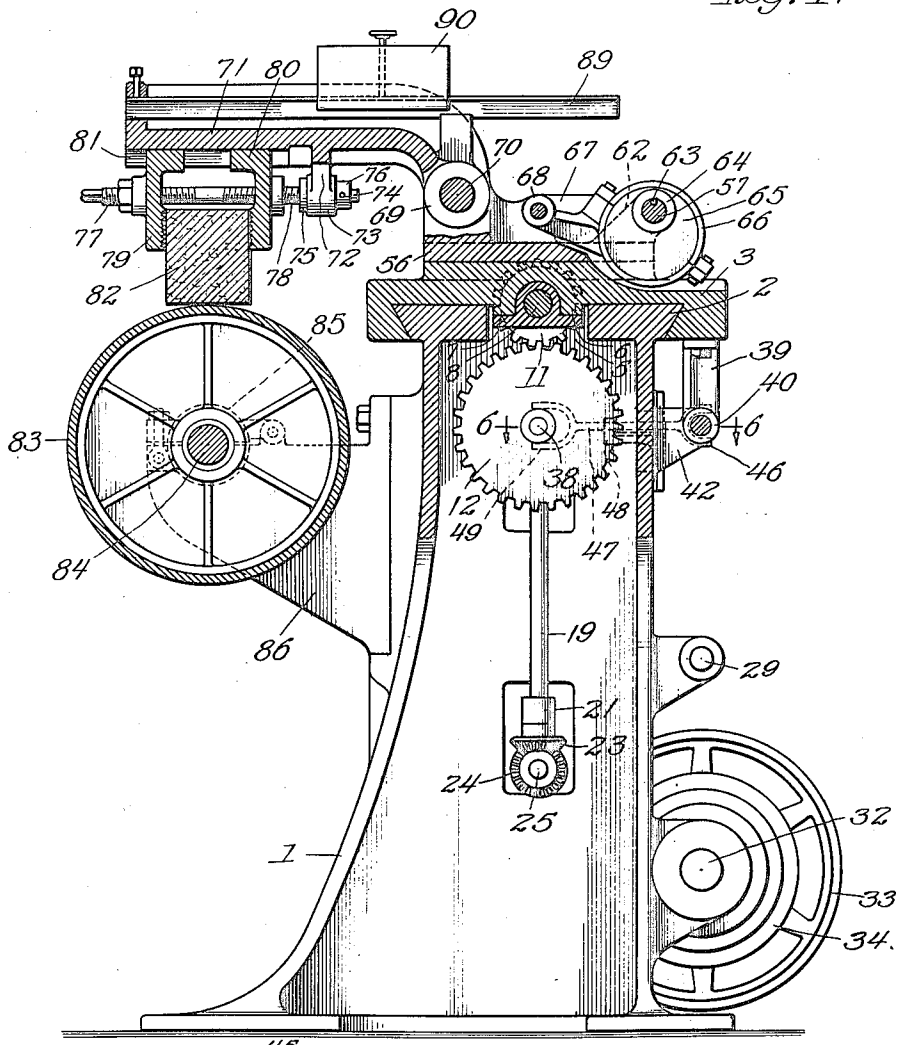
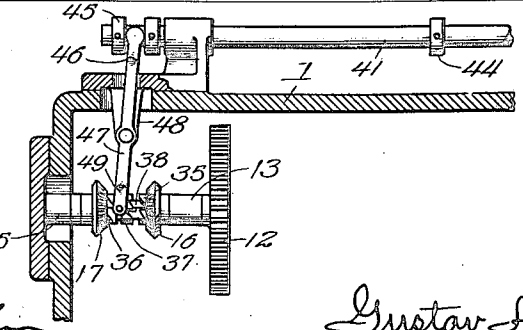



Fig. 6.




