

Nov. 13, 1923.

1,474,321

P. DE MATTIA

GRINDING MACHINE

Filed Aug. 6, 1921

4 Sheets-Sheet 1

Fig. 3.

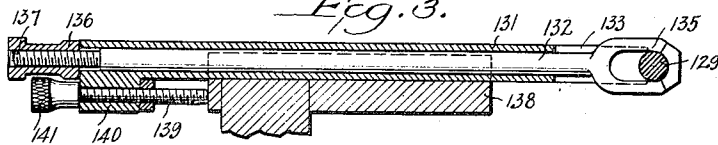
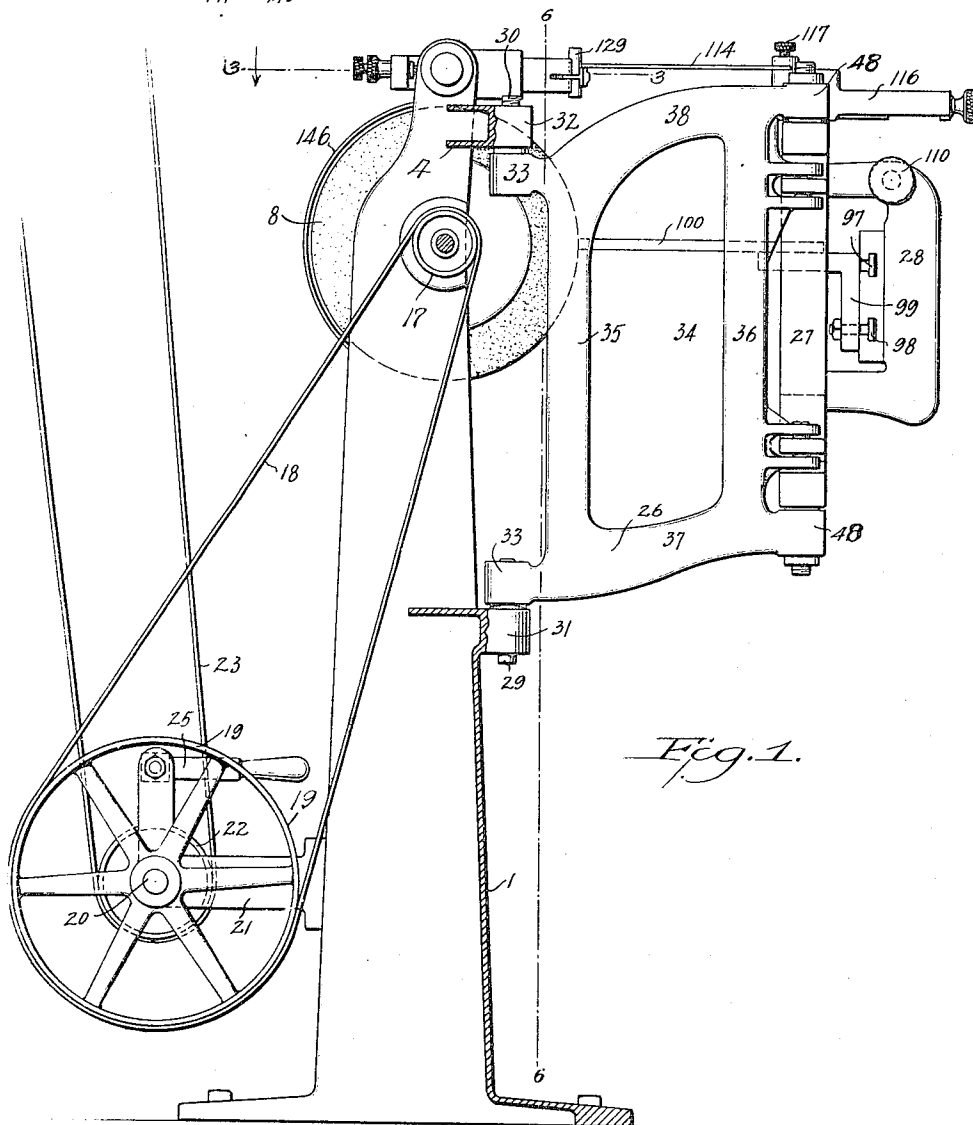
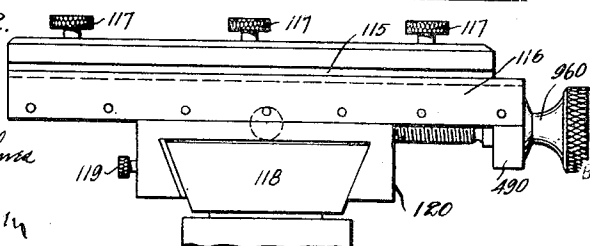


Fig. 1.

Fig. 2.

WITNESSES

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Fig. 4.

