

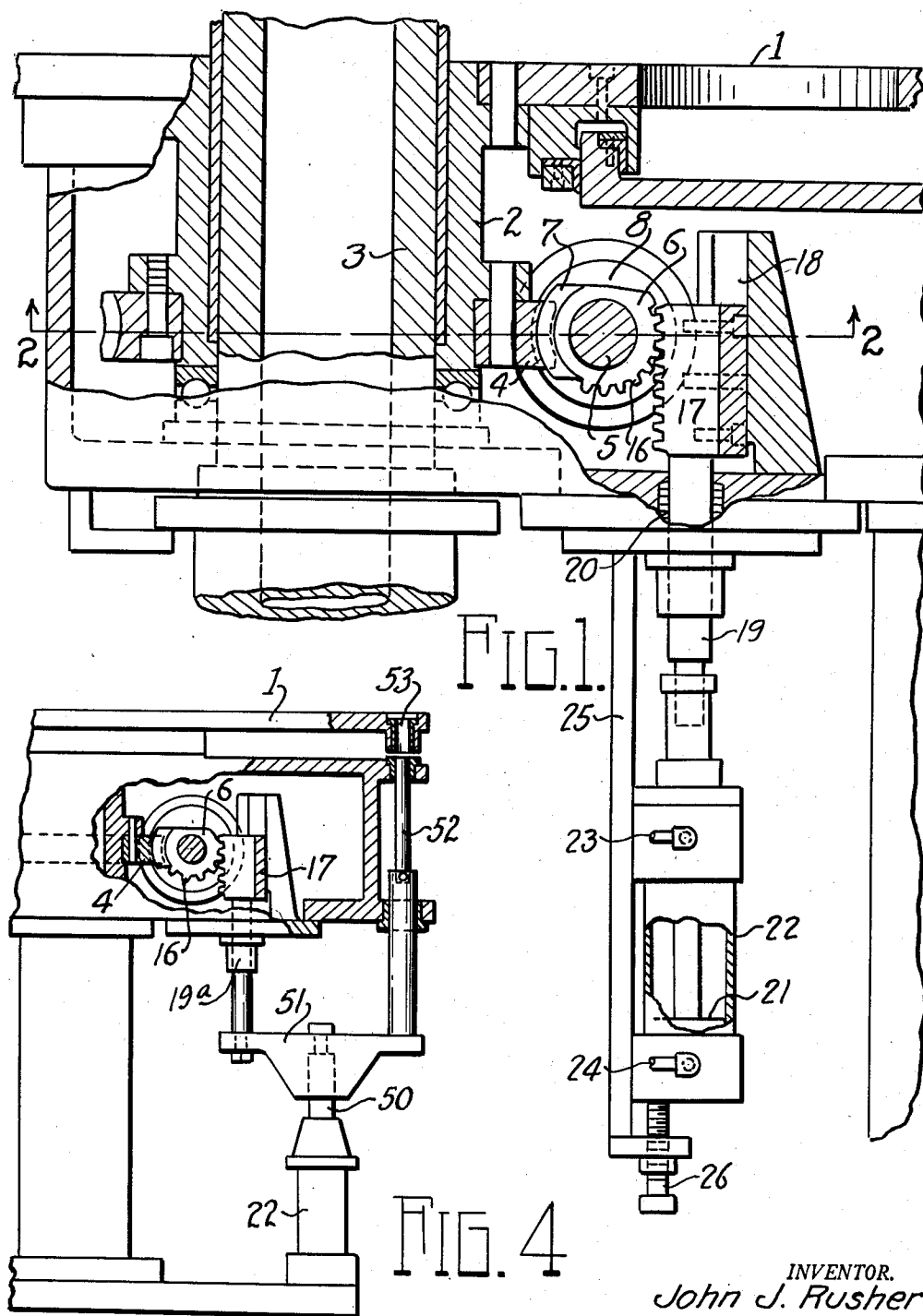
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J. J. RUSHER
INDEXING MECHANISM

