

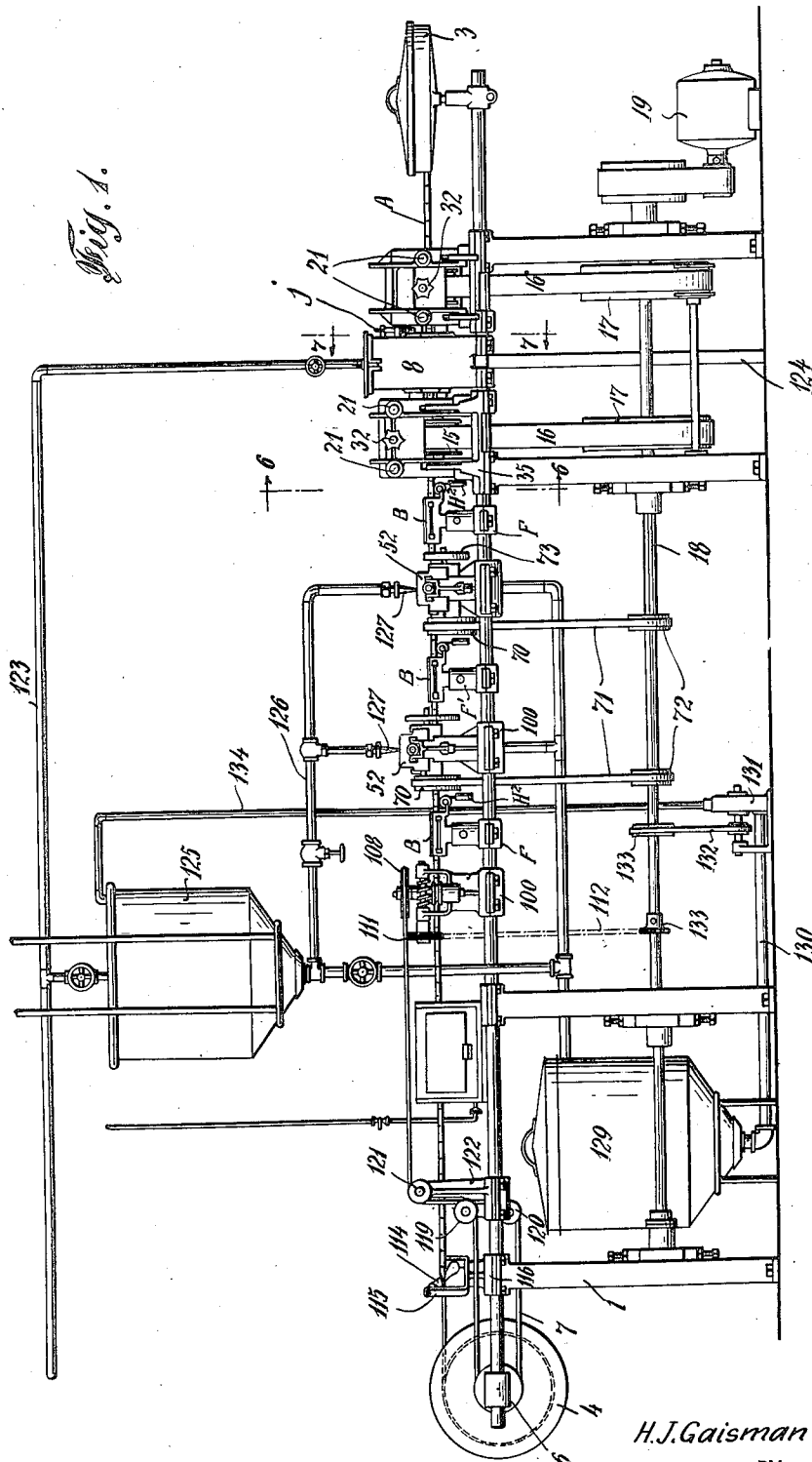
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H. J. GAISMAN ET AL
METAL SHARPENING MACHINE

