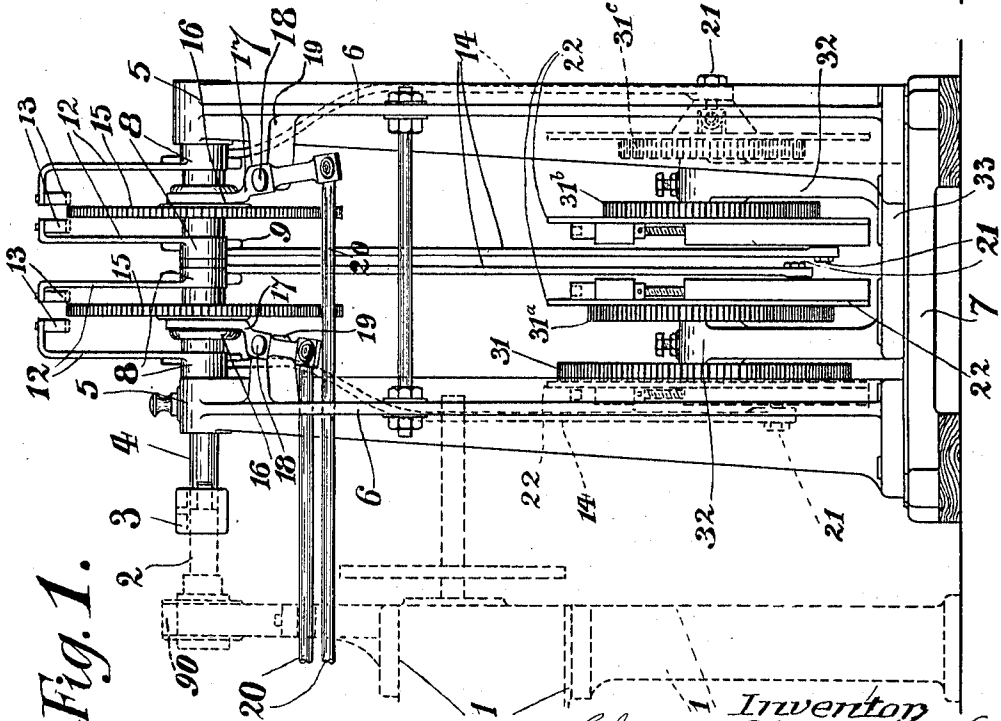
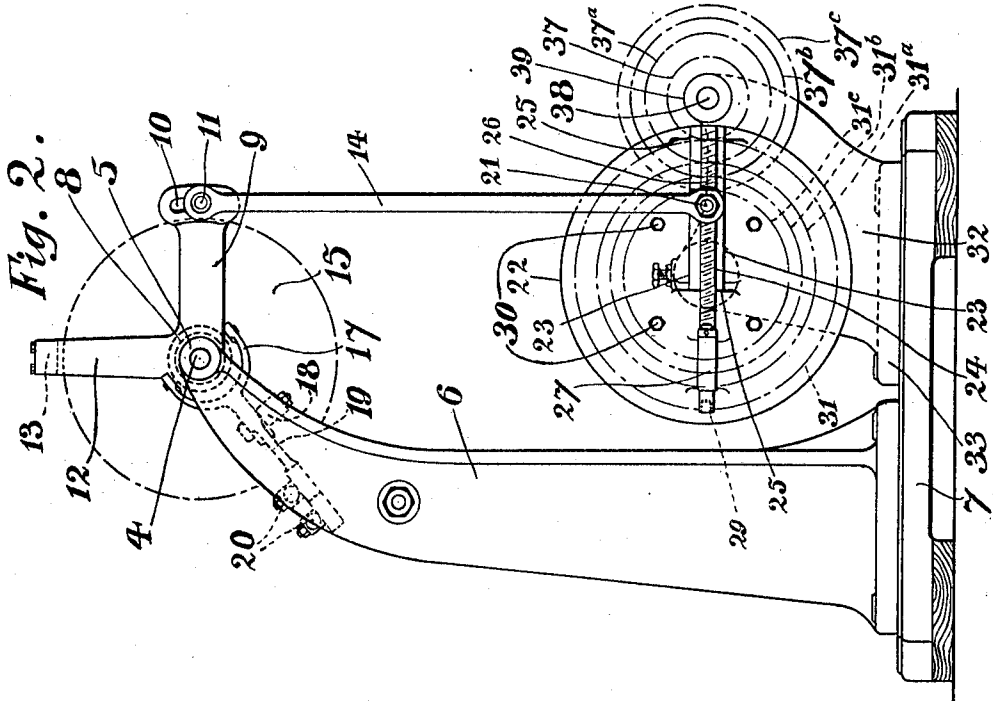


C. A. KER.
ROCKING GEAR FOR MILL ENGRAVING.
APPLICATION FILED MAY 19, 1911.

1,055,186.

Patented Mar. 4, 1913.

