Oct. 6, 1936. J. Y. BLAZEK ET AL 2,056,707

TURNING ATTACHMENT

Filed April 9, 1934 3 Sheets-Sheet 1

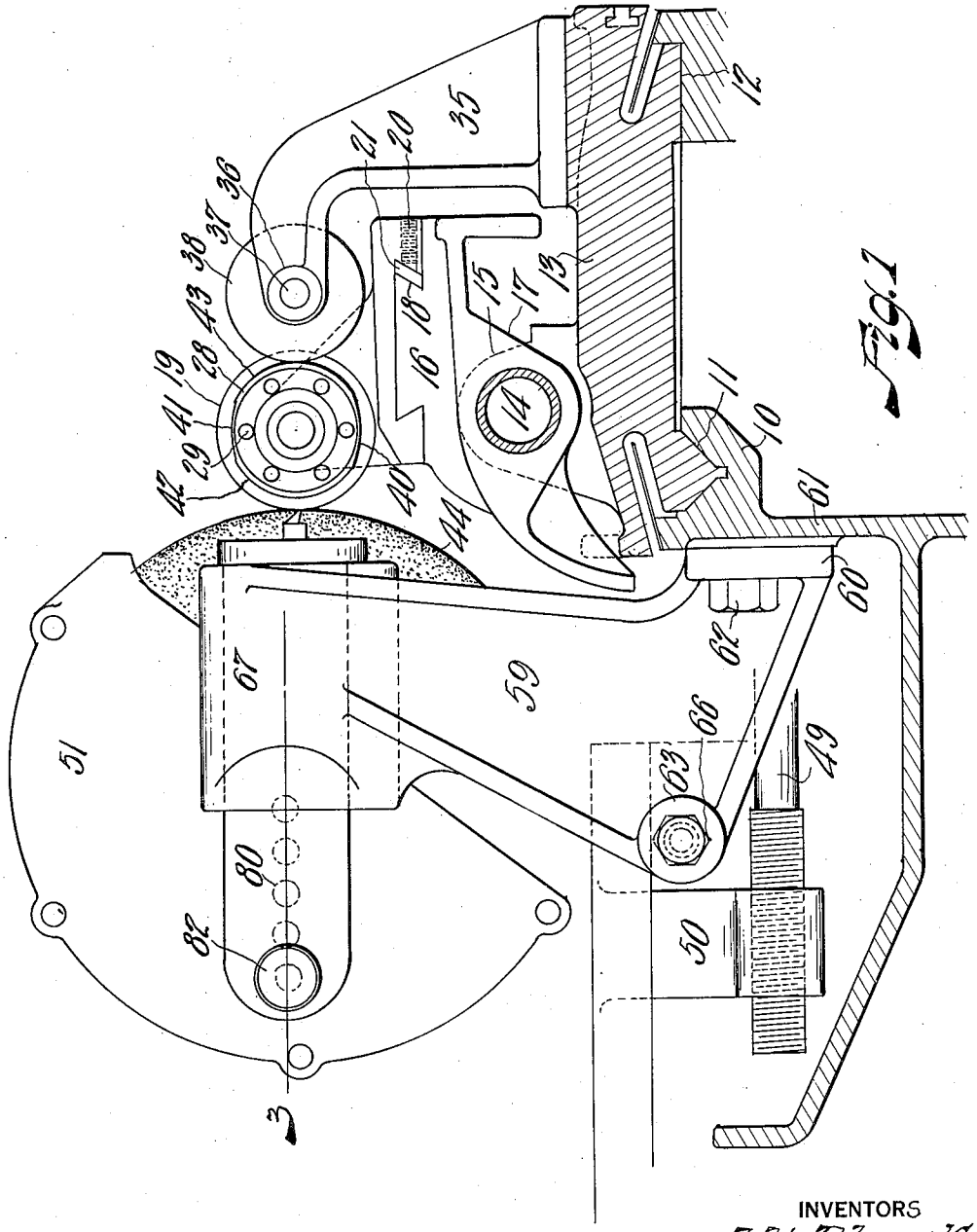


Fig. 1

