J. C. BLEVNEY.

GRINDING AND POLISHING MACHINE.

APPLICATION FILED SEPT. 9, 1911.

1,052,453.

Patented Feb. 11, 1913.

5 SHEETS—SHEET 1.

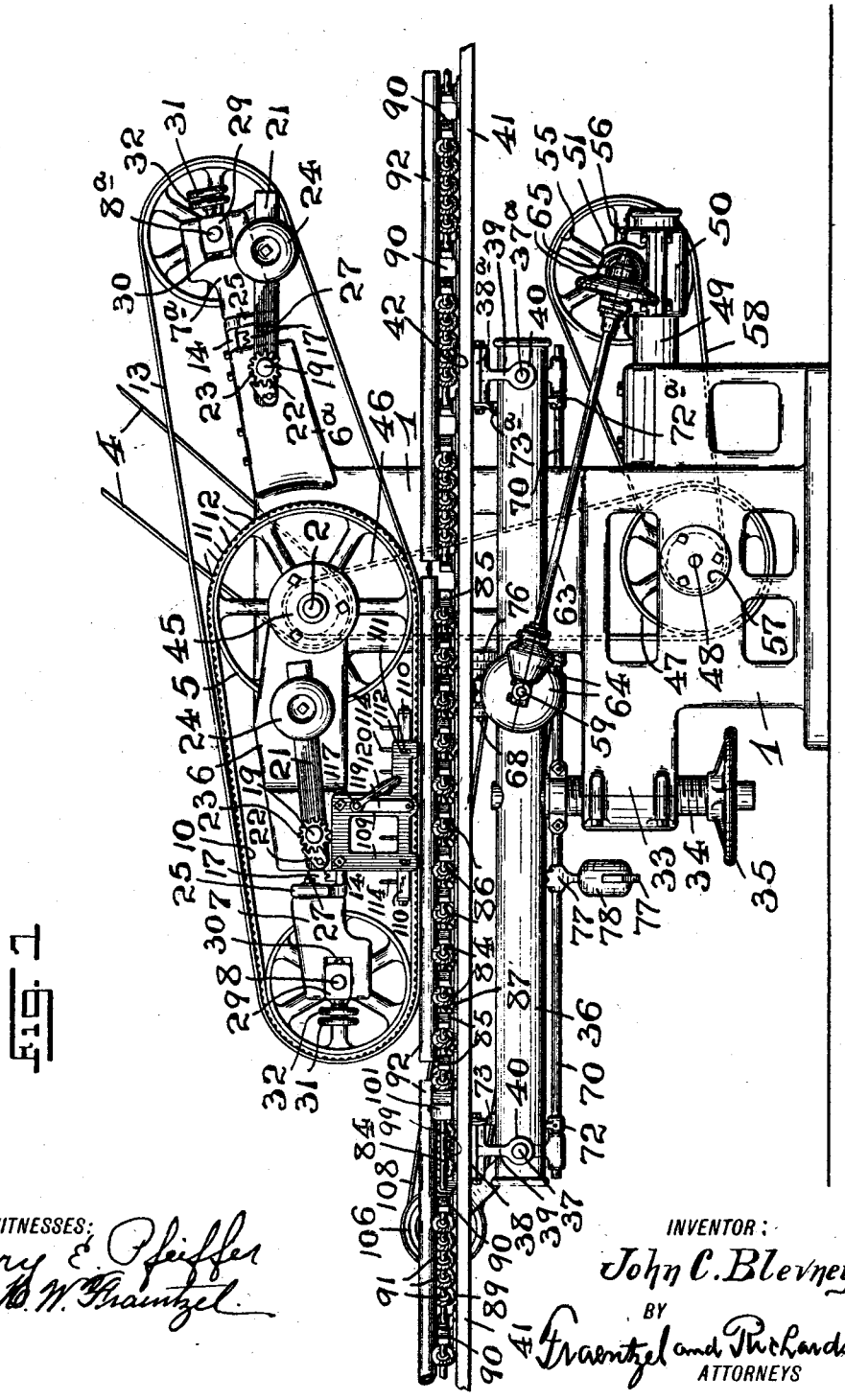

Fig. 1.

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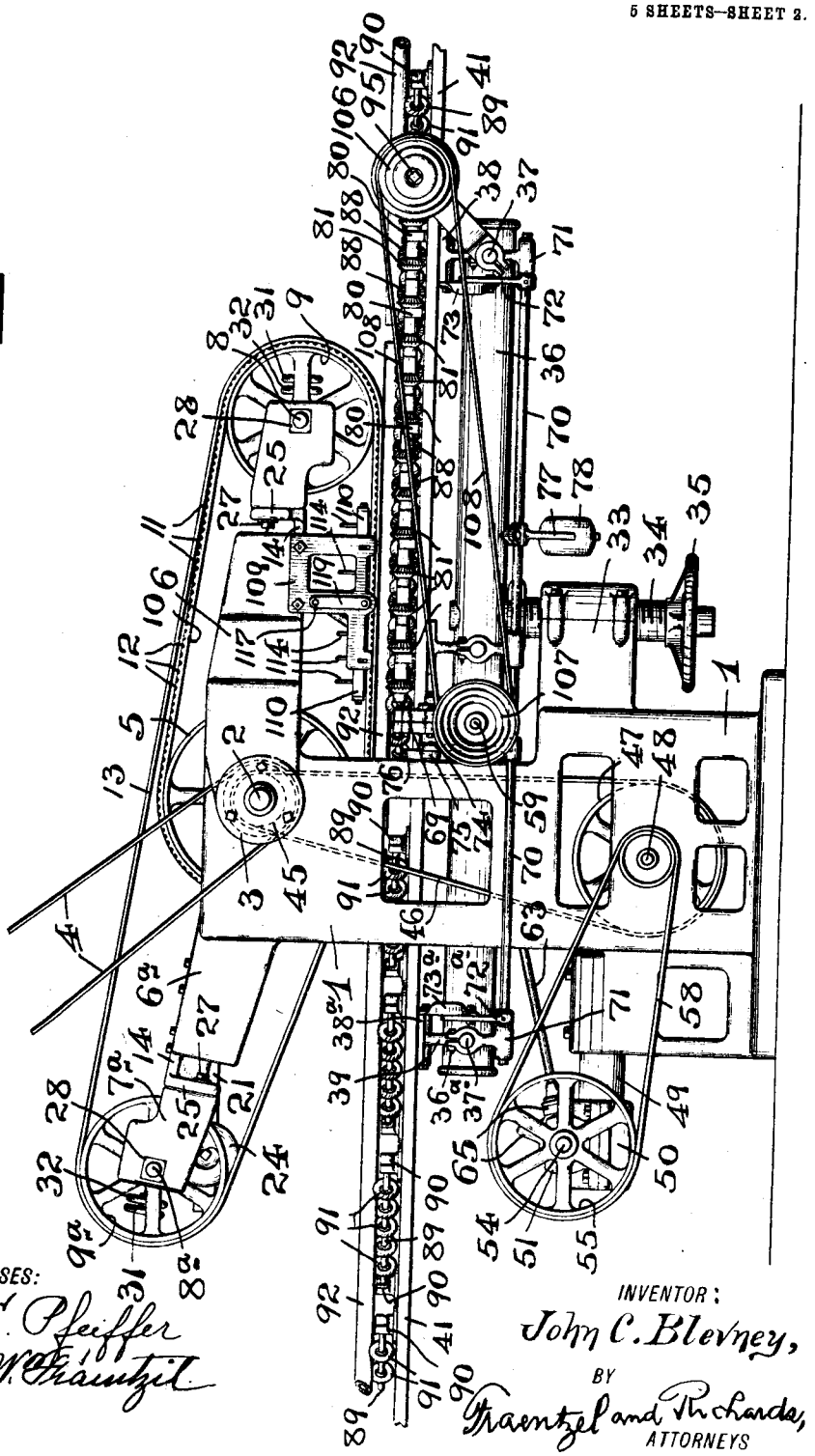
5 SHEETS—SHEET 2.

