H. B. ROSS.

GRINDING MACHINE.

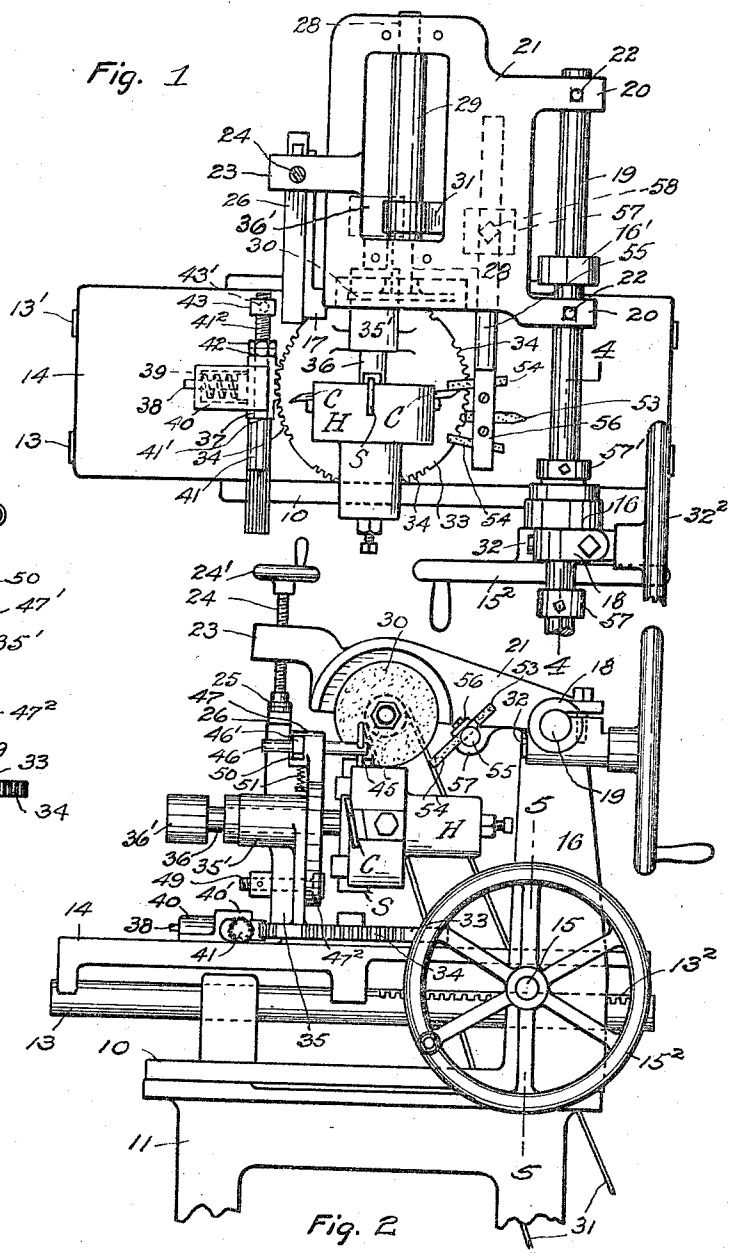
APPLICATION FILED APR. 1, 1916.

1,229,526.

Patented June 12, 1917.