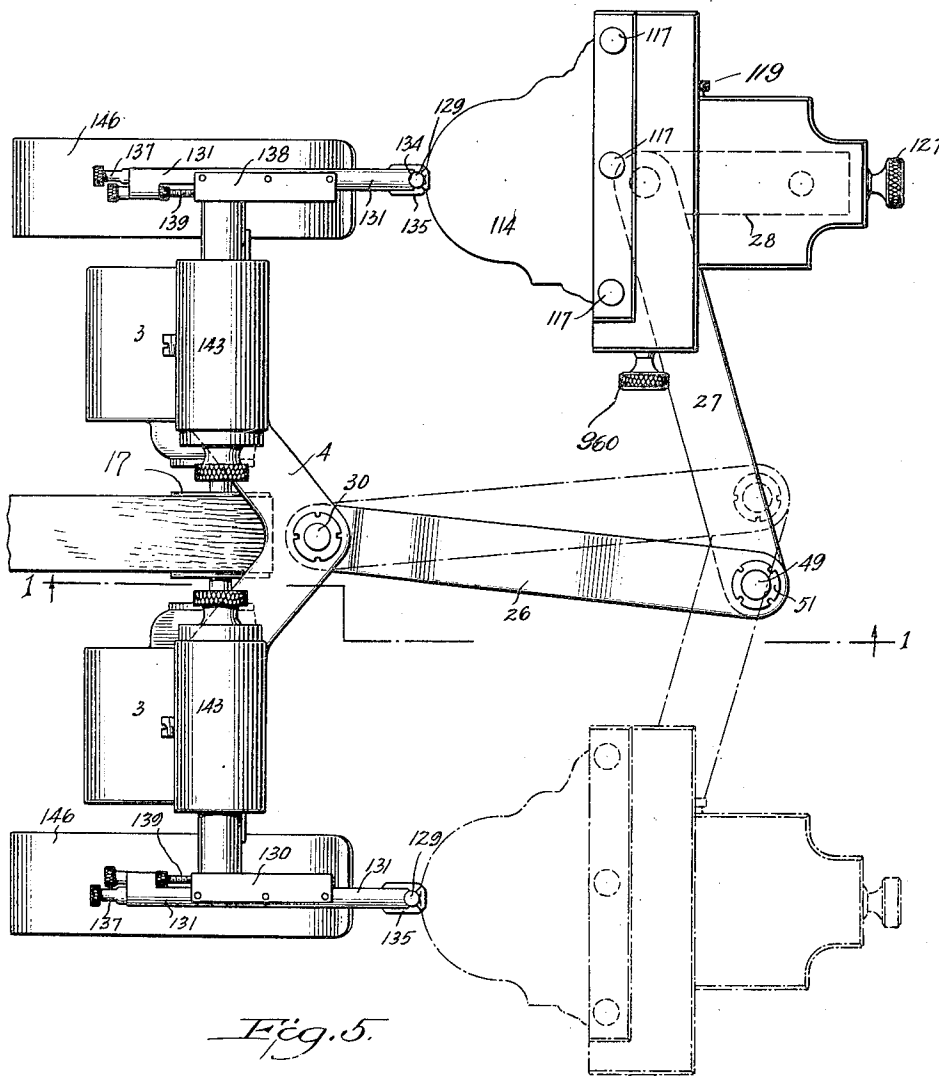
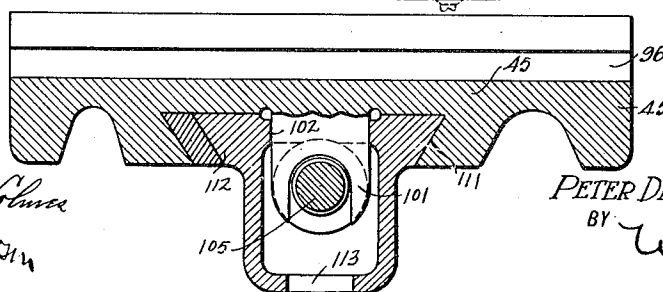


Fig. 5.