Fig. 2.



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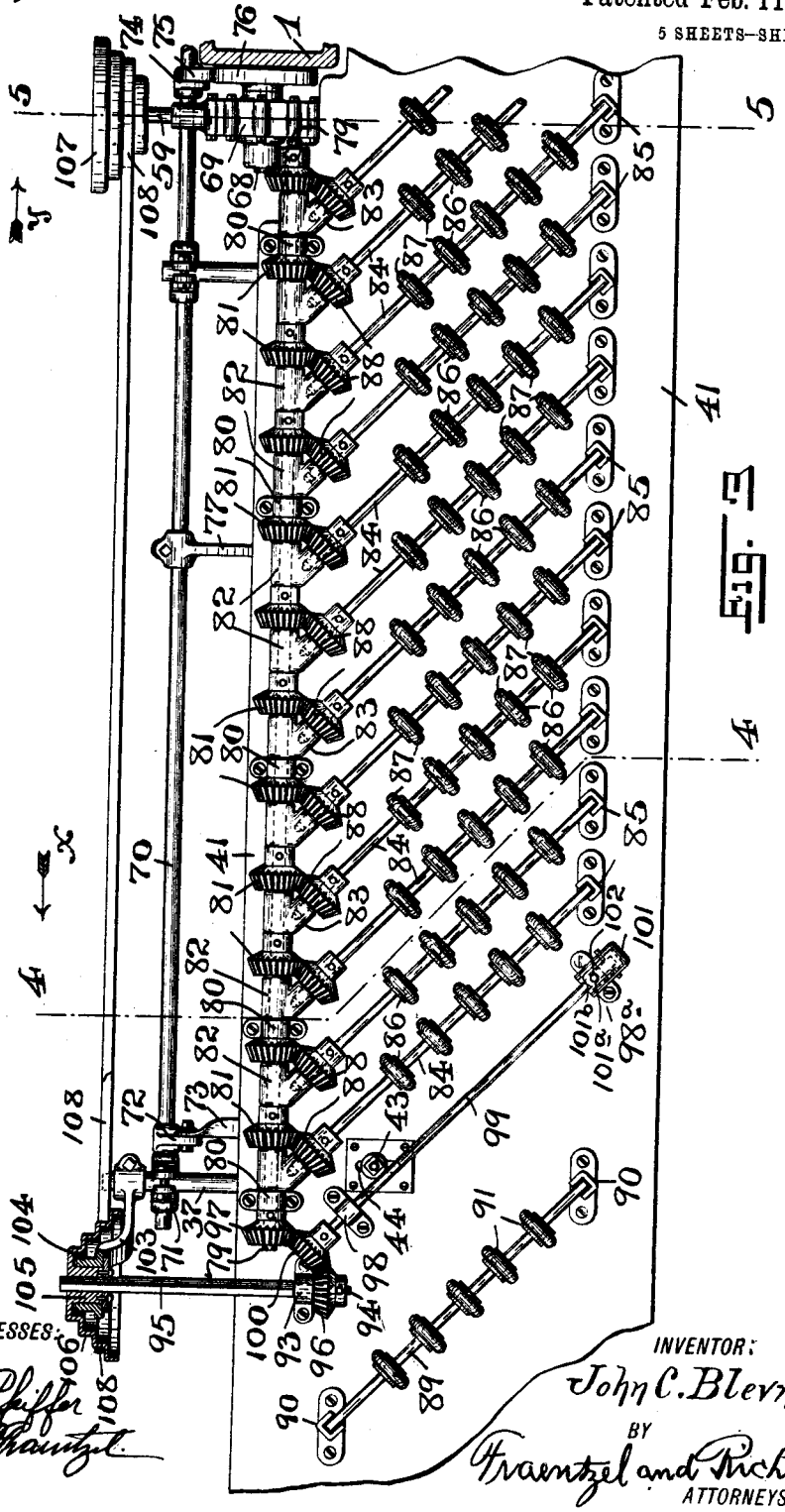

Fig. 3.

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5 SHEETS—SHEET 4.