4 SHEETS-SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 4.

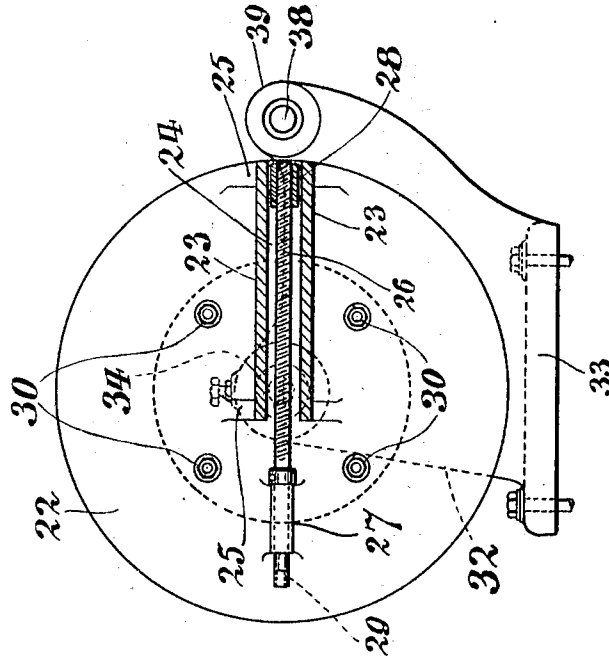
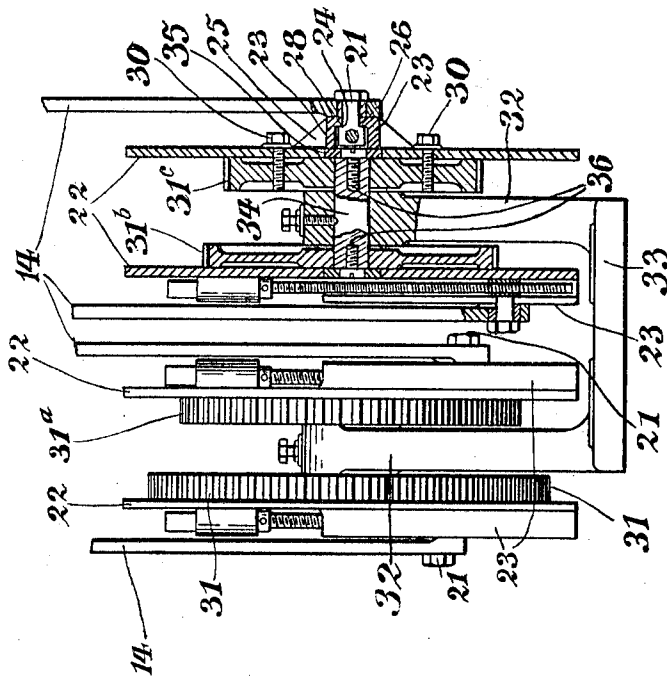


Fig. 3.



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4 SHEETS—SHEET 3.

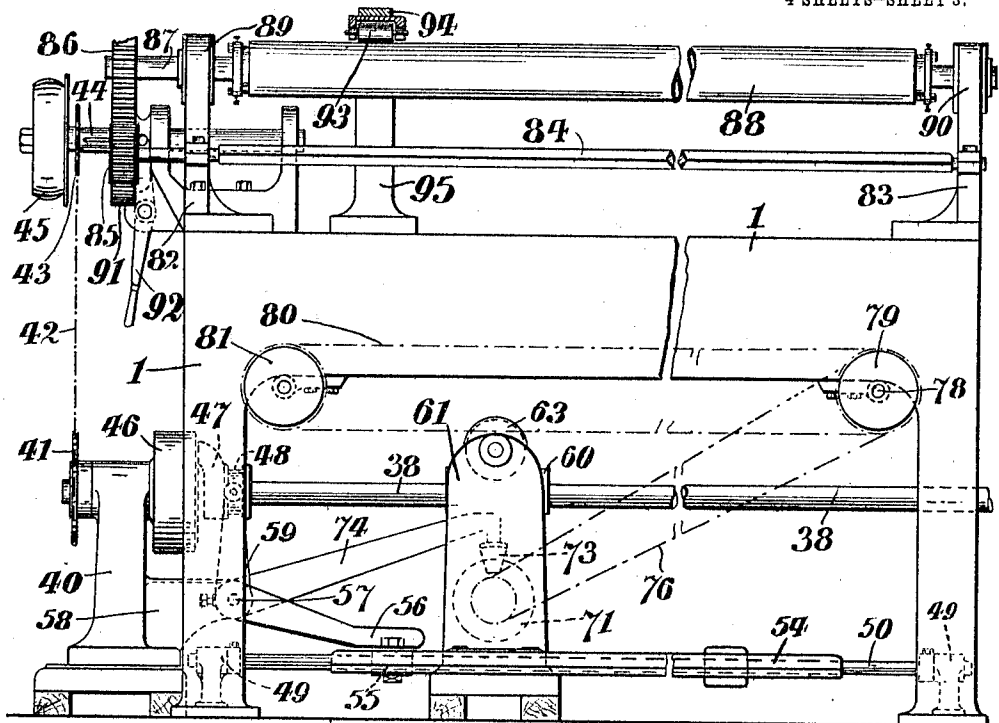


Fig. 5.

