(No Model.) 2 Sheets—Sheet 1.

W. G. BUDLONG.

COMBINED METAL WORKING MACHINE.

No. 437,284. Patented Sept. 30, 1890.

Fig. 1.

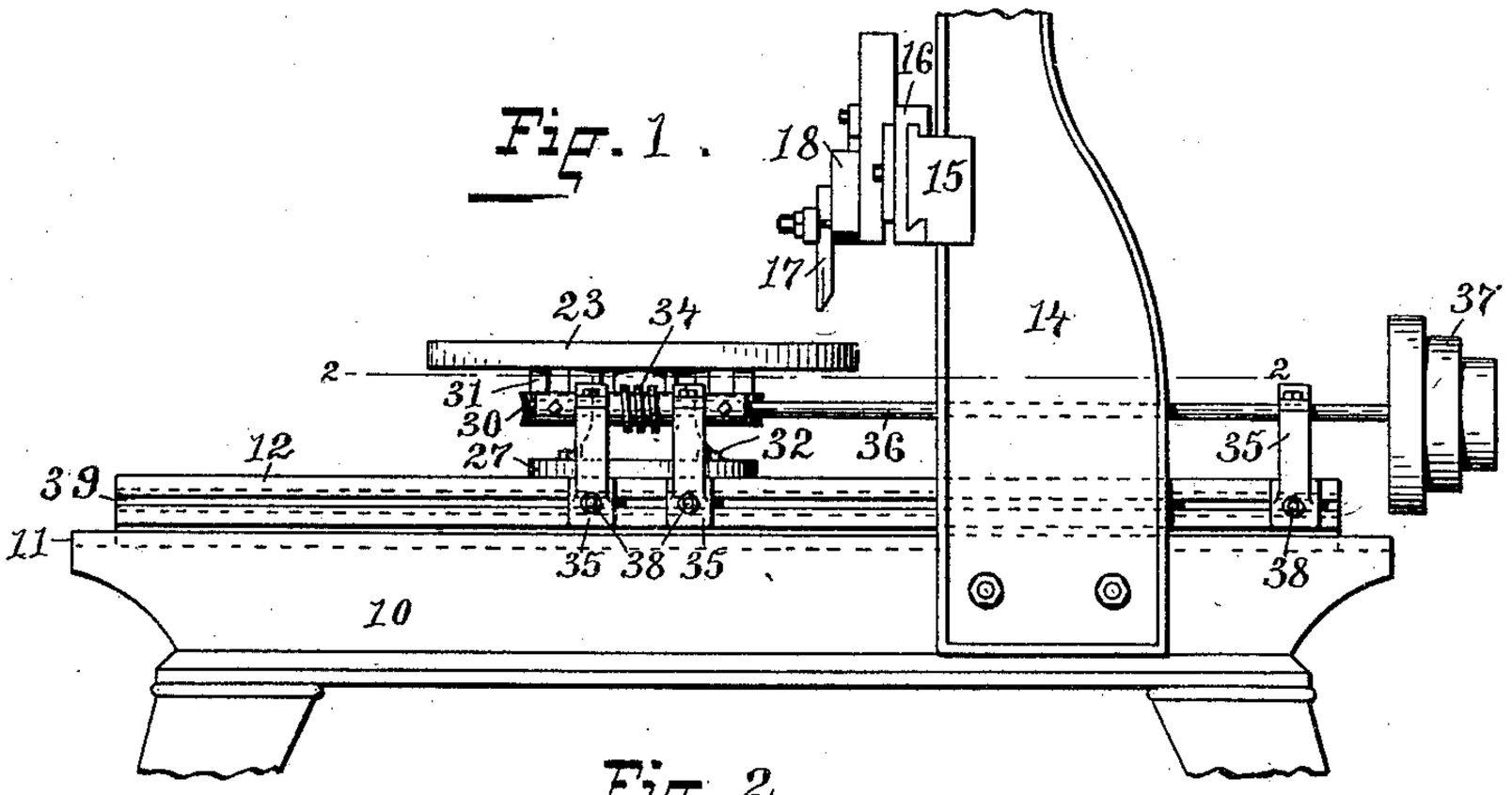


Fig. 2.

