Aug. 28, 1928.

1,682,472

W. J. BAUMBERGER ET AL

WORK ADJUSTING MEANS

Filed April 26, 1926

3 Sheets-Sheet 1

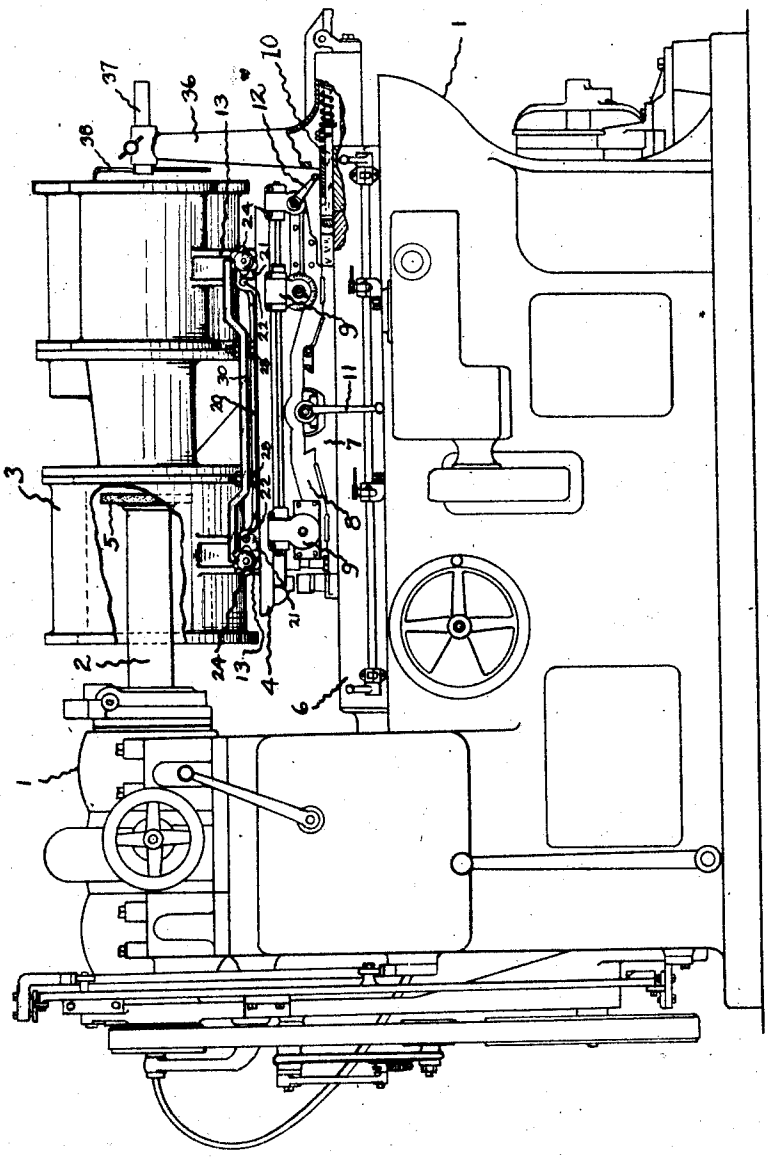


FIG. 1.

INVENTORS

W. J. Baumberger

H. H. York

by Evans and Meloy

ATTORNEYS

Aug. 28, 1928. 1,682,472

W. J. BAUMBERGER ET AL

WORK ADJUSTING MEANS

Filed April 26, 1926 3 Sheets-Sheet 2

FIG. 2.

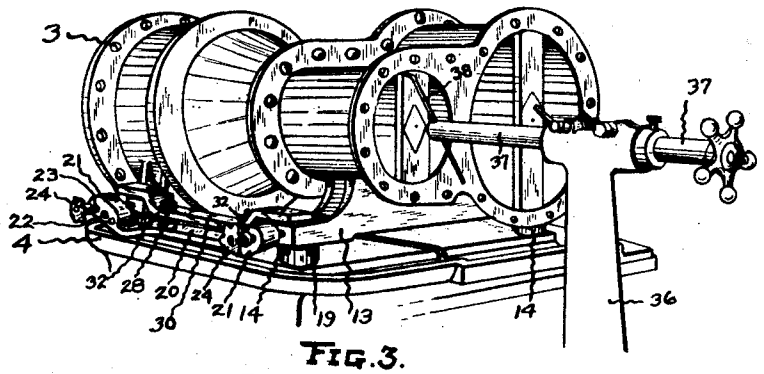


FIG. 3.