WITNESSES

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4 Sheets-Sheet 3

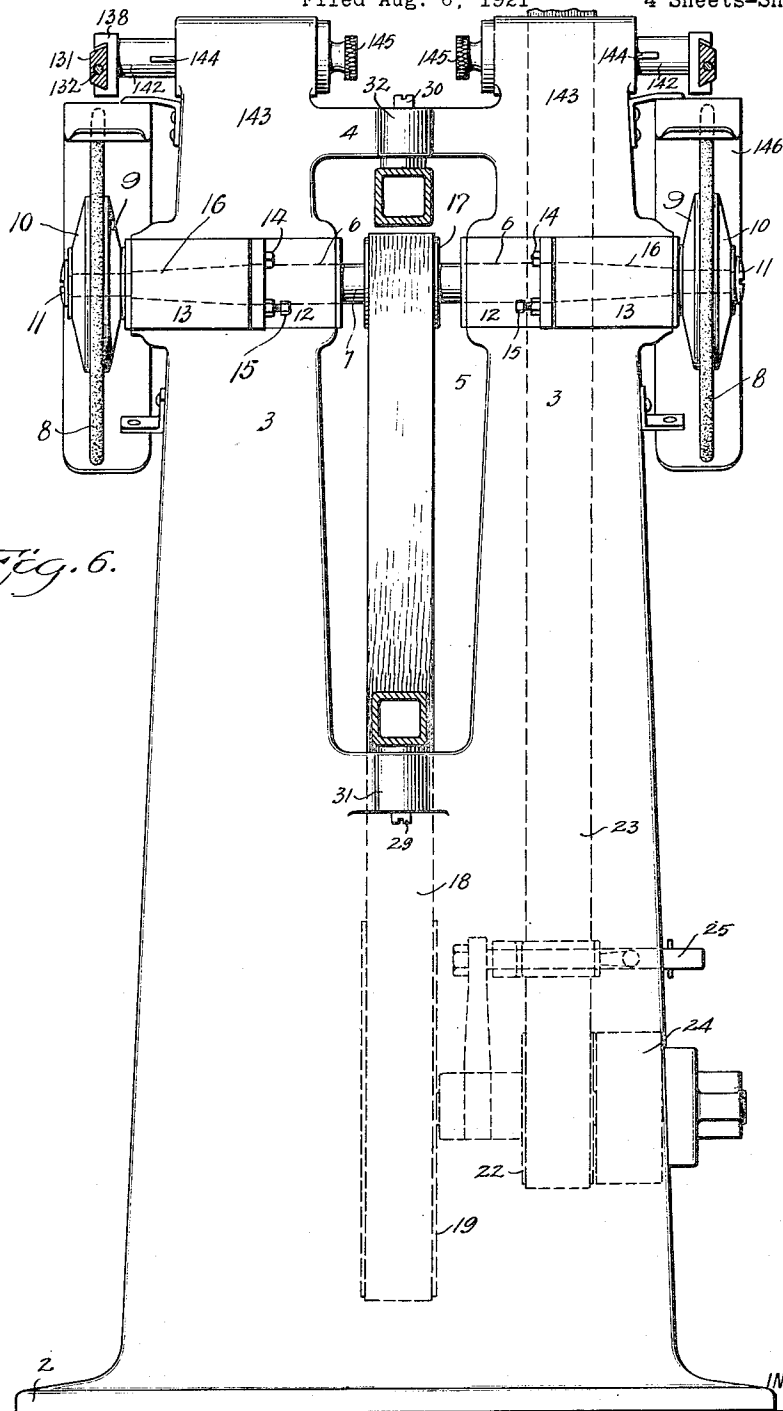


Fig. 6.

WITNESSES

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Nov. 13, 1923.