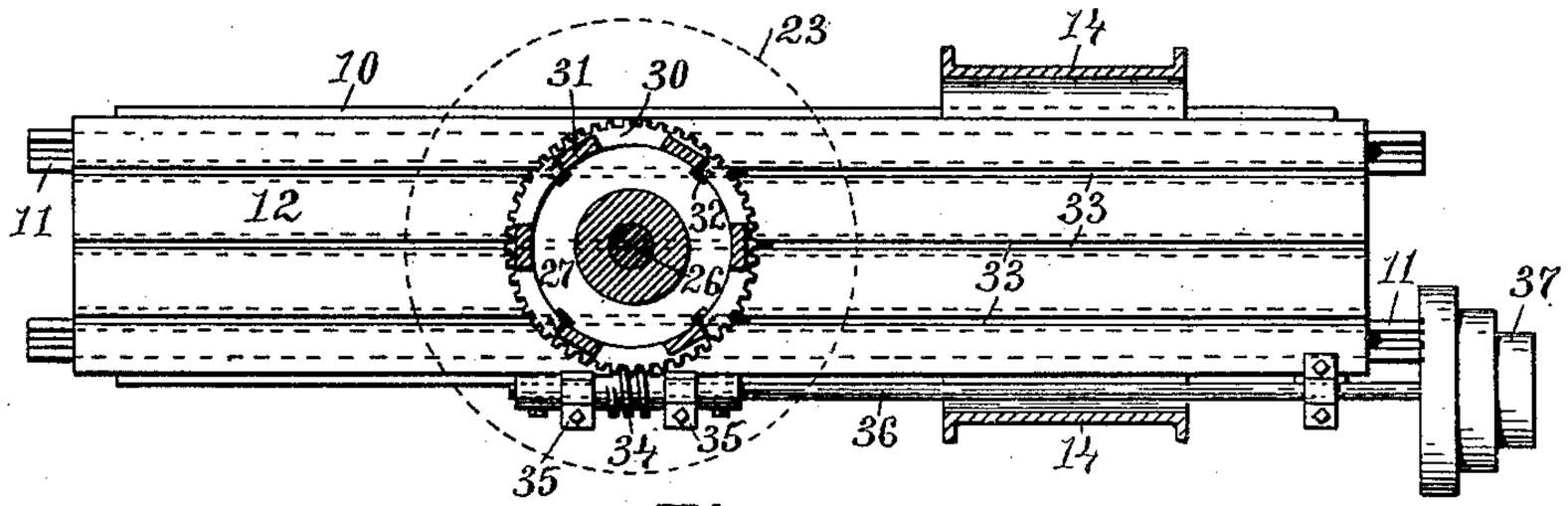
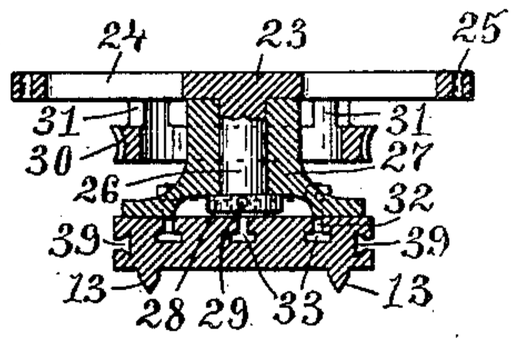