Filed May 1, 1924

12 Sheets-Sheet 1



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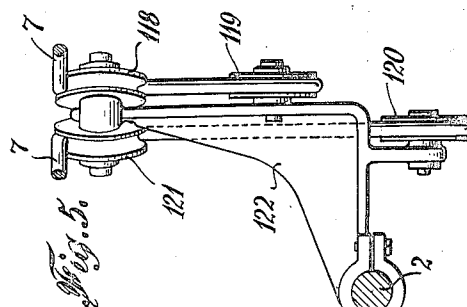
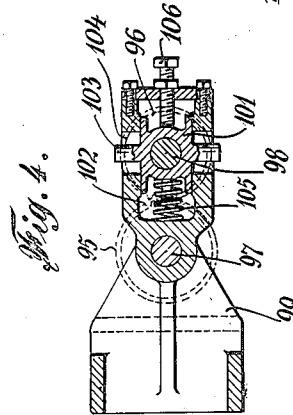
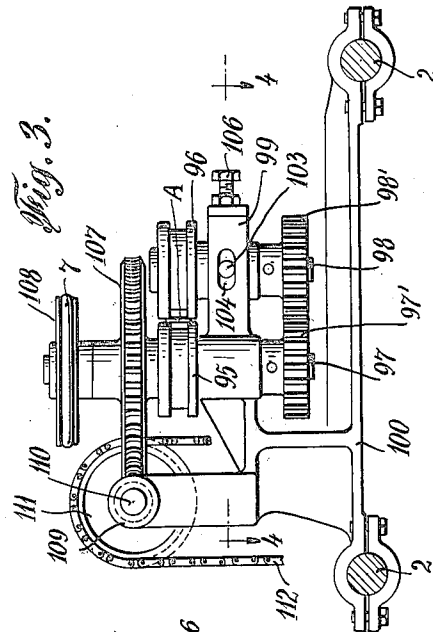
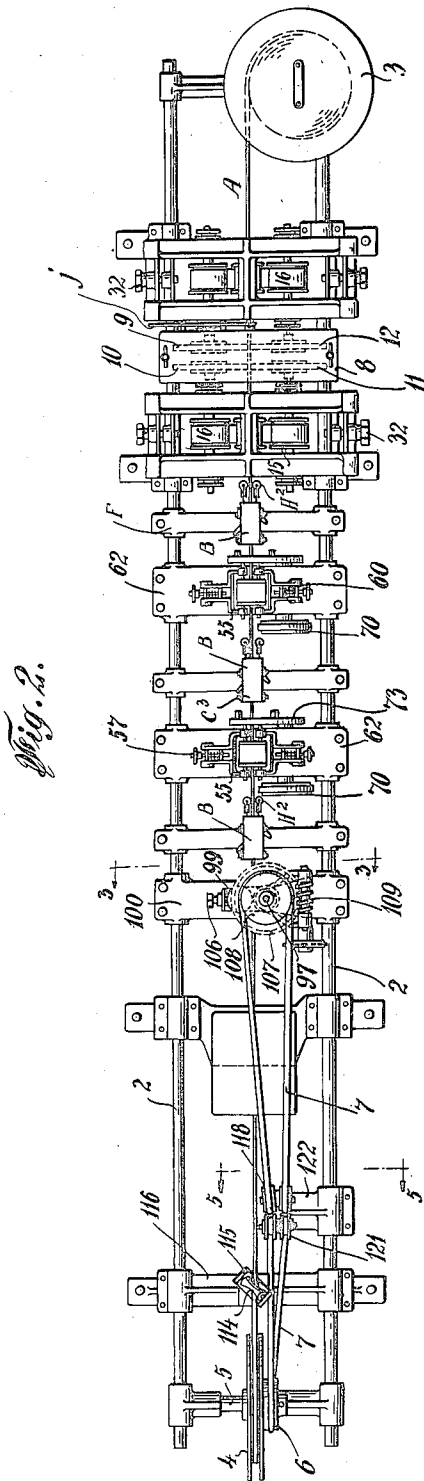
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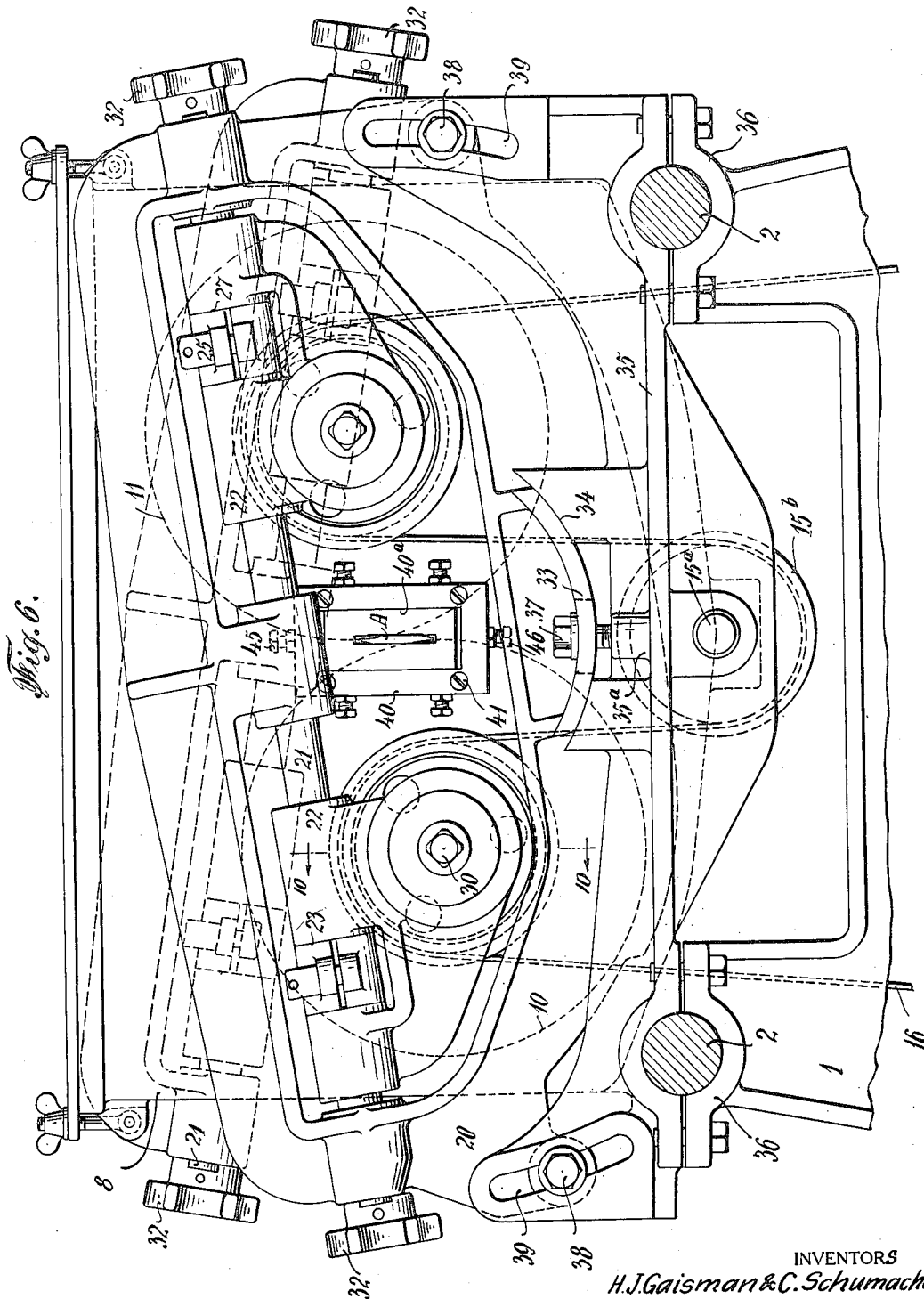
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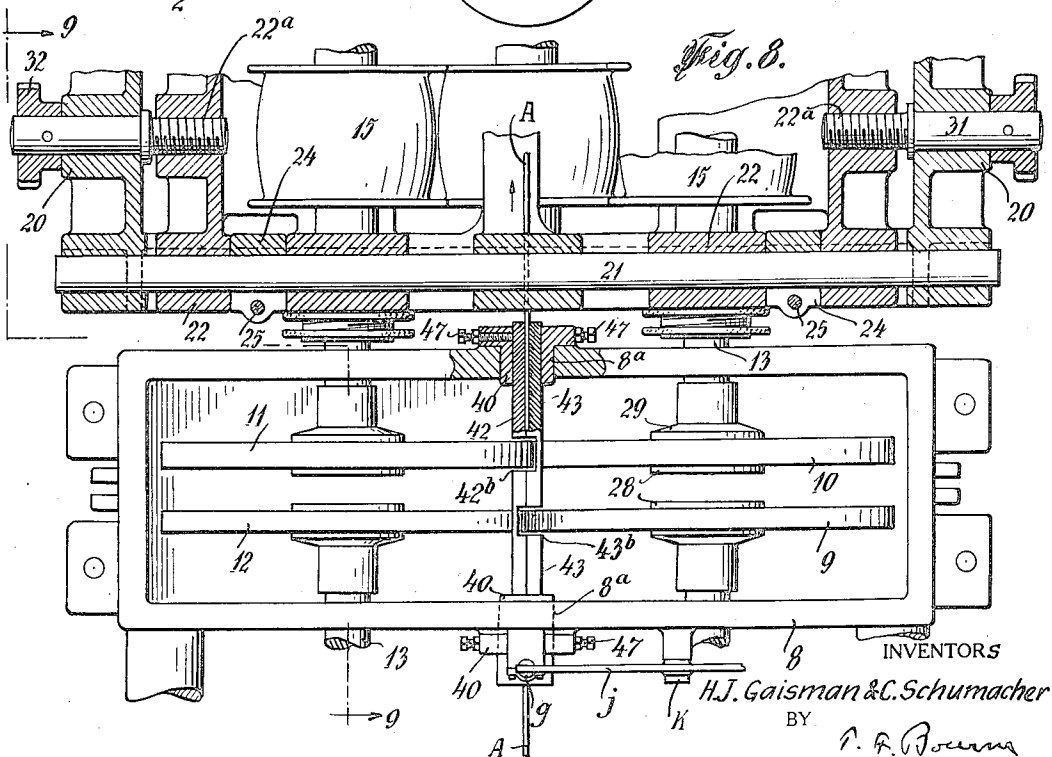
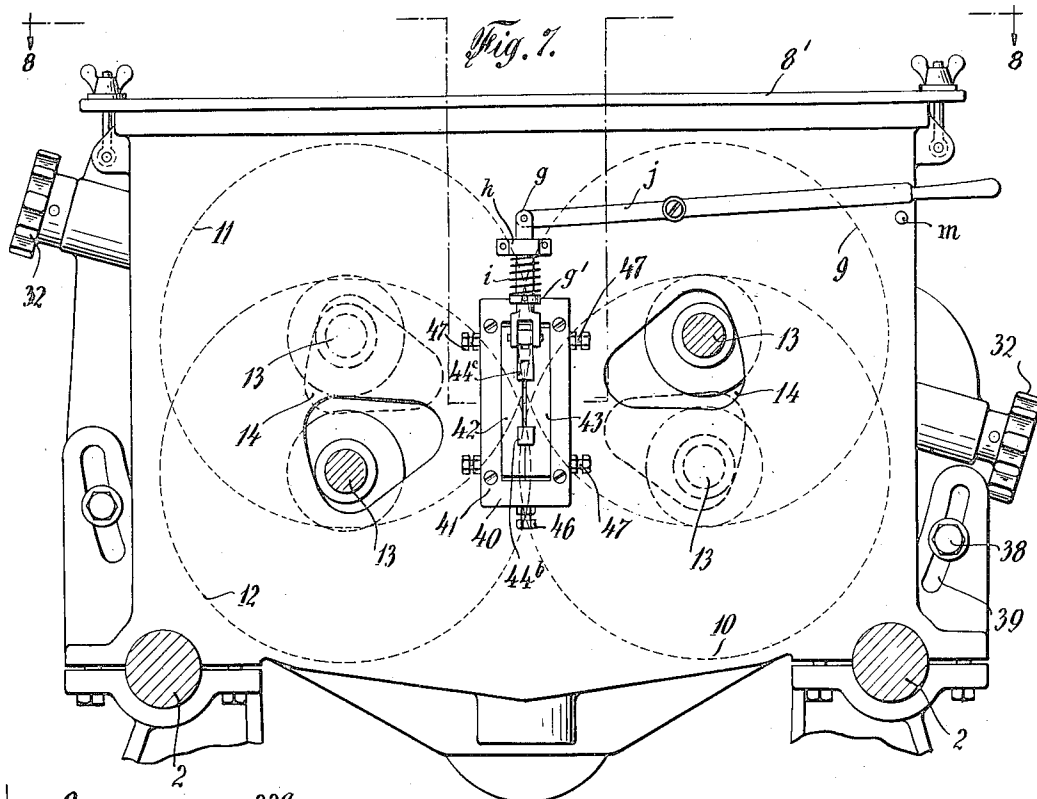
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12 Sheets-Sheet 4