2 SHEETS—SHEET 1.

Fig. 1



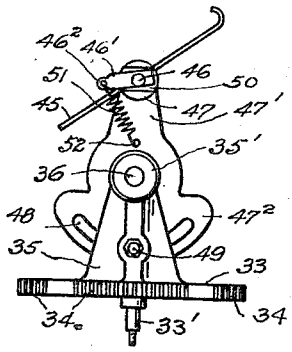


Fig. 7

Fig. 2

WITNESS

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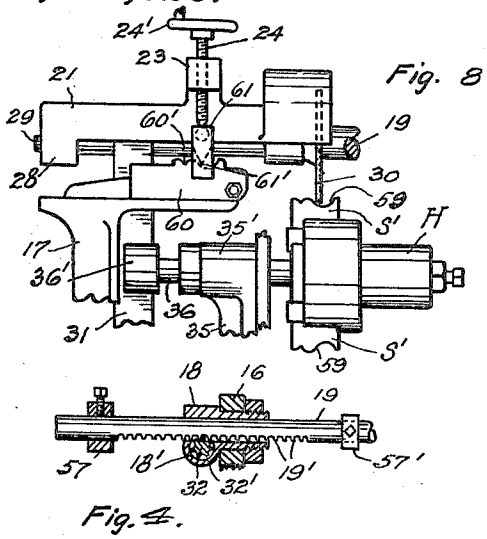

Fig. 8

Fig. 4.

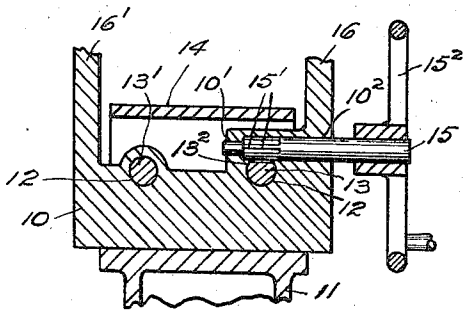

Fig. 5

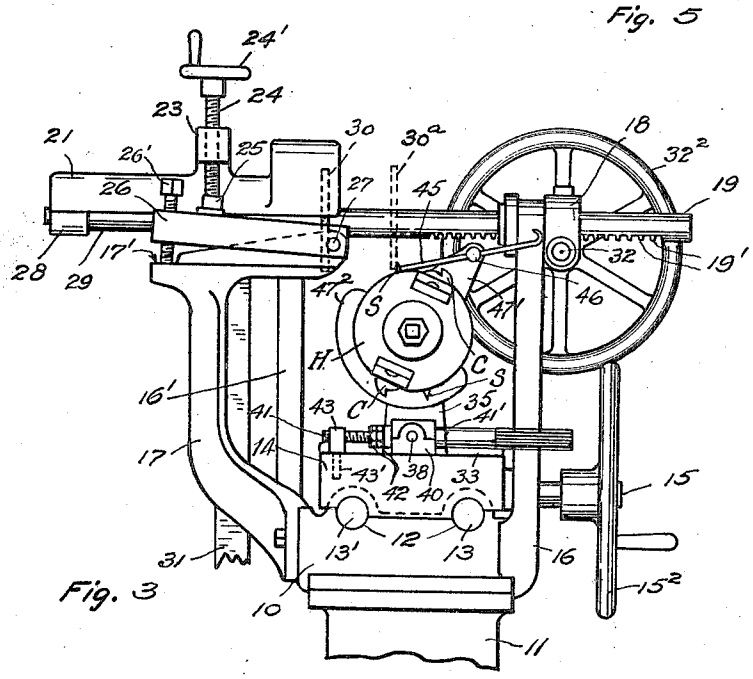

Fig. 3

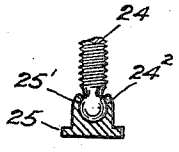

Fig. 6.

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UNITED STATES PATENT OFFICE.

HARRY B. ROSS, OF SEATTLE, WASHINGTON, ASSIGNOR TO PHILBRICK CUTTER HEAD COMPANY, OF SEATTLE, WASHINGTON, A CORPORATION OF WASHINGTON.

GRINDING-MACHINE.

1,229,526. Specification of Letters Patent. Patented June 12, 1917.

Application filed April 1, 1916. Serial No. 88,210.

To all whom it may concern:

Be it known that I, HARRY B. ROSS, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

This invention relates to grinding machines and, more especially, to grinders for sharpening and jointing the bits and knives of cutter-heads for wood-planing machines.

The object of my improvements is to provide a simple and efficient grinding machine of this character and in which the grinding wheel and the work are adapted to be adjusted to properly and uniformly grind bits or knives of different sizes and shapes and without the necessity of employing skilled labor.