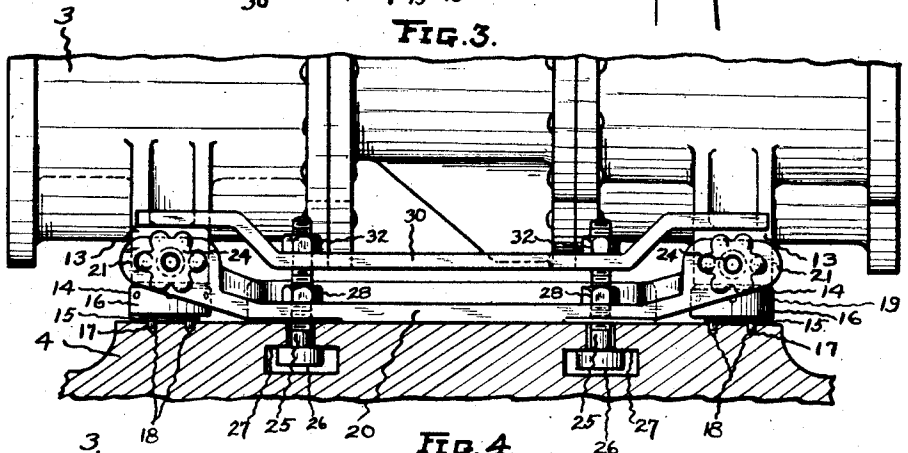
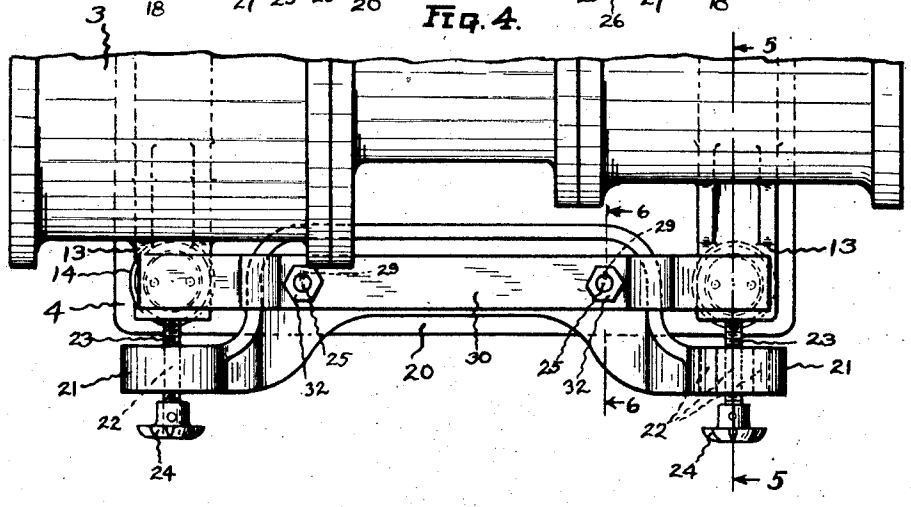


FIG. 4.



INVENTORS
W. J. Baumberger
H. H. Zurk
by Evans and Meloy
ATTORNEYS

Aug. 28, 1928. 1,682,472

W. J. BAUMBERGER ET AL

WORK ADJUSTING MEANS

Filed April 26, 1926 3 Sheets-Sheet 3

FIG. 5.

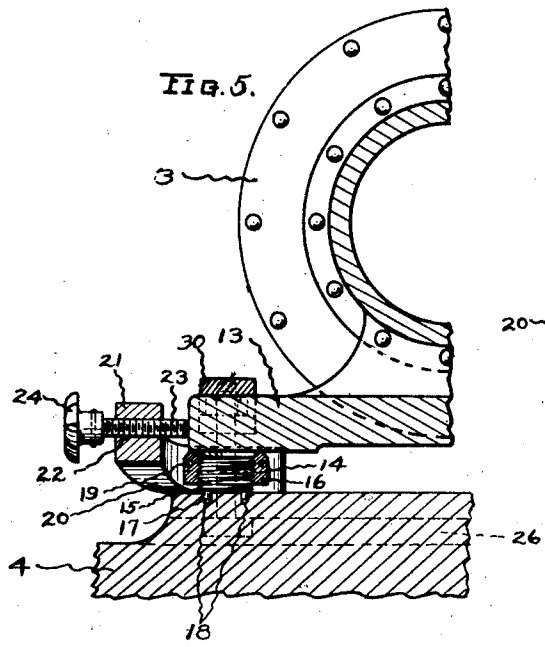


FIG. 6.