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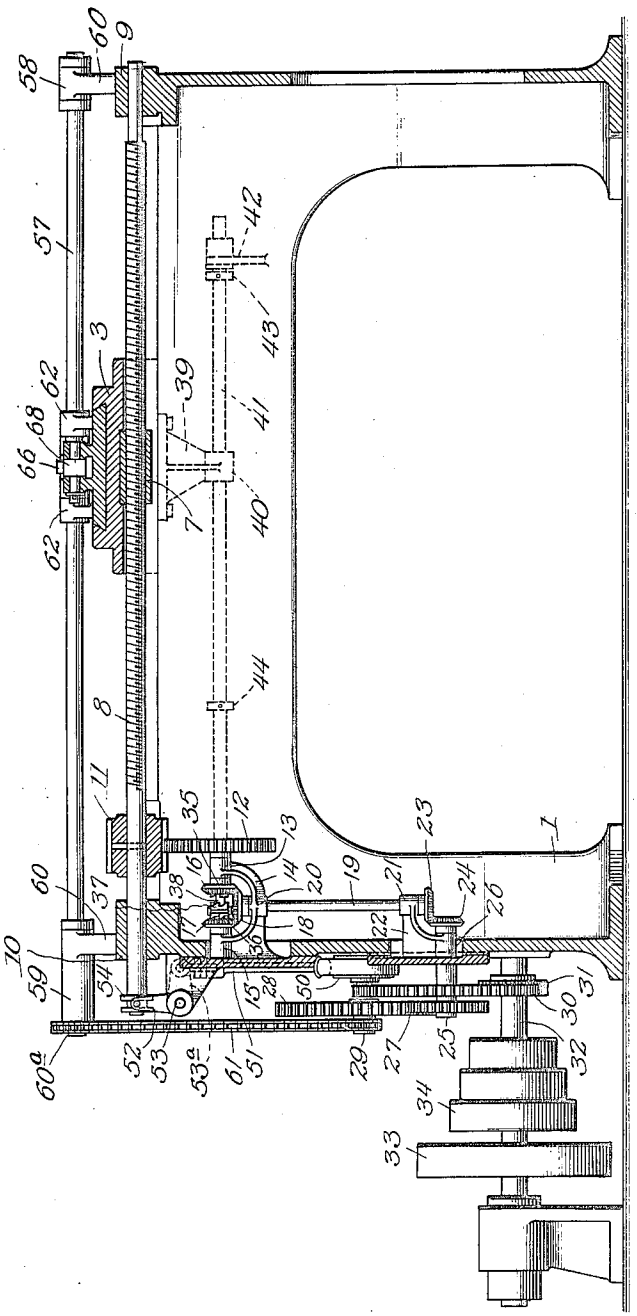
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5 SHEETS—SHEET 5.

Fig. 5.




Witnesses:

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# UNITED STATES PATENT OFFICE.

GUSTAV A. FRIESS, OF CHICAGO, ILLINOIS.

## CYLINDER-GRINDING MACHINE.

1,227,775. Specification of Letters Patent. Patented May 29, 1917.

Application filed November 23, 1916. Serial No. 133,048.

*To all whom it may concern:*

Be it known that I, GUSTAV A. FRIESS, subject of the Emperor of Germany, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cylinder-Grinding Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to cylinder grinding machines and has for its object to provide a machine of this character which will automatically accurately grind cylinders to any desired depth.

The invention is particularly designed and adapted for grinding and polishing the printing cylinders of printing presses, and more particularly the copper cylinders of so-called intaglio or rotogravure presses, but may be used for grinding cylinders of every description including lithographic stones and the like.

The particular objects of the invention are:

First: To provide a machine of the character described in which the grinding or polishing element bears with uniform pressure upon the cylinder surface so as to uniformly grind all parts of the surface with which it comes in contact.

Second: To provide cylinder grinding means in which the grinding or polishing element is given a compound motion whereby all parts of its surface are brought substantially equally in contact with all parts of the cylinder surface to be ground.

Third: To provide a machine of this character in which the movement of the grinding or polishing element longitudinally of the cylinder being ground is automatically reversed as said element reaches the respective ends of the cylinder operated upon.

Fourth: To provide a machine of this character in which the rapidity of the grinding may be changed and varied without varying the speed of the machine or any part thereof and without changing the grinding element.

Other objects of the invention will be fully understood from the following specification.

The invention consists in the features of construction and combinations of parts hereinafter fully described and claimed.