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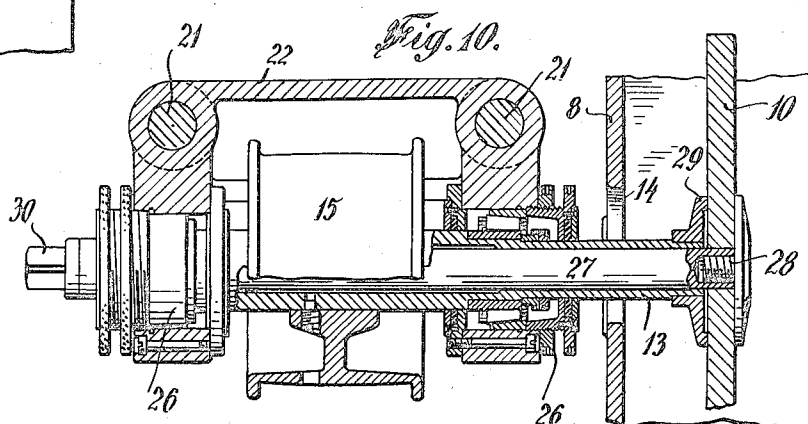
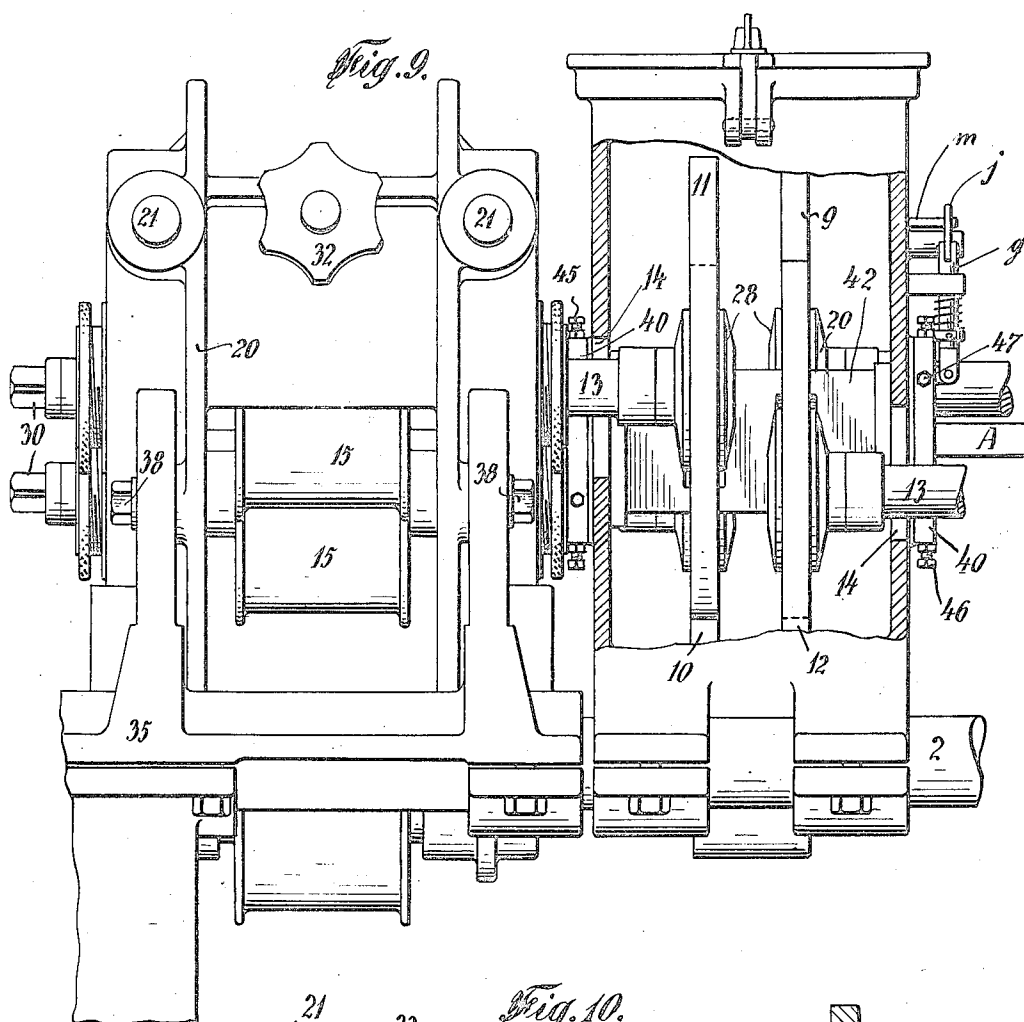
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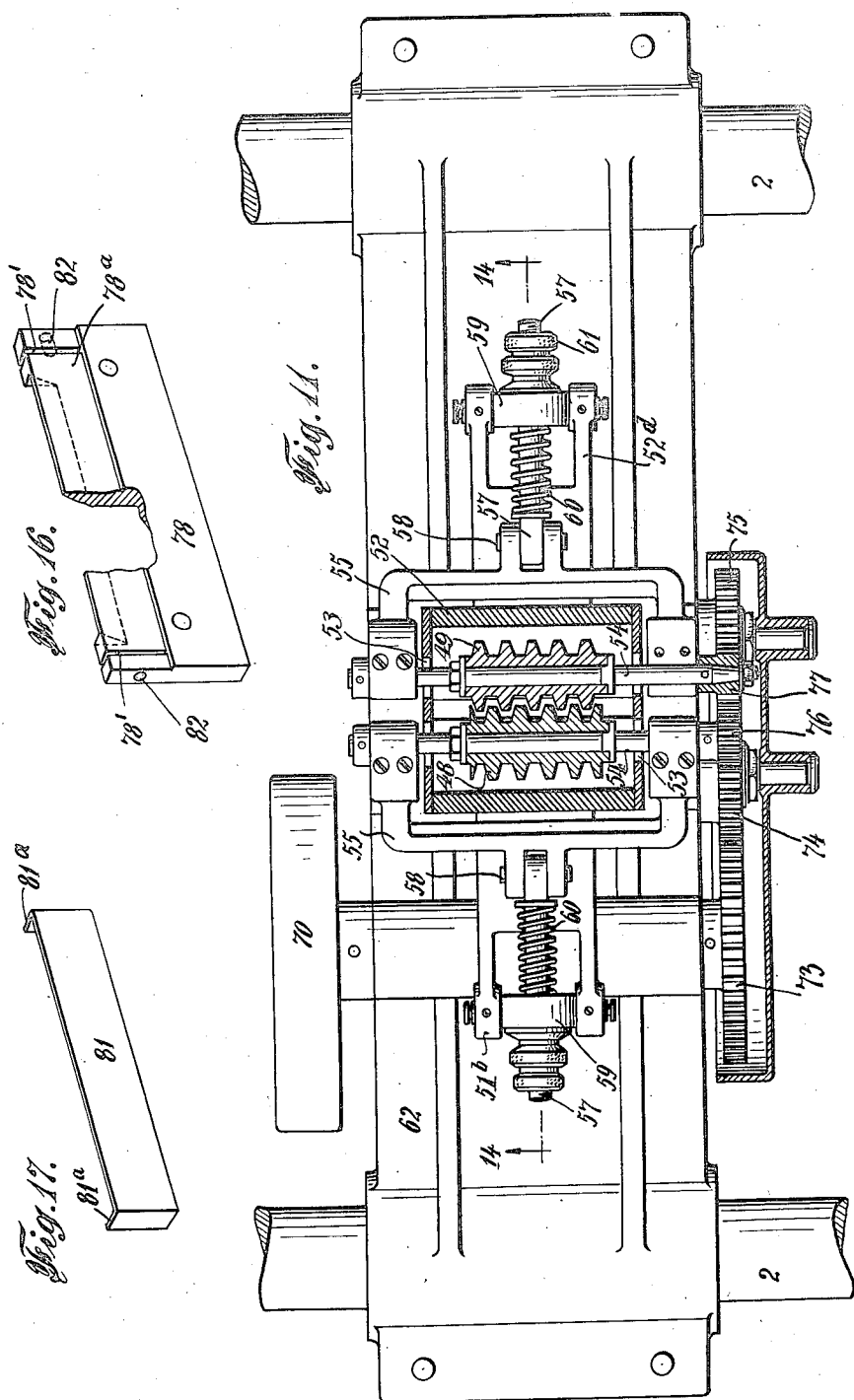
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METAL SHARPENING MACHINE