2,665,589

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3 Sheets-Sheet 1



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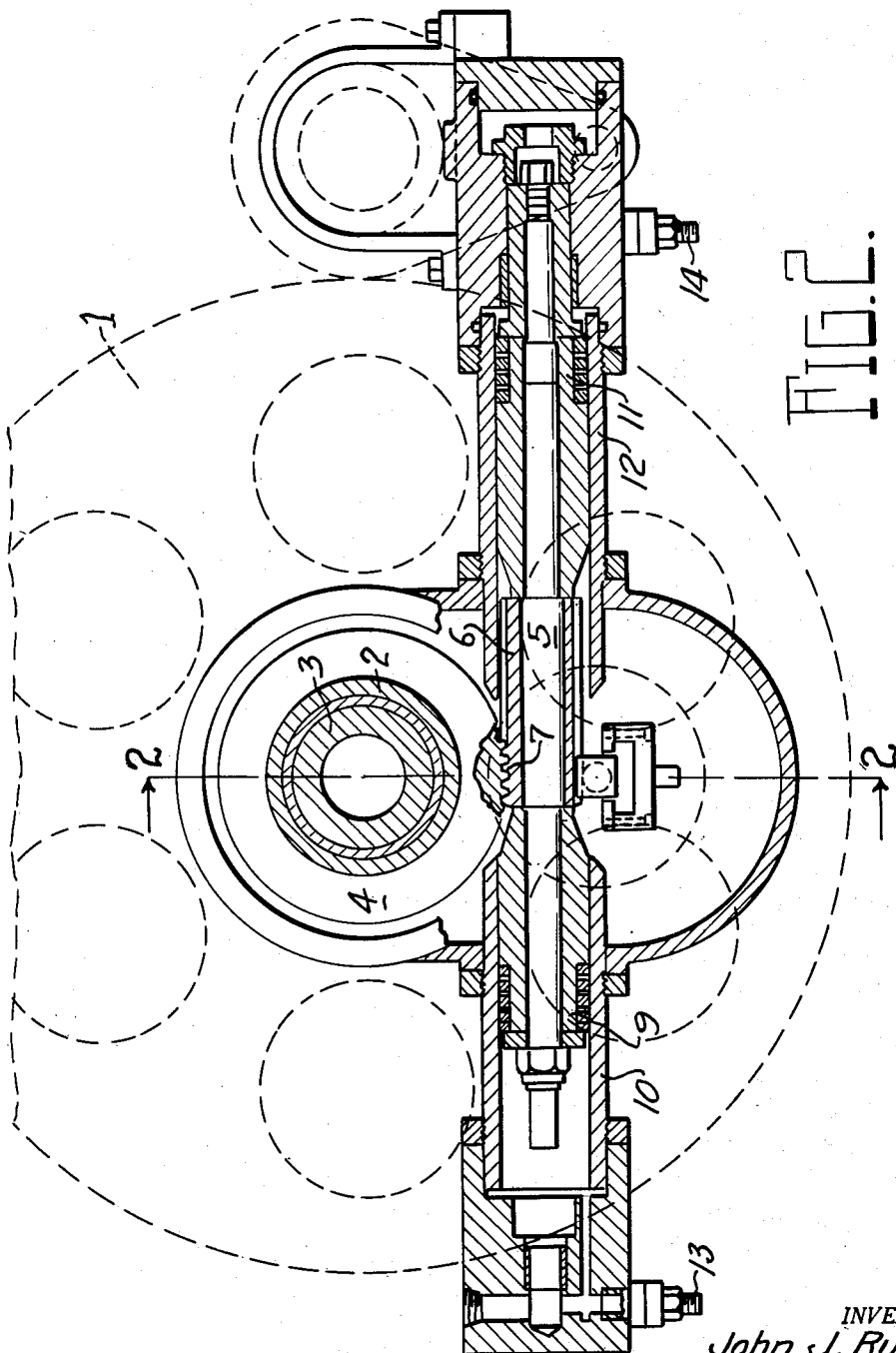


FIG. 2.