The invention consists in the novel construction, adaptation and combination of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan view of a grinding machine embodying my invention. Fig. 2 is a front elevation and Fig. 3 is an end elevation of the same with a portion of the supporting frame and the work shown in different positions from which it is represented in Fig. 1. Fig. 4 is a sectional view through 4—4 of Fig. 1. Fig. 5 is a similar view through 5—5 of Fig. 2. Fig. 6 is a detail of the lower end of the screw for regulating the relative height of the grinder wheel and its connection with the sliding shoe which is shown in transverse vertical section. Fig. 7 is an end elevation of the work-holding turret with the gaging attachments thereon. Fig. 8 is a fragmentary end elevation of the machine adapted for jointing bits having curved cutting edges.

Referring to the drawings, the numeral 10 designates the frame or base of the machine which, as illustrated, is supported upon a stand 11. Said base is provided with ways 12 for bar slides 13 and 13^1 secured to the underside of a carriage 14. The slide 13 is formed with rack teeth 13^2 engageable with peripheral teeth 15^1 provided on a stub shaft 15 which, as shown in Fig. 5, is journaled in bearings 10^1 and 10^2 of the base and having a hand wheel 15^2, by the turning of which transverse motion may be imparted to the carriage.

At one of its ends, said base is provided with upwardly extending standards 16 and 16^1 and at the rear and adjacent to its other end the base is provided with a bracket 17 which extends to a distance above the carriage 14.

Extending through a bore provided in standard 16^1 and through a bushing 18 seated in a bore of the other standard 16 is a horizontal shaft 19 which also extends through and is rigidly secured to lugs 20 provided at one side of a movable frame 21, as by set screws 22.

At the opposite side from the lugs 20, frame 21 has a lug 23 which is provided with a screw-threaded aperture in which engages the thread of a substantially upright screw 24 having at its upper end a hand-wheel 24^1 for rotating the same, and at its lower end has a globular extremity 24^2 which fits into a corresponding socket 25^1 (Fig. 6) of a shoe 25 to make a ball-and-socket joint therewith. As shown in Figs. 2 and 3, the shoe 25 is supported upon a bar 26 which is pivotally connected at its forward end by a pin 27 and has an adjustment screw 26^1 extending through its other end and bearing against a shelf portion 17^1 of the bracket 17.

Journaled in bearings, indicated by 28, in said frame, is a horizontal spindle 29 which carries at its forward end a grinding wheel 30 and between its bearings the spindle is formed with a relatively large diameter to serve as a pulley for a power belt 31 whereby the spindle is rotated to drive the grinding wheel. The aforesaid bushing 18 is formed with a transversely arranged bearing 18^1 for a shaft 32 provided with peripheral teeth 32^1 (Fig. 4) to engage rack teeth 19^1 provided in the shaft 19 and having a hand wheel 32^2 whereby the shaft 32 may be rotated to afford forward or rearward movements to the frame 21 for adjusting the horizontal position of the grinding wheel.

The elevation of the grinding wheel is adjusted by tilting the frame about the axis of the shaft 19 at one side of the frame by means of the screw 24 at the other side thereof.

Rotatably mounted on the carriage 14, as by a king-pin 33^1, is a turret having immediately above the carriage a disk 33 which is provided in its periphery with series of

spur-gear teeth 34, as best shown in Figs. 1 and 7.

Extending upwardly from the disk at a distance from the axis thereof is a post 35 which is surmounted by a tubular boss 35^1 in which is journaled a horizontally disposed arbor 36. This arbor is provided at one end with a pulley 36^1 which, upon occasion, may be swung by turning the turret into the position shown in Figs. 1 and 8, to engage the belt 31 for rotating the arbor.

The part of the arbor at the opposite side of the turret post from the pulley 36^1 is machined to fit into the hub recess of a cutter head H whose bits are to be ground. Said head is detachably secured to the arbor, as by means (not shown) such as the ordinary clamping devices obtaining in cutter-heads for securing the same to their spindles of planing machines.