In the accompanying drawings illustrating the preferred embodiment of the invention:

Figure —1— is a view in side elevation of a grinding machine constructed in accordance with the invention.

Fig. —2— is a top plan view of the same.

Fig. —3— is an end elevation of the same.

Fig. —4— is a vertical transverse section of the same on the line 4—4 of Fig. —2—.

Fig. —5— is a vertical longitudinal section of the same on the line 5—5 of Fig. —2—.

Fig. —6— is a fragmentary detail horizontal section on the line 6—6 of Fig. —5—.

The said machine comprises a suitable frame which includes the standards 1 and the flanged plate or table 2 carried thereby and constituting the support for the carriage 3, which is movable longitudinally of said plate 2, the edge portions of the latter being beveled to fit the beveled inner faces of the flanges 4 of the carriage and constituting a dove-tail guide for said carriage 3 which is thus held firmly down upon the plate 2 and is held against lateral movement relatively to the same. Said table or plate 2 is provided midway between its side edges with a longitudinal slot 5 into which the middle portion 6 of the carriage 3 projects, the latter being provided with a bushing 7 internally threaded to receive the screw-shaft 8 mounted midway between the side edges of the slot 5, and having its axis disposed substantially in the plane of the upper face of the plate 2. The said screw-shaft 8 is journaled at its ends in bearings 9 and 10 on the frame of the machine, and is provided between its ends with a relatively long spur pinion 11. The latter meshes with a spur gear 12 on a short countershaft journaled in the bearing 13 in the yoke arm 14 integral with the standard 1 at one end of the machine. Axially alined with said shaft carrying said spur gear 12 is a similar short shaft 15 journaled in the bearings 16 and 17. On said shaft 15 are two loose bevel pinions 18 and 19 respectively, meshing with the bevel pinion 20 on a vertical shaft 21 which is journaled in a bearing 22 between the ends of the arm 14 and in a bearing 23 in a bracket 24 carried by one of the standards

of the frame. Said shaft 21 carries a bevel pinion 25 meshing with a bevel pinion 26 on a countershaft 27 journaled in a bearing 28 of one of the standards 1. The latter carries a spur gear 29 meshing with a spur gear 30 on a countershaft 31 disposed above the same. It also carries a spur gear 32 meshing with a spur pinion 33 on the drive-shaft 34, the latter being equipped with a stepped pulley 35 for rotating the shaft carrying the cylinder to be ground at various speeds in an obvious manner.

The bevel gears 18 and 19 are simultaneously driven in respectively opposite directions. The opposed faces thereof are equipped with clutch faces 37 and 36 respectively, adapted to be engaged by the reciprocable clutch member 38 which is keyed to the shaft 15 between the opposing faces of said gears 18 and 19. Said shaft 15 carries said spur gear 12 so that as said clutch member 38 is thrown to engage the bevel gear 18 said spur gear 12 and screw-shaft 8 will be rotated in one direction; whereas, when said clutch member 38 is engaged with the clutch face of the gear 19 it will be rotated in the opposite direction thereby obviously varying the direction of movement of said carriage 3.

The said carriage 3 is provided with a downwardly extending projection 39 at its rear edge which is equipped at its lower end with a sleeve 40 through which a shaft 41 passes; the latter being journaled in bearings in the ends of the brackets 42 mounted on the frame of the machine and longitudinally movable in said bearings. The said shaft is equipped with collars 43 and 44 which are adapted to be engaged by said sleeve 40 for imparting longitudinal movement to said shaft. The latter is further provided with an annularly grooved collar 45 in which the forked end 46 of a lever 47 engages, the latter being pivotally mounted between its ends on a projection 48 on the frame of the machine, and having its bifurcated other end engaging in the annular groove between the ends of the clutch member 38 so that as the sleeve 40 engages the collar 44 said shaft 41 will be moved in a direction to cause the clutch member 38 to mesh with the clutch face of the gear 18, and when said sleeve 40 engages the collar 43 said clutch member will be thrown into engagement with the clutch face of the gear 19.