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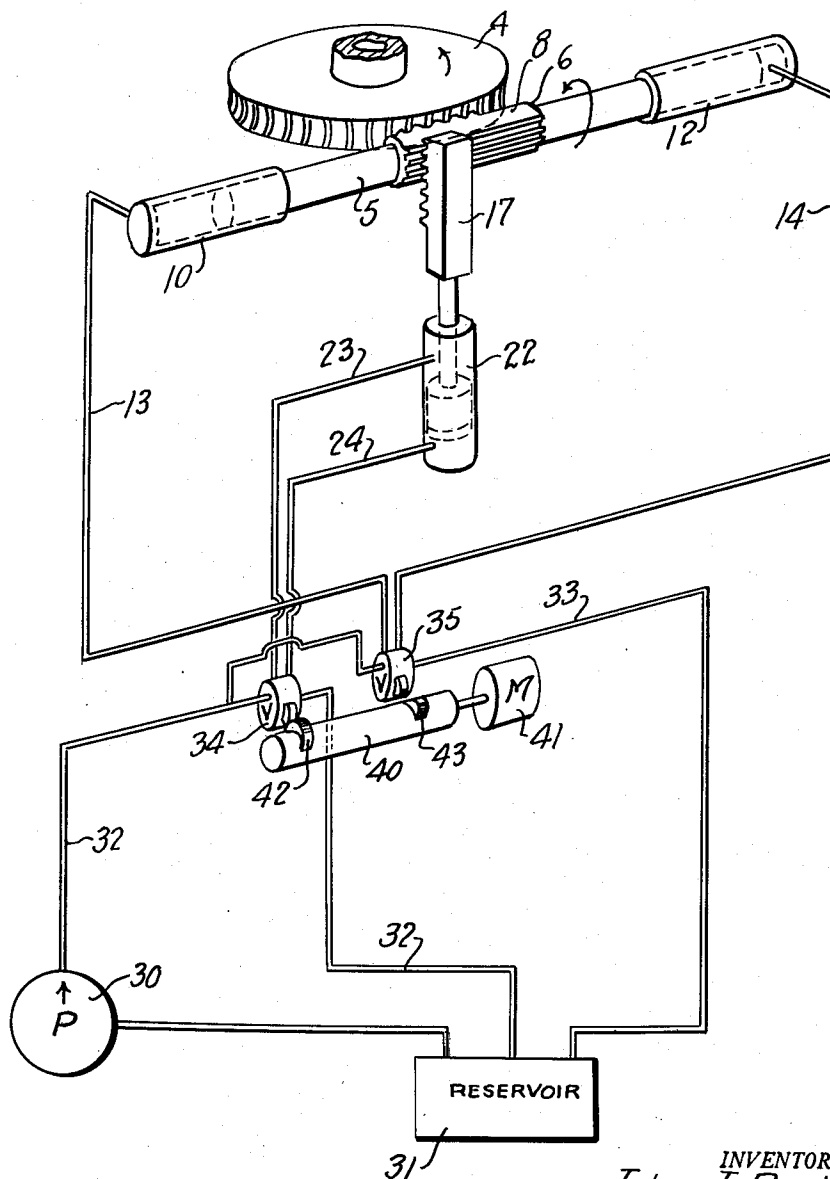
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INDEXING MECHANISM

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FIG. 3.



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INDEXING MECHANISM

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8 Claims. (Cl. 74—88)

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This invention relates to means for imparting predetermined indexing movements to a rotatable object, and has for its primary object the provision of a simple, improved and efficient mechanism of this character.

A further object of the invention is the provision of means employing a plurality of reciprocally movable rack members and coacting pinions, one of which members is successively operated to engage and release its pinion by reciprocatory movements of the other, and when engaged and axially moved is caused to impart a predetermined indexing movement to its pinion.

Further objects and advantages of the invention will be apparent from the following detailed description, and from the accompanying drawings illustrating one embodiment of the invention, in which—

Fig. 1 is a fragmentary side elevation of a device embodying the invention, with parts broken away, and with the indexing rack-bar in operative relation to its pinion; Fig. 2 is a reduced cross-section on the line 2—2 in Fig. 1, with parts in full; Fig. 3 is a diagram of the mechanism with associated fluid pressure control means, and Fig. 4 is a view similar to Fig. 1 with an associated locking means for the indexing table.