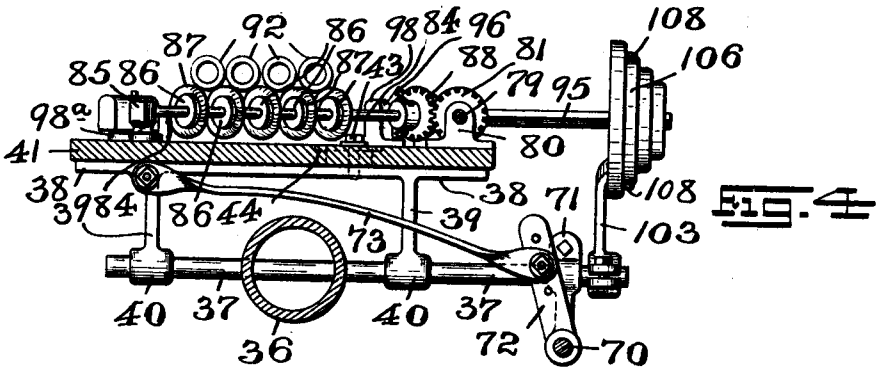

Fig. 4

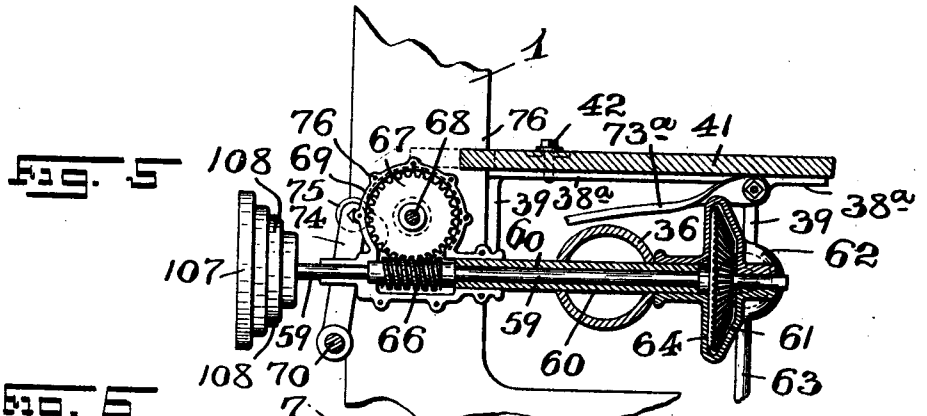

Fig. 5

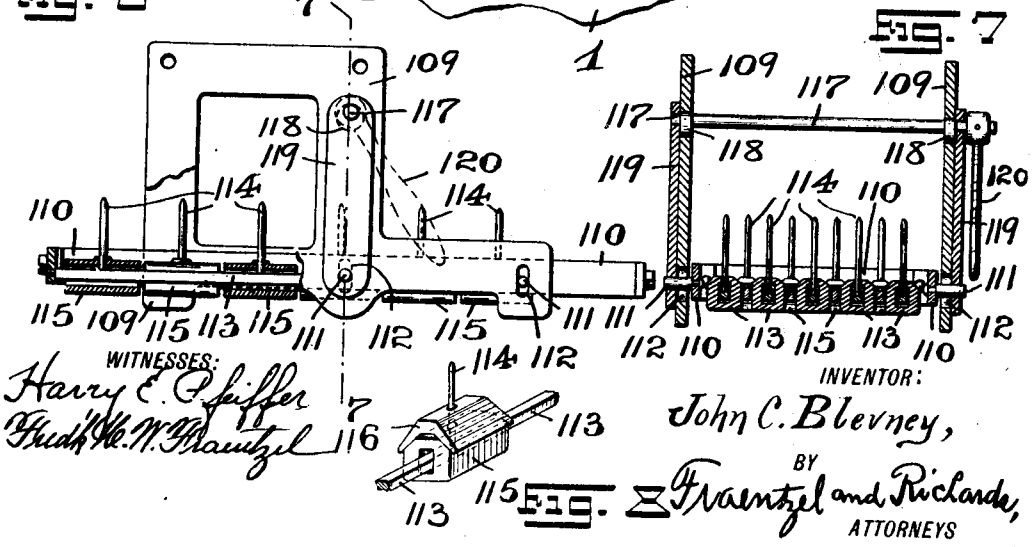

Fig. 6

Fig. 7

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5 SHEETS—SHEET 5.

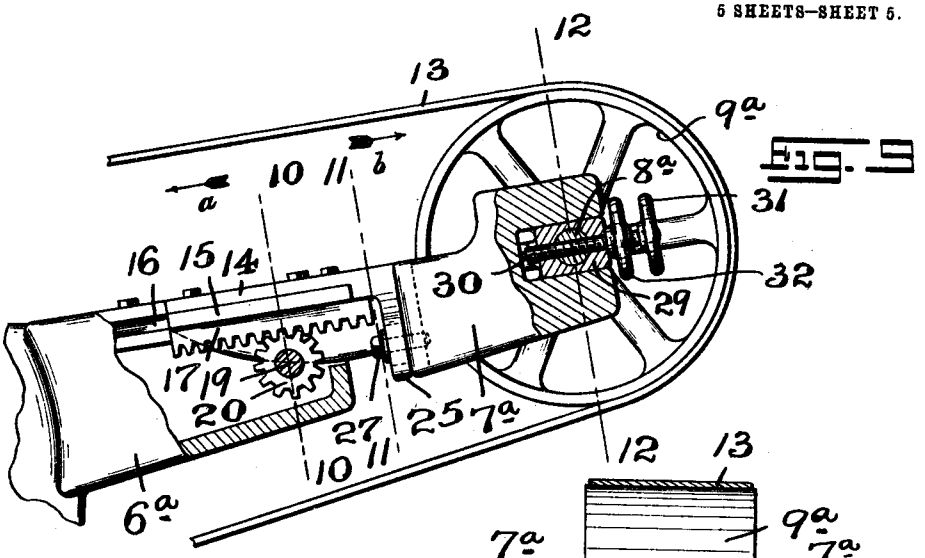

Fig. 9

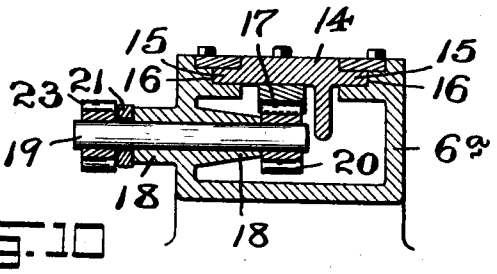

Fig. 10

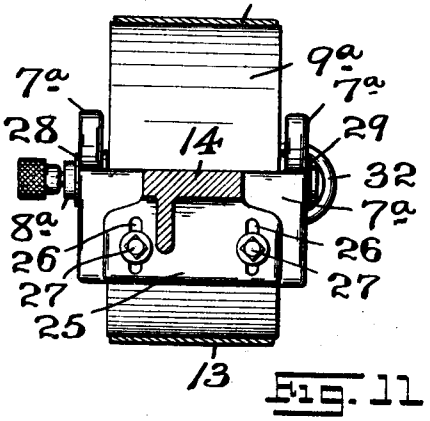

Fig. 11

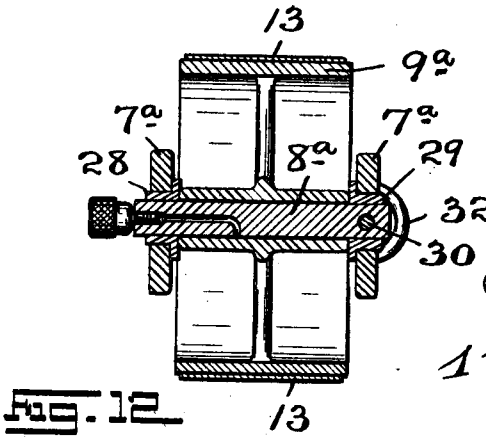

Fig. 12

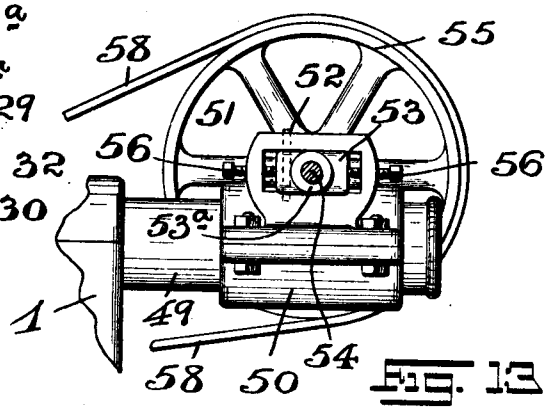

Fig. 13

WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN C. BLEVNEY, OF NEWARK, NEW JERSEY.