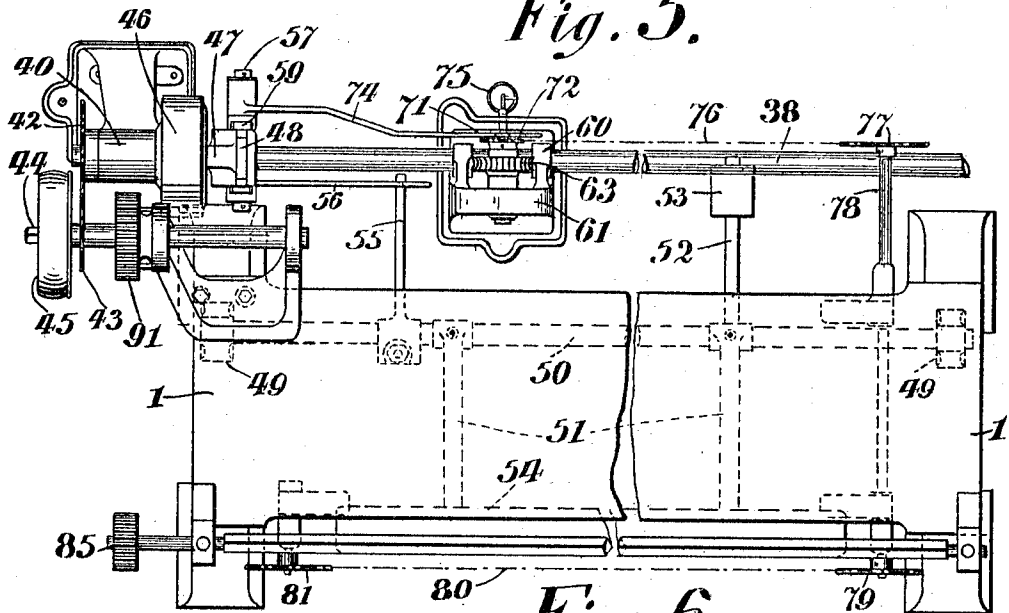


Fig. 6.

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4 SHEETS—SHEET 4.

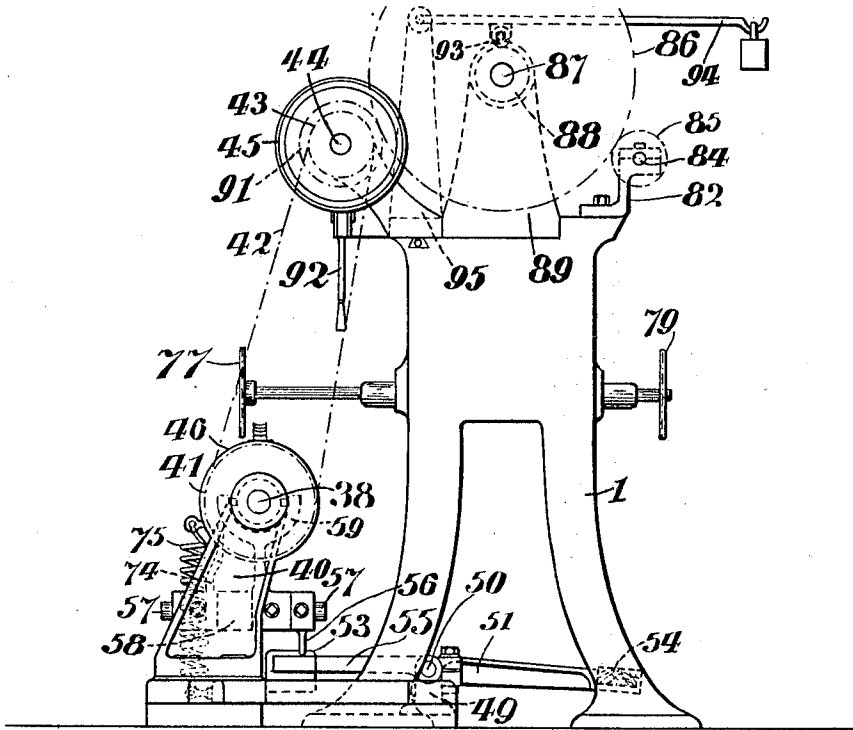


Fig. 7.

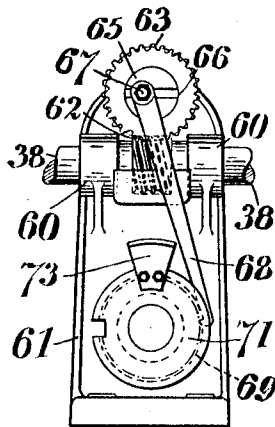


Fig. 8.

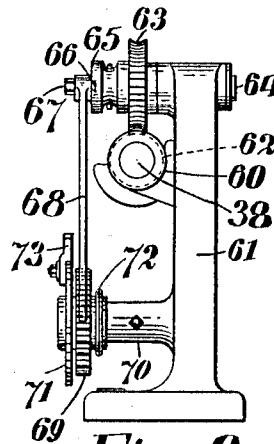


Fig. 9.

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UNITED STATES PATENT OFFICE.

CHARLES ALISON KER, OF GLASGOW, SCOTLAND, ASSIGNOR OF ONE-THIRD TO ANDREW WILSON AND ONE-THIRD TO WILLIAM ALISON KER, OF GLASGOW, SCOTLAND.

ROCKING-GEAR FOR MILL-ENGRAVING.

1,055,186.

Specification of Letters Patent.

Patented Mar. 4, 1913.

Application filed May 19, 1911. Serial No. 628,348.

To all whom it may concern:

Be it known that I, CHARLES ALISON KER, a subject of the King of Great Britain, residing at Glasgow, Scotland, have invented certain new and useful Improvements in Rocking-Gear for Mill-Engraving, of which the following is a specification.

This invention relates to automatic and variable rocking gear for use in engraving machines for rocking the mill or die when making an impression therewith on the copper or other roll or plate.

The invention is specially adapted for use in the engraving of copper rolls.