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

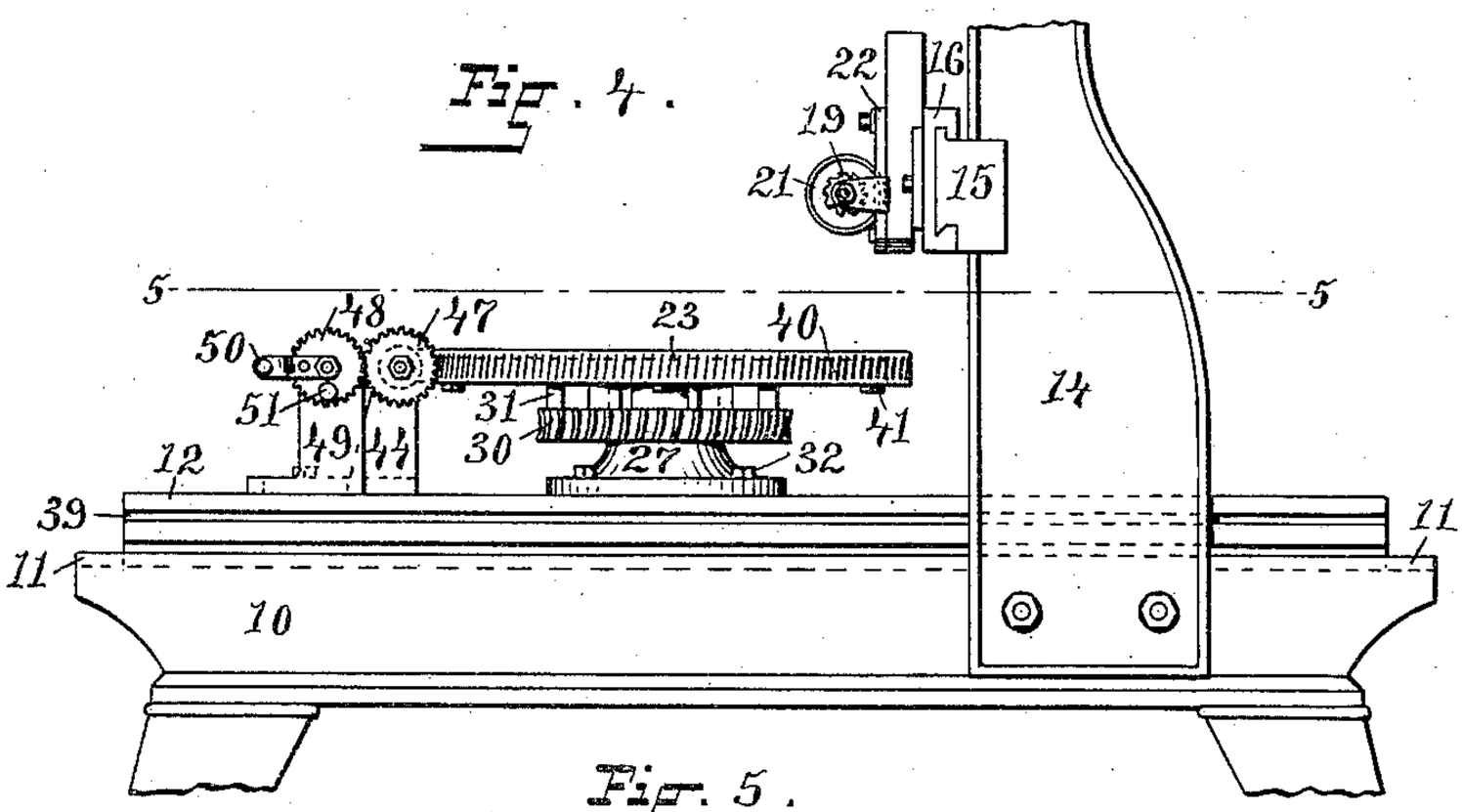


Fig. 5.