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Fig. 13.

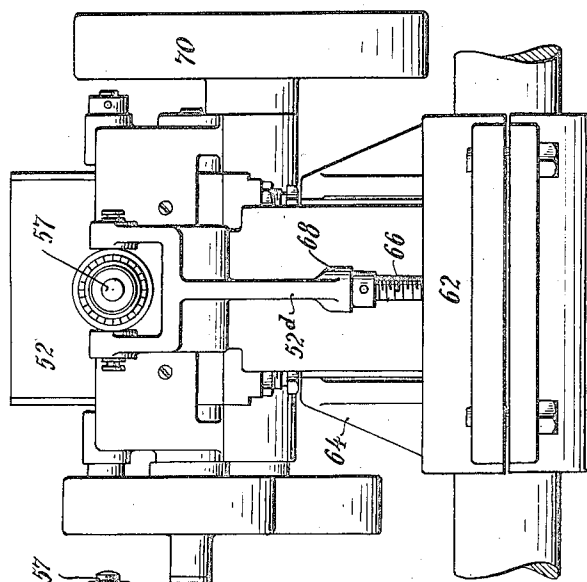
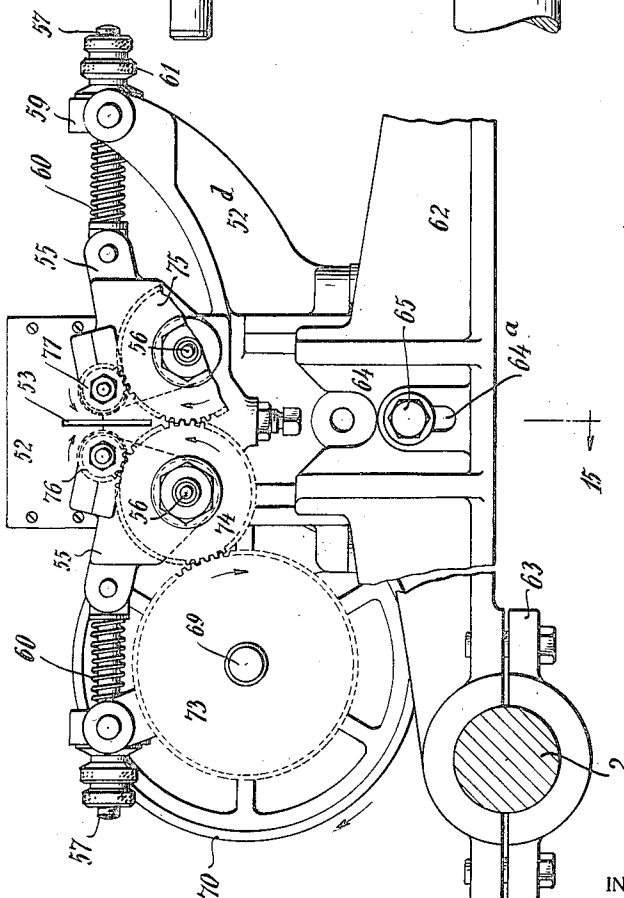


Fig. 12.