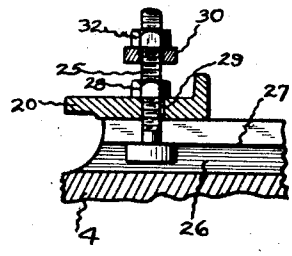


FIG. 7.

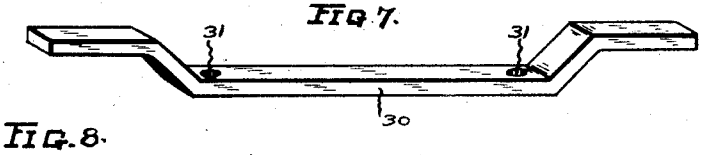


FIG. 8.

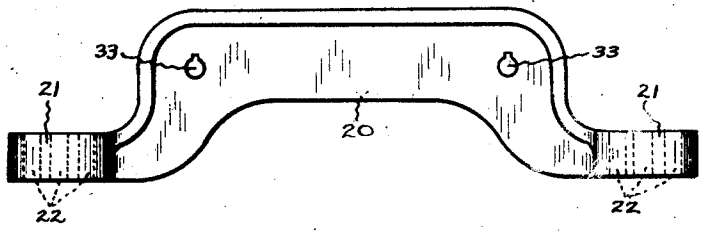


FIG. 9.

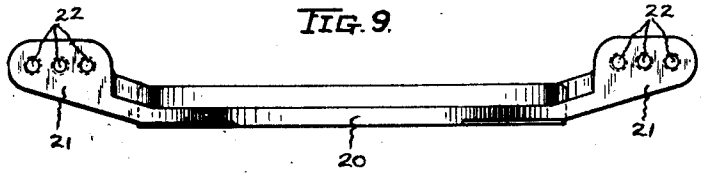


FIG. 10.

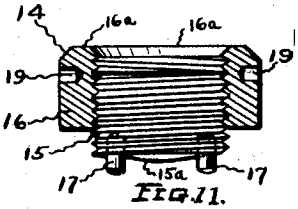
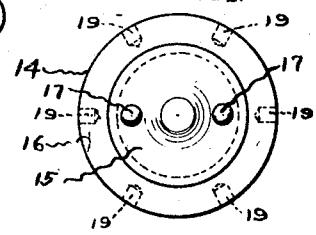


FIG. 11.



INVENTORS
W. J. Baumberger
H. H. Yurk
by Evans and Mecoy
ATTORNEYS

Patented Aug. 28, 1928. 1,682,472

UNITED STATES PATENT OFFICE.

WILLIAM J. BAUMBERGER AND HENRY H. YERK, OF DAVENPORT, IOWA, ASSIGNORS TO MICRO MACHINE COMPANY, OF BETTENDORF, IOWA, A CORPORATION OF IOWA.

WORK-ADJUSTING MEANS.

Application filed April 26, 1926. Serial No. 104,559.

This invention relates to machine tools and more particularly to means for accurately disposing work on the work supporting table of an internal grinding machine or the like.

It has been found desirable that certain types of work be very accurately disposed on the work supporting table of a grinding machine. For example, in order to obtain the best results in grinding longitudinally aligned cylinders in a pump casing or parallel cylinders in such a casing, it is desirable that such cylinders be disposed on the work supporting table in exact parallelism with the work supporting table and with the tool spindle of the grinding machine.

Such pump casings to be ground are frequently provided with base supports, by means of which supports the casing rests upon the work supporting table. It frequently happens, however, that such base supports are slightly uneven or non-uniform. Due to such irregularities in the pump casing itself, it has been difficult in the past to accurately dispose a pump casing directly on the work supporting table of a grinding machine for the grinding of the cylinders thereof. The importance of grinding such cylinders so that the axes thereof are in accurate relation to each other will be appreciated from the fact that the more accurate the grinding of the cylinders, the greater is the operating efficiency and longevity of a pump, for example, of which the casing forms a part.

An object of this invention is to provide means for accurately disposing work in desired position on a work supporting table.