1,474,321

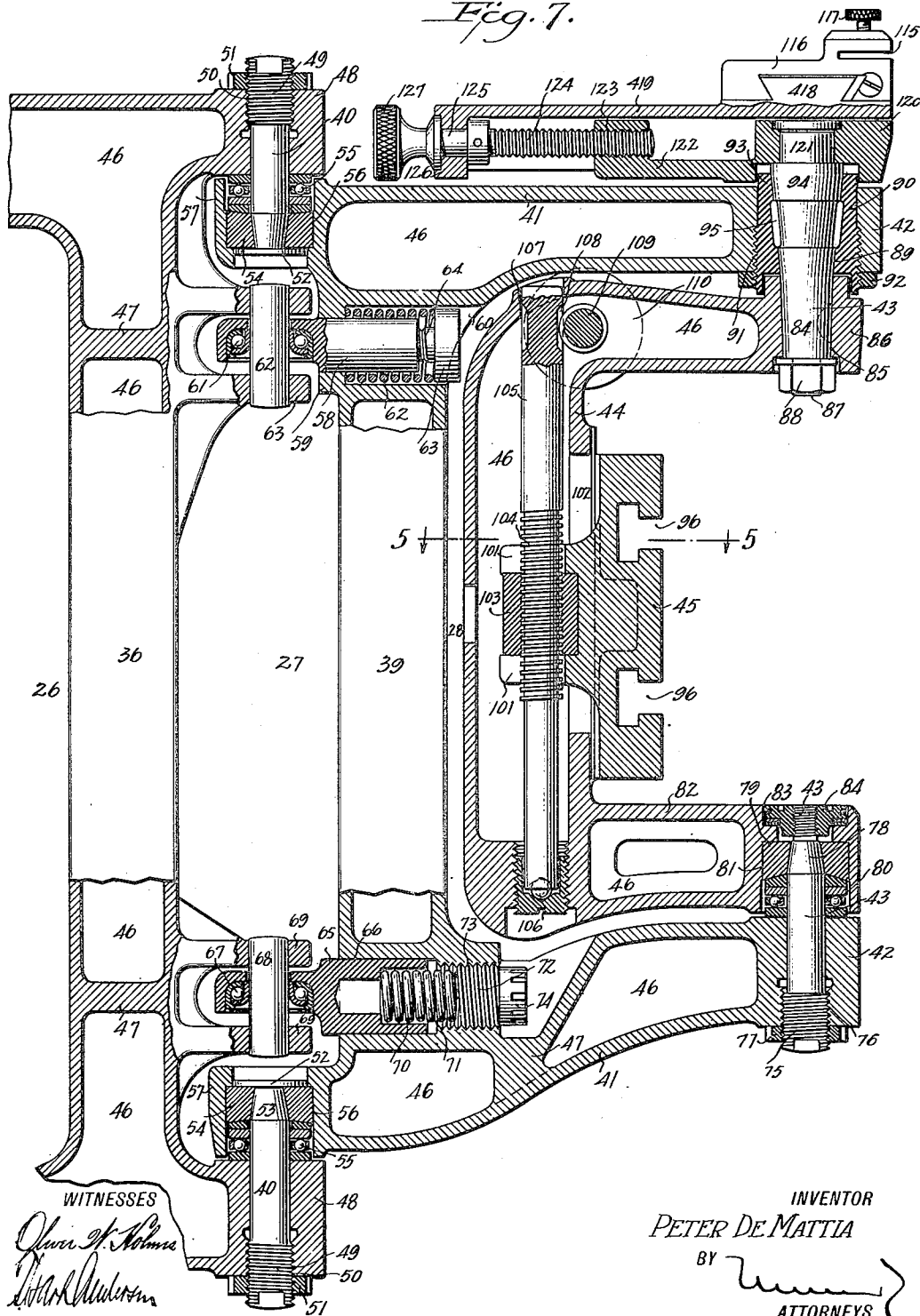
P. DE MATTIA

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Filed Aug. 6, 1921

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Fig. 7.



UNITED STATES PATENT OFFICE.

PETER DE MATTIA, OF CLIFTON, NEW JERSEY.

GRINDING MACHINE.

Application filed August 6, 1921. Serial No. 490,392.

To all whom it may concern:

Be it known that I, PETER DE MATTIA, a citizen of the United States of America, and resident of Clifton, in the county of Passaic and State of New Jersey, have invented a new and useful Improvement in Grinding Machines.

The present invention relates to machines for grinding and dressing the surface of metal parts where it is essential that accuracy be attained and that large numbers of parts similar in outline, shall have their surfaces ground and dressed uniformly in exact correspondence. In such machines it is essential that there shall be a freedom of movement of the part to be ground and dressed with relation to the grinding element, so that all portions of its surface to be acted upon by the grinding element, may be properly presented thereto, and at the same time there must be no liability of loose or lost motion, liable to produce "chattering," but the work to be acted upon must at all times be rigidly held while acted upon by the grinding element and at the same time absolute freedom of movement must be provided, so that every portion of the surface to be acted upon may be presented to the grinding element as freely as though the part was held in the hands of the operator.

The object of the present invention therefore is to provide a grinding machine with work-supporting and guiding instrumentalities, so constructed that the article to be ground shall be rigidly supported yet be freely movable with relation to the grinding element at the effective point of operation, and having means whereby the work to be operated on may be accurately positioned and the operation of the grinding element thereon controlled, whereby each and every piece of work of the same shape shall be ground and dressed to that extent which shall insure that all shall be exact duplicates.

To the above ends the present invention consists of the grinding machine and the devices and combinations of devices which will be hereinafter described and claimed.

The present invention is illustrated in the accompanying drawings, in which:

Figure 1 shows the machine partly in ele-

vation and partly in vertical section, the section being taken on the line 1—1 in Figure 4.

Figure 2 shows the template holder in front elevation.

Figure 3 shows a sectional view taken on the line 3—3 in Figure 1, looking downward in the direction of the arrow.

Figure 4 shows a top plan view of the machine, illustrating the operation of the swinging work-support and also showing in dotted lines that the work-support may be moved to present work to the action of either one of two grinding elements.

Figure 5 shows a horizontal sectional view taken on the line 5—5 in Figure 7, illustrating the manner of adjusting the work holder.

Figure 6 is a front elevation of the standard and grinding mechanisms, with the work-support omitted, parts being shown in section, the section being taken on the line 6—6 in Figure 1.

Figure 7 is an enlarged view showing in partial vertical section and partial elevation, the swinging work-support and illustrating the various adjustments, bearings and means whereby perfect freedom of motion is attained while at the same time preserving rigidity of parts.

Similar reference characters will be employed throughout the specification and drawings to designate corresponding parts.