To present the head at various angles to the grinding wheel, the turret is turned by the operator to approximately the proper position, then temporarily secured and finally adjusted by means of the following described devices.

Such devices consist of a rack-block 37 whose teeth are normally caused to be engaged with a selected series of teeth 34 of the turret by means of a headed rod 38 being urged against the block by means of a spring, indicated by broken lines 39 in Fig. 1. Said spring and the rod 38 are housed in a casing 40 which is rigid with the carriage and is provided with a protruding ward 40^1 between which and the carriage is provided a space to accommodate the rack-block.

41 represents a rod extending across the carriage and through an aperture provided in the block 37, the latter being secured between a shoulder 41^1 of the rod and interlocked nuts 42 engaged on a screw-threaded portion 41^2 of the rod. This screw part of the rod also engages in a screw-threaded hole provided in a nut 43 having a stem 43^1 which serves as the fulcrum for the rod 41 when the same is to be used as a lever to withdraw the rack-block 37 from its engagement with the teeth of the turret-disk in opposition to the power of the spring 39.

When the rack-block is engaged with the turret-teeth, then by rotating said rod, the screw-part thereof acting in the nut 43 will cause the rod and the block to be moved toward or from the back of the carriage to accordingly affect the turret for adjusting the rotary position thereof.

The illustrated head H is provided, as shown in Figs. 1, 2 and 3, with circular bits C and with the so-called "jointing" bits S, or "knives", as they will be hereinafter designated. The grinding wheel 30 is utilized to sharpen both the bits and the knives and also to joint the latter.

To sharpen the knives S, the turret is adjusted to have the axis of the head disposed parallel relative to the direction of travel of the carriage, as shown in Figs. 2 or 3, or nearly so; then advancing and tilting the frame 21, as before explained, to bring the grinding wheel into position, such as indicated by broken lines 30^a (Fig. 3) to sharpen the cutting edge of a knife brought into a plane with a face of the wheel as adjusted.

The head being thus regulated, the carriage is reciprocated by the operator through the medium of the hand-wheel 15^2 to carry a knife to and fro across the face of the wheel.

After one of the knives is thus sharpened, the arbor 36 is turned to revolve another knife into position to be ground, as above explained.

To properly set and adjustably hold the knives into positions to be ground, I employ a gage finger 45 which extends diametrically through a rod 46 which, in turn, extends through a boss 47 provided on an arm 47^1 of a quadrant 47^2 which is rotatable about the axis of arbor 36.

The quadrant 47^2 is provided with an arcuate slot 48 (Fig. 7) disposed concentrically of the arbor axis to accommodate a bolt 49 by which the quadrant is adjustably secured to the turret post. The rod 46 has rigid therewith a collar 46^1 which is seated in a transversely arranged slot 50 of the boss 47 and of greater depth than the thickness of the collar to afford a limited amount of oscillatory motion with the rod 46 about the axis of the same.

A helical spring 51 is connected at one of its ends to an end 46^2 of the collar and has its other end connected to a stud 52 secured to the post. The function of said spring is to yieldingly hold the gage finger 45 against the periphery of the head and against a knife S and serve as a stop to prevent the head being accidentally turned when such knife is being sharpened.

After one of the knives is thus sharpened, the grinding wheel is temporarily raised and the head turned to bring another knife into grinding position when held against the finger for sharpening.

In turning the head, the spring 51 yields to allow the protruding portions of the knives to pass beneath the finger and after thus passing for a short distance therebeyond, the head is turned in a contrary direction to carry the referred-to knife back against the finger.

When the knives are inclined oppositely from that shown in the drawing, as in a "left-hand" head, the rod 46 is retracted axially to withdraw the collar 46^1 from the slot 50 and is thereupon turned to transpose the spring-connected end of the collar to the

opposite end of the slot, and then advancing the rod to restore the collar into the slot.