Mounted on the shaft 29 is an eccentric 50 engaged with an eccentric rod 51 connected at its upper end with one arm of a bell-crank lever 52 pivotally mounted in a bracket 53 on the frame of the machine. The other arm of said lever 52 is bifurcated and engages in the annular groove of a collar 54 mounted at one end of the screw-shaft 8 so that during the rotation of the shaft 31 reciprocal motion will be imparted to said shaft 8 thus imparting a reciprocable motion to the carriage 3 independently of the reciprocal motion imparted to the same by its threaded engagement with the screw-shaft 8 and the rotation of the latter.

The said carriage 3 is provided with transverse guides 55 in which the base-plate of a carriage 56 engages, the latter being reciprocable relatively to the carriage 3. Extending parallel with the screw-shaft 8 is a countershaft 57 which is journaled in bearings 58 and 59 carried at the ends of brackets 60 on the frame of the machine. Said shaft 57 is provided at one end with a sprocket wheel 60 geared by means of the sprocket chain 61 to a sprocket on the shaft 31 so that said shaft 57 rotates in unison with said shaft 31 and at a speed preferably differing from the speed of rotation of the shaft 8. The carriage 56 is provided with a pair of brackets 62 carrying bearings in which the shaft 57 is journaled between its ends and which are adapted to move longitudinally of said shaft in accordance with the several reciprocable movements of the carriage 3 longitudinally of the said shaft. Said shaft 57 is provided throughout its length with a key-way or groove 63. Disposed between the bearings of the bracket 62 is the hub 64 of an eccentric 65 which is carried by said shaft 57 and is keyed thereto, but is movable longitudinally thereof while held against rotation relatively thereto, as will be obvious. An eccentric strap 66 carried by said eccentric 65 and constituting a part of the plunger or connecting rod 68, which is pivotally secured to the carriage 56 serves to impart reciprocal movement to the carriage 56 relatively to the carriage 3. The carriage 56 carries the bearings 69 for the shaft or pin 70 by means of which an arm 71 is pivotally engaged with said carriage 56. The said arm 71 is provided with a depending projection 72 carrying the bearing 73 for one end of a screw-shaft 74 which is rotatable in said bearing and is held against longitudinal movement relatively to the same by means of the collars 75 and 76. The said shaft 74 has right and left threads 77 and 78 respectively, the threads 77 being engaged with a clamping member 79 and the threads 78 with a similar member 80, both said members being movable longitudinally of the arm 71 in a suitable guide groove 81 in the lower face of the latter. As said shaft 74 is rotated said member 79 and 80 will be moved toward and from each other respectively to engage and release the grind-stone or grinding or polishing element 82. The latter is adapted to rest upon the surface of the cylinder 83 to be ground which is carried by a shaft 84 extending parallel with the shaft 8 and journaled in bearings 85 in brackets 86 on the frame of the machine. The said shaft 84 carries a

stepped pulley 87 at one end which is geared by means of a belt 88 with the pulley 33 on the drive shaft 32 for rotating said shaft 84 at different speeds.

The arm 71 also carries a rail 89 on which a weight 90 is reciprocably movable longitudinally of the arm 71 and transversely of the shaft 8. The said rail 89 projects through the vertical plane of the axis of the pin 70 so that the weight 90 may be used to counterbalance the weight of the arm 71 or increase the weight of the latter; depending upon the pressure desired to be applied to the grinding or polishing element 82.

While it is believed that the operation of the machine will be well understood from the foregoing description, the said operation is briefly reviewed as follows:

The cylinder 83 to be ground is first mounted on the shaft 84. The grinding element 82 is then mounted between the clamping members 79 and 80 and the weight 90 then adjusted to provide the desired degree of pressure on the surface of the cylinder 83. The drive-shaft 32 is then rotated thereby, in the manner described, effecting a constant rotation of the shaft 8 whereby to impart slow longitudinal movement to the carriage 3 relatively to the cylinder 83, the direction of movement of the carriage 3 being changed at intervals determined by the engagement of the sleeve 40 with the collars 43 and 44 respectively, as hereinbefore set forth. During the rotation of the screw-shaft 8 the latter is reciprocated by means of the arm 52 of the shaft 53, the other arm $53^a$ of which is connected by means of the connecting rod with the shaft 31 to impart rocking motion to said shaft 53. Thus, while the carriage 3 moves gradually in a general direction it is, during said interval, reciprocated relatively rapidly, the total movement being thus compound and this being obviously imparted to the grinding element 82. Through the reciprocal motion imparted to the carriage 56 by means of the eccentric 65 the grinding or polishing element 82 is at the same time given a transverse reciprocal movement, thus causing the face thereof contacting with the surface of the cylinder 83 to have a triplicate motion, one of the same being reciprocably compound, and the other being transverse to the first-named. Thus the grinding or polishing surface of the element 82 will suffer uniform wear throughout, and the cylinder surface will at the same time be ground very uniformly and exactly over its entire surface. The rapidity of the grinding will be determined by the position of the weight 90 and the depth of the grinding will depend upon the length of time the cylinder 83 is left in the machine and the speed of its rotation, the latter obviously also influencing the rapidity of grinding or polishing, the element 82 being interchangeable to produce the respective results.

The reciprocal movement of the grinding element transversely of the cylinder axis is preferably very slow and because of the fact that the middle portion of the grinding face parallel with the cylinder axis is subjected to twice the wear of the edge-portion of said element, the grinding face of the latter will become gradually concave, such concavity being of larger radius than the cylinder surface acted upon. This I find to be very advantageous in that only a relatively small area of grinding surface is applied to the cylinder surface at any time and this area is continuously changing, thereby entirely preventing scoring or unequal grinding of the cylinder surface and insuring the utmost accuracy and uniformity of grinding.

The foregoing applies with equal force to the polishing element when the latter is used.

My said machine is very simple and efficient. It will be obvious that the construction thereof may be modified and varied to a considerable extent as mechanical skill and judgment may dictate without departing from the invention as defined in the appended claims.

I claim as my invention:

1. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for reciprocating said element during its said movement.

2. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for reciprocating said element in said direction during its said movement.

3. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for imparting rapid reciprocal movement of relatively short stroke to said element in said direction during its said movement.

4. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for reciprocating

said element transversely of its general direction of travel and during the latter.

5. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for imparting rapid reciprocal movement of relatively short stroke to said element transversely of its general direction of travel and during the latter.

6. A machine of the kind specified, including a rotatable support for the cylinder to be ground, means for rotating the same, a grinding element, mechanism for moving the same longitudinally of the cylinder while in contact therewith and from end to end of the latter, and mechanism for imparting rapid reciprocal movement of relatively short stroke to said element in said direction during its said movement, and mechanism for imparting reciprocal movement to said grinding element laterally of its general direction of travel and simultaneously with the compound longitudinal movement thereof.

7. A machine of the kind specified including means for rotating a cylinder to be ground, a grinding element, a carriage for the same adapted to maintain the said grinding element in surface contact with said cylinder by gravity, and means for moving said carriage longitudinally of said cylinder during rotation of the latter.

8. A machine of the kind specified including means for rotating a cylinder to be ground, a grinding element, a carriage for the same adapted to maintain the said grinding element in surface contact with said cylinder by gravity, a weight movably mounted on said carriage and adapted to be shifted in position relatively to said grinding element to partially counterbalance the same to lessen the pressure exerted thereby on the cylinder surface or to add its weight in whole or in part to such pressure to increase the same during its said movement.

9. A machine of the kind specified including means for rotating a cylinder to be ground, a carriage movable longitudinally of said cylinder, a pivoted arm on said carriage adapted to receive a grinding element to be held by gravity in contact with the cylinder surface, a rail on said arm extending transversely of the pivotal axis thereof and beyond both sides of the vertical plane of said axis, a weight movable on said rail and adapted to increase and counterbalance respectively the weight of said arm and said grinding element, and means for moving said carriage longitudinally of said cylinder during rotation of the latter.