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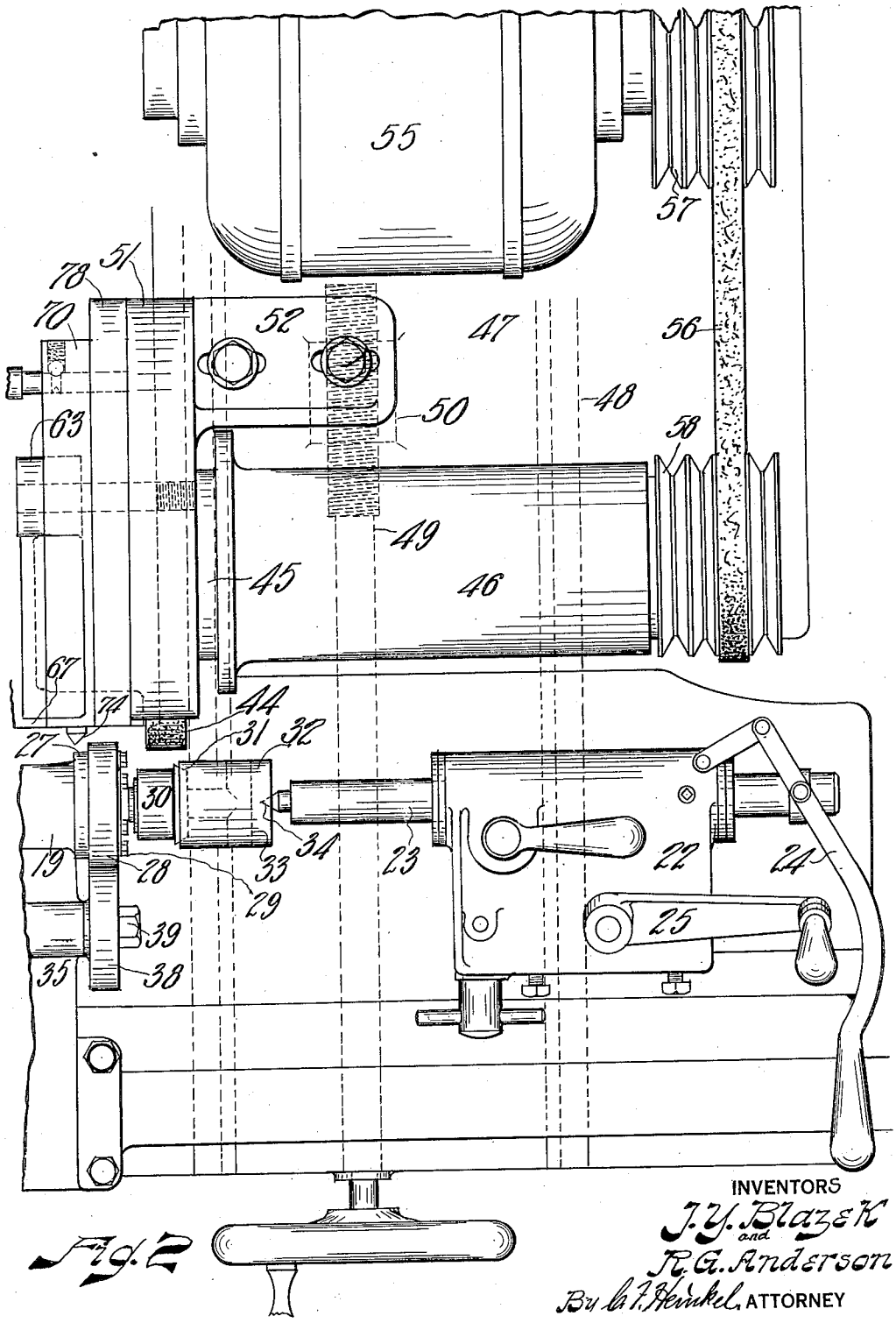


Fig. 2

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Filed April 9, 1934 3 Sheets-Sheet 3