Another object of the invention is to provide means for disposing work having an internal cylindrical surface to be ground in accurate position on the work supporting table of a grinding machine with the axis of such cylinder parallel to the work supporting table and to the grinding wheel spindle.

A further object of the invention is to provide means for accurately positioning a pump casing having longitudinally aligned and parallel cylinders adjacent a grinding wheel spindle, whereby said cylinders may be successively disposed in accurate and aligned relation to said spindle.

Another object of this invention is to provide readily adjustable means for disposing work in desired position on a work supporting table and for maintaining said work in said desired position.

Other objects of the invention will be apparent to those skilled in the art from the description of it hereinafter given.

In the drawings:

Figure 1 is a front elevation of an internal grinding machine showing a pump casing disposed in cooperative relation to the grinding wheel spindle by means contemplated by this invention;

Fig. 2 is a perspective view of a pump casing having parallel and longitudinally aligned cylinders, said casing being disposed in desired relation on a work supporting table by means contemplated by the invention;

Fig. 3 is an elevation, partly in section, showing adjustable means for moving the work vertically and laterally to dispose said work in desired position on a work supporting table, and means for maintaining the work in said desired position;

Fig. 4 is a plan view of the structure shown in Fig. 3;

Fig. 5 is a vertical section on line 5—5 of Fig. 4;

Fig. 6 is a vertical section on line 6—6 of Fig. 4;

Fig. 7 is a perspective view of a clamp member for maintaining the work in desired position;

Fig. 8 is a plan view of a bracket adapted to cooperate with laterally movable means for moving work laterally;

Fig. 9 is a front elevation of the bracket shown in Fig. 8;

Fig. 10 is a vertical section of a jack for adjusting the work vertically; and

Fig. 11 is a bottom plan view of the jack shown in Fig. 10.

In Fig. 1 is shown an internal grinding machine 1 which may be of usual construction but is preferably of the construction shown in application Serial No. 730,626, filed Aug. 7, 1924, by H. H. Yerk and W. J. Baumberger. The said grinding machine 1 is provided with a horizontally disposed grinding wheel spindle 2, which may be rotated about its own axis and orbitally about

an axis eccentric to its own. The pump fixture or other work 3 to be ground is shown as disposed on a horizontal work supporting table 4 and thereby brought into cooperative relation with the grinding wheel 5 mounted at the outer end of the spindle 2. The work supporting table 4 is adapted to be moved longitudinally of the grinding machine and of the grinding wheel spindle, laterally thereof, and may be revolved by associated mechanism shown in Fig. 1 and more particularly disclosed in the copending application of H. H. Yerk and W. J. Baumberger, Serial No. 15,050 filed March 12, 1925. Thus on the longitudinally movable and reciprocable carrier bed 6 is disposed a pivotally mounted base member 7, on which member 7 is mounted a frame 8 slidable laterally or transversely of the grinding machine upon said member 7 by turning the crank 11. The carrier bed 6 is reciprocable longitudinally of the machine by hand or automatic means commonly associated with machines of this character. By mechanism 9 including suitable cams (not shown) the work supporting table 4 may be moved vertically with respect to the grinding machine and the grinding wheel spindle 2, said mechanism being operated by turning the crank 12. By releasing a latch 10, the base member 7 may be revolved, whereby the opposite side of the work 3 may be presented to the grinding wheel 5.

As has been previously mentioned, the base supports of the work 3 are not always uniform or even, so that when such supports are disposed directly on a work supporting table 4, the axes of the cylinders of the pump casing are frequently not parallel with the table 4 and with the spindle 2. This invention contemplates means whereby a pump casing or other work may be accurately disposed on a work supporting table regardless of the degree of irregularity of the base supports 13 of such work.

We have provided by the jacks 14 independently operable means, whereby portions of the work 3 may be independently moved vertically with respect to the work supporting table 4 to the end that, in the pump casing illustrated in the drawings, the pump cylinders may be disposed with all of their axes parallel to the work suporting table 4 and parallel to the tool spindle 2. The jacks 14 may be of any suitable construction, and are each shown as comprising an externally threaded elevating screw 15 and an internally threaded elevating nut 16. Preferably, the screw 15 is provided at its lower end with dowels 17 adapted to cooperate with apertures 18 in the work supporting table 4, whereby said screw may be prevented from rotation and from translatory, or bodily, movement on said table. The nut 16 may be provided with depressions 19 with which a suitable tool (not shown) may be employed to rotate said nut to move the work vertically.