The circular bits C are sharpened by the grinding wheel 30 but are jointed by independent devices consisting of emery stones 53 and 54 held in notches provided in a bar 55 by means of a clamping plate 56. The bar 55 is movable in a guide 57 depending from the frame 21 and held in selected positions by means of a set screw 58.

The stone 53 which is used for jointing circular bits intended for cutting grooves in flooring, or the like, is arranged in approximately rectangular relations to the axis of the bar 55. The other stones 54 which are utilized for jointing bits designed to be employed for cutting the sides of flooring tongues are inclined, as indicated in Fig. 1, so as to be capable of facing the sides of such bits, which are themselves inclined to give clearance when in operation.

The manner of employing these stones for jointing purposes is to first set the bar 55 to hold the stones in advance of the grinding wheel 30, then regulate the positions of the stones with respect to the bits by moving the frame 21 in horizontal and vertical positions through the medium of the hand-wheels 15^2 and 24^1.

To prevent the stones from being excessively moved, set collars 57 and 57^1, shown in Figs. 1 and 4, may advantageously be employed on the shaft 19 to limit the travel of the frame. In the jointing operations of both the knives and the bits, the turret is turned to have the head in the position in which it is represented in Fig. 1 to be rotated by means of the belt 31 engaging the pulley 36^1 of the arbor upon which the head is mounted.

The sharpening and jointing of knives having cutting edges inclined from the axis of the head is effected by regulating the bar 26 to a corresponding inclination, whence it is evident that the frame in being reciprocated will be raised and lowered as the shoe 25 reciprocates on the bar.

Where the jointing of knives with irregular or curved cutting edges, as 59, with respect to the knives S^1 of Fig. 8, is to be effected, a former or templet 60 having an edge 60^1 similarly shaped to those of the knives, is secured to the bracket 17 and, instead of a shoe 25, I use an attachment 61 with a sharp edge 61^1 to track on the edge 60^1 of the templet, whereby the free end of the frame 21 is suitably raised and lowered to correspondingly influence the grinding wheel 30 as it traverses the orbital path of the knives while revolved.

In practice, the bits and knives are usually first sharpened and subsequently jointed. While the grinding wheel 30 is being used, the bar 55 is shoved back so as not to interfere, and to enable the frame 21 to be freely moved, the collars 57 and 57^1 may have to be temporarily loosened.

The operation of the invention will, it is thought, be understood from the foregoing description.

What I claim as my invention, is—

1. In a grinding machine of the class described, a tiltable frame, a grinding wheel, a spindle therefor journaled in said frame, means to drive said spindle to rotate the wheel, a bar adapted to serve as a track element for the last named means, means for reciprocating said frame, and means for adjusting the inclination of the track-bar to impart selective vertical movements to the grinding wheel during the travel of the same with said frame.

2. A grinding machine having in combination, a power driven grinding wheel arranged for axial movements, a carriage, means to reciprocate said carriage rectangular to the axis of said wheel, a turret rotatably mounted on said carriage, means to adjustably secure said turret in selected rotary positions, a work-supporting arbor journaled in said turret, gaging means engageable with the work for regulating the rotary positions of the arbor and the work, and means to impart axial movements to the grinding wheel to effect the grinding of the work.

3. A grinding machine having in combination, a grinding wheel, a spindle therefor arranged for vertical and axial movements, means to effect such movements of the spindle independently or together, means to drive the spindle, a reciprocatory carriage, a rotary support for the work, and means to secure said support in adjusted rotary positions.

4. In a grinding machine, the combination with the grinding wheel, a reciprocatory carriage, and means to effect such movement of the carriage, of a work-supporting turret rotatably mounted on said carriage, said turret comprising a disk element having peripheral teeth, a post extending upwardly from said disk element, and a horizontally disposed arbor journaled in said post for supporting the work, and adjustable means engaging the teeth of said disk element whereby the turret may be adjustably secured in selected rotary positions.