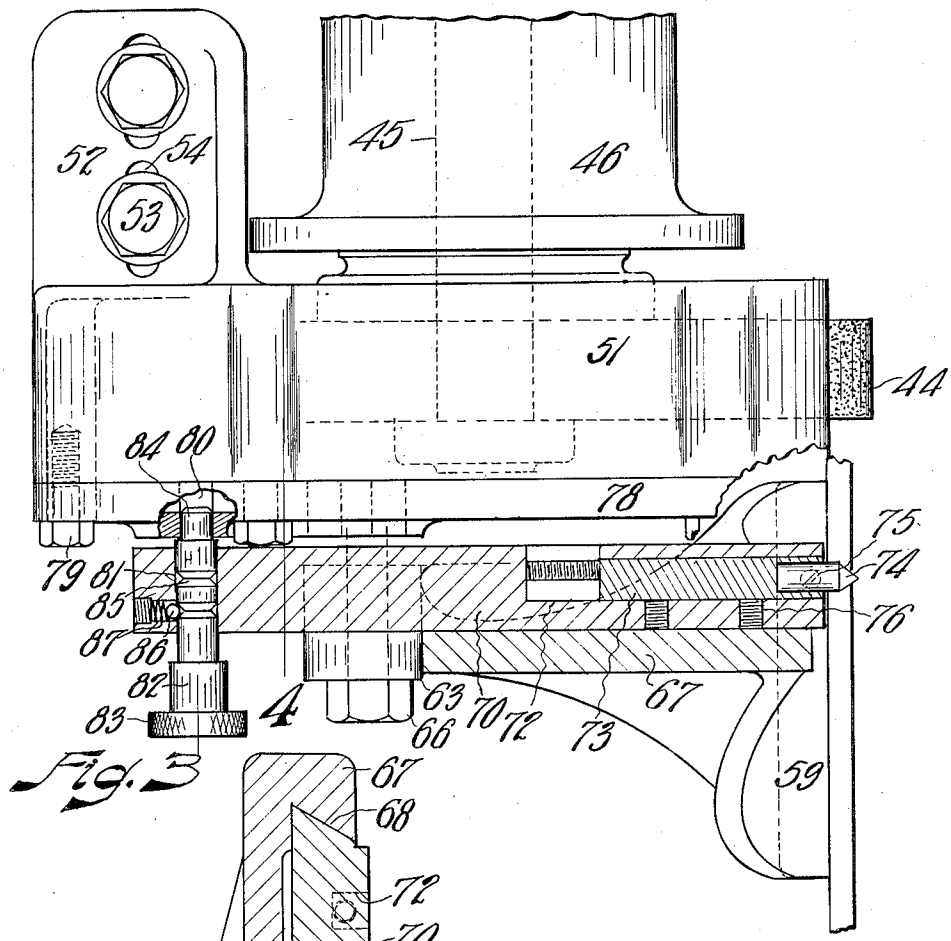


Fig. 3

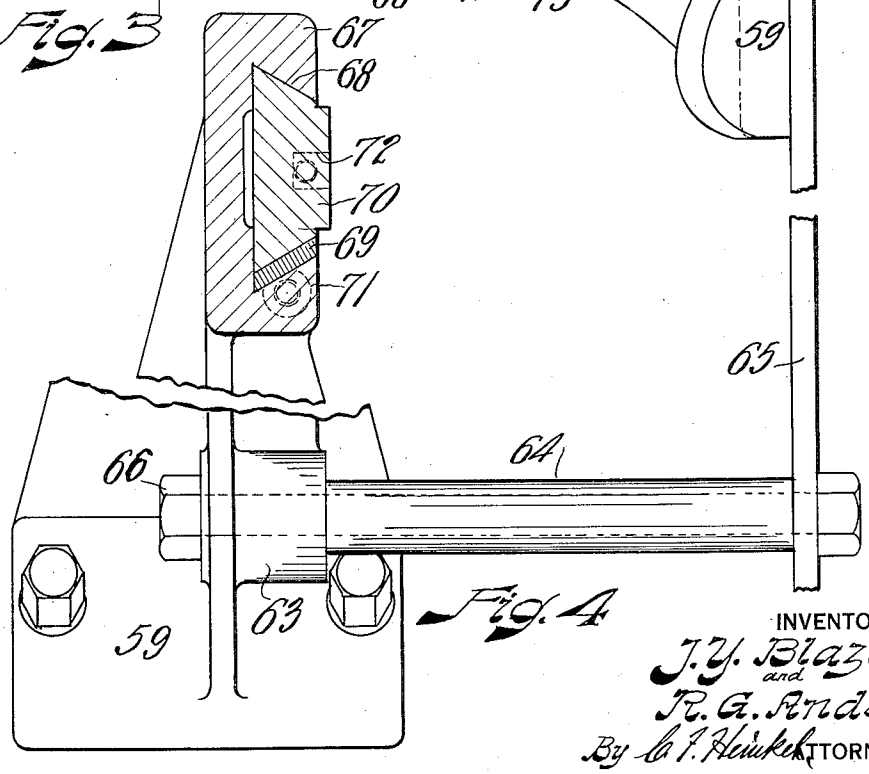


Fig. 4

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UNITED STATES PATENT OFFICE

2,056,707

TURNING ATTACHMENT

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Application April 9, 1934, Serial No. 719,684

21 Claims. (Cl. 29—28)

The present invention relates to improvements for machining work.

The present invention is disclosed in principle in our co-pending patent application Serial No. 707,488.

In many instances, it would be quite advantageous that a turning or trueing up means be available to operate either conjointly with or successively to another operation performed by a machine so that a piece of work need not be changed from one machine to another for finishing the same. Also, in such devices as grinding machines, for instance, it would be quite advantageous that a trueing up means be available to relieve the slowly grinding wheel of the burden of first trueing up work and thereby saving considerable time in machining work. The present invention aims to provide a machine or an attachment for such machines to attain the advantages mentioned.

Objects of the present invention are to provide assistance in a machine to finish work more quickly; to provide a means, attachable to an existing machine, to operate along with tools of the machine to true up work previous to finishing the work in the same machine; to provide for trueing up work before finishing the same by the same machine; to provide a means, attachable to an existing machine, whereby work is finished by an operation other than that performed by the original tools of the machine; to provide a means, attachable to an existing machine, to augment operation on work by the machine.

Other objects will be pointed out during description of the device shown and described or will become obvious or apparent or will suggest themselves upon an inspection of this specification and the accompanying drawings.

The present invention is illustrated in one form thereof in the accompanying drawings forming part of this specification, in which drawings:

Fig. 1 is a side view of a trueing up or stock removing device, embodying the present invention, shown as attached to a grinding machine of a type shown in our above-mentioned co-pending patent application; the view being partly in section of the bed and table thereon to more clearly show the invention attached thereto.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a plan view of Fig. 1, showing the trueing up device in horizontal section; the section being taken on line 3 of Fig. 1.

Fig. 4 is a vertical section taken on line 4 of Fig. 3.

Similar reference characters refer to similar parts throughout the views.

The accompanying drawings show and this specification describes specifically a machine for finishing work wherein the finished surface is uneven or irregular or has depressions and elevations therein. A tool supporting bracket is attached to the machine. It is obvious that the bracket could be made integral with the machine and that the rocking head and tail stocks shown could be replaced by head and tail stocks as are now known. For instance, the bracket and tool of the present invention can be applied to the known grinding machines or to other machines of a similar character or even a dissimilar character.

The bed 10 of the machine shown has the guideways 11 and 12 to guide the table 13 in its longitudinal movement on the bed.

The pivot shaft 14 is mounted in the bosses 15 which, in this instance, are integral with the table.

The rocking carriage or cradle 16 has the bosses 17 in which the pivot shaft 14 is mounted. The upper part of the carriage has the guide-way 18 for purposes appearing presently.

The cradle 16 rocks or pivots on or with the shaft 14. The shaft is located so that the axis thereof is outwardly of the axis of the work carrying spindle and so that the major portion of the cradle overhangs at one side of the shaft 14. By this arrangement, the weight of this major portion of the cradle always tends to hold the cam 28 against the cam 38 by gravity and the cradle must rock according to the cam surfaces on the cam when the spindle rotates.