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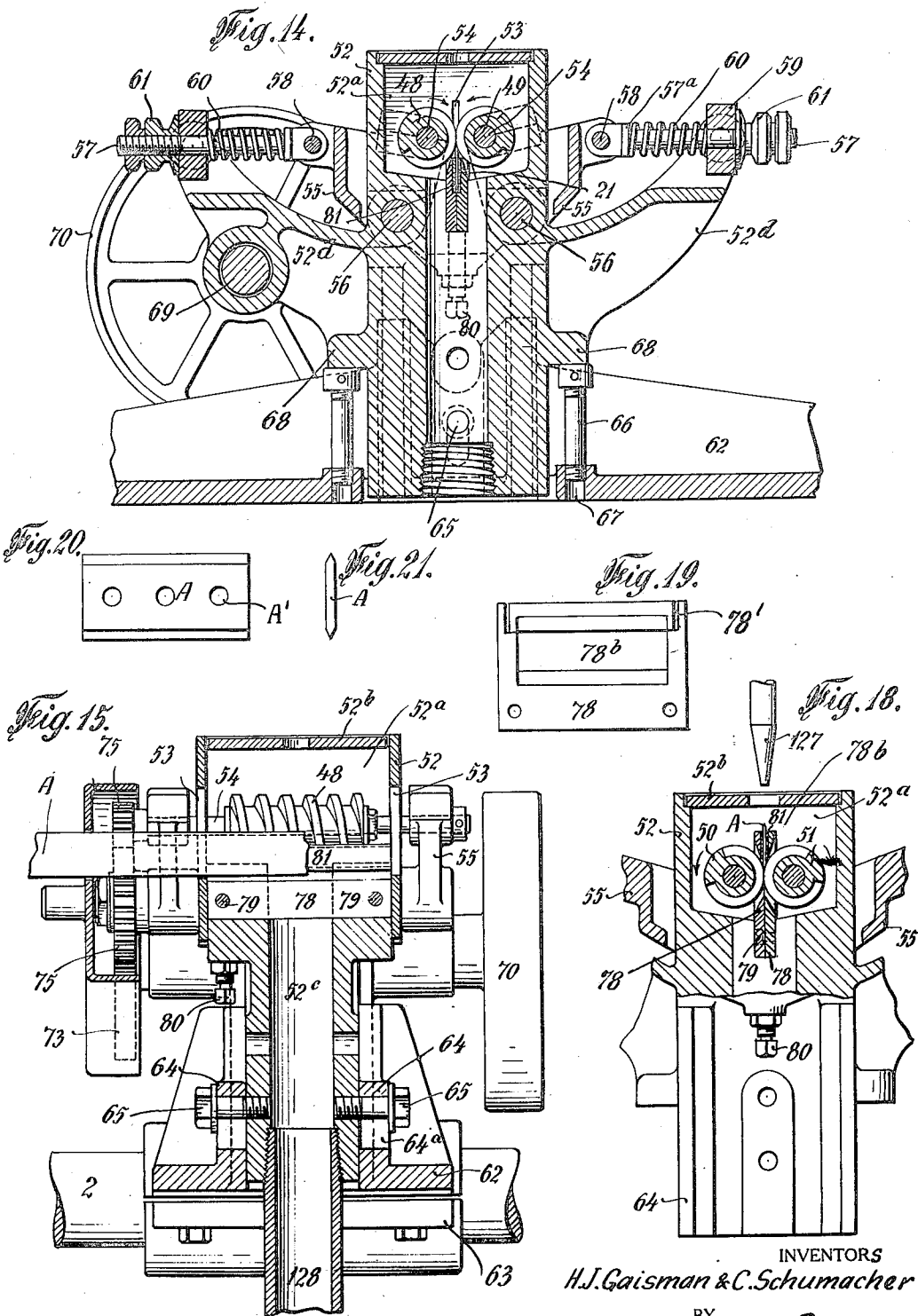
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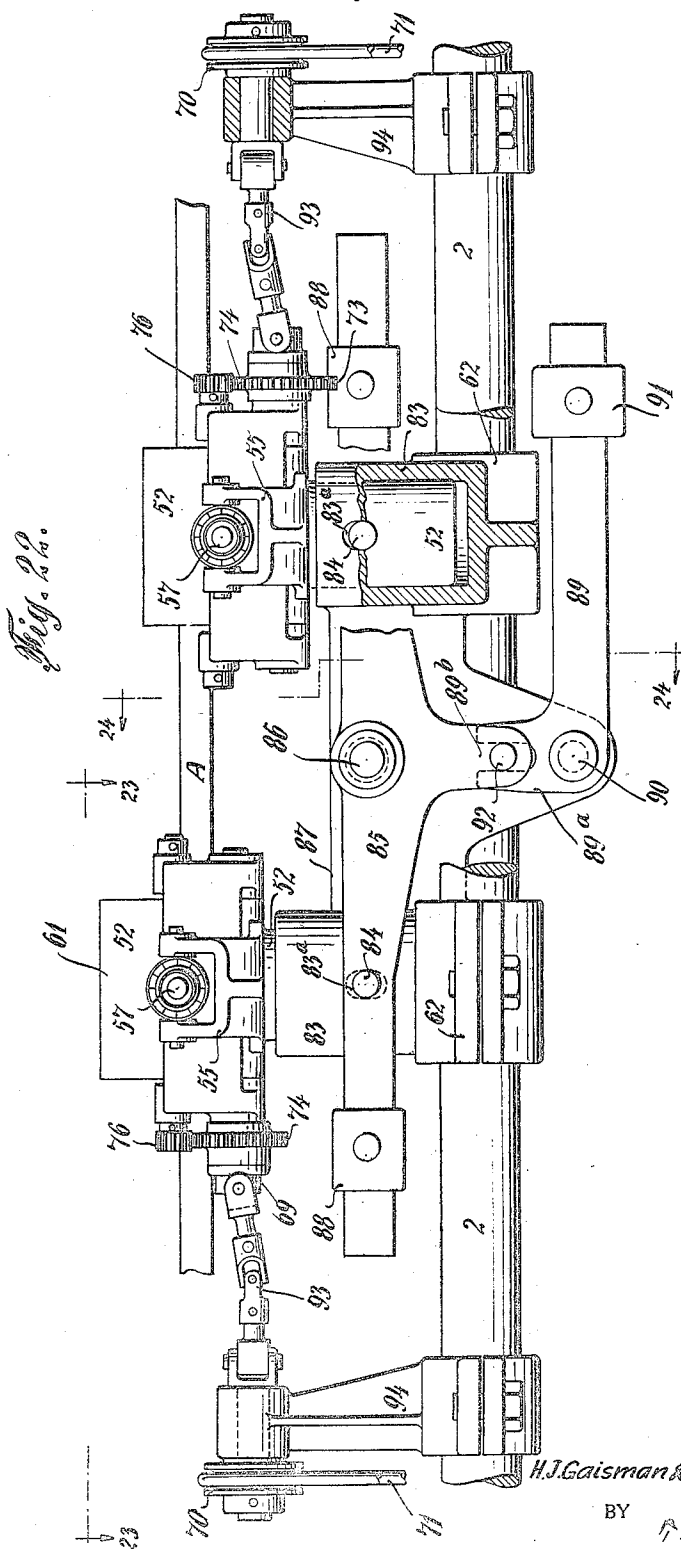
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12 Sheets-Sheet 9



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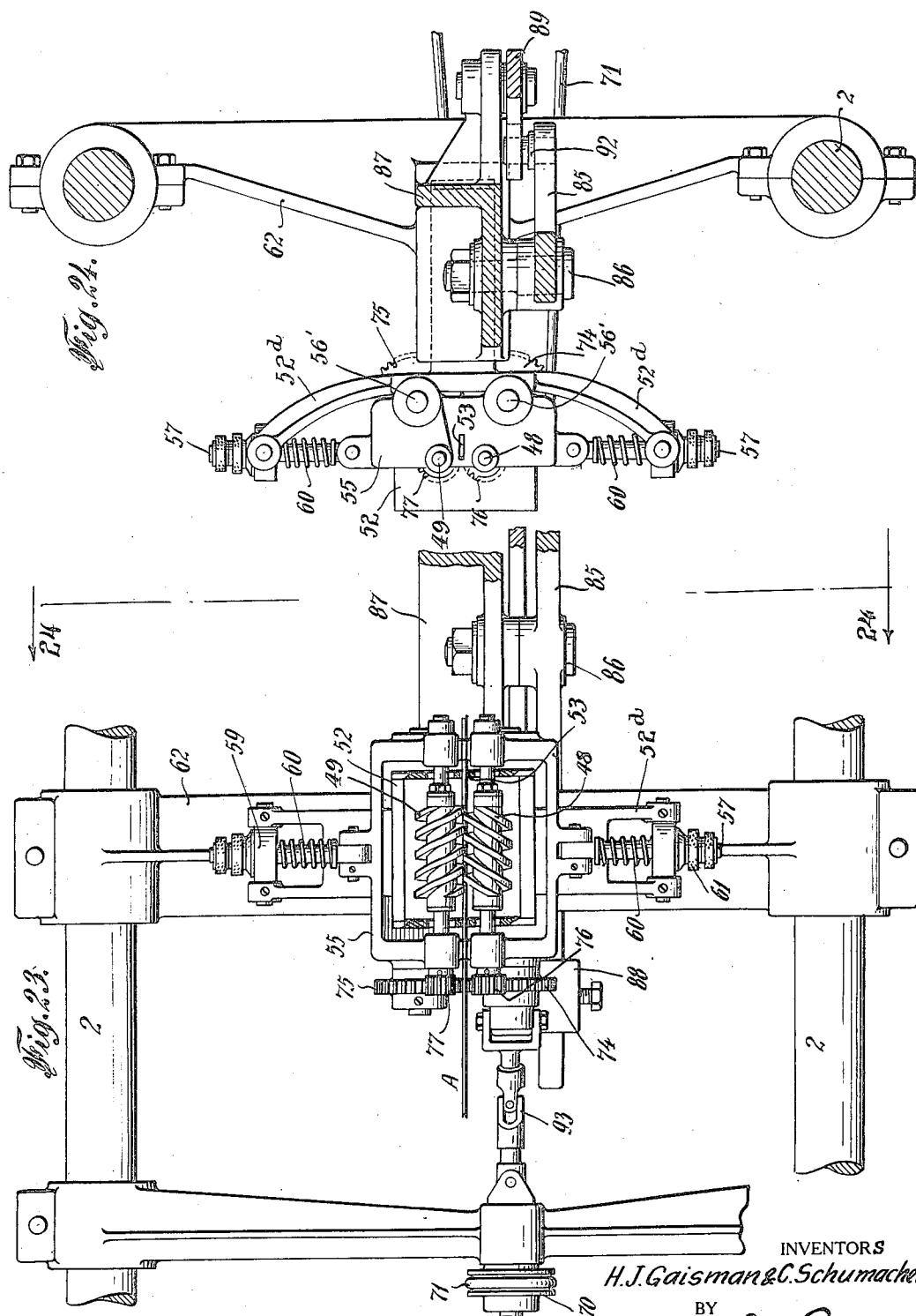
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12 Sheets-Sheet 10