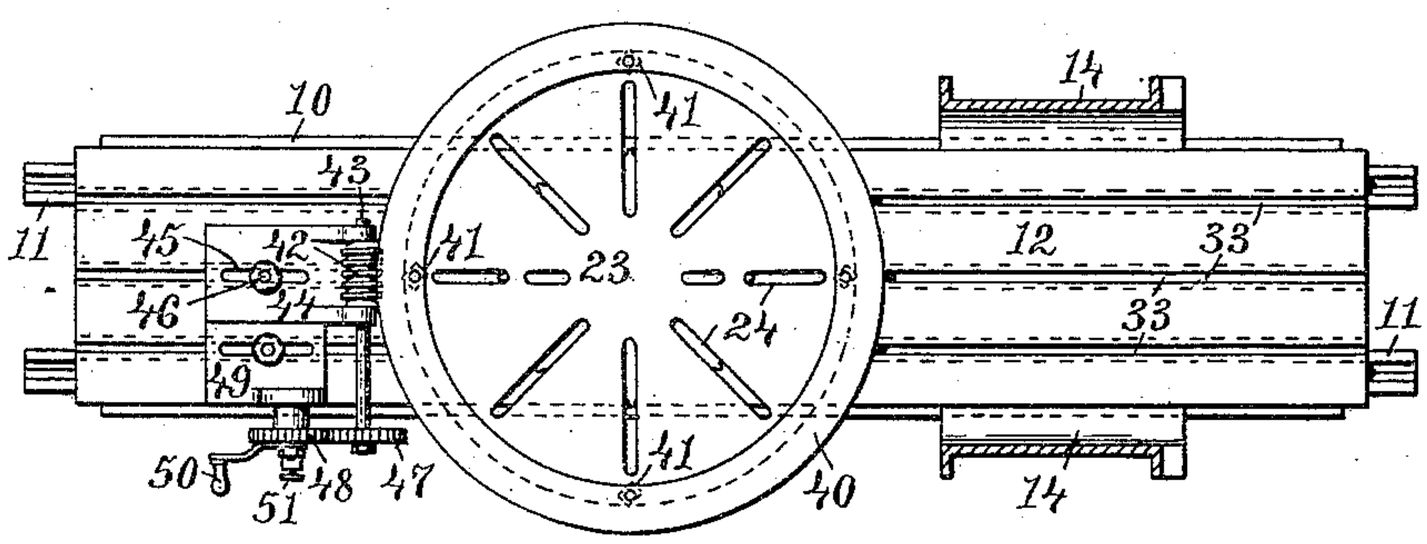


Fig. 6.

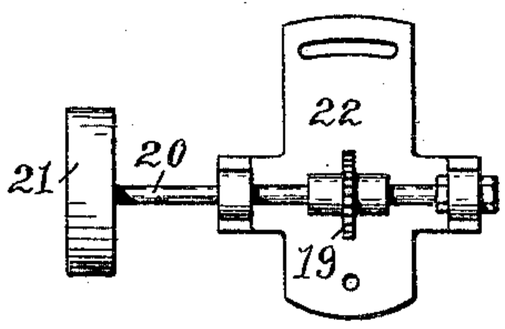


Fig. 7.

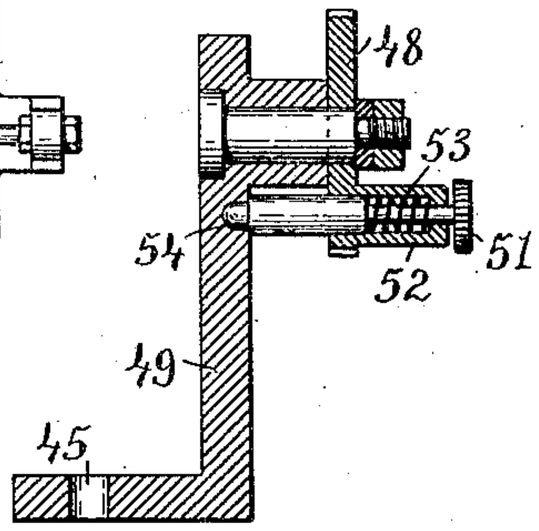
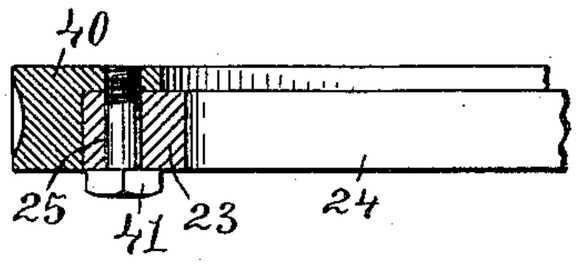