The pivot shaft 14 may be journaled either in the bosses 15 or in the bosses 17, or in all of the bosses. The object of this pivot shaft is to support the carriage and structure thereon and to let the same swivel or pivot either thereon or therewith. Means should be provided to prevent end movement of the shaft 14 which may be done by threading a nut on each end thereof when the shaft is rotatable in the bosses 15 and 17. When either of the bosses, 15 or 17, is made fast to the shaft 14 so that the same moves rotatively upon a swivelling or rocking movement of the carriage, the fastening means, such as a cotter pin, can be used to also hold the shaft axially by driving the same through the corresponding boss and the shaft 14.

The head stock 19 is movable on the above-mentioned guideways 18 longitudinally of the cradle so that the same may be adjusted longitudinally thereof to suit conditions to be met such as tool relation to work. When the head stock

is in proper or desired relation to other elements of the machine, a tightening of the screws 20, threaded into the head stock and abutting the gib 21, will effectively lock the head stock relative to the cradle.

The tail stock 22 is also movable longitudinally of the cradle on the guide-ways 18 so that the same may be adjusted to a definite position thereon and locked in that position as is the head stock for instance or by means of the lever clamp shown.

The tail spindle 23 is axially movable in the tail stock 22 and may be provided with means for quickly moving the tail spindle back and forth manually. Such a means is shown as the lever 24 although other known means can answer the same purpose. The tail spindle has means for locking thereof when the same is axially adjusted. Such a means is shown as the lever 221 having a clamping mechanism connected therewith to engage the tail spindle for such clamping. The lever 25 operates clamping mechanism for moving the tail stock axially on the guide ways and the locking screw 222.

The work carrying spindle 26 is journaled in the head stock 19 and has the flange 27 upon which the cam roller 28 is mounted. The screws 29 are threaded into the flange 27 and the heads thereof abut the cam roller 28 to hold the roller to the flange and to and rotatable with the spindle for purposes appearing presently. The adapter or work centering and work supporting member 30 is carried by the spindle 26 and has the tapering face 31 to engage, in this instance, the piston 32 which is to be machined. The work driving means, in this instance, is shown as the driver 33 entering the wrist pin holes in the piston so that rotation of the spindle 26 also rotates the piston. When a piston is inserted into the machine, the center 34 of the tail spindle is moved into a corresponding center hole in the piston to steady the outer end of the piston and to hold the inner end thereof onto the adapter 30 and thereby support the piston on the centralizing elements. The tail spindle is to be locked in the manner described above when the same is correctly adjusted axially for correctly supporting the piston. When the piston is to be released from the machine, the clamping means of the tail spindle is released and the tail spindle is moved backwardly by means of the lever 24 to release the center 34 from the piston.

The bracket 35 is secured to the table 13 and extends upwardly therefrom and terminates in the boss 36 wherein is fixed the stud 37 in this instance. The cam roller 38 is journaled on the stud 37 and is held adjacent to the boss 36 by the nut 39 threaded onto the end of the stud 37.

In this instance, the machine is to finish the piston with the relieved surface around the wrist pin holes on opposite sides of the piston.

The cam rollers 28 and 38 contact each other as shown.

The cam roller 28, in this instance, has the two diametrically opposite relief producing surfaces 40 and 41 so that rotation of the spindle abuts the cam roller 28 on the cam roller 38 and, while the cam faces 42 and 43, which are concentric with the axis of the spindle, are contacting the cam roller 38, the carriage or cradle and the piston thereon is not moved laterally so that surface machined during this part of the rotation of the piston will be concentric with the axis of the piston. While, during rotation of the spindle and the cam roller 28 thereon, the cam faces 40 and 41 contact the cam roller 38 and thereby permit the cradle to rock on the pivot shaft 14 and thereby move the spindle and the piston carried thereby laterally so that the below described tool means reproduce on the piston the eccentric contour in replica of the eccentric faces 40 and 41.

The cam roller 28 can be exchanged with the cam roller 38. However, applicants have found in practice that better reproduction is produced when the cam roller 28 is mounted on the spindle. In order to render the cam roller 28 more easy of removal therefrom, the heads of the screws 29 are on the outside where the same are easily reached when the cam roller is to be changed for one of a different kind or with the one on the stud 37.

The grinding wheel 44 is mounted on the grinding wheel spindle 45 which is journaled in the bearing part 46 of the carriage 47 which is guided on the guide-ways 48 transversely of the bed and moved by rotation of the screw 49 threaded into the bracket 50 on the bottom of the carriage 47.