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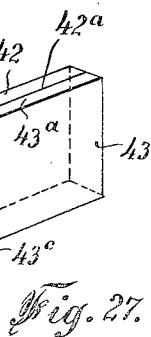
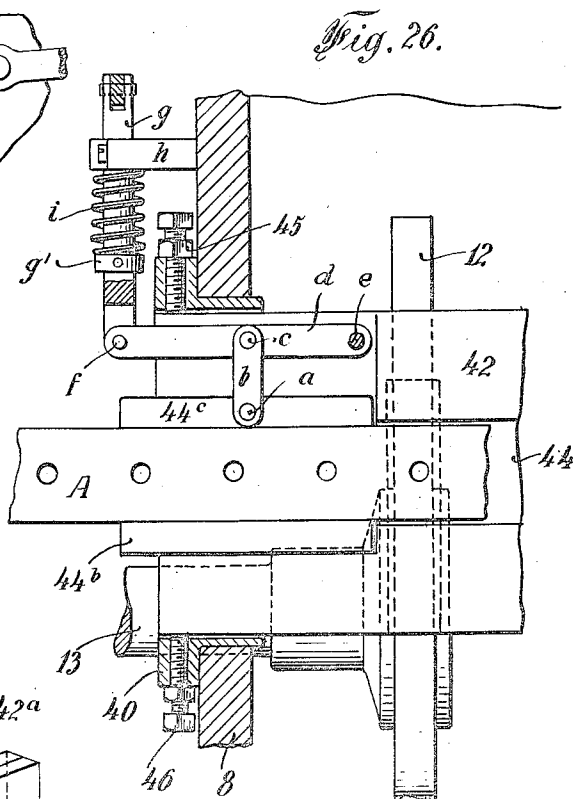
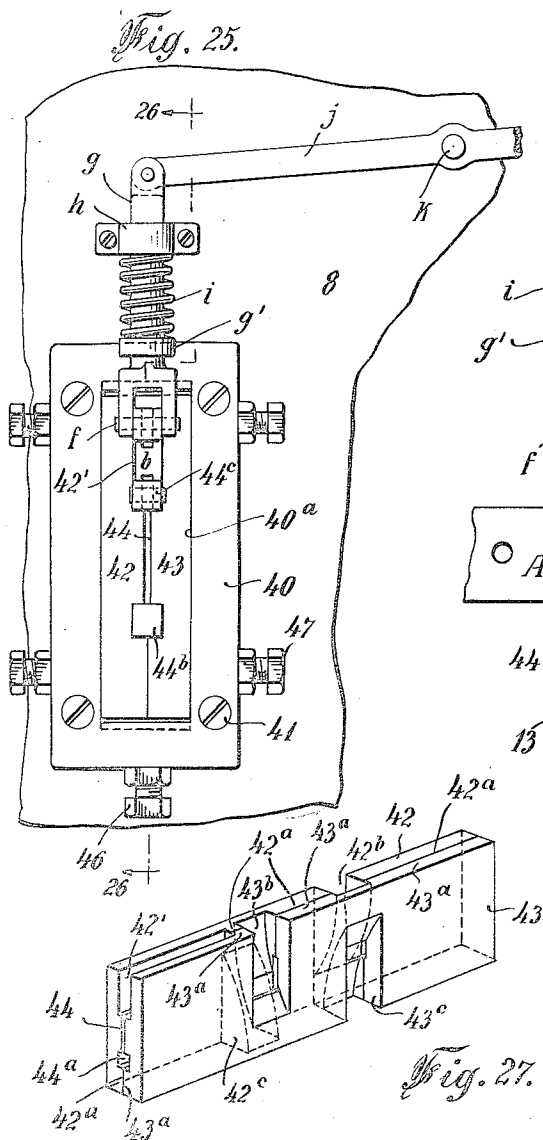
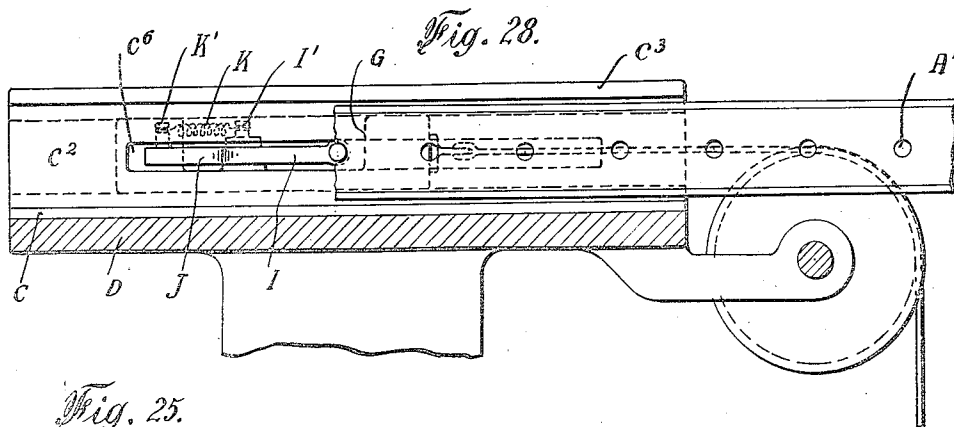
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METAL SHARPENING MACHINE

Filed May 1, 1924

12 Sheets-Sheet 11



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UNITED STATES PATENT OFFICE.

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METAL-SHARPENING MACHINE.

Application filed May 1, 1924. Serial No. 710,270.

This invention relates to improvements in machines adapted to grind and hone the edges of strips of metal. The invention is particularly adapted for sharpening the edges of metal strips adapted to be cut into pieces to serve as safety razor blades, and the invention embodies means for simultaneously grinding and honing opposite edges of the metal strip to provide blades of the so-called double-edge variety.