The machine comprises a vertical standard 1 rising from a base 2. At its upper end the standard 1 is divided, providing two sub-standards 3, which preferably are united at or near their upper ends by a cross-brace 4. This provides an open space 5 at the upper center, for a purpose which will be hereinafter set forth. The sub-standards 3 are provided with suitable bearings 6 in which is mounted a horizontally extending shaft 7, the said shaft at its opposite ends, carrying the grinding disks 8 which may be formed of emery, carborundum or other suitable material. The disks 8 are held to the ends of the shaft 7 between metal collars 9 and 10, between which the disks 8 are clamped, suitable screws 11 being provided to effect the clamping action of the disks 9 and 10. The bearings for the shaft 7 preferably comprise two members

12 and 13, adjustably held together and in alignment with each other by means of an adjusting screw 14, and a set screw or stop 15, and as indicated in dotted lines in Figure 6 the bearing in the members 12, for the shaft 7 is substantially cylindrical, whereas that portion of the bearing in the members 13, tapers outwardly as indicated at 16, to receive the tapered portions of the shaft. This construction enables an accurate adjustment of the bearings for the shaft 7, whereby while providing for the free revolution of the shaft 7 any longitudinal movement or lost motion of any kind will be prevented.

Centrally disposed upon the shaft 7 and within the space 5, is fixedly secured a belt pulley 17, which is engaged and driven by a belt 18 which is in turn driven by a driving pulley 19 mounted on a shaft 20 carried in bearings supported by a bracket 21 projecting rearwardly from the standard 1. The shaft 20 also carries a belt pulley 22 driven by a belt 23 receiving motion from a suitable source of power, and a loose pulley 24 may be provided, and a belt shifting device 25, whereby the belt 23 may be shifted from the fast pulley 22 to the loose pulley 24 as required.

The work to be operated on is supported so that it may be moved horizontally in almost any direction with relation to the grinding wheels 8, in order to present all surfaces which need grinding or finishing to the action of the grinding wheels 8, and to secure the best results the work is presented to the periphery of the grinding wheels in a plane approximating that which would be defined by a horizontal line extending diametrically across the grinding wheels and through the axes thereof.

To accomplish this result the work-support in the machine of the drawing consists of a plurality of vertically disposed, horizontally swinging, articulated frames 26, 27 and 28. The frame 26 is pivotally supported on vertical pivots 29 and 30 mounted and adjustable in bearings 31 and 32, projecting from the standard 1 at the base of the opening 5, and carried by the connecting brace 4 at the top of the opening 5 respectively, and in vertical alignment with each other and at the true vertical center of the machine between the grinding wheels 8, at the front thereof. By this arrangement the frame 26 has a swinging movement towards the right or left about the pivotal supports 29 and 30. The connection between the frame 26 and its pivotal supports comprises the rearward extending bearings 33 formed integrally with the frame 26. For lightness the frame 26 is provided with an opening 34 surrounded by the vertically disposed side pieces 35 and 36, and the top and bottom pieces 37 and 38. At the forward end of the frame 26 is the inter-

mediate frame 27, which is pivotally mounted for a horizontal swinging movement, on suitable bearings comprising the studs 40, mounted in the forwardly extending lugs 48 of frame 26, the arrangement being such that the frame 27 is supported by and moves with the frame 26 and at the same time may have a horizontal swinging movement about the studs 40 independent of and with relation to the frame 26. The frame 27 is provided with the forwardly extending arms 41 in the forward ends of which are suitable bearings 42 carrying the studs 43 upon which is pivotally supported the yoke or frame 28 carrying the work-support 45. This arrangement is such that the yoke or frame 28 has a swinging movement with the frames 26 and 27 and also has a swinging movement about its pivotal supports 43 independently of the movement of the frames 26 and 27. Preferably all of the frames 26, 27 and 28 will be formed with the hollowed parts as indicated at 46, in order to secure lightness of parts.

It is of course essential that the pivotal operation of the swinging frames shall be free, and yet that the parallelism of the vertical axes shall be at all times accurately maintained, as well as rigidly positioning the work in the desired horizontal plane with relation to the periphery of the grinding wheels, for upon this freedom of movement and rigidity of support of the work, depends the proper operation of the grinding tools and the finishing and shaping of the work insuring the production of a large number of parts, each a duplicate of all the others in size, shape and finish, and to secure this result there has been provided in the machine of the drawings the adjustable supporting anti-friction and other bearings, and other adjustable parts, which will now be described.

At its forward end the frame 26 carries the forwardly projecting extensions 48 in which the studs 40 are mounted, said studs being provided with a threaded portion 49 engaged with the threaded sockets 50 and also with lock nuts 51 whereby they may be prevented from turning after the desired adjustment thereof has been secured. Each of the studs 40 for a portion of its length is substantially smooth, and at one end is provided with a head or disk 52, and adjacent the head or disk 52 the studs are slightly tapered as shown at 53, and engage a tapered bearing in a block 54. Between the block 54 and the inner opposing surfaces of the projections 48 are suitable anti-friction bearings 55, said bearings and the headed ends of the studs 40 being received within chambered sockets 56 carried by the rearwardly projecting extensions 57 of the frame 27.