The work 3 is engaged by the top 16^a (Fig. 10) of each nut 16. In order that substantially the entire top 16^a may engage the work, regardless of non-parallelism of the work 3 on the work supporting table 4, the base 15^a of the screw 15, which rests directly on the table 4, is preferably rounded, whereby the longitudinal axis of the jack 14 may be maintained perpendicular to the adjacent portion of the work 3 and thereby a large area of contact obtained between the top 16^a and the work 3. The apertures 18 are preferably sufficiently large to permit such limited pivotal movement of the jacks 14 about the bases 15^a, the clearance necessary for such pivotal movement being, however, relatively so small that such clearance is not shown in Figs. 3, 4 and 5.

Any suitable number of jacks 14 may be employed, depending on the nature and construction of the work 3. In the case of the particular pump casing 3 illustrated in the drawings, it has been found convenient to dispose a jack 14 under each of the four supports 13.

We have also provided means for adjusting the work laterally. Thus we have provided the centering brackets 20 which may be disposed on the work supporting table and which are provided with bosses 21, through which are shown extending a plurality of threaded horizontal apertures 22. The apertures 22 are adapted to receive adjusting screws 23 provided with suitable knobs 24. The brackets 20 may be maintained in rigid position upon the work supporting table 4 by means of shouldered bolts 25, slidable in the grooves 26 and engaging the upper surface 27 of said grooves. The shouldered bolts 25 extend through slotted apertures 33 in the brackets and cooperate with nuts 28 to maintain the brackets in rigid position with the bosses 21 adjacent the respective base supports 13. The bolts 25 may be prevented from turning by keys 29 engaging in slots in the apertures 33 and in the bolts 25. It will be seen that by turning the knob 24 the work may be moved laterally. The adjusting screws 23 may be disposed in the aperture 22 most convenient to cooperate with the particular work to be adjusted. While the brackets 20 are shown as extending longitudinally of the work supporting table and grinding machine, it will be understood that said brackets may, if desired, be disposed transversely thereof, depending on the particular work to be mounted and the convenience of operation in any particular case. The bosses 21 are shown as raised so that the adjusting screws 23 may more readily engage with the supports 13.

We have also shown a convenient clamping means which may be readily employed to firmly lock the work in the desired position attained by the above described means for moving the work vertically and laterally. This clamping means is shown as comprising a clamp bar 30 having apertures 31 disposed to cooperate with the bolts 25, the said clamp bar being adapted to extend over each of a pair of base supports 13. Preferably, the clamp bar may be depressed at the central portion thereof, whereby shorter bolts 25 may be employed. Nuts 32 may be employed to firmly maintain the clamp bars 30 in position.

To assist in accurately disposing a pump casing 3 or the like upon the work supporting table 4 with the cylinders thereof in alignment with the grinding wheel spindle 2, centering means may be provided remote from the grinding wheel spindle. Thus, the standard 36 extends upwardly from the carrier bed 6. A longitudinally disposed rotatable shaft 37, which is supported by the standard 36, carries an adjustable radial indicator arm 38, which may be employed to properly center the end of the pump cylinder remote from the grinding wheel spindle. The pump cylinder adjacent to the grinding wheel spindle may be centered by slowly moving the grinding wheel spindle about its orbital axis or by removing the grinding wheel 5 and substituting therefor a suitable indicator arm 39 (Fig. 2) similar to the arm 38. To align the cylinders of a pump casing with the grinding wheel spindle, the pump casing 3 may be moved vertically and laterally by turning the cranks 12 and 11 respectively and the final adjustment to correct for irregularities in the base supports 13 may be readily and accurately made by the above-described means contemplated by our invention.

It will thus be seen that we have provided a simple, yet effective, combination of parts, whereby work of irregular shape or structure may be accurately disposed and maintained in desired position on the work supporting table of a machine tool mechanism in desired relation to the tool spindle thereof.

It will furthermore be understood that by means contemplated by our present invention, the machining or grinding of work may be much more accurately accomplished than heretofore. Furthermore, in the case of structures comprising aligned cylinders, such cylinders may be machined or ground each in accurate alignment with the other, thereby deriving many benefits where such accurate alignment is especially desirable.