In carrying out the invention as illustrated in the accompanying drawings the machine is provided with grinding disks or rolls set in such relative positions that an adjacent pair of disks will grind simultaneously opposite sides diagonally disposed of a metal strip passing between the disks, and the machine is also provided with means for honing ground edges of the strip, such means being so arranged that one set of honing members will simultaneously hone along one ground edge and another set of honing members will simultaneously hone along the other ground edge of the metal strip.

The invention comprises novel details of improvement that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part hereof, wherein Fig. 1 is a side elevation of a machine embodying the invention;

Fig. 2 is a plan view of the machine;

Fig. 3 is a section on line 3, 3, in Fig. 2;

Fig. 4 is a section on line 4, 4, in Fig. 3;

Fig. 5 is a section on line 5, 5, in Fig. 2;

Fig. 6 is an enlarged view taken on the section line 6, 6, in Fig. 1, looking in the direction of the arrows;

Fig. 7 is a corresponding view on the line 7, 7, in Fig. 1;

Fig. 8 is a view partly in plan and partly in section on the irregular line 8, 8, in Fig. 7;

Fig. 9 is an elevation partly in section on line 9, 9, in Fig. 8;

Fig. 10 is a detail section on line 10, 10, in Fig. 6;

Fig. 11 is a partly sectional plan view enlarged, illustrating honing devices;

Fig. 12 is a side view of part of Fig. 11;

Fig. 13 is a side view of Fig. 12;

Fig. 14 is a section on line 14, 14, in Fig. 11, illustrating the honing rolls in position

to hone the upper ground edge of metal strips;

Fig. 15 is a section on line 15, 15, of Fig. 12;

Fig. 16 is a partly broken detail of guiding means for the strip for the honing rolls of Fig. 14;

Fig. 17 is a perspective detail of a facing for the guiding means of Fig. 16;

Fig. 18 is a detail cross section similar to Fig. 14 but illustrating a set of honing rolls in position to hone the lower edge of the ground metal strip;

Fig. 19 is a detail of part of Fig. 18;

Figs. 20 and 21 are details of the sharpened metal strip;

Fig. 22 is a partly sectional side elevation illustrating means for supporting the honing rolls in a resilient way for operating upon the ground edges on opposite sides of the metal strip;

Fig. 23 is a plan view taken along the line 23, 23, in Fig. 22;

Fig. 24 is a detail section on line 24, 24, in Fig. 22;

Fig. 25 is an enlarged face view of strip guiding means;

Fig. 26 is a section on line 26, 26, in Fig. 25;

Fig. 27 is a perspective detail of a strip guide;

Fig. 28 is a partly sectional side view of strip guiding means;

Fig. 29 is a horizontal section of Fig. 28;

Fig. 30 is a side elevation of Fig. 29;

Fig. 31 is a detail cross section on line 31, 31, of Fig. 30, and

Fig. 32 is a section on line 32, 32 of Fig. 31.

Similar numerals of reference indicate corresponding parts in the several views.

The main frame 1 of the machine may be of any suitable construction and is shown provided with spaced rods 2 fitted longitudinally along opposite sides of the machine upon which fixed parts are mounted. At A is a strip of metal, such as of steel, suitable for the production of razor or other blades, which strip is supplied in a coil on a reel within a casing 3 suitably carried by the main frame in a well known way. The strip is led through the machine to a take-up reel 4 detachably carried upon the shaft 5 shown journaled on rods 2 in a well known way,

(Fig. 2). The shaft or reel 4 is shown provided with a pulley 6 operated by a belt 7. Means for actuating belt 7 will be hereinafter described.

5 In the example illustrated in the accompanying drawings means are provided to grind the opposite sides of each of the longitudinal edges of strip A as the latter travels through the machine. Within a suitable protecting casing 8 secured upon the main frame, and preferably having a removable cover 8', (Fig. 7), grinding disks 9, 10, 11 and 12, of carborundum or other suitable material, are rotatively disposed in pairs for grinding the appropriate edges of strip A. Each pair of disks is diagonally disposed respecting strip A so as to grind along diagonally opposite edges of the strip. In the arrangement illustrated, as indicated in dotted lines in Fig. 7, the pair of disks 10 and 11 grind on diagonally disposed edges of strip A and the pair of disks 9 and 12 grind on the remaining other diagonally disposed edges of said strip, the pairs of grinding disks being suitably spaced apart, as indicated in Figs. 8 and 9. The casing 8 is provided with slots 8^a on opposite sides for the passage of strip A, (Fig. 8). Each of the disks is carried by a corresponding shaft 13 that extends through a corresponding opening 14 within the appropriate side wall of casing 8. Such shafts are shown provided with corresponding pulleys 15 receiving belts 16 from pulleys 17 on main drive shaft 18 journaled in the main frame 1, which shaft 18 may be rotated by an electric motor 19, or in any suitable way. The shafts 13 of each pair of disks, at their disk-supporting ends, are spaced apart, (Fig. 8), and each pair of shafts is movably supported for lateral adjustment toward and from each other, so that the corresponding pair of disks may be caused to operate as desired upon diagonally opposite edges of strip A for grinding said edges. Each pair of shafts 13 are similarly supported on opposite sides of casing 8, and as the arrangements are the same for each pair of grinding disks the description of one will suffice for both. An adjustable frame 20 is provided with diagonally disposed spaced rods 21, (Figs. 1, 6 and 8), upon which blocks 22 are mounted for sliding adjustment, each of which blocks supports a shaft 13. In suitable spaces 23 in the blocks 22 clamp-members 24 are mounted upon rods 21, which clamp members are shown split and provided with screws 25 for clamping them securely upon said rods, (Figs. 6 and 8). The shafts 13 are shown journaled in anti-friction bearings 26 carried by the blocks 22, (Fig. 10). Since the grinding disks are relatively close together and may require replacement, means are provided to permit removal and replacement of the disks without disturbing the corresponding shaft 13 in its bearings. As

shown in Fig. 10, shaft 13 is hollow and contains a rod 27 threaded at one end to receive screw 28 bearing against the outer surface of the corresponding grinding disks to force the latter securely against flange 29 on shaft 13, the opposite end of rod 27 being retained securely within shaft 13 by screw 30. Each block 22 is shown threaded at 22^a receiving corresponding screw 31 that projects through the appropriate part of frame 20 and is provided with a finger piece or button 32 for operating the corresponding screw, (Fig. 8). By loosening clamp 24 and rotating screw 31 the corresponding block 22 may be adjusted along its rods 21 to adjust the corresponding disk radially to set the operating edge of said disk respecting the edge of strip A to be ground, and then by tightening clamp 24 the grinding disk will be retained in set position. The frame 20 may be adjusted angularly to simultaneously present the corresponding pair of grinding disks in angular relation to the plane of travel of strip A, hence angularly respecting the diagonal edges of strip A to be ground. The frame 20 is shown provided with a curved ledge or projection 33 adapted to rest upon a curved supporting part 34 of a brace or bracket 35 secured upon rods 2 of the main frame by clamping straps 36, (Fig. 6). A screw 37 passing through a slot in projection 33 and threaded in a projection 35^a of brace 35 serves to secure frame 20 in set position, which frame may be further secured by means of bolts 38 carried by frame 20 and operative in slots 39 in brace 35 for securing frame 20 in set position, (Fig. 6).