Under the present invention the rocking gear has separate variable means for each rock, or throw, these means being separately adjusted so as to give the required rocks or throws and means are, or may be, provided for automatically counting the number of rocks for each adjustment and for automatically stopping the operation of the rocking mechanism on the desired number of rocks having been made at each adjustment.

In order that the invention may be clearly understood I have hereunto appended explanatory drawings which show a rocking gear adapted to give four different rocks and to be adjusted separately to the required degree. In order to show the position of the engraving machine relatively with the improved rocking gear, the outline of the machine has in certain views of the drawings been indicated.

On the said drawings:—Figure 1 is a front view of the rocking gear and showing the end of the machine 1. Fig. 2 is an end view looking on the right hand side of Fig. 1 but without showing the end of the machine. Fig. 3 is a detail view partly in section and partly in front elevation of the variable mechanism. Fig. 4 is a part section and part end view looking on the right hand side of Fig. 3. Fig. 5 is a front elevation of the machine 1 showing the counting device and the automatic stopping mechanism. Fig. 6 is a plan view of the same. Fig. 7 is an end view of the same looking on the left hand end of Figs. 5 and 6. Fig. 8 is a view of the counting device showing the opposite side to that shown at Fig. 5. Fig. 9 is a side view looking on the right hand side of Fig. 8. Figs. 3 and 4 and Figs. 8 and 9 are drawn to a larger scale and Figs.

5 to 7 are drawn to a smaller scale than Figs. 1 and 2.

In the variable rocking mechanism shown at Figs. 1 to 4 the end of the engraving machine is indicated by dotted lines at 1 (see Fig. 1) and the extended end of the shaft to be rocked is indicated at 2. Coupled at 3 to this extended end of the shaft which preferably carries the copper roll to be engraved is a short shaft 4 adapted to be rocked and to transmit its rocking movement to the shaft 2 and so to the roll thereon. This shaft 4 is carried between bearings 5, 5, in a pair of brackets or cheeks 6, 6 mounted on a base 7 situated at the end of the engraving machine, and for rocking this shaft 4 there is loosely mounted thereon four bosses 8 each of which has projecting therefrom a radial arm 9 having in the outer end thereof a slot 10 by means of which it may be jointed, by a bolt 11, to the upper end of a connecting rod 14 for imparting the rocking motion to the shaft 4, and each boss 8 has also projecting therefrom a second radial arm 12 upon whose outer end there is secured a toothed piece 13, the teeth facing inward in such manner that they may engage the teeth of a wheel 15 on the shaft 4. Feather-keyed on the shaft 4 are two such wheels 15 each being located between two of the bosses 8 so that it may be caused to engage one or other of the toothed pieces 13 in connection with the two bosses 8. Formed on each wheel 15 is a sleeve part 16 having a groove for the reception of a fork 17 which is pivotally mounted on a pin 18 in a bracket 19 projecting from the bracket or cheek 6, and jointed to the end of each fork piece 17, for operating the same, is a rod 20 which is passed through an opening in one of the brackets or cheeks 6 and extends across the front of the engraving machine 1 where it is suitably guided or supported in such manner that, on being moved longitudinally by hand, the fork piece 17 is caused to turn on its fulcrum and so slide the wheel 15 into engagement with one or other of the two toothed pieces 13 adjacent thereto, or into the mid position between and clear of the pieces 13.

For operating the connecting rods 14 in such manner as to rock the radial arms 9 and the shaft 4, the lower end of each connecting rod 14 is fitted with an adjustable

crank pin 21 adapted to be moved closer to or farther away from the center of a rotary disk 22 for the purpose of varying the throw. Each rotary disk 22 has formed thereon a radial guideway having projecting sides 23, an open slot 24 therebetween and end walls 25, the guideway extending from the center of the disk to the circumference thereof, and located within each guideway is a radial screw-threaded spindle 26 which rotates in a bearing bracket 27 formed on the face of the disk 22 in line with the guideway, and engaging the screw thread of the spindle 26 within the guideway is a nut 28 formed on the end of the aforesaid crank pin 21, the arrangement being such that on the spindle 26 being rotated by means of a suitable tool inserted in the square recess 29 in the end thereof, the nut 28 and consequently the crank pin 21 are moved closer to or farther away from the center of the disk 22 thereby varying the throw of the crank to the required degree. The rotary disks 22 are secured by means of set pins 30 on the faces of four spur wheels 31, 31^a, 31^b, and 31^c, of different diameters which are mounted in pairs on two brackets 32 projecting from a base plate 33 secured on the base 7 before referred to. The one bracket 32 (see Fig. 3) has fitted therein a stationary pin 34 on the ends of which the spur wheels 31^b and 31^c are revolvably mounted by means of washers 35 which are secured on the ends of the pin 34 by means of set pins 36 in such manner as to bear against the spur wheels 31^b and 31^c and retain the same on the pin 34. The second bracket 32 on the base plate 33 carries in a similar manner the two spur wheels 31 and 31^a.