Furthermore, it is to be understood that the particular forms of apparatus shown and described are presented for purposes of explanation and illustration and that various modifications of said apparatus can be made without departing from our invention as defined in the appended claims.

What we claim is:

1. The combination with a grinding machine having a carrier bed, a grinding wheel spindle rotatable about its own axis and in an orbital path about an axis eccentric to its own, and means for causing relative reciprocation between said carrier bed and spindle longitudinally of said spindle, of means for disposing work having a cylinder to be ground in desired cooperative relation to said grinding wheel spindle, said means comprising a work supporting table mounted on said carrier bed and arranged to carry said work, pivotal supporting means for swinging said table in a horizontal plane to predetermined desired rotative positions, means for adjusting said table in a horizontal plane transversely of the grinding wheel spindle, independent means mounted on said work supporting table adjacent opposed sides of work to adjust the work laterally on said table, and independent adjustable means on said table to individually vertically adjust at least three spaced portions of said work with respect to said table.

2. The combination with a grinding machine having a carrier bed, a grinding wheel spindle rotatable about its own axis and in an orbital path about an axis eccentric to its own, and means for causing relative reciprocation between said carrier bed and spindle longitudinally of said spindle, of means for disposing work having a cylinder to be ground in desired cooeprative relation to said grinding wheel spindle, said means comprising a work supporting table mounted on said carrier bed and arranged to carry said work, pivotal supporting means for swinging said table in a horizontal plane to predetermined desired rotative position, means for adjusting said table in a horizontal plane transversely of the grinding wheel spindle, means for adjusting said table vertically, said means being arranged to maintain said table in desired vertically adjusted position during a grinding operation, and independent adjustable means on said table to individually vertically adjust at least three spaced portions of said work with respect to said table.

3. The combination with a grinding machine having a carrier bed, a grinding wheel spindle rotatable about its own axis and in an orbital path about an axis eccentric to its own, and means for causing relative reciprocation between said carrier bed and spindle longitudinally of said spindle, of means for disposing work having a cylinder to be ground in desired cooperative relation to said grinding wheel spindle, said means comprising a work supporting table mounted on said carrier bed and arranged

to carry said work, pivotal supporting means for swinging said table in a horizontal plane to set positions spaced 180 degrees apart, means for adjusting said table in a horizontal plane transversely of the grinding wheel spindle, means for adjusting said table vertically, said means being arranged to maintain said table in desired vertically adjusted position during a grinding operation, independent means mounted on said work supporting table adjacent opposed sides of said work to adjust the work laterally on said table, and independent adjustable means on said table to individually vertically adjust at least three spaced portions of said work with respect to said table.

4. The combination with a machine tool having an adjustable work supporting table, of means for readily and accurately disposing and maintaining work in desired position on said table, said means comprising in combination, at least three individually vertically adjustable jacks cooperable with spaced portions of work adjacent opposed sides thereof, said jacks being removably secured to said table and disposed on said table intermediate said table and work, clamping bars arranged to cooperate with spaced portions of said work adjacent opposed sides thereof, and means removably secured to said table arranged to hold said clamping bars securely against said work in adjusted position.

5. The combination with a machine tool having an adjustable work supporting table, of means for readily and accurately disposing and maintaining work in desired position on said table, said means comprising, in combination, brackets disposed on said table adjacent opposed sides of the work to be operated upon, means for removably securing said brackets to said table, means carried by said brackets for cooperating with portions of said work to individually move said portions for adjustment laterally of said table, clamping bars carried by said means securing said brackets to the table, said clamping bars being arranged to cooperate with said work adjacent the portions engaged by the lateral adjusting means, means for holding said clamping bars securely against said work in adjusted position, each set of clamping bars and brackets being removable together from said work supporting table.

6. The combination with a machine tool having an adjustable work supporting table, of means for readily and accurately disposing and maintaining work in desired position on said table, said means comprising, in combination, at least three individually vertically adjustable jacks disposed on and removably secured to said table and disposed intermediate said table and spaced portions of the work, brackets disposed on said table adjacent opposed sides of the work, means for removably securing said brackets to said table, means carried by said brackets for cooperating with portions of said work to individually move said portions for adjustment laterally of said table, clamping bars carried by said means securing said brackets to the table, said clamping bars being arranged to cooperate with said work adjacent the portions engaged by the lateral adjusting means, means for holding said clamping bars securely against said work in adjusted position, each set of clamping bars and brackets being removable together from said work supporting table.