This arrangement provides for anti-friction bearings located in direct vertical

axial alignment with each other and where-
by the said bearings can be accurately
adjusted. Co-operating with the bearings
just described, which form the connection
5 between the swinging frames 26 and 27, are
tension devices, which without in the
slightest degree affecting the freedom of
movement provided by the anti-friction
bearings, yet insure that there shall be no
10 undue lateral wear of the pivots between the
swinging frames 26 and 27. This tension
mechanism comprises in the upper member
a plug 58 having a smooth outer surface
arranged to slide in a bearing 59, which
15 opens into a socket 60. The plug 58 is
provided with an anti-friction bearing 61
which engages a vertically disposed pin 62
mounted in the parallel ears 63 carried by
the frame 26 and about which the
20 plug 58 is adapted to turn. Within the
chamber 60 the plug 58 is surrounded by a
coil spring 621, which at one end is seated
against the base of the chamber 60 and at its
opposite end engages the inner surface of
25 a head 63, which is carried by a threaded
shank 64, which engages a threaded bearing
in the plug 58. Obviously by turning the
head 63 the tension of the spring 62 may be
adjusted more or less as required. At the
30 lower end a plug 65 is fitted in a bearing 66
and carries an anti-friction bearing 67
which engages a pin 68 mounted in the ears
69. At its forward end the plug 66 is pro-
vided with a socket 70, which receives one
35 end of a coil spring 71, the opposite end
being engaged by a threaded plug 72 which
engages a threaded bearing 73, and in which
it may be turned to adjust the tension of the
spring 71.

40 It is to be observed that the upper spring
tension device exerts a backward pull on the
frame 27, whereas the lower tension device
exerts an outward thrust on the frame 27,
so that by properly adjusting these tension
45 devices the true vertical axial position of
the couplings between the frames 26 and 27
may be obtained. It is of course understood
that the head 63 and the projecting end 74 of
the stud 72 are provided with suitable means
50 whereby they may be engaged by a tool to
turn the same for the purpose of securing
the desired tension in the coil springs 621.

Not only does the foregoing construction
provide for the accurate adjustment of the
55 articulation between the frames 26 and 27,
but to some extent the spring tension devices
assist in supporting the load and steadying
the frame 27.

The frame 28 is mounted upon the studs
60 43 carried by the bearings 42 at the forward
ends of the arms of the frame 27. The
lower stud 43 has a threaded portion 75
which fits a threaded bearing 76, in which
it may be turned and it is provided with a
65 lock nut 77. At its upper end the stud 43

is tapered as shown at 78 and fits a tapered
bearing in a block 79 forming a part of the
anti-friction bearing 80, which is received
within a chamber 81 in the arm 82 of the
frame 28. In its upper surface the arm 82
70 is provided with a chamber 83 which receives
a nut 84 screwed to the upper end of the
stud 43.

The foregoing arrangement is such that
the turning of the stud 43 secures not only
75 an adjustment of the bearing 80, but also
secures the lower arm 82 of the frame 28 to
the lower arm 41 of the frame 27. The stud
43 at the upper part of the frame 28 is pro-
vided with a tapered portion 84 received
80 in the tapered bearing 85 in the upper arm
86 of the frame 28, and at its lower end it is
provided with a threaded portion 87 to
which is threaded a nut 88.

The tapered portion 84 of the upper stud
85 43 is seated in a tapered bearing 89 in a
bushing 90, which is adjustably mounted
and secured by means of the complementary
screw threads 91 in the forward end of the
upper arm 41 of the frame 27, the lower end
90 of the bushing being provided with a lock
nut 92. The bushing 90 also has a beveled
seat or bearing 93 which is engaged by an
enlarged beveled portion 94 of the stud 84
and between the upper and lower beveled
95 portions is formed a lubricating cham-
ber 95.

It must be noted that the upper arm of
the frame 28 is suspended in the upper arm
of the frame 27 by means of the stud 84 and
that adjustment is secured by adjusting the
bushing 90.

The frame 28 is the work carrying frame
and it is provided with any suitable work
support, such as the block 45, provided with
105 the horizontally disposed, transversely ex-
tending parallel slots or grooves 96 adapted
to receive the headed studs 97 and the bolts
98 of the bracket 99, upon which the work
100 is directly secured in any suitable man-
ner. The block 45 is provided with the rear-
wardly extending, slotted ears 101 which
project through an opening 102 formed in
the front of the frame 28 and which carry
115 a threaded nut 103 located between the slot-
ted ears 101 and engaging the threaded por-
tion 104 of a vertical shaft 105. The shaft
105 at its lower end is seated upon an ad-
justable anti-friction bearing 106 and at its
upper end is mounted to turn in a bearing
120 107 directly over and in line with the ad-
justable anti-friction bearing 106. By rotat-
ing the vertical shaft 105 the threaded nut
103 will be caused to move up or down as the
case may be, to position the work 100 in
125 that position with relation to the operative
periphery of the grinding disks 8 which may
be required. For the purpose of rotating the
vertical shaft 105, at or near its upper end,
it is provided with a worm gear 108 which
130

is engaged by a worm 109, mounted to turn in suitable bearings and provided with a head 110 by means of which it may be turned for the purpose of raising or lowering the work supporting block 45.