Gearing with and driving the spur wheels 31, 31^a, 31^b, and 31^c, each at different speeds are four pinions 37, 37^a, 37^b, and 37^c keyed on a common shaft 38 mounted in bearings 39 in extensions of the brackets 32 and extended longitudinally of the machine along the back thereof. At the opposite end of the machine to that at which the rocking gear is situated the said shaft 38 is (see Figs. 5 to 7) supported in a bearing bracket 40 and has mounted thereon a sprocket wheel 41 driven by means of a chain 42 from a second sprocket wheel 43 on a driving shaft 44 mounted in the upper part of the machine and having a belt pulley 45 for the driving belt through which the rocking gear is operated. For throwing the rocking gear into and out of operation the said sprocket wheel 41 is secured on a sleeve which is loose on the shaft 38 and has also secured thereon a clutch member 46 with which there may engage a second clutch member 47 feather-keyed on the shaft and having a grooved sleeve 48 by means of which it may be moved into and out of engagement with the mem-

ber 46. For throwing the rocking gear into operation there is mounted near the center of the machine, in pedestal bearings 49, a longitudinal shaft 50 from which there extend, toward the front of the machine, two lever arms 51 having secured on the front ends thereof and extending practically the entire length of the machine a foot-board 54 which may be depressed by the foot in such manner as to rock the shaft 50, and extending from one of these lever arms 51 is an arm 52 carrying thereon a counterweight 53 by means of which the shaft 50 is returned to its normal position on the foot-board 54 being released, and extending rearwardly from the shaft 50 is another lever arm 55 whose end projects beneath the end of another lever arm 56 projecting from a pin 57 mounted in a bracket 58 extending from the bearing bracket 40, the lever arm 56 being secured to the pin 57 which has also secured thereto a forked lever 59 engaging the grooved sleeve 48 of the clutch member 47 in such manner that on the footboard 54 being depressed the lever 56 is raised by means of the lever arm 55 and the clutch member 47 is thrown into engagement with the member 46 by means of the forked lever 59. For automatically throwing out the clutch 46, 47, and so stopping the rocking operation there is provided on the shaft 38 (see particularly Figs. 8 and 9) between projecting bearing bushes 60 on a bracket 61 at the back of the machine, a worm 62 which gears with and drives a worm-wheel 63 mounted on a pin 64 in the bracket 61 and having secured thereto a disk 65 made with a diametric dovetailed groove 66 for the reception of a dovetailed head on a bolt 67 on which is pivotally hung a pawl 68 having on its lower end a hook adapted to engage the teeth of a ratchet wheel 69 secured on a pin carried in a projecting boss 70 on the bracket 61 and having secured thereto a disk 71 and a toothed free wheel 72, the arrangement being such that, by the weight of the pawl 68 the lower hooked end thereof remains in engagement with the ratchet wheel 69 while the upper end moves in a circular path and the ratchet wheel 69 is rotated intermittently by the pawl 68, and transmits its rotary motion to the disk 71, without, however, transmitting rotary motion to the free wheel 72.

Secured on the disk 71 is a quadrant piece (or pieces) 73 which forms on the periphery of the disk 71 a raised part which may be of greater or less extent as required, the piece 73 being secured in position on the disk 71 by means of set pins in such manner that it may be readily removed and interchanged as required. Adapted to engage the periphery of the disk 71, or the edge of the piece 75, according to the position of the disk 71, is a lever arm 74 (Figs. 5 and 6)

which is secured at its one end to the afore-
 said pin 57 which also carries the arms 56
 and 59, and has connected to its opposite
 end, one end of a spiral spring 75 (see Figs.
 5 6 and 7) which has its other end connected
 to the base of the bracket 61 and holds the
 arm 74 in engagement with the disk 71 or
 piece 73. When the end of the lever arm
 74 is in engagement with the piece 73 the
 10 clutch member 47 is held by means of the
 fork lever 59, in engagement with the clutch
 member 46, and, on the piece 73 being moved
 by the rotation of the ratchet 69 and disk
 71 out of line with the end of the lever arm,
 15 the latter is pulled downward by the action
 of the spiral spring 75 and the clutch is
 thrown out of engagement, thereby stopping
 the rocking operation. The sprocket wheel
 72 above mentioned is geared by means of
 20 a chain 76 with another sprocket 77 also at
 the back of the machine, and this second
 sprocket 77 is keyed on a shaft 78 which
 extends from back to front of the machine
 and has also secured thereon at the front of
 25 the machine a sprocket wheel 79 in gear
 through a chain 80 with another sprocket
 81 also at the front of the machine but at
 an opposite end thereof, the arrangement
 being such that the attendant, by grasping
 30 the chain 80 at the front of the machine and
 at any point in the length of the machine,
 and moving the same in the proper direc-
 tion, rotates the free wheel 72 and brings the
 piece 73 into the correct position to give the
 35 required number of rocks before the lever arm
 74 leaves the piece 73 and so causes the
 clutch 46, 47, to be disengaged and the rock-
 ing operation to be stopped.

For adjusting the copper roll to bring the
 40 mill into the correct position relatively
 thereto there is mounted between end brack-
 ets 82, 83, on the machine, a squared or
 other shaft 84 having keyed thereon a pin-
 ion 85 in gear with a large spur wheel 86
 45 on the roll shaft 87 so that, by gripping the
 said squared or other shaft 84 at any point
 throughout its length and rocking or
 slightly rotating the same, the attendant
 may conveniently adjust the roll. The shaft
 50 87 for the copper roll 88 is shown mounted
 between end bearing brackets 89, 90 on the
 machine frame 1, and for rotating the roll
 by power independently of the hand ad-
 justment shaft 84, the spur wheel 86 on the
 55 roll shaft may be driven from the power
 shaft 44 by means of a pinion 91 fitted with
 a hand lever 92 by which it may be slid into
 or out of engagement with the said spur
 wheel 86. The mill 93 is carried in the
 60 usual weighted arm 94 pivotally mounted on
 the usual longitudinally adjustable bracket
 or slide 95.