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM G. BUDLONG, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE UNION MACHINE COMPANY, OF SAME PLACE.

COMBINED METAL-WORKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 437,284, dated September 30, 1890.

Application filed July 19, 1887. Serial No. 244,701. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. BUDLONG, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Combined Metal-Working Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to a machine for cutting metallic blanks or bodies in certain different manners by means of tools.

The objects of my invention are to provide a metal-working machine, which will be equally well adapted for performing the work of turning, gear-cutting, and boring metals, and which may be readily and easily arranged to perform either of the aforesaid operations.

To the above purposes my invention consists in the certain combinations set forth in the claims at the end of this specification, and which comprise the following mechanical devices, namely: a reciprocating bed, a rotary work-table secured upon and sliding on the bed and adjustable horizontally thereon, means for supporting and operating the cutting-tool, rotating means for the work-table, mechanism for imparting to the work-table partial rotations, so as to gradually rotate the table, and said mechanism secured upon and sliding on the bed.

In order that my invention may be fully understood, I have illustrated in the accompanying drawings and will proceed to describe the best forms thereof, so far as devised by me, with the knowledge that such forms may be variously modified in construction, without, however, making a substantial departure from the spirit of my invention.

In the accompanying drawings, Figure 1 is a side view of my improved machine with a portion of the frame broken away and arranged for turning and boring metals. Fig. 2 is a horizontal sectional view taken on line 2 2 in Fig. 1 and with the position of the rotating circular work-table indicated in broken lines. Fig. 3 is a central vertical section of the rotary work-table, the stand therefor, and the reciprocating bed, the section being taken transversely to the length of the said bed. Fig. 4 is a side view of my improved machine with a portion of the frame thereof broken off and the machine arranged for the gear-cutting operations. Fig. 5 is a horizontal sectional view taken on line 5 5 in Fig. 4. Fig. 6 is an enlarged detail view of the gear-cutter and its shaft and apron shown in side view in Fig. 4. Fig. 7 is an enlarged vertical sectional view taken through the center of the gear-wheel having the device for automatically locking the wheel at each complete revolution thereof. The view shows the gear-wheel and its locking device and the L-shaped standard upon which these parts are mounted, as shown in Figs. 4 and 5. Fig. 8 is an enlarged vertical sectional view in part of the rotating circular work-table and the detachable gear which may be temporarily secured thereto when cutting gears.

In the said drawings like numbers of reference designate corresponding parts throughout.

Referring to the drawings, the number 10 designates the machine-frame supporting the grooved ways 11, upon which moves the reciprocating bed 12, which is provided upon the under side with the extensions 13, adapted to work in the grooves of the ways or tracks 11. The bed 12 may be reciprocated on its length by any of the means ordinarily used for planing-machines. To each side of the frame 10 are secured the uprights 14, across which is placed the cross-head 15, which is adjustable upon the uprights relatively to the horizontal plane. This cross-head is disposed transversely to the bed 12, and serves as a support for the cross-slide 16, which slides horizontally thereon, and is provided with the ordinary mechanism (not shown) for giving the different motions to the cutting-tool 17, which is attached to the apron 18, fixed upon the cross-slide, as shown in Fig. 1.