7. The method of grinding the interior walls of a casing containing a pair of longitudinally disposed cylinders to obtain longitudinally aligned cylindrical surfaces having a desired common axis, by a grinding wheel rotatable on its own horizontal axis and orbitally about a horizontal axis eccentric to its own, which method comprises disposing said casing on a support adjacent said grinding wheel, bodily adjusting said support and casing longitudinally and laterally of the grinding wheel spindle to approximately dispose said cylinders with the desired common axis of the surfaces to be ground in longitudinal alignment with said eccentric axis, independently adjusting spaced portions of said casing vertically and horizontally with respect to said support to accurately position said desired common axis with respect to the eccentric axis of the spindle, grinding the cylinder adjacent the grinding wheel, swinging the support in a horizontal plane through 180 degrees, and grinding the other cylinder.

8. The method of grinding the interior walls of a casing containing a pair of longitudinally disposed cylinders to obtain longitudinally aligned cylindrical surfaces having a desired common axis, by a grinding wheel rotatable about its own horizontal axis and orbitally about a horizontal axis eccentric to its own, the ends of said cylinders at the outer ends of said casing being suitably marked to indicate the position of said desired common axis, which method comprises disposing said casing on a support adjacent said grinding wheel, bodily adjusting said support and casing laterally and vertically to approximately dispose said cylinders with the desired common axis of the surfaces to be ground, as indicated by said markings on said cylinders, in longitudinal alignment with spaced indicators carried by the machine indicating the axis of orbital movement of said grinding wheel, independently adjusting spaced portions of said casing vertically with respect to said support to accurately position said desired common axis of said cylinders with respect to said indicated eccentric axis of the spindle, grinding

the cylinder adjacent the grinding wheel, swinging the support in a horizontal plane through 180 degrees, and grinding the other cylinder.

9. The method of grinding the interior walls of a casing containing a pair of longitudinally disposed cylinders to obtain longitudinally aligned cylindrical surfaces having a desired common axis, by a grinding wheel rotatable about its own horizontal axis and orbitally about a horizontal axis eccentric to its own, the ends of said cylinders at the outer ends of said casing being suitably marked to indicate the position of said desired common axis, which method comprises disposing said casing on a support adjacent said grinding wheel, bodily adjusting said support and casing laterally and vertically to approximately dispose said cylinders with the desired common axis of the surfaces to be ground, as indicated by said markings on said cylinders, in longitudinal alignment with said eccentric axis, independently adjusting spaced portions of said casing vertically and horizontally with respect to said support to accurately position said desired common axis of said cylinders with respect to said eccentric axis of the spindle, and grinding said cylinders.

10. The method of grinding the interior walls of a casing containing a pair of longitudinally disposed cylinders to obtain longitudinally aligned cylindrical surfaces having a desired common axis, by a grinding wheel rotatable on its own horizontal axis and orbitally about a horizontal axis eccentric to its own, which method comprises disposing said casing on a support adjacent said grinding wheel, bodily adjusting said support and casing longitudinally and laterally of the grinding wheel spindle to approximately dispose said cylinders with the desired common axis of the surfaces to be ground in longitudinal alignment with said eccentric axis, independently adjusting spaced portions of said casing horizontally with respect to said support to accurately position said desired common axis with respect to the eccentric axis of the spindle, grinding the cylinder adjacent the grinding wheel, swinging the support in a horizontal plane and disposing the second cylinder adjacent the grinding wheel in grinding position, and grinding said last named cylinder.

11. The combination with a grinding machine having a carrier bed, a grinding wheel spindle rotatable about its own axis and in an orbital path about an axis eccentric to its own, and means for causing relative reciprocation between said carrier bed and spindle longitudinally of said spindle, of means for disposing work having a cylinder to be ground in desired cooperative relation to said grinding wheel spindle, said means comprising a work supporting table mounted on said carrier bed and arranged to carry said work, pivotal supporting means for swinging said table in a horizontal plane to predetermined desired rotative positions, means for moving said table in a horizontal plane transversely of the grinding wheel spindle, and independent means mounted on said work supporting table at each end portion of the work to adjust the ends of said work laterally, whereby said work may be disposed with the axis of the cylinder to be ground therein in accurate longitudinal alignment with the axis of the grinding wheel spindle.

In testimony whereof we affix our signatures.

WILLIAM J. BAUMBERGER.
HENRY H. YERK.