GRINDING AND POLISHING MACHINE.

1,052,453. Specification of Letters Patent. Patented Feb. 11, 1913.

Application filed September 9, 1911. Serial No. 648,525.

To all whom it may concern:

Be it known that I, JOHN C. BLEVNEY, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Grinding and Polishing 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention has reference, generally to improvements in grinding and polishing machinery; and, the present invention has for its principal object to provide an efficient and automatically operating grinding and polishing machine adapted, more particularly, to grind and polish objects having round or cylindrical surfaces, and to provide such objects with a smooth, uniform and highly finished surface, free from blemishes, burns, or buckling appearance.

The various specific objects of the present invention not at this time more particularly enumerated will be clearly understood from the following detailed description of this invention.

With the various objects of the present invention in view, the said invention consists, primarily, in the novel grinding and polishing machine hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the several devices and parts, as well as in the details of the construction of the same, all of which will be more fully described in detail in the following specification, and then finally embodied in the clauses of the claims which are appended to and which form an essential part of the said specification.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figures 1 and 2 are side elevations of the respective opposite sides of a grinding and polishing machine showing one embodiment of the principles of the present invention; and Fig. 3 is a detail plan view of the work-supporting table and the automatic work-feeding or carrying mechanism connected therewith, said view being made on an enlarged scale. Fig. 4 is a detail cross section taken on line 4—4 in said Fig. 3, looking in the direction of the arrow *x;* and Fig. 5 is another detail cross section, taken on line 5—5 in said Fig. 3, looking in the direction of the arrow *y*. Fig. 6 is a detail side elevation and part longitudinal vertical section of a gravity presser-foot, made on an enlarged scale, and removed from its connection with the machine, the same being adapted to press the grinding element or belt against the material or objects which are to be worked upon; Fig. 7 is a transverse vertical section of the same, said section being taken on line 7—7 in said Fig. 6; and Fig. 8 is a detail perspective view illustrating the application of additional weights to said gravity presser-foot. Fig. 9 is a detail view illustrating the method of tensioning the grinding element or belt, and a means for adjusting and alining the pulleys supporting the same, said view being in part a longitudinal vertical section and in part an elevation, to more clearly illustrate the mechanical features thereof; Fig. 10 is a detail vertical cross section of the same, taken on line 10—10 in said Fig. 9, looking in the direction of the arrow *a;* Fig. 11 is another cross section of the same, taken on line 11—11 in said Fig. 9, looking in the direction of the arrow *b;* and Fig. 12 is still another cross-section of the same, said section being taken on line 12—12 in said Fig. 9, also looking in the direction of said arrow *b*. Fig. 13 is a detail view of part of the power transmission mechanism arranged and constructed to operate the work-supporting table and said work-feeding or carrying mechanism connected therewith.

Similar characters of reference are employed in all of the said above described views, to indicate corresponding parts.

Referring now to the said drawing, the reference-character 1 indicates the frame of the machine, and 2 indicates the main driving shaft suitably supported in bearing in the upper portion of said frame. Secured upon one end-portion of said shaft 2 is a pulley 3, over and around which passes a belt 4 for driving the machine. Suitably secured upon said driving shaft 2 is driving pulley 5. Extending from the upper portion of said frame 1 are oppositely directed arms 6 and 6ª in which are respectively supported suitable bearing-brackets 7 and 7ª, and adjustably carried by the said bearing-brackets are the respec-

tive shafts 8 and 8ª upon which are rotatably mounted the pulley wheels 9 and 9ª.

The reference-character 10 indicates a suitable belt which passes around the said driving pulley 5 and said pulley wheel 9, this belt being made of leather or any other desirable material, and carrying upon the surface thereof a series of transverse and raised portions or projections, as 11, which alternate with a series of depressions, as 12. Extending around the said pulleys 9 and 9ª, outside of the belt 10, is a grinding belt 13, said belt 13 being preferably made of a suitable fabric, such as cloth or a webbing, and the outer surface of which is covered with a suitable abrading or polishing material, such as emery.

The proper tensioning of the respective belts 10 and 13 is automatically regulated and maintained by the following means:—Each bearing-bracket 7 and 7ª is provided with a rearwardly extending bracket-arm 14 having suitable guide-members 15 which are slidably supported in guide-ways 16, with which the respective arms 6 and 6ª of the frame 1 are provided. Suitably secured to the said bracket-arms is a rack-member 17, and journaled in suitably disposed bearing-portions 18, with which the respective arms 6 and 6ª are proivded, is a shaft 19, upon the inner end of which is mounted a spur gear 20 which is in operative engagement or mesh with the said rack-member 17. Journaled upon the outer end of said shaft 19 is a lever-member 21 carrying at one end thereof a toothed dog 22 which is pivotally connected therewith. The said toothed dog 22 engages the teeth of a second spur gear 23, also secured upon the outer end of said shaft 19, and being located adjacent to the said lever-member. Adjustably secured upon the opposite portion of said lever-member 21 is a weight 24.