In Figs. 4 and 6 the cutting-tool is of a different character from that shown in Fig. 1, and consists in a gear-cutter 19, mounted upon the pulley-shaft 20, which is provided with a band-pulley 21, and is mounted on the apron 22, designed to be attached to the cross-slide 16, as shown in Fig. 4.

The foregoing-described parts are well known in the construction of metal-working machinery, and I therefore make no claim to such parts.

My improvements consist in the features now to be described.

The rotary work-table 23 is a circular plate formed with the radial bolt-slots 24 and with the bolt-holes 25 near the edge thereof. From the center of the lower side of the work-table projects the integral journal 26, which is journaled in the stand 27, and is held therein by means of the collar 28 and the set-screw 29. The worm-gear 30 is attached to the under side of the work-table by means of the ribs 31, and the gear 30, together with the ribs 31, the work-table 23, and its journal 26, are all formed in a single casting.

The stand 27 of the rotary work-table is secured upon the traversing bed 12 by means of the members or clamp-bolts 32, which take through the flaring base of the stand 27 and travel in the T-grooves 33, which are parallel and run longitudinally of the bed throughout its length. The lower ends of the clamp-bolts 32 are provided with heads which move in the T-grooves, so that when the clamps are loosened the stand 27 may be slid over the bed 12 to any point, and then be rigidly secured to the traversing bed by tightening the clamp-bolts.

The work-table is rotated on its axis by means of the worm 34, which is in mesh with the worm-gear 30, and is mounted in the movable brackets 35. The worm is revolved by the connected shaft 36, which is provided with a bearing in another movable bracket 35 and is driven by the speed-pulleys 37, located at the outer end of the shaft, so that when the pulleys 37 are turned the work-table 23 will be rotated. The several brackets 35 are each secured to the bed 12 by means of a bolt 38, an enlarged end of which works in the groove 39, formed in the edge of the bed 12. The brackets may be adjusted at any place along the table in order to place the worm 34 in mesh with the worm-gear 30 for rotating the table, and these brackets may be held in such adjustment by tightening the bolts 38.

The construction shown in Fig. 1 is for turning and boring metals. In the operation of turning, the tool 17 may be located eccentrically relative to the center of the rotary work-table 23; but in boring or drilling, the work-table will be adjusted so as to have its center brought in axial alignment under the tool, and the rotation of the table will cause the stationary tool to bore into the work, which may be held onto the work-table by passing through the slots 24 the ordinary clamps which are used for holding the work in position.

To accomplish gear-cutting by the use of my rotary work-table, I have devised, in connection with the work-table, mechanism for imparting to the table equal partial rotations, so that after one gear-tooth has been cut the mechanism may be operated by hand to advance the work the same distance in order to form the next tooth, and so on. The means for driving the table by power are removed, and the removable worm-gear 40, which consists in a toothed annular frame designed to fit over the periphery of the circular work-table 23, is secured upon the table by means of the bolts 41, which extend through the bolt-holes 25, formed in the table, and take into the gear 40. The worm-pinion 42 meshes with the gear 40, and is provided with the shaft 43, which turns in the standard 44, which is adjustably secured to the bed 12 by means of the slot 45, formed in the base of the standard, and the bolt 46, passing through the slot and into the groove 33 of the bed. Upon one end of shaft 43 is fixed the gear-wheel 47, which receives its motion from the intermeshing gear-wheel 48, which is mounted upon the standard 49 and is rotated by means of the attached handle 50. The standard 49 is provided with a slot and a bolt like the construction just described for the standard 44, and the two standards are independently adjustable along the length of the table by means of the slot, bolt, and the grooves 33. The gear-wheel 48 is locked at each revolution thereof by the spring-click mounted thereon and consisting in the movable click 51, working in the chamber 52 and provided with the spring 53, which tends to normally keep the click pressed in toward the standard. At each revolution of the gear 48 the spring-click enters the socket 54, as shown in Fig. 7, and locks the attached wheel, which may be released for the next revolution of the wheel by retracting the click. A number of revolutions of the gear-wheel 48 will represent one complete revolution of the work-table, and the gear being cut will have as many teeth as it takes revolutions of the wheel 48 to make one complete revolution of the work-table. By varying the size of the intermediate gear-wheel 47 the number of revolutions of the gear 48 which will make one revolution of the work-table will be accordingly increased or decreased, and in this way the size and number of the teeth to be cut on a gear may be regulated. In cutting gears the work is clamped on the work-table, which is slid into proper relative position to the gear-cutter 19, which is then lowered so as to perform the cutting, and when the cut is completed the gear-cutter is raised clear of the work, which is then given a partial rotation by means of the attached mechanism. The gear-cutter is again lowered into contact with the the newly-presented surface and the cutting proceeds as before. This operation is repeated until the gear is finished.