The casing 51 for the grinding wheel 44 may be made integral with the carriage 47. In some instances, however, it may be desirable to make it of a separate piece in which instance the foot 52 may be provided thereon to abut the top of the carriage 47 and held thereto by means of the screws 53. The slots 54 are provided so that the casing 51 can be adjusted relative to the carriage 47.

In this instance, the grinding wheel is driven by the motor 55 through the belt 56 extending over the pulley 57 on the armature shaft of the motor and the pulley 58 on the end of the grinding wheel spindle 45. One belt 56 may be used as shown but it may be advisable in some instances to use more than one belt. It is preferred that V belts be used as shown in place of a wider flat belt on the ground that better contact of the belt is attained on the pulleys. Furthermore V belts as shown can more easily be reduced or increased in number according to needs of the grinding wheel.

The turning tool supporting bracket 59 has the foot 60 on the bottom thereof to contact the part 61 of the bed. The screws 62 extend through this foot and are tapped into the part 61 to hold the bracket against this part 61 of the bed. The boss 63 of the bracket 59 abuts one end of the space 64 while the other end of the spacer abuts the part or wall 65 of the bed. The screw 66 extends through the boss 63 and the sleeve or spacer 64 and is threaded into the part 65 of the bed. This foot and boss and screw means holds the bracket 59 permanently and rigidly to the two walls or parts of the bed at right angles to each other and thereby provides securing means which holds the bracket in position quite firmly.

The head 67 on the upper part of the bracket 59 has the guide-ways 68 therein. The gib 69 is placed into the guide-ways at one side thereof and the turning tool carrying bar 70 is mounted in and takes up the remainder of the space between the guide-ways. The screws 71 are provided to move the gib axially in the guide-ways so that the bar 70 can be held rigidly in the bracket when the screws are tightened. The gib is made taper for that purpose.

The front end of the bar 70 has a slot 72 in a side thereof. The block 73 is mounted in this slot, has the turning tool 74 in the outer end thereof and held in position therein by the screw 75, and the block 73 is held in the slot 72 by means of the screw 76. This structure affords adjust-

ment of the block 73 and the turning tool therein axially of the slot 72 so that adjustment of the turning tool can be made to accommodate variously sized work or to various amounts of stock to be removed. The screw 77 may be provided to assist in holding the block 73 in position and in moving it into position.

The cover 78 is made of the contour of the casing for the grinding wheel and is held thereon by means of the screws 79. The cover 78 has the four pin receiving holes 80 through the wall thereof. The turning tool carrying bar 70 has the hole 81 in the other end thereof to receive the retaining pin 82. The retaining pin 82 has the head 83 on one end thereof and the pilot 84 on the other end thereof fitting closely to each of the holes 80 in the cover. Intermediate the ends of the pin 82 are the two V grooves 85 spaced so that the ball 86 mounted behind the spring 87 in the bar 70 enters one of such grooves and holds the pin in that position when the pilot part of the pin engages one of the holes in the cover 78 and engages the other one of those grooves when the pilot part 84 of the pin 82 is out of any of the holes of the cover and holds it out of the cover until the pin is forcibly pushed in when the pilot registers with one of the holes in the cover.

With this structure, the retaining pin 82 can remain in the turning tool supporting bracket 59 and the pilot 84 thereof can enter either one of the holes in the bar when the bar is moved axially to move the turning tool further away from the work or closer thereto. The screw 49 affords closer adjustment of the tool relative to the work in between the spacing of the pilot holes 80 in the cover.

As to operation:

Upon starting of the motor 55 the grinding wheel 44 will rotate and operate on work held in the work supporting means carried by the cradle 16; the grinding wheel being adjusted relative to the work as is required for the size of the work. The machine, as is usual in such machines, has mechanism, not shown in the drawings hereof, to reciprocate the table 13 and thereby cause the grinding wheel 44 to operate on the work. This part of the machine is quite well known and has been in practice for some time.