As shown in Figure 5 of the drawing the rear face of the block 45 is provided with a vertically disposed guide having the beveled sides 111 arranged to engage the beveled guides 112 extending vertically on the frame 28 adjacent to the slot 102. For the purpose of affording access to the chamber in the frame 28 the rear face thereof will be provided with an opening 113 located at or near the vertical center thereof. It is to be noted that by the arrangement just described the work supporting block 45 is rigidly mounted on the frame 28 but may be readily vertically adjusted by instrumentalities which are independent of the means by which the said block is slidingly supported.

With the work fixedly secured to the work supporting block 45 it may be presented and subjected to the action of either of the grinding wheels 8 and all parts of its peripheral edge or surface brought under the action of the grinding wheels.

It is of course essential that some suitable means be provided whereby the action of the grinding wheels or disks shall not only impart to the surface to be operated upon and to the article, a uniform finish but shall insure that the shape imparted shall be identical, in all of the articles of a given shape and size subjected to the action of the machine. To secure this result a template 114 is provided, which template is supported and held in the slot 115 of a template support 116, suitable set screws 117 being provided to fixedly secure the template in the template support. The template support is mounted upon the dovetail projection 118 whereby it may be laterally adjusted in one direction, such adjustment being secured by set screw 119. This provides for an adjustment along one axis or diameter. It is of course desirable to secure an adjustment in lines at right angles to the adjustment just described and for this purpose the dovetail 418 is mounted upon a carrier 119; which is slidingly connected to a block 120 fixedly secured to the upper portion 121 of the stud 43 and arranged to turn therewith and with the frame 28. The block 120 has a rearwardly projecting portion 122 which carries a threaded bearing 123, which is engaged by an adjusting screw 124 supported fixedly, but to freely turn in the bearing 125 of a downwardly extending projection 126 of the carrier 119, the said screw being provided with a milled head 127. The lateral adjustment is secured by a screw 960 engaging the projection 418 and the downturned lug 490 of the support 116. By this arrange-

ment the template carrier may be adjusted with relation to the stud 43 in two directions, so as to properly position the template with relation to the work supported by the work support 45 and the edge of the grinding disks.

The template 114 engages a guide or stop, of which there is one co-operating with each grinding disk, which comprises a short cylindrical block 129, preferably of steel, which is adjustably mounted in a carrier. This carrier comprises a dovetail slide 131 through which projects a rod 132, the slide at its forward end being slotted as at 133 and provided with notches 134, and the rod 132 is provided with a slotted head 135 to receive the short cylindrical steel block 129. The rear end of the rod 132 is threaded as at 136 and receives a threaded nut 137, by means of which the rod may be drawn backward whereby to clamp the cylindrical block 129 against the notched ends of the slide 131. This provides for firmly locking the cylindrical blocks 129 and also for vertically adjusting them within the limits of their length. In order to adjust the guide as a whole so as to properly position it with relation to the peripheral edges of the disks 8, the slides 131 are arranged to slide in a guide 138 and moved therein by means of an adjusting screw 139 held in a threaded bearing 140 on the under side of the slide 131, and provided with a milled head 141 whereby an accurate longitudinal adjustment may be secured. When once adjusted the slide 131 is secured in any suitable manner.

The guides 138 are formed integrally with and permanently secured to the outer ends of cylindrical shanks 142 arranged to slide and be adjusted in bearings 143 at the upper ends of the sub-standards 3, but prevented from turning therein by means of keys 144. Suitable adjusting screws 145 are provided whereby to move the shanks 142 in their bearings.

By the foregoing construction the cylindrical blocks 129 may be accurately positioned with relation to the peripheral edge of the grinding disks 8 so as to engage the template 114 and thus accurately position the work to be operated on.

Suitable guards or shields 146 are provided partially surrounding the grinding disks 8.

In operation the work having been mounted upon the work support and the proper adjustment of the template and guides having been made, the grinding disks are rotated and the edge of the work or the surface to be acted upon is presented to the action of the grinding disks.

During this action the work is positively and firmly supported, yet is free to be turned in all directions, guided by the tem-

plate and guide blocks, and all surfaces will be ground to the extent required.

It will of course be understood that if desired the work may be presented to either of the grinding disks at the will of the operator.