Referring to the drawings, 1 designates a movable indexing member, in the present instance, of round table form that is rotatably movable about a vertical axis. This table has a hub sleeve 2 mounted for free rotation, in the present instance, on a standard 3 mounted on or carried by any suitable support (not shown). A pinion 4 is fixedly carried by the sleeve 2 concentric therewith and beneath the table 1, and its teeth are preferably arcuate in form transverse to the pinion.

An indexing rack-bar 5 is mounted at one side of the axis of the pinion 4 transverse thereto and spaced radially from the pinion periphery. A sleeve 6 is mounted for rotary movements on the bar 5 and is held against axial movements thereon, so that the sleeve is caused to have axial reciprocatory movements with the bar. The sleeve at one side of its axis is provided with a longitudinal series of segmental teeth 7 adapted to mesh with the teeth of the pinion 4 and to move into and out of engagement therewith by rotary movements of the sleeve on the bar 5. The teeth 7 extend over approximately a 90° area of the sleeve and at one side of such area the sleeve is provided with a blank or neutral space 8 throughout its length which, when moved into register with the pinion 4, causes disengage-

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ment of the rack teeth 7 and pinion 4, so that axial movement of the sleeve will not impart rotation to the pinion.

The rack-bar 5, in its present embodiment, at one end carries a plunger 9 operating in a cylinder 10 and at its other end a plunger 11 operating in a cylinder 12. Fluid pressure is introduced into the outer end of the cylinder 10 from a suitable source of supply through a line 13 and into the outer end of the cylinder 12 through a line 14 whereby controlled reciprocatory movements are imparted to the bar.

The rack-bar sleeve 6 is provided at one side of its axis with a segmental set of pinion teeth 16 concentric to the axis of the sleeve and with the teeth extending lengthwise of the sleeve. The circumferential length of this tooth set is greater than 90° and opposes both the tooth set 7 and the space 8. The pinion teeth 16 are in permanent mesh with the teeth of a rack-bar 17 which is mounted, in the present instance, in a guide 18 for reciprocatory movements transverse to the rack sleeve axis and preferably parallel to the axis of the standard 3. The rack-bar 17 has a stem 19 projecting from its lower end through a guide 20 and carrying a plunger 21 in a cylinder 22. Admission of fluid pressure to opposite ends of the cylinder is through lines 23 and 24. The cylinder 22, in the present instance, is carried by a frame part 25 and is axially adjustable thereon by the turning of a screw 26.

In the operation of the mechanism, the rack-bar 17 at the beginning of an indexing cycle is in lowered position, and the rack-bar teeth 7 on the sleeve 6 are in mesh with the pinion 4 that is connected to and turned with the indexing table. This relation of the parts is shown diagrammatically in Fig. 3. A cycle is started by admitting pressure to the lower end of the cylinder 22 to effect a raising of the rack-bar 17 and a consequent turning of the sleeve 6 to place the neutral space 8 thereof into register with the teeth of the pinion 4 and at the same time to move the set of teeth 7 laterally out of engagement with such pinion. When this operation has been effected, pressure is admitted to the right hand cylinder 12 to force the rack-bar 5 and its sleeve 6 to the left, with the teeth of the rack-bar 17 sliding lengthwise of the teeth 16 on the sleeve. This having been done, fluid pressure is admitted to the cylinder 22 through the line 23 which effects a lowering of the rack-bar 17 and a consequent turning of the sleeve 6 to place its teeth 7 into mesh with those of the pinion 4.

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Pressure is then admitted to the left hand cylinder 10 through the line 13, causing movement of the rack-bar 5 to the right and a consequent predetermined indexing movement of the pinion 4 and connected table 1. This completes the cycle. It is thus apparent that the rack-bars 17 and 5 are alternately operated first to raise bar 17, then to move bar 5 to the left, then to lower 17 and finally move the bar 5 to the right to index the pinion 4.