The work carrying spindle 26 is rotated in any convenient manner. Upon rotation of the spindle and the cam rollers 28 mounted thereon, the cam roller 38, when the cam surface thereof or of the cam roller 28 is uneven, rocks the cradle 16 and the work carrying spindle 26 therein and the work carried thereby to move the work closer to or further away from the grinding wheel 44 and thereby reproduces the contour of the cam roller 28 on the work. The desired contour of the work may be divided between the two cam rollers so that part of it is put onto one of the rollers and the remainder on the other.

The turning tool 74 operates on the work the same as the grinding wheel 44 described above.

Due to the extra adjustment of the block 73 for the turning tool 74 the latter can be adjusted closer to the axes of the work carrying spindle 26 than the grinding wheel 44 so that the turning tool may operate on work while the grinding wheel is not operating thereon. When the grinding wheel only is to operate on the work the turning tool may be adjusted so that it does not operate on the work while the grinding wheel does. In some instances it may be desirable that the turning tool and the grinding wheel operate on work conjointly. This is particularly the case when the turning tool only removes the small quantity of stock or merely trues up the work so that the more slowly stock removing grinding wheel does not have to do so much work and work is machined much more quickly.

We are aware that our invention can be applied to different kinds of existing machines as well as to new machines and that changes and modifications can be made in the structure and in the arrangements of the parts as shown and described in this application within the spirit and intent of the present invention and of the appended claims. Therefore, without limiting ourselves to the precise application of our invention nor to the precise structure and arrangements of parts as shown and described in this application,

We claim:

1. A machine having thereon a tool means comprising a grinding element and supporting means therefor having means connected therewith to adjust the same relative to work, and a turning tool element, for operation on the work, located on the same side of the work as is said grinding element, attachable to said supporting means of said grinding element and being individually adjustable relative to the work and to said grinding element.

2. A machine for machining irregular surface of work having thereon a rockable cradle and means for rocking the same, a work carrying spindle carried by said cradle, an abrading tool to finish the work carried by said spindle, and a trueing up tool on the same side of the work as is said abrading tool to remove surplus stock from the work previous to finishing thereof by said abrading tool.

3. A machine for machining irregular surface of work having thereon a rockable cradle, a rotatable work carrying spindle mounted in said cradle to work laterally therewith, gravity and cam means to rock said cradle to move said spindle laterally, and a turning tool to remove stock from the work and an abrading tool to remove stock from the work while said spindle and work therein is rotating and moving laterally.

4. A machine for trueing up and finishing irregular surface of work having thereon a laterally movable work carrying spindle, cam and gravity and tool pressure means to move said spindle laterally, a surplus stock removing tool to operate on work while said spindle is moving laterally, and an abrading tool to also operate on the same surface of the work while said spindle is moving laterally.

5. A machine having thereon a grinding means provided with a series of holes in a part thereof, a bracket having a guide-way therein, a bar axially movable in said guide-way and having a pin receiving hole therethrough, a turning tool carried on an end of said bar, an axially movable retaining pin having a pilot to engage exchangably either one of said series of holes and extending through said pin receiving hole, and means in said bar to automatically releasably engage said pin to retain said pilot respectively in and out of engagement with the corresponding one of said series of holes upon corresponding axial movement of said retaining pin.

6. A machine having a work supporting means, a work grinding wheel and a support therefor, a work turning tool and support therefor, operating on the same side of the work as said grinding wheel and ahead thereof and including a longitudinally movable bar having said turning tool in an end thereof, and a pin and socket means be-

tween said grinding wheel support and said bar to relate and vary the relation of said turning tool to said grinding wheel and to the work.

7. A machine having a work supporting means, a work grinding wheel and a support therefor, a bar longitudinally movable and spaced sidewise of said support of said grinding wheel, a work turning tool in one end of said bar and on the same side of the work as said grinding wheel, and means between said support and said bar to retain said tool in cooperative work machining relation with said grinding wheel and to retain said tool out of work machining relation relative to said grinding wheel.

8. A work grinding machine having a work supporting means, a work grinding means and support therefor, a bracket carrying a work turning means and being easily and conveniently attachable to and removable from the machine for said turning means to cooperate with said work grinding means for turning of the work previous to grinding thereof, and a retaining means between said support and said work turning means to hold said work turning means in and out of cooperative machining relation with said work grinding means.