The herein-above described parts operate in the following manner:—The said weight 24 operates to oscillate the said lever-member 21 upon said shaft 19, as its fulcrum, the movement of said lever being transmitted through the said toothed dog 22 to the said spur gear 23, which in turn rotates said shaft 19 and the spur gear 20, the latter operating upon the rack-member 17 so as to move the same and the bracket-arm 14 to which it is secured in an outward direction, thereby carrying outwardly the bracket-bearing and the pulley wheel supported in connection therewith. It will thus be clearly apparent, that the movements of the respective pulley wheels 9 and 9ª, thus effected, are in opposite directions, whereby the respective belts 10 and 13 are stretched and maintained at a desired tension. The toothed dogs 22 may be caused to engage with respective spur gears in such a manner so that the position of said lever-member 21 may be adjusted to make use of the force of gravitation, and so that the latter will properly operate upon said weights to produce the herein-above described operation of the tensioning mechanism. It will also be evident, that the said weights may be shifted upon said lever-members so as to increase or decrease the leverage of the same, and in such a manner secure the desired degree of tension in the said belts 10 and 13. To the end that a proper alinement of the belts 10 and 13 may be obtained, as they run over their respective pulleys, the said bearing-brackets 7 and 7ª are adjustably secured to their respective bracket arms 14, this adjustment being effected by providing each bracket-arm 14 with a head-flange 25 which is provided with suitably disposed slots 26, which allows of a proper adjusting movement in a vertical plane to be made over the bolts 27 by means of which the said bearing-brackets are secured to said head-flange. It is also desirable to secure an adjustment of said pulley wheels 9 and 9ª in a horizontal plane to insure a proper running of the respective belts 10 and 13. To this end, the said bracket-bearings 7 and 7ª are provided with stationary bearing-blocks 28 and with movably disposed bearing-blocks 29, in which bearing-blocks the end-portions of the respective shafts 8 and 8ª are supported, the movements of said slidable or movable bearing-blocks 29 being effected by means of adjusting screws 30, the said bearing-blocks 29 and the portions of the shafts supported in said blocks, if desired, being internally screw-threaded, so as to receive the said adjusting screws. The free end-portion of each adjusting screw 30 bears against the end of the opening in each bracket-bearing in which the said bearing-block is arranged, so that by turning the screw, by means of its hand-wheel 31, the screw will move said bearing-block, as desired. Each adjusting screw 30 may also be provided with a lock-wheel or nut, as 32, which is threaded so as to ride upon the adjusting screw, and to lock the same when the desired adjustment has been obtained, in a manner that will be clearly obvious from an inspection of the said parts, as illustrated in the several figures of the drawings.

In the arrangement of the respective pulley wheels over which the belts 10 and 13 travel, it is desirable to so arrange the same with relation to each other that the grinding belt 13 is driven by its contact with the belt 10, at a point where the said belts pass over the pulley wheel 9; and, furthermore, the respective belts are permitted to run in contact with each other only at the place where the grinding belt contacts with the objects or material which is to be ground or polished. Extending outwardly from the lower portion of the said frame 1 is an arm 33

which is internally screw-threaded adjacent to its free end, so as to thereby provide a bearing for a screw-threaded standard 34. The lower end of this screw-threaded standard is provided with a suitable hand-wheel 35, for the proper manipulation of the same. Secured upon the upper end of said screw-threaded standard, in any desired manner, is a longitudinally extending table-beam 36 which is provided with transversely and horizontally extending supporting arms 37 and 37ª. The reference-characters 38 and 38ª indicate suitably formed bed-brackets, each bracket having a pair of downwardly extending portions 39 which terminate in bearing-pieces 40, and which respectively slidably engage with the said respective supporting arms 37 and 37ª. Suitably supported by the respective bed-brackets 38 and 38ª is a longitudinally extending work-supporting table 41, which is arranged in such a manner so that it extends beneath the said grinding belt 13 where the latter is presented in its grinding position. The said work-supporting table is adjustably secured to the said bed-brackets so that it will be presented in proper alinement with the said grinding belt, or in an obliquely arranged position with relation to the said grinding belt. The means for thus adjustably securing the said work-supporting table upon the said bed-brackets comprises a pivot-bolt 42 which connects the table with said bed-bracket 38ª, and which forms the pivot of the adjustable relation of the said table, and a lock-bolt 43 being employed, said bolt operating through a slotted plate 44 affixed to said table, for securing the said table in its desired adjusted position to the said bed-bracket 38. The reference-character 45 indicates a pulley which is secured upon said main driving shaft 2 and over which runs a belt 46 for driving a larger pulley 47 which is secured upon a counter-shaft 48, and which shaft is journaled in suitable bearings in the lower portion of the frame 1. Connected with the said frame 1 is an outwardly extending arm 49 upon which is secured in any desired position and is capable of longitudinal adjustment thereon a bearing-member 50, said member 50 being provided with a suitably constructed yoke-shaped portion 51, and with which is connected a pivot-pin or post 52. Arranged in the said opening of the yoke-shaped portion and pivotally connected with the said pivot-pin or post 52 is a bearing-block 53 in which is journaled a counter-shaft 54. The said bearing-block 53 is capable of being moved upon said pivot-pin or post in a horizontal plane to adjust the counter-shaft 54 and the pulley 55 secured thereto, this movement of the said bearing-block 53 being accomplished by means of set-screws 56 arranged in the side-walls of the said yoke-shaped portion 51. The said counter-shaft 48 is provided with a small pulley 57 over which runs a belt 58 by means of which the said pulley 55 and the counter-shaft 54 are driven.

The reference-character 59 indicates a transversely arranged shaft which is journaled in a bearing-member 60 connected with the previously mentioned table-beam 36. Secured to one end of said shaft 59 is a bevel gear 61 which meshes with another bevel-gear 62 suitably secured upon a shaft 63. The respective bevel gears 61 and 62 are inclosed in a suitable casing, as 64, adapted to swivel upon one end of the said bearing-member 60, another portion of said casing forming the bearing in which said shaft 63 is journaled at one end. The said shaft 63 is journaled at its opposite end in a portion of another gear-casing 65, adapted to swivel upon the shoulder 53ª of the bearing-block 53, and which contains another pair of intermeshing bevel gears, similar in arrangement to the said bevel gears 61 and 62, one of said bevel gears being secured to said shaft 63, and the other bevel gear being secured to the said counter-shaft 54. It will be apparent, that when the table-beam 36 is raised or lowered to adjust the position of said work-supporting table with relation to the said grinding belt 13, the power transmission elements adapted to drive said shaft 59 will easily adjust themselves in their driving relation to any raised or lowered position of said beam 36, since the bevel gear connections will roll upon themselves to permit the vertical adjustment, and said counter-shaft 54 being supported in a bearing block adapted to swing on the pivot-pin 52, the same will easily follow the consequent adjusted position of said shaft 63. Secured upon the opposite end of said transverse shaft 59 is a worm 66 which meshes with and drives a worm-wheel 67, the shaft 68 of which is journaled in a portion of a casing-member 69, enveloping said worm and worm-wheel, said casing-member being supported by securing the same to one end of said bearing-member 60.