5. In a grinding machine, the combination with the grinding wheel, means to drive said grinding wheel, a reciprocatory carriage, and means to effect such movement of the carriage, of a work-supporting turret rotatably mounted on said carriage, said turret comprising a disk element having peripheral teeth, a post extending upwardly from said disk element, a horizontally disposed arbor journaled in said post for supporting the work at one end thereof, means provided at the other end of the arbor and

engageable with the aforesaid means for rotating the arbor, and adjustable means engaging the teeth of said disk element whereby the turret may be adjustably secured in selected rotary positions.

6. In a grinding machine, a carriage, means to reciprocate said carriage, a work-holding turret rotatably mounted on said carriage, said turret having a disk element provided with spur teeth in its periphery, a rack-block, a spring serving to normally maintain the teeth of said rack-block in engagement with selected teeth of said disk element, a rod rotatable in said rack-block, a swivel connection between the rod and the carriage, screw-threads provided on said rod and engageable with threads provided in said connection whereby rotary movements of the rod will influence said rack-block to effect rotary movements of the turret, said rod also serving with said connection as a lever whereby the rack-block may be disengaged from the teeth of said disk element in opposition to said spring.

7. In a grinding machine, a carriage, means to reciprocate said carriage, a work-holder mounted on the carriage and including a rotary arbor, a grinding-wheel, a spindle therefor, a frame in which said spindle is journaled, manually actuated means for regulating the movements of said frame in directions axially of said spindle, adjustable means connected with said frame for regulating the elevation of the grinding wheel, means coöperating with the last named means whereby the elevation of said grinding wheel is controlled by the movements of the frame axially of the spindle, means to drive the spindle, and means provided on the arbor and engageable with said spindle-driving means whereby the arbor may be rotated.

8. In a grinding machine, a work-holder having an arbor upon which the work is adapted to be detachably secured, a frame, a bar adjustably secured against rotative movements in said frame, jointing devices secured to said bar, means whereby the frame may be adjustably moved to regulate the horizontal and vertical positions of said jointing devices with respect to the work and means to drive said arbor for rotating the work and thereby render said devices operative to effect the jointing of the work.

9. In a grinding machine, a post, a horizontally disposed arbor carried by the post for supporting a cutter-head, a quadrant rotatably connected to said post having a recess in an arm thereof, means to secure the quadrant at selected rotary positions, a rod extending through said quadrant, a gage-finger carried by the rod at one end thereof, a collar rigid with the rod and detachably seated in said recess, and a spring connecting an end of said collar with the post whereby the gage-finger is yieldingly held through the medium of the rod.

10. In a grinding machine of the class described, a frame, a grinding wheel, a spindle therefor journaled in said frame, means to drive said spindle to rotate the wheel, means to support the frame, means to reciprocate the wheel axially thereof through the medium of said frame, means comprising a hinge connection at one side of the frame and adjustable devices at the opposite side thereof whereby the frame may be affected to adjust the elevation of said wheel, and an adjustable track for said devices whereby the elevation of the wheel may be controlled during the reciprocatory movements thereof.

11. In a grinding machine, a base member, standards extending upwardly from one end thereof, a bracket extending upwardly from near the other end of said base member, a horizontal shaft journaled and movable axially in said standards, a frame secured from one of its sides to said shaft, a grinding wheel, a horizontal spindle provided for said wheel and journaled in the frame intermediate its width, means operable through the medium of said shaft and the frame to effect axial movements to the wheel, means to rotate the wheel, an adjustable bar provided on said bracket, means carried by the frame at its side opposite to its connection with said shaft and supported by said bar whereby the frame may be tilted and coöperating with said bar to control the elevation of the wheel while being moved axially or otherwise.

12. In a grinding machine, the combination with the machine frame, a work-holding arbor, and means to drive said arbor for rotating the work, of a second frame connected to and supported by the machine frame, jointing devices carried thereby, means to impart reciprocatory movements to the second-named frame, and adjustable means provided for the latter to limit the movements of the second-named frame to present said devices in positions to joint work which is rotated on the arbor.

Signed at Seattle, Washington, March, 1916.

HARRY B. ROSS.