When making an impression on a copper
 or other roll with a hard mill or die it is
 65 usual to rock the roll in contact with the

mill or die and in order to properly impress
 the design or pattern into the copper or other
 material, it is necessary to change the angle
 or degree of rock from time to time so as
 to have the design or pattern evenly and uni-
 70 formly reproduced, the higher portions of
 the design or pattern on the mill requiring
 to be rocked a greater number of times in
 order to properly form or "mill" the corre-
 sponding deep depression in the roll. It is, 75
 therefore, usual to give a certain number of
 rocks through a certain angle to produce
 the deep impression and to then change the
 angle and repeat the rocking operation to
 produce the shallower impression or im- 80
 pressions. Two, three, or at most four
 changes of the angle or degree of rock are
 found sufficient to "mill" ordinary designs
 or patterns. In certain cases also it is found
 necessary to vary the number of oscillations 85
 or rocks given through each angle.

In the rocking gear in accordance with
 the present invention the rocking operation
 is performed mechanically, and in operation
 the various crank pins 21 having been ad- 90
 justed on the screws 26 so as to give the
 required rocks and the roll 88 having been
 properly adjusted, the attendant, at the
 front of the machine, moves the rods 20 so
 as to put one of the wheels 15 into engage- 95
 ment with one of the arms 12 for the first
 rock or throw, and having moved the chain
 80 in such manner as to bring the side face
 of the quadrant piece 73 against the lever
 arm 74 the attendant then depresses the foot 100
 board 54 and so raises the lever arm 74,
 engages the clutch 46, 47, and starts the
 rocking operation. On the foot board being
 then released the lever arm 74 rests on the
 edge of the quadrant piece 73 which will by 105
 the action of the worm and ratchet mecha-
 nism (Figs. 8 and 9) have moved below the
 lever arm, and on the quadrant piece 73
 moving, by the rotation of the disk 71, clear
 of the lever arm 74 the rocking operation 110
 is automatically stopped. The mechanism
 may then be changed for the next rock or
 throw and the same operation repeated.
 When it is desired to give a different num-
 ber of rocking movements of the roll for 115
 each adjustment a series of quadrant pieces
 73 of varying lengths may be fitted around
 the periphery of the disk 71.

Having now fully described my invention
 what I claim and desire to secure by Letters 120
 Patent is:—

1. In a mill engraving machine having
 means for carrying the work to be engraved,
 an automatic and variable rocking gear for
 rocking said work holding means compris- 125
 ing, in combination, a rock shaft, variable
 throw mechanism for rocking the shaft,
 means on the said shaft for connecting the
 same with, or disconnecting the same from,
 the said variable throw mechanism, and 130

means for starting and stopping the rocking mechanism.

2. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, a variable throw mechanism for rocking the shaft, means on the said shaft in permanent connection with the said variable throw mechanism, means in permanent connection with the shaft and capable of being engaged with or disengaged from the said means in connection with the variable throw mechanism, and means for starting and stopping the rocking mechanism.

3. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, variable throw mechanism for rocking the shaft, toothed members on the said shaft and permanently connected with the said variable throw mechanism, means in permanent connection with the shaft and capable of being engaged with or disengaged from the toothed members, and means for starting and stopping the rocking mechanism.

4. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, variable throw mechanism for rocking the shaft, toothed members on the said shaft and permanently connected with and operated from the said variable throw mechanism, toothed wheels in permanent connection with the shaft and capable of being engaged with or disengaged from the toothed members, and means for starting and stopping the rocking mechanism.

5. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, variable throw mechanism for rocking the shaft, toothed members on the said shaft and permanently connected with and operated from the said variable throw mechanism, a pair of toothed wheels in permanent connection with the shaft, means for moving each toothed wheel along the shaft into or out of engagement with a toothed member, and means for starting and stopping the rocking mechanism.

6. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, variable throw crank mechanism for rocking the shaft, means on the said shaft in permanent

connection with the said crank mechanism, means in permanent connection with the shaft and capable of being engaged with or disengaged from the said means in connection with the said crank mechanism, and means for starting and stopping the rocking mechanism.

7. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, variable throw crank mechanism for rocking the shaft, toothed members on the said shaft and permanently connected with and operated from the said crank mechanism, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, and means for starting and stopping the rocking mechanism.

8. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, crank mechanism for rocking the shaft, toothed members on the shaft and permanently connected with and operated from the crank mechanism, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, means for varying the throw of the crank mechanism for each toothed member, and means for starting and stopping the rocking operation.

9. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, crank mechanism for rocking the shaft, bosses on the shaft, toothed members on the bosses, means for connecting the bosses with and operating the same from the crank mechanism, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, means for varying the throw of the crank mechanism for each toothed member and means for starting and stopping the rocking operation.

10. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, crank mechanism for rocking the shaft, bosses on the shaft, a radial arm on each boss, a toothed member on each arm, a second radial arm on each boss, means connecting the latter radial arms with and operating the

same from the crank mechanism, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, means for varying the throw of the crank mechanism for each toothed member, and means for starting and stopping the rocking operation.

11. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, crank mechanism for rocking the shaft, bosses on the shaft, toothed members on the bosses, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, adjustable crank pins in the crank mechanism, means for connecting the crank pins with the bosses, means for adjusting the crank pins in such manner as to vary the throw, and means for starting and stopping the rocking operation.

12. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a rock shaft, crank mechanism for rocking the shaft, toothed members on the shaft and operated from the crank mechanism, toothed wheels in permanent connection with the shaft, means for moving the said toothed wheels into or out of engagement with the said toothed members, adjustable crank pins in the crank mechanism, nuts on the crank pins, revoluble screws for traversing said nuts and so varying the crank throw, means for connecting the crank pins to the said toothed members for the purpose of rocking the same, and means for starting and stopping the rocking operation.

13. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on the shaft, a series of toothed wheels of varying diameters driven by the pinions, adjustable crank pins on the said wheels, a rock shaft, rocking members on the shaft, means for connecting the said crank pins with the rocking members, means on the rocking shaft and capable of being engaged with or disengaged from the rocking members, and means for starting and stopping the rocking operation.

14. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on

the shaft, a series of toothed wheels of varying diameters driven by the pinions, disks secured to the spur wheels, crank pins adjustably fitted on the disks, means for adjusting the crank pins, a rock shaft, rocking members on the rock shaft, connecting rods between the crank pins and the said rocking members for rocking the latter, means in permanent connection with the rocking shaft and capable of being engaged with or disengaged from the rocking members, and means for starting and stopping the rocking operation.

15. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on the shaft, a series of toothed wheels of varying diameters driven by the pinions, disks secured to the spur wheels, screwed spindles on the disks, nuts on the screwed spindles, means for preventing the nuts from rotating with the screwed spindles, crank pins on the nuts, a rock shaft, rocking members on the rock shaft, connecting rods between the crank pins and the said rocking members for rocking the latter, means in permanent connection with the rock shaft and capable of being engaged with or disengaged from the rocking members, and means for starting and stopping the rocking operation.

16. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on the shaft, a series of toothed wheels of varying diameters driven by the pinions, disks secured to the said wheels, crank pins adjustably fitted on the disks, means on the disks for moving the crank pins closer to or further away from the axes of the disks, a rock shaft, toothed rocking members thereon, means connecting the said crank pins with the toothed members for rocking the latter, toothed wheels in permanent connection with the rocking shaft and capable of being engaged with or disengaged from the rocking members, and means for starting and stopping the rocking operation.

17. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on the shaft, a series of toothed spur wheels of varying diameters driven by the pinions, disks secured to the spur wheels, crank pins adjustably fitted on the disks, means for adjusting the crank pins, a rock shaft, bosses

thereon, means connecting the said crank pins with the bosses for rocking the latter, toothed members on the bosses, wheels on the rocking shaft, hand means for independently moving the said wheels into or out of engagement with the said toothed members, and means for starting and stopping the rocking operation.

18. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, a series of toothed pinions of varying diameters on the shaft, a series of toothed spur wheels of varying diameters driven by the pinions, disks secured to the spur wheels, crank pins adjustably fitted on the disks, means for adjusting the crank pins, a rock shaft, bosses revolubly fitted thereon, radial arms on the bosses, slots in the outer ends of the arms, connecting rods between the said crank pins and the slots for rocking the bosses, a second radial arm on each boss, a toothed member thereon, toothed wheels feather keyed on the rock shaft and capable of being slid into or out of engagement with the said toothed members, forked levers for sliding the wheels, hand rods for operating the forked levers, and means for starting and stopping the rocking operation.

19. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, means for starting the rocking operation, and means for automatically stopping the rocking operation.

20. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, manually operated means for starting the rocking operation, and means operated from the said driving shaft for automatically stopping the operation on a predetermined number of rocks having been made.

21. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for

rocking said work holding means comprising, in combination, a driving shaft, variable thrown crank mechanism operated therefrom, a rock shaft rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, means operated from the driving shaft simultaneously with the rocking gear, a rotary member operated therefrom, a clutch through which motion is transmitted to the said driving shaft, means for engaging the clutch and so starting the rocking operation, and means controlled from the said rotary member for automatically stopping the operation on a predetermined number of rocks having been made.

22. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, worm gear operated by the driving shaft, a rotary disk member, means for operating the said disk member from the worm gear, a clutch through which rotary motion is transmitted to the said driving shaft, means for manually engaging the clutch and so starting the rocking operation, and means controlled from the said disk member for automatically stopping the rocking operation on a predetermined number of rocks having been made.

23. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, worm gear operated from the driving shaft, ratchet mechanism operated from the worm gear, a rotary disk member operated from the ratchet mechanism, a clutch through which rotary motion is transmitted to the driving shaft, a lever for engaging or disengaging the clutch, a foot board for engaging the clutch and so starting the rocking operation, and means in connection with the said rotary disk member for operating the said lever in such manner as to disengage the clutch on a predetermined number of rocks having been made.

24. In a mill engraving machine having

means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, worm gear operated from the driving shaft, a variable throw crank pin operated from the worm gear, a pawl on the crank pin, a ratchet wheel and rotary disk operated by the pawl, a clutch through which rotary motion is transmitted to the shaft, a foot board through which the clutch may be engaged, and means on the said rotary disk for automatically effecting the disengagement of the clutch on a predetermined number of rocks having been made.

25. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, a rotary member for controlling the rocking operation, means for operating the said rotary member from the driving shaft, a clutch through which rotary motion is transmitted to the driving shaft, a fork lever for operating the clutch, a counter-weighted lever for operating the forked lever and engaging the clutch, a foot board on the counter-weighted lever for operating the same, and means on the said rotary disk for automatically effecting the disengagement of the clutch on a predetermined number of rocks having been made.

26. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, a rotary member for automatically controlling the rocking operation, means operated from the driving shaft for rotating the rotary member, a clutch through which rotary motion is transmitted to the driving shaft, a fork lever for operating the clutch, means for operating the fork lever in such manner as to engage the clutch,

a lever arm connected with the fork lever, spring means for holding the said lever arm in engagement with the said rotary member, and means on the rotary member whereby the clutch is held in engagement until a predetermined number of rocks have been made.

27. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, a rotary member for automatically controlling the rocking operation, means operated from the driving shaft for operating the rotary member, a clutch through which rotary motion is transmitted to the driving shaft, means for engaging the clutch, an interchangeable piece on the rotary member, means engaging said piece and holding the clutch in engagement, and spring means whereby on a predetermined number of rocks having been made the clutch is automatically disengaged.

28. In a mill engraving machine having means for carrying the work to be engraved, an automatic and variable rocking gear for rocking said work holding means comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock-shaft, rocking means on the rock shaft operated from the said crank mechanism, means in permanent connection with the rock shaft and capable of engaging the said rocking means operated from the crank mechanism, a rotary member for automatically controlling the rocking operation, means operated from the driving shaft for operating the rotary member, a clutch through which rotary motion is transmitted to the driving shaft, means for engaging the shaft, means in connection with the rotary member for automatically disengaging the clutch on a predetermined number of rocks having been made, and chain and sprocket means whereby the rotary member may be turned to the starting position before the commencement of the rocking operation.

29. A mill engraving machine comprising, in combination, a driving shaft, variable throw crank mechanism operated therefrom, a rock shaft secured to the work carrying means, rocking means on the rock-shaft operated from the said crank mechanism, means in permanent connection with the rock-shaft and capable of engaging the said rocking means, a main drive shaft in the machine, means for driving the said driving shaft therefrom, means for rotating the said

rock-shaft from the main drive shaft, and means for starting and stopping the rocking operation.

30. A mill engraving machine comprising, 5
in combination, a driving shaft, variable
throw crank mechanism operated therefrom, 10
a rock-shaft, rocking means on the rock-
shaft operated from the said crank mecha-
nism, means in permanent connection with
the rock-shaft and capable of engaging the 15
said rocking means, a main drive shaft in
the machine, means for driving the said
driving shaft therefrom, a spur wheel on the
said rock shaft, a toothed wheel on the main 20
drive shaft, means for sliding the latter
wheel into engagement with the spur wheel
for rotating the rock shaft, a shaft extend-
ing the full length of the machine, a pinion
on the end of said shaft and engaging said 25
spur wheel to permit fine adjustment of the
work carried on the rock-shaft, and means
for starting and stopping the rocking oper-
ation.

31. A mill engraving machine comprising, 25
in combination, a driving shaft, variable
throw crank mechanism operated therefrom,
a rock shaft, rocking means on the rock
shaft operated from the said crank mecha-
nism, means in permanent connection with 30
the rock shaft and capable of engaging the
said rocking means, a main drive shaft in
the machine, means for driving the said
driving shaft therefrom, a spur wheel on
the said rock-shaft, a toothed wheel on the 35
main drive shaft, means for sliding the lat-
ter wheel into engagement with the spur
wheel for rotating the rock shaft, a squared
shaft extending the full length of the ma-
chine, a pinion on the end of said squared 40
shaft and engaging said spur wheel to per-
mit of fine adjustment of the work carried
on the rock shaft, a foot board extending
the full length of the machine for starting
the rocking operation, automatic means for 45
stopping the operation on the completion
of a predetermined number of rocks, and
means extending the full length of the ma-
chine for bringing the automatic means to
the starting position before the commence-
ment of the operation. 50

32. A mill engraving machine comprising,

in combination, a driving shaft, variable
throw crank mechanism operated therefrom,
a rock shaft, rocking means on the rock 55
shaft operated from the said crank mecha-
nism, means in permanent connection with
the rock shaft and capable of engaging the
said rocking means, a main drive shaft in
the machine, means for driving the said
driving shaft therefrom, means for rotating 60
the rock shaft from the main drive shaft,
means extending the full length of the ma-
chine for adjusting the rock shaft angularly,
means extending the full length of the ma-
chine for moving the last said means in per- 65
manent connection with the rock shaft into
or out of engagement with or clear of the
rocking means on the said shaft for the pur-
pose of changing the degree of rock impart-
ed to the rocking shaft, and means for start- 70
ing and stopping the rocking operation.

33. A mill engraving machine comprising,
in combination, a driving shaft, four vari-
able throw crank disks operated therefrom,
a rock shaft, rocking means on the rock 75
shaft operated from each crank disk, a pair
of wheels in permanent connection with the
rock shaft each being located between a pair
of rocking means and being capable of en-
gagement with either or of being moved 80
clear of both, a main drive shaft in the ma-
chine, means for driving the said driving
shaft therefrom, means for rotating the
rock shaft from the main drive shaft, means
for finely adjusting the rock shaft angularly, 85
means extending the full length of the ma-
chine for moving each wheel of the said
pair in permanent connection with the driv-
ing shaft into engagement with one or other
of the adjacent rocking means or out of en- 90
gagement with both for the purpose of
changing the degree of rock imparted to the
rock shaft or for disengaging the rocking
mechanism from the rock shaft, and means
for starting and stopping the rocking oper- 95
ation.

In testimony whereof I affix my signature
in presence of two witnesses.

C. ALISON KER.

Witnesses:

JAMES AIKEN,

MARGARET FINDLAY YOUNG.