9. A machine having a work supporting means, a work trueing up tool and support therefor, and a work grinding wheel on the same side of the work as is the trueing up tool and following said trueing up tool to finish the work while the same is supported by said work supporting means.

10. A machine having a rockable work supporting element having a work carrying spindle journaled therein, a work grinding wheel and support therefor, said element being rockable away from said grindiing wheel by gravity thereof, and a cam means including a master cam secured to and rotatable with said spindle to move said element toward said grinding wheel.

11. A machine for machining surface of work having a rockable cradle, a work carrying spindle journaled therein eccentric with the axis of rocking of said cradle, an element on said cradle, a turning tool to operate on the work and support therefor mounted on the machine, said cradle rockable away from said tool by its own gravity, a roll mounted on the machine, and a cam mounted on and rotatable with said spindle and contactable on said roll to rock said cradle toward said tool upon operation of the machine.

12. A machine for machining surface of work having a longitudinally movable and transversely rockable cradle, a work carrying spindle journaled in said cradle eccentric with the axis of rocking of said cradle, a work turning tool carried by the machine, a work grinding wheel carried by the machine to operate on the work after said tool, a roll mounted on the machine, a cam mounted on said spindle and being abuttable on said roll to rock said cradle toward said tool and said grinding wheel, gravity of said cradle moving the same away from said tool and grinding wheel and against said cam, and means for moving said cradle longitudinally for feeding the work relative to said tool and grinding wheel.

13. A grinding machine for machining surface of work having a longitudinally movable and transversely rockable cradle, a work carrying spindle journaled in said cradle eccentric with the axis of rocking of said cradle, a work turning tool means individually and easily and conveniently attachable to and removable from the machine and carrying a tool to turn work previous to grinding thereof, a roll on the machine, a cam on said spindle and abuttable on said roll to rock said cradle toward said tool when the machine is operated, the gravity of said cradle moving the same away from said tool and against said cam, and means for moving said cradle longitudinally for feeding the work relative to said tool and grinding wheel.

14. A bracket easily and conveniently attachable to and removable from a machine which has a stock removing means, and a second stock removing means carried by said bracket to operate on work while the work remains in the machine and removing stock in a different manner than the firstly mentioned stock removing means.

15. A bracket easily and conveniently attachable to and removable from a work grinding machine, and a work turning tool carried by said bracket and located on the same side of the work as is the grinding wheel of the machine to also operate on the work in the grinding machine.

16. A machine having thereon a rockable cradle, a work carrying spindle mounted in said cradle, an abrading tool carried by said machine to operate on work carried by said spindle, and a work turning tool carried by said machine and located on the same side of the work as is said abrading tool to also operate on the work carried by said spindle conjointly with and previous to operation thereon by said abrading tool.

17. A machine having thereon a rockable cradle, a work carrying spindle mounted in said cradle to rock laterally therewith, cam means and gravity of said cradle to work said cradle to move said spindle laterally, a work trueing up tool to remove surplus stock from the work, and an abrading tool to finish the work and being located on the same side of the work as is said trueing up tool.

18. A bracket having means for rigid attachment thereof to a work grinding machine and carrying thereon a work turning tool means to also operate on the work in the machine and being located on the same side of the work as is the grinding wheel of the machine.

19. A bracket having means for rigid attachment thereof to a work grinding machine and carrying thereon a work turning tool means to also operate on the work in the machine and being located on the same side of the work as is the grinding wheel of the machine, said grinding means and said turning means adapted to be adjustably connected to retain mutual relationship therebetween.

20. A bracket having means for rigid attachment thereof to a work grinding machine, a work turning tool means carried by said bracket to also operate on the work in the machine and being located on the same side of the work as is the grinding wheel of the machine, said turning tool means and the supporting means for the grinding wheel of the machine being connected for mutual relationship thereof and one being movable relative to the other for individual relative adjustment between the same.

21. A machine having thereon a work grinding means, a bar longitudinally movable relative to said grinding means, a work turning tool carried by said bar, and a longitudinally movable stop pin through said bar and a series of corresponding adjusting holes in said grinding means to releasably retain said bar and said grinding means in an adjusted mutual relationship.

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