It is desirable that the work-supporting table 41 shall have a transverse reciprocating movement during the operation of the machine, to the end that the work to be ground or polished may be carried in contact transversely with all portions of the grinding belt 13, so that the entire grinding efficiency of the belt may be utilized and the same prevented from streaking or wearing off in limited portions of its grinding surface, instead of being uniformly and evenly worn off. To accomplish this result, there is provided a longitudinally extending rock-shaft 70, which is supported by means of shaft-hangers 71, depending from portions of the said supporting arms 37 and 37ª. Secured in proper locations upon said rock-shaft 70

are suitable lever-arms 72 and 72ª, said arms being pivotally connected with the respective bed-brackets 38 and 38ª by means of connecting rods 73 and 73ª. Secured upon said rock-shaft 70 is a rocker-arm 74 which is provided with an anti-friction roller 75, said anti-friction roller 75 being in operative engagement with the cam-surface of a rotating cam-member 76, affixed to and rotated by the said shaft 68. This cam-member tends to reciprocate said rocker-arm 74, so as to oscillate the said rock-shaft 70 and lever-arms 72 and 72ª, and the latter operating through said connecting rods 73 and 73ª, slide the said bed-brackets 38 and 38ª back and forth upon said supporting-arm 37 and 37ª, and consequently reciprocate the work-supporting table 41 in transverse directions. Secured to said rock-shaft 70 is an outwardly extending arm 77, provided with a counter balance weight 78, which tends to maintain said rocker-arm 74 in constant engagement with said cam-member 76 by oscillating said rock-shaft in the opposite direction during the slacking movement of said cam-member, and thereby assists in producing the reciprocatory movement of said work-supporting table. The said work-supporting table is provided with means for carrying the work to be ground or polished beneath the grinding belt 13. This means comprises a longitudinally extending shaft 79, journaled in suitably disposed bearings 80, so that the said shaft will extend along one side of said work-supporting table. Secured at suitable intervals upon said shaft 79 are a plurality of bevel-gears 81, and mounted so as to swivel upon said shaft 79 between the bevel gears 81 are sleeves 82 which are provided with off-set socket-bearings 83.

The reference-character 84 indicates a plurality of obliquely or diagonally disposed carrier-shafts, one end of each shaft being journaled in a socket-bearing 83, and the other end of each shaft being journaled in an open bearing-member 85, a number of such members 85 being secured adjacent to the opposite side of the said work-supporting table. Each of said carrier-shafts is provided with a plurality of carrier-wheels 86 which are secured to said shafts, so as to be rotated thereby, and each wheel is provided with a cushioning or flexible periphery, such as a rubber or felt ring 87, or other suitable means. Said carrier-shafts 84 are also provided with bevel gears 88, which mesh with bevel-gears 81, whereby the said carrier-shafts are rotated upon the rotation of said shaft 79. Located adjacent to each end of said series of carrier-shafts 84 are a series of idler carrier-shafts 89, journaled in open bearing members 90, the same being arranged to extend obliquely or diagonally across the work-supporting table, and each being provided with carrier-wheels 91 of the same description as those hereinbefore set forth. The work to be ground, such as cylindrical tubes or rods 92, is supported upon said carrier-wheels in the manner illustrated in Figs. 1, 2 and 4 of the drawings, so as to straddle two adjacent carrier-wheels upon each carrier-shaft. Upon the revolution of the carrier-shafts 84 and their carrier-wheels 86, the said tubes or rods 92 are carried forward beneath the grinding belt 13. In addition to the forward movement thus produced, the said tubes or rods 92 are also rotated upon their longitudinal axis, due to the oblique pitch of said carrier-wheels, all in a manner which will be clearly obvious from an inspection of the several figures of the drawings. This combined forward and rotary feeding movement of said tubes and rods 92, tends to present all parts of the surfaces of the same to the abrading action of the grinding belt, so as to produce a uniform and completely ground and finished surface.

It will of course be evident, that when it is desired to operate upon tubes or rods of various diameters, it is necessary to set the said carrier-wheels 86, either closer together or farther apart, in accordance with the diameter of the tubes or rods to be operated upon. To accomplish this end, the said carrier-shafts are constructed and assembled so as to be removable, by lifting one end of said carrier-shafts out of the open bearing-members 85. The socket-bearing 83 at the other end swings upwardly, owing to the pivotal relation of the supporting sleeve 82 to the shaft 79, and thus said carrier-shafts may be pulled out of said socket-bearings 83, to thereby disengage the bevel gears 88 from their meshed relation with the bevel gears 81. In this manner, said carrier-shafts 84 are made interchangeable, so that a carrier-shaft possessing properly disposed carrier-wheels is adapted to be accommodated to the diameters of the tubes or rods to be ground, when arranged upon the work supporting table. Of course, if desired, the carrier-wheels may be adjustably secured upon said carrier shafts so as to secure the same result. The means for rotating said shaft 79 and thereby to operate said carrier-shafts 84 comprises the following elements:—Secured upon said work-supporting table, in a proper position, is a bearing-member 93 in which is journaled a shaft 94 which is provided with an outwardly extending and preferably squared extension or tail-piece 95. Fixed upon said shaft 94 is a bevel-gear 96, and also fixed upon one end of said shaft 79 is a driving bevel-gear 97. Mounted upon the table are a pair of bearings 98 and 98ª in which is journaled a shaft 99, capable of longitudinal movement in said bearings.

Secured to one end of said shaft 99 is a clutch bevel-gear 100, normally in mesh upon either side with said bevel gear 96 and said driving bevel-gear 97, whereby the rotation of said shaft 94 is transmitted to said shaft 79. A rearward sliding movement of the said shaft 99 in its bearings disengages said clutch bevel-gear from its above described intermeshing relation with said bevel-gears 96 and 97, and thereby arrests the feeding movement of said carrier-shafts. Said shaft 99 is provided with a lock-member 101 which is pivotally secured to the outer end of said shaft 99, said lock-member 101 extending over the bearing-member 98^a, and being provided with a perforation 101^a in its upper portion, adapted to be engaged by a stop-pin 102, whereby the said lock-member is held in such a position, that it will maintain said shaft 99 in position to present the clutch bevel-gear 100 in its meshing relation with said bevel gears 96 and 97. By lifting said lock-member and swinging the same upon its pivot, to disengage the same from said stop-pin, the said shaft 99 may be drawn backward so as to disengage said bevel-gear 100, which position of the shaft 99 is maintained by bringing into engagement with said stop-pin a notch or second perforation 101^b with which said lock-member is provided. Secured to one end of said supporting rod 37 is an upwardly extending bracket-arm 103, said arm having at its free end a bearing-portion 104 in which is journaled the hub 105 of a variable speed-belt pulley 106. Said belt-pulley 106 has a fixed rotary relation to said bearing-portion 104, and the same is provided with a squared opening through which passes the said squared extension or tail-piece 95 of the shaft 94, so that the said tail-piece has a longitudinal play through said pulley 106, while receiving rotating impulse therefrom; hence, permitting the continuous operation of said carrier-shafts and their driving mechanism, notwithstanding the transverse reciprocatory movement of said work-supporting table carrying the same, as hereinabove described. The reference-character 107 indicates a driving variable speed belt-pulley which is secured upon and is driven by said transverse shaft 59, and which, by means of a properly arranged belt connection 108, drives the said belt-pulley 106.