Having described my invention, I claim:—

1. In a grinding machine, in combination, a grinding element, an articulated sectional work carrier pivotally supported and movable in a horizontal plane with relation to the grinding element, and independent adjustable tension devices located in vertical alignment connecting two members of the articulated work carrier.

2. In a grinding machine, in combination, a grinding element, a pivoted swinging work carrier comprising a plurality of articulated members and independent adjustable tension devices connecting two of the members of the articulated work carrier, such tension devices being located respectively at or near the top and bottom of the members in vertical alignment and exerting their force in opposite directions.

3. In a grinding machine, in combination, a movable grinding element, a swinging work support comprising a plurality of independently movable articulated members, adjustable anti-friction bearings connecting the said members, and oppositely acting tension devices connecting two of the members at or near the upper and lower pivotal connections in vertical alignment.

4. In a grinding machine in combination, a plurality of grinding disks, a swinging work-carrier located intermediate the grinding disks, comprising a plurality of articulated members arranged to swing in a horizontal plane, upper and lower tension devices connecting two of such articulated members, said upper tension device exerting a backward pull on one of the articulated members, and the said lower tension device exerting an outward thrust on the said articulated members.

5. In a grinding machine in combination, a plurality of grinding disks mounted at the opposite ends of a rotary shaft, an articulated work-carrier arranged to swing in a horizontal plane, comprising an inner member pivotally supported on the frame of the machine, an intermediate member pivotally mounted to the said inner member, and an outer member pivotally supported by the intermediate member, carrying a work support, upper and lower tension devices connecting the inner and intermediate members, and a templet carrier movable with the outer member to subject the work carried by the work support to the action of either one of the grinding devices.

6. In a grinding machine in combination,

a plurality of grinding disks mounted at the opposite ends of a rotary shaft, a swinging work carrier located intermediate the grinding disks and pivotally supported to swing in its horizontal plane, said work carrier comprising a plurality of articulated members, adjustable bearings connecting the said members, and independent adjustable tension devices connecting the inner and the intermediate members of the work carrier, a work support mounted upon the outer articulated member, and a templet movable with the outer articulated member, to subject the work carried by the work support to the action of either one of the grinding disks.

7. In a grinding machine in combination, a plurality of grinding disks mounted at the opposite ends of a rotary shaft, a swinging work carrier located intermediate the grinding disks and pivotally supported upon the frame to swing in a horizontal plane with relation to the grinding disks, the said work carrier comprising a plurality of articulated members, and independent adjustable tension device connecting two of the articulated members, a work support mounted upon the outer articulated member, and a templet mounted upon one of the pivots of the outer articulated member and movable therewith to subject the work carried by the work support to the action of either one of the grinding disks.

8. In a grinding machine in combination, a plurality of grinding disks, an articulated work carrier arranged to swing in a horizontal plane, comprising an inner member, an intermediate member pivotally mounted to the said inner member and provided with outwardly extending arms pivotally supporting an outer member, upper and lower tension devices connecting the inner and intermediate members in vertical alignment, the said upper tension device comprising a plug engaging a pin carried by the inner member and arranged to enter a socket in the intermediate member, and a spring member provided in said socket to exert a backward pull on the intermediate member.

9. In a grinding machine in combination, a plurality of grinding disks, an articulated work carrier arranged to swing in a horizontal plane, comprising an inner member, an intermediate member pivotally mounted to the said inner member and provided with outwardly extending arms pivotally supporting an outer member, upper and lower tension devices connecting the inner and intermediate members in vertical alignment, the said upper tension device comprising a plug engaging a pin carried by the inner member and arranged to enter a socket in the intermediate member, a spring member provided in said socket to exert a backward

pull on the intermediate member, and said lower tension device exerting an outward thrust on the said intermediate member.

10. In a grinding machine in combination, a plurality of grinding disks, an articulated work carrier arranged to swing in a horizontal plane, comprising an inner member, an intermediate member pivotally mounted to the said inner member and provided with outwardly extending arms pivotally supporting an outer member, upper and lower tension devices connecting the inner and intermediate members in vertical alinement, the said upper tension device comprising a plug engaging a pin carried by the inner member and arranged to enter a socket in the intermediate member, a spring member provided in said socket to exert a backward pull on the intermediate member, and said lower tension device comprising a plug fitting in a bearing in the intermediate member and engaging a pin

mounted in the inner member, and a spring member arranged to exert a thrust on the said plug to effect an outward thrust on the intermediate member. 25

11. In a grinding machine in combination, a plurality of grinding disks, an articulated work-carrier arranged to swing in a horizontal plane comprising an inner articulated member having outwardly extending lugs, an intermediate articulated member pivotally mounted between said outwardly extending lugs, said intermediate articulated member provided with outwardly extending arms pivotally mounted therebetween, an outer articulated member arranged to swing inwardly between the arms of the intermediate articulated member, a work support mounted upon the outer articulated member, and a templet-carrier adjustably supported upon one of the pivots of the said outer articulated member. 30 35 40

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