By the use of the gear-cutting mechanism it will be possible to mill tools by securing the tool to be cut upon the rotary work-table and replacing the gear-cutter 19 with an emery-wheel, and in this way milling may be accomplished in the manner just described for gear-cutting.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, in a machine for dressing metal, with the frame, the adjustable tool-holder, and the reciprocating bed of a planing-machine, of a rotary work-table mounted on a stand adjustably secured to the planer-bed, a worm-gear on the work-table, and a shaft supported in bearings and provided with a worm engaging with the worm-gear constructed to rotate the work-table, as described.

2. The combination, as hereinbefore set forth, with a planing-machine and its reciprocating bed provided with longitudinal grooves, of a rotary work-table mounted on the bed and provided with a stand having clamp-screws for traveling in the said grooves of the bed and for holding the stand thereto, substantially as and for the purpose herein described.

3. The combination, as hereinbefore set forth, with the bed of a planing-machine, of a rotary work-table mounted on the bed and adjustable longitudinally thereon, a worm-gear for rotating the work-table, a drive-shaft provided with a worm in mesh with said gear, and pulleys on the driving-shaft constructed to operate the work-table independent of the planer-bed, substantially as and for the purpose herein described.

4. The combination, as hereinbefore set forth, with a planing-machine and its bed and a rotary work-table horizontally adjustable thereon, of a supporting-frame sliding on the bed in order to follow the sliding table and having a worm-gear mounted thereon for imparting to the work-table a partial rotation, whereby the table may be rotated by degrees, substantially as herein-described.

5. The combination, as hereinbefore set forth, with a planing-machine and its bed and a rotary work-table mounted thereon and provided with a worm-gear, of a shaft mounted in a supporting-frame and provided with a worm-pinion in mesh with the worm-gear of the table, and means for revolving the shaft with the worm-pinion, substantially as and for the purpose herein described.

6. The combination, as hereinbefore set forth, with a planing-machine and its bed and a rotary work-table secured upon the bed and capable of sliding thereon and provided with a worm-gear, of a supporting-frame consisting of two adjustable standards mounted and sliding upon the bed and one of the standards provided with a shaft having a worm-pinion meshing with the cog-gear of the table and a gear-wheel mounted on the said shaft, the other standard having a gear-wheel journaled thereon and provided with a handle and a spring-click which is adapted to take into a socket formed in the latter standard at each complete revolution of the connected gear-wheel, substantially as and for the purpose herein described.

7. The combination, with the bed of a planing-machine and the stand 27, of the single casting comprising the work-table and the central journal thereof, and the worm-gear for rotating the table, substantially as herein described.

8. The combination, as hereinbefore set forth, with a planing-machine and the traversing bed 12, provided with the grooves 33, of the rotary work-table 23, provided with the worm-gear 30 and having the stand 27 and the clamp-bolts 32, passing through the foot of the stand and traveling in the grooves 33, and a worm for rotating the work-table, substantially as herein described.

WILLIAM G. BUDLONG.

Witnesses:
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J. A. MILLER, Jr.