The reference-character 109 indicates the supporting frame-work of a gravity or presser-foot mechanism which is connected with the arm 6 of the machine-frame 1, so as to present said presser-foot mechanism above said superimposed belts 10 and 13 at a point where said grinding-belt comes in contact with the work to be ground. The object of said presser-foot is to yieldingly press said grinding belt against the work, and thus assure the efficient operation of the abrading surface thereof upon the work to be ground. Said presser-foot comprises a rectangular frame 110 which is provided upon its longitudinal sides with a plurality of outwardly projecting studs 111, which ride in properly disposed slots 112, with which said frame-work 109 is provided. Connected with said rectangular frame 110 are a series of longitudinally supported carrying-rods 113, from which extend upwardly, in proper positions, a series of retaining fingers 114, and arranged upon said carrying-rods are a plurality of presser-weights 115, the same being capable of free vertical play upon said rods, but being prevented from moving longitudinally by means of said retaining fingers 114, which project upwardly through perforations with which the upper portion of each presser-weight is provided. The presser-weights arranged on one carrying rod are preferably staggered as to their positions with relation to the presser-weights carried by the adjoining carrying rods. It will be apparent, that when said presser-weights are brought in contact with said belts 10 and 13, they will exert, by reason of the gravitation of the weights, a yielding pressure upon all portions of the belts passing thereunder, so that said grinding belt is caused to bear properly upon the somewhat uneven surface which is presented by a series of tubes or rods 92 which are carried into contact with said grinding belt by the work-feeding mechanism. Where the pressure of the fixed presser-weights is less than desired, such pressure may be increased by means of the auxiliary presser-weights 116, which may be built up upon the fixed presser-weights, and are retained in their operative relation therewith, by means of the said retaining fingers 114, in the manner illustrated in Fig. 8 of the drawings. Of course it will be evident that one or more of said auxiliary presser-weights may be added to the fixed presser-weights, as the occasion may demand. Said rectangular frame 110 is arranged and supported in such a manner, in its relation with the frame-work 109, that the same may be lifted to remove the presser-weights from operative contact with said belts 10 and 13. To this end, there is provided a shaft 117 having eccentric or cam-shaped portions 118, which are journaled in a suitable manner in the upper portion of said frame-work 109. Connecting said shaft 117 with a pair of opposite studs 111 of said rectangular frame are a pair of supporting links 119. A handle-member 120 is secured to said shaft 117, by means of which said shaft may be rotated. Upon rotating said shaft 117, the eccentric or cam-shaped portions tend to raise the shaft, and such upward movement is transmitted to said rectangular frame 110, by means of said supporting links 119, said rectangular frame

being guided in its vertical movements by said studs 111 which ride in the slots 112 of said frame-work 109.

The operation of the above specified novel construction of grinding and polishing machine and its various parts, in the performance of its functions, will be readily understood from said specification, and an inspection of the illustrating drawings, without the necessity of further description.

As many changes may be made in the above described construction of my invention and its detail parts, and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, I intend that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. I desire it also to be understood that the language used in the following claims is intended to cover all generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween. Hence, I do not limit my present invention to the exact arrangements and combinations of the devices and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts, as illustrated in the accompanying drawings.

I claim:—

1. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same, means carried upon said table for feeding the work to said abrading means, means providing a pivotal adjustment of said table in a horizontal plane, means for causing a transverse reciprocation of said table, and means for raising and lowering said table.

2. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same, means carried upon said table for feeding the work to said abrading means, and means providing a pivotal adjustment of said table in a horizontal plane.

3. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same, work-feeding means carried thereby, means for rotating said work feeding means, means for reciprocating said table laterally, and means for raising and lowering said table.

4. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same longitudinally of said abrading means, a plurality of diagonally disposed carrier-shafts provided with carrier-wheels arranged upon said table and beneath said abrading means, and means for rotating a portion of said carrier-shafts, to carry the work in contact with said abrading means and simultaneously rotate the work on its longitudinal axis.

5. In a device of the class described, an abrading means, a transversely reciprocating work-supporting table arranged beneath the same, means for raising and lowering said table, a plurality of diagonally disposed carrier-shafts provided with carrier-wheels arranged upon said table, and means for rotating a portion of said carrier-shafts to carry the work in contact with said abrading means and simultaneously rotate the work on its longitudinal axis.

6. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving shaft, means for disconnecting said driving shaft from its rotating means, a plurality of diagonally disposed carrier-shafts provided with carrier-wheels, gears upon said carrier-shaft normally meshing with the gears of said driving shaft, and means for detachably supporting said carrier-shafts in their geared relation to said driving-shaft.

7. In a device of the class described, an abrading means, a transversely reciprocating work-supporting table arranged beneath the same, means for raising and lowering said table, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving shaft, a plurality of diagonally disposed carrier shafts provided with gears normally meshing with said gears upon said driving shaft, and a plurality of carrier-wheels fixed upon each carrier-shaft.

8. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same longitudinally of said abrading means, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving shaft, a plurality of diagonally disposed carrier-shafts provided with gears normally meshing with said gears upon said driving shaft, said carrier-shafts being disposed beneath said abrading means, and a plurality of carrier-wheels fixed upon each carrier-shaft.

9. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same longitudinally of said abrading means, a plurality of diagonally disposed driven carrier-shafts provided with carrier-wheels arranged upon said table beneath said abrading means, and a plurality of diagonally disposed idler carrier-shafts provided with carrier-wheels ar-

ranged upon said table at the beginning and end of said plurality of driven carrier-shafts.

10. In a device of the class described, an abrading means, a transversely reciprocating work-supporting table arranged beneath the same, means for raising and lowering said table, a plurality of diagonally disposed idler carrier-shafts provided with carrier-wheels arranged upon said table at the beginning and end of said plurality of driven carrier-shafts.

11. In a device of the class described, an abrading means, a transversely reciprocating work-supporting table arranged beneath the same, means for raising and lowering said table, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving shaft, means for disconnecting said driving shaft from its rotating means, a plurality of diagonally disposed carrier-shafts provided with gears normally meshing with said gears upon said driving shaft, a plurality of carrier-wheels fixed upon each carrier-shaft, and means for detachably supporting said carrier-shafts in their geared relation to said driving shaft.