10. A machine of the kind specified including means for rotating a cylinder to be ground, a carriage movable longitudinally of said cylinder, a pivoted arm on said carriage adapted to receive a grinding element to be held by gravity in contact with the cylinder surface, a rail on said arm extending transversely of the pivotal axis thereof and beyond both sides of the vertical plane of said axis, a weight movable on said rail and adapted to increase and counterbalance respectively the weight of said arm and said grinding element, means for moving said carriage longitudinally of said cylinder, and means for imparting reciprocal motion to said carriage during rotation of the said cylinder.

11. A machine of the kind specified including means for rotating a cylinder to be ground, a grinding element, a carriage for the same adapted to maintain the said grinding element in surface contact with said cylinder by gravity, and means for imparting reciprocal motion to said carriage during rotation of said cylinder.

12. A machine of the kind specified including means for rotating a cylinder to be ground, a grinding element, a carriage for the same adapted to maintain the said grinding element in surface contact with said cylinder by gravity, and means for imparting compound reciprocal motion to said carriage during rotation of said cylinder.

13. A machine of the kind specified including means for rotating a cylinder to be ground, a carriage movable longitudinally of said cylinder, a pivoted arm on said carriage adapted to receive a grinding element to be held by gravity in contact with the cylinder surface, a rail on said arm extending transversely of the pivotal axis thereof and beyond both sides of the vertical plane of said axis, a weight movable on said rail and adapted to increase and counterbalance respectively the weight of said arm and said grinding element, and means for imparting compound reciprocal motion to said carriage during rotation of said cylinder.

14. A machine of the kind specified including means for rotating a cylinder to be ground, a carriage movable longitudinally of said cylinder, a pivoted arm on said carriage adapted to receive a grinding element to be held by gravity in contact with the cylinder surface, a rail on said arm extending transversely of the pivotal axis thereof and beyond both sides of the vertical plane of said axis, a weight movable on said rail and adapted to increase and counterbalance respectively the weight of said arm and said grinding element, and means for imparting compound reciprocal motion to said carriage in relatively transverse directions during rotation of said cylinder.

15. A machine of the kind specified including means for rotating a cylinder to be ground, a carriage movable longitudinally of said cylinder, a pivoted arm on said carriage adapted to receive a grinding element to be held by gravity in contact with the cylinder surface, a rail on said arm extending transversely of the pivotal axis thereof and beyond both sides of the vertical plane of said axis, a weight movable on said rail and adapted to increase and counterbalance respectively the weight of said arm and said grinding element, and means for imparting compound reciprocal motion to said carriage during rotation of said cylinder in the direction of the axis thereof, and means for simultaneously therewith imparting reciprocal motion to said carriage laterally of the axis of said cylinder.

16. A machine of the kind specified including means for rotating a cylinder to be ground about its axis, a carriage, a grinding element carried thereby adapted to engage the cylinder surface, means for moving said carriage from end to end of said cylinder during rotation thereof, means for automatically reversing the travel thereof as said grinding element reaches the respective limits of its movement, and means for reciprocating said carriage and the mechanism for imparting the aforesaid movement thereto during such movement thereof.

17. A machine of the kind specified including means for rotating a cylinder to be ground about its axis, a carriage, a grinding element carried thereby adapted to engage the cylinder surface, means for moving said carriage from end to end of said cylinder during rotation thereof, means for automatically reversing the travel thereof as said grinding element reaches the respective limits of its movement, and means for reciprocating said carriage and the mechanism for imparting the aforesaid movement thereto during such movement thereof, and in the direction of such movement.

18. A machine of the kind specified including means for rotating a cylinder to be ground about its axis, a carriage, a grinding element carried thereby adapted to engage the cylinder surface, means for moving said carriage from end to end of said cylinder during rotation thereof, means for automatically reversing the travel thereof as said grinding element reaches the respective limits of its movement, and means for reciprocating said carriage and the mechanism for imparting the aforesaid movement thereto during such movement thereof, and in the direction of such movement, and means for imparting reciprocal movement to said grinding element laterally of the movement of said carriage and during the aforesaid movement thereof.

In testimony whereof I have signed my name in presence of two subscribing witnesses.

GUSTAV A. FRIESS.

Witnesses:
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J. J. YOUNG.