One manner of automatic control for the two rack-bars 5 and 17 is shown diagrammatically in Fig. 3. In this figure a pump 30 operates to force fluid from a reservoir 31 and back to it through a pressure line 32 and also from said line through a branch line 33 back to the reservoir. A valve 34 in the line 32 is operable to control the directing of pressure therefrom first through the line 24 to raise the rack-bar 17 and to bleed the opposite end of the cylinder to the reservoir through the line 23, and then, at a predetermined point in an indexing cycle, to direct fluid pressure through the line 23 to the upper end of the cylinder to lower said rack-bar and at the same time permitting return of pressure to the reservoir from the opposite end of the cylinder through the line 24. A second valve 35 is disposed in the branch line 33 and is operable to control the alternate admission of fluid pressure to the cylinders 10 and 12 at predetermined points in a cycle through the respective lines 13 and 14, whereby the rack-bar 5 is first moved to the left when the sleeve 6 is in neutral position and then at a predetermined point in a cycle is moved to the right to effect the indexing action. The valves 34 and 35 are each of a type having rockable cores which, when alternately rocked, connect one or the other of the cylinder ends with the respective pressure lines 32 and 33, and at the same time connect the opposite ends of the cylinders with the reservoir 31 for bleeding.

The valve 34 is normally in position to connect the pressure side of the line 32 with the line 23 and to connect the line 24 with the reservoir side of the line 32. This causes the rack-bar 17 to normally stand in its lowered position, as shown. Likewise, the valve 35 is normally in position to connect the pressure side of the line 33 with the cylinder 10 and the reservoir side thereof with the cylinder 12, thus tending to hold the rack-bar 5 to the right end of its stroke, as shown. During each cycle, a cam shaft 40 has one complete revolution imparted thereto by a motor 41, and this shaft has cam projections 42 and 43 extending circumferentially thereof and adapted to respectively coast with the valves 34 and 35 during predetermined portions of a single rotation of the shaft to move them to positions in which the cylinder lines 24 and 14 will be connected with the pressure side of the line 32, while the lines 23 and 13 will then be connected with the reservoir. It is thus apparent that the rack-bar 17 is raised to rock the rack sleeve 6 to neutral relation to the pinion 4 and to retain it in such position while the rack-bar 5 is being moved to the left. Also, that while the rack-bar 5 is in such left position, the cam 42 will release the valve 34, permitting the rack-bar 17 to be returned to its normal lowered position, and that after this the cam 43 releases the valve 35 permitting it to return to normal position and to cause the pressure in line 13 to become active and return the rack-bar 5 to the right to effect an indexing action.

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In Fig. 4 is shown a means that is automatically operable to lock the table 1 in indexing position during each rest period thereof, thus insuring that the table has turned a predetermined extent at each indexing operation, or effecting a stopping of the machine if such extent of movement is not obtained. This means is also operable to lock the table against movement during a rest period. To accomplish this, the plunger 21 in the cylinder 22 has its stem or rod, here marked 50, shortened and provided without the upper end of the cylinder with a cross-bar 51, to one end of which is attached the stem 19a of the rack-bar 17 while to the other end thereof is attached a lock-pin 52. The rack-bar stem and lock-pin are disposed with their longitudinal axes parallel to that of the plunger stem or rod 50. The table 1 has a socket 53 for each station thereto and, in the present instance, near the table rim, and the lock-pin 52, when raised after an indexing movement, is intended to enter a registering socket and lock the table against movement during a rest period and until released by a lowering of the pin. If the table has not received a proper indexing movement the lock-pin when raised will not enter a socket and operation of the machine will be stopped.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In an indexing mechanism, an indexing pinion, a longitudinally reciprocable rack-bar, a member carried by said bar for movement therewith and for transverse shifting movements relative thereto, said member having one set of rack teeth for meshing engagement with said pinion and a second set of rack teeth transverse to the first set, a second rack-bar in mesh with said second set of rack-bar teeth, and means operable to reciprocate said second rack-bar in predetermined timed relation to the strokes of said first rack-bar to move said first teeth out of meshing register with said pinion when the first rack-bar is in one position of its movement and into register with the pinion when said first rack-bar is in another position of its movement.

2. In an indexing mechanism, an indexing pinion, a reciprocably movable rack-bar, a sleeve mounted on the rack-bar for reciprocatory movements therewith and for rotary movements thereon, said sleeve having a set of teeth meshing with said pinion to impart predetermined indexing movements thereto when the bar is moved in one direction and being movable to disengage the pinion by rotary movement of the sleeve, means connected to said sleeve and operable to rotate the sleeve to alternately engage and disengage said sleeve teeth and pinion, means operable to impart reciprocatory movements to said rack-bar, and means operable at predetermined positions of reciprocatory movement of said rack-bar to alternately move the sleeve to move its teeth into and out of registering relation to the pinion.