12. In a device of the class described, an abrading means, a transversely reciprocating work-supporting table arranged beneath the same, means for raising and lowering said table, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving shaft, means for disconnecting said driving shaft from its rotating means, a plurality of diagonally disposed carrier-shafts provided with gears normally meshing with said gears upon said driving shaft, a plurality of carrier-wheels fixed upon each carrier-shaft, and means for detachably supporting said carrier-shafts in their geared relation to said driving shaft, a plurality of diagonally disposed idler carrier-shafts detachably mounted upon said table at the beginning and end of said plurality of driven carrier shafts, and a plurality of carrier-wheels fixed upon each idler carrier-shaft.

13. In a machine of the class described, a frame, a driving shaft, an abrading means driven thereby, a work-supporting table, means connected with said frame for adjustably supporting said table with relation to said abrading means, means connected with said table supporting means for reciprocating said table laterally upon said supporting means, and connected through intermediate mechanism to the driving shaft, work-feeding and carrying means carried by said table, and means for rotating said work feeding means also connected through said intermediate mechanism to said driving shaft.

14. In a machine of the class described, a frame, a driving shaft, an abrading means driven thereby, a table beam provided with laterally extending supporting arms, means for raising and lowering said table-beam, bed-brackets slidably arranged upon the supporting arms of said table-beam, a work-supporting table adjustably secured upon said bed-brackets, a rock-shaft supported with relation to said table-beam, lever-arms upon said rock-shaft, connecting rods connecting said lever-arms with said bed-brackets, a counter-balance weight connected with said rock-shaft, a rocker-arm, and a cam-member for operating said rocker-arm to oscillate said rock-shaft, connected through intermediate mechanism to said driving-shaft.

15. In a machine of the class described, a frame, a driving shaft, a driving pulley thereon, a pair of guide-pulleys, bearing brackets in which said guide-pulleys are adjustably supported, bracket-arms slidably connected with said frame, means for adjustably securing said bearing-brackets to said bracket-arms, an abrasive belt running over said guide-pulleys, a transversely corrugated cushioning belt running over said driving pulley and one of said guide pulleys within said abrasive belt, and means for exerting an outwardly moving pressure upon said bracket-arms to maintain said guide pulleys in a tensioning relation to said belts, comprising a rack carried by each bracket-arm, shafts journaled in said frame, pinions upon each shaft in engagement with said racks, a lever-arm pivoted upon each shaft, a dog upon one end of each lever-arm, a second pinion upon each shaft engaged by said dogs, and a weight adjustably secured upon the opposite end of each lever-arm.

16. In a machine of the character described, a frame, a driving shaft, a driving pulley thereon, a pair of yieldingly supported guide-pulleys connected with said frame, an abrasive belt running over said guide-pulleys, a cushioning belt running over said driving pulley and one of said guide pulleys within said abrasive belt, means for adjusting said guide-pulleys in horizontal and vertical planes, a work-supporting table, means connected with said frame for supporting said table beneath said abrasive belt, means for raising and lowering said table-supporting means, means for reciprocating said table laterally upon its supporting means connected by intermediate driving mechanism to said driving shaft, work-feeding and carrying means carried by said table, and means for rotating said work-feeding means also connected by said intermediate driving mechanism to said driving-shaft.

17. In a machine of the character de-

scribed, a frame, an abrasive belt, a cushioning belt running in contact with a portion of said abrasive belt, a pair of yieldingly supported guide-pulleys and a driving pulley over which the said respective belts run, means for adjusting said guide-pulleys in a horizontal plane, comprising a bracket-bearing, a stationary bearing-block at one side of said bracket-bearing, a movable bearing-block at the other side of said bracket-bearing, a shaft carried by said respective bearing-blocks upon which the guide-pulley is journaled, and means for moving said movable bearing-block to swing said shaft in a horizontal plane.

18. In a machine of the character described, a frame, an endless abrasive belt, a cushioning belt running within the same, means for supporting and driving said belts, a work-supporting table arranged beneath the same, means carried by said table for feeding the work to said abrasive belt, and means supported by said frame for holding said abrasive belt and its cushioning belt yieldingly against the work carried thereto by said feeding means, comprising a frame-work, carrying-rods, upon said frame-work, retaining fingers extending upwardly from said carrying-rods, a plurality of presser-weights carried by said carrying-rods, each presser-weight having an independent vertical movement upon its carrier-rod, but being retained against longitudinal movement by said retaining fingers, and means for raising and lowering said frame-work to carry said presser weights away from or into operative contact with said cushioning and abrasive belts.

19. In a machine of the character described, an abrasive element, means for holding said abrasive element yieldingly to its work, comprising a frame-work, carrying-rods upon said frame-work, retaining fingers extending upwardly from said carrying-rods, a plurality of presser-weights carried by said carrying-rods, each presser-weight having an independent vertical movement upon its carrier-rod, but being retained against longitudinal movement by said retaining fingers, means for raising and lowering said frame-work to carry said presser-weights away from or into said operative contact with said abrasive element, and a plurality of auxiliary presser-weights adapted to be coöperated with said fixed presser weights, and retained in operative relation thereto by said retaining-fingers.

20. In a device of the class described, an abrading means, a work-supporting table arranged beneath the same longitudinally of said abrading means, a driving shaft provided with a plurality of gears mounted upon said table, means for rotating said driving-shaft, a plurality of diagonally disposed carrier-shafts provided with gears normally meshing with said gears upon said driving-shaft, a plurality of carrier-wheels fixed upon each carrier-shaft, and means for detachably supporting said carrier-shafts in their geared relation to said driving-shafts, comprising sleeves mounted to pivot or turn on said driving-shaft, off-set socket bearings connected with said sleeves and adapted to journal the ends of said carrier-shafts, and open bearing-members secured to said work-supporting table adapted to journal the opposite ends of said carrier-shafts in such a manner as to permit of lifting out said carrier-shafts to free said opposite ends and thus permit the withdrawal of said carrier-shafts from said off-set socket-bearings, and a disengagement of the geared relation of said carrier-shafts with said driving-shaft.

21. In a machine of the class described, a main frame, pulleys supported by said frame, an abrasive belt running over said pulleys, and a gravity presser foot engaging said abrasive belt, comprising a frame-work supported in connection with said main frame, a plurality of presser-weights supported by said frame-work, each presser-weight possessing a free and independent vertical movement, and each presser-weight being independently maintained in engagement with said abrasive belt by the gravity of its mass.

In testimony, that I claim the invention set forth above I have hereunto set my hand this seventh day of September, 1911.

JOHN C. BLEVNEY.

Witnesses:
GEORGE D. RICHARDS,
FREDK. H. W. FRAENTZEL.