3. In an indexing mechanism, an indexing pinion, a rack-bar longitudinally movable transverse to the pinion axis, a member carried by said rack-bar for movements therewith and for transverse shifting movements relative thereto, said member

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having a set of rack teeth adapted to mesh with the pinion when the member is in one position of its transverse movement and to disengage the pinion when the member is in another position of such movement, a second set of teeth on said member transverse to said first set, a second rack-bar in engagement with said second set of teeth and reciprocally movable to rotate the member on its rack-bar to alternately engage and release the first set of teeth with respect to the pinion, and fluid pressure means operable to impart predetermined reciprocatory movements to said first rack-bar and predetermined movements to said second rack-bar whereby said member is shifted into driving engagement with the pinion when in one position of movement of the first rack-bar and is released therefrom when in another position of such movement.

4. In an indexing mechanism, an indexing pinion, a reciprocally movable rack-bar having a set of rack teeth rotatably shiftable transverse to the bar movement into and out of driving mesh with the pinion, means operable to impart stroke movement to said rack-bar first in one direction and then another, means to rotate said rack teeth into and out of meshing relation to the pinion alternately with said strokes, and means operable with said second means to lock said pinion against movement during predetermined movements of said last-mentioned means.

5. In an indexing mechanism, an indexing pinion, a longitudinally reciprocable rack-bar, a member carried by said bar for movement therewith and for rotary transverse shifting movements relative thereto, said member having one set of rack teeth for meshing engagement with said pinion and a second set of rack teeth transverse to the first set, a second rack-bar in mesh with said second set of rack teeth, means operable to reciprocate said second rack-bar in predetermined timed relation to the strokes of said first rack-bar to move said first teeth out of meshing register with said pinion when the first rack-bar is in one position of its movement and into register with the pinion when said first rack-bar is in another position of its movement, and means operable with said second rack-bar to lock said pinion against movement during predetermined movements of said last-mentioned means.

6. In an indexing mechanism, a rotatable indexing table, an indexing pinion connected to said table for imparting rotation from one to the other, a longitudinally reciprocable rack-bar, a member carried by said bar for movement therewith and for transverse shifting movements relative thereto, said member having one set of rack teeth for meshing engagement with said pinion and a second set of rack teeth transverse to the

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first set, a second rack-bar in engagement with said second set of rack teeth, means operable to reciprocate said second rack-bar in predetermined timed relation to the strokes of said first rack-bar to move said first teeth out of meshing register with said pinion when the first rack-bar is in one position of its movement and into register with the pinion when said first rack-bar is in another position of its movement, said table having a series of sockets therein corresponding in number to indexing positions thereof and a lock-pin movable with said second rack-bar and operable to interengage a registering socket on the table to lock the table against movement during a rest period thereof.

7. In an indexing mechanism, an indexing pinion, a longitudinally reciprocatory and transversely rotatable rack member having a set of rack teeth thereon shiftable transversely into and out of meshing register with said pinion, means mounting the rack member for said movements, means operable to alternately move said rack member longitudinally first in one direction and then in an opposite direction a predetermined extent, means operable to rotate said rack member out of engaging register with the pinion at the beginning of one stroke and into engaging register therewith at the beginning of the next stroke, and means operable in timed relation to said last means to prevent turning of said pinion when disengaged from the rack member.

8. In an indexing mechanism, an indexing pinion, an indexing member movable by said pinion, a reciprocally movable rack bar, a rack tooth member carried by said bar for movement therewith and for rotary transverse shifting movements relative thereto into and out of register with the pinion, means operable to impart stroke movements to said rack bar first in one direction and then another, means to rotate said tooth member out of pinion meshing position at one end of the rack bar stroke and into meshing position at the other end of the stroke, and means operable in synchronized relation to said last means to lock said indexing member against movement when the tooth member is out of mesh with the pinion.

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