Each pair of shafts 13 with their corresponding grinding disks are supported by a corresponding frame 20, and each frame with its shafts and grinding disks is angularly or diagonally disposed with respect to the plane of the strip A passing through the machine on edge, one pair of grinding disks being disposed at an angle to strip A differing from the angular disposition of the other pair of grinding disks respecting said strip, (Fig. 7). It will be understood that by adjusting the frame 20 of either pair of disks the edges of the latter may be set in desired position to grind corresponding diagonally disposed edge portions of the strip. While the upper and lower disks 9 and 12 of one pair will grind upper and lower diagonally disposed side portions of the strip A along its edges, the other pair of upper and lower disks 11 and 10 will grind the other two diagonally disposed side portions of said strip along its edges, with the result that when the strip passes beyond the pairs of disks its upper and lower edges will have been ground on both sides. (see Figs. 20 and 21.) The engagement of the grinding disks with the corresponding edges of the strip A may be additionally adjusted by

operating the corresponding screw 31, so that, in addition to the adjustment of the disks to engage the strip by setting the corresponding frame 20 in desired angular relation, a further and final adjustment of either disk respecting strip A may be effected to set the appropriate grinding disk in proper operating relation to the blade edge.

In order to guide and brace the strip A adjacent to the points of contact of the grinding disks therewith a retaining frame 40 is placed in each of the openings 8^a of casing 8 and secured by means of screws 41, (Figs. 6, 7, 8 and 25), which frames have vertically disposed slots 40^a in which are located opposing plates 42, 43 that extend through casing 8 from its side walls. The plates 42, 43 are recessed and spaced at 44 on their opposing surfaces to permit the strip A to slide therebetween, (Figs. 25 and 27). Said plates are retained in adjusted position respecting strip A by means of upper and lower screws 45, 46 which determine the vertical position of the plates within slots 40^a, and the plates are held pressed together by means of laterally disposed screws 47, which screws operate in frame 40, the screws 47 bearing against the sides of the plates, the walls 42^a, 43^a of the plates abutting and bearing firmly together providing the space at 44 for the passage of strip A. The plate 42 is recessed on its upper and lower portions at 42^b, 42^c, and the plate 43 is correspondingly recessed at its lower and upper portions 43^b, 43^c, (Fig. 27), such recesses being in position to admit the adjacent edges of the corresponding grinding disks 9, 10, 11, 12 to operate against the corresponding upper and lower edges of strip A, (Fig. 28). At the end of the plates 42, 43, where the strip A enters casing 8, just under the recess 44, said plates are oppositely recessed to provide the space 44^a in which a hardened metal block 44^b is located and clamped by the plates, on which block the lower edge of strip A slides, (Figs. 25, 26 and 27). To retain the strip A pressed downwardly upon the block 44^b an adjustable resiliently pressed block 44^c bears upon the strip and is guided in a recessed portion 42' between the plates 42, 43 above block 44^b, (Figs. 25, 26 and 27). The block 44^c is pivotally connected at *a* with a link *b*, centrally disposed along said block, which link is pivotally connected at *c* with an arm *d* pivotally supported at *e* between the plates 42, 43, which arm is pivotally connected at *f* with a rod *g* having a fork at its lower end receiving said arm and pivot, (Figs. 7, 25 and 26). The rod *g* is reciprocative in a guide bracket *h* projecting from casing 8, and a coil spring *i* bears against said bracket and against stop *g'* on rod *g* tending normally to force the block 44^c against strip A. A lever *j* is pivotally

supported at *k* upon casing 8, the inner end of said lever being pivotally connected with rod *g* and the outer end of the lever is in position to be manipulated. When the parts are in the position shown in Fig. 7, during operation of the machine, the block 44^c is resiliently pressed by spring *i* against strip A and said block may tilt as may be required according to the travel of the strip. When it is desired to insert a new strip, or for other purposes, the outer end of lever *j* may be depressed and retained by pin *m* on casing 8, whereupon rod *g* and arm *d* will be raised to correspondingly lift block 44^c. By the means described the strip A will be properly guided between the grinding disks at the portion of the strip between plates 42, 43, and since the disks of each pair operate on opposite sides of the strip the latter will retain its proper position to receive the grinding disks.

After the edges of strip A have been suitably ground the ground edges are presented to honing rolls. A pair of honing rolls 48, 49 are adapted to operate along the upper ground edges of strip A, (Fig. 14), and a pair of honing rolls 50, 51 similarly arranged are adapted to operate upon the lower ground edges of strip A, (Fig. 18), therefore one pair of honing rolls is located at a higher level than the other pair with the strip A traveling in the space between said pairs of rolls. The honing rolls may be made of metal or other suitable material designed to finish the edges of strip A suitably for use as a razor or other blades when the honed strip A has been cut into suitable lengths for such blades, as indicated in Fig. 20. Said pairs of honing rolls are arranged and operate in substantially the same way, hence the description of one pair will suffice for both. Each pair of rolls is shown located within a corresponding chamber 52^a in a protecting head 52 carried upon the main frame. Each head is provided with vertical slots 53 at opposite ends for the passage of strip A, (Figs. 12 and 15). Each head 52 is mounted for vertical adjustment, and the corresponding honing rolls are mounted for adjustment toward and from the ground edges of strip A. The shafts 54 of the honing rolls are journaled in corresponding frames 55 which are respectively pivotally supported upon shafts 56 carried by the corresponding head 52, whereby the honing rolls 48, 49, and correspondingly the honing rolls 50, 51, are independently adjustable toward and from the opposite respective ground edges of strip A. Each frame 55 is resiliently retained so that the corresponding honing rolls may bear resiliently against the strip A, for which purpose rods 57 are pivotally connected with said frames at 58, (Figs. 11 and 14), and pass freely through guide blocks 59 jour-

naled on arms 52^a respectively of heads 52. Springs 60 interposed between stops 57^a on rods 57 and against the blocks 59 resiliently press corresponding honing rolls against strip A and resist lateral movement of said rolls. The rods 57 are retained in set position by nuts 61 thereon permitting said rods to slide in blocks 59, whereby adjustment of the honing rolls with respect to the corresponding ground edge of strip A may be made.

The heads 52 are adjustable in the plane of the width of strip A; a brace or bracket 62 carried upon the rods 2 and extending across the machine frame serving to support the corresponding head 52. Straps 63 secure the braces or brackets 62 to the rods 2 in set position, (Figs. 12 and 15). The braces 62 have spaced slotted jaws 64 between which the corresponding head 52 is located, screws 65 passing through the slots 64^a enabling vertical adjustment and retention of heads 52, (Fig. 15). Adjusting screw 66 meshing within threads in apertures 67 in braces 62 and bearing against abutments 68 on the corresponding head 52 enable adjustment of said heads vertically as well as angularly with respect to screw 65 and as to the travel of strip A for centering the heads respectively said strip, (Figs. 13 and 14).

The rolls 48, 49 rotate in the direction of the arrows in Fig. 14, and the rolls 50, 51 rotate in the direction of the arrows in Fig. 18. Means for rotating said rolls comprise shaft 69 journaled in bearings upon an arm 52^a, the shaft being provided with pulley 70 receiving corresponding belt 71 from the appropriate pulley 72 on drive shaft 18, (Figs. 1 and 11). Each shaft 69 is provided with a gear 73 in mesh with gear 74 on one shaft 56, the gear 74 being in mesh with a gear 75 on the other shaft 56, (Fig. 12). The shafts of the honing rolls are respectively provided with pinions 76, 77 in mesh with the corresponding gears 74, 75, (Fig. 12), whereby the honing rolls 48, 49 will be rotated in the direction of the arrows in fig. 12. Corresponding gearing is appropriately arranged for rotating the honing rolls 50, 51 in the direction of the arrows in Fig. 18. In other words, the pairs of honing rolls respectively rotate in such a way that their operating edges advance toward the corresponding ground edges of strip A. The honing rolls are shown longitudinally disposed in the direction of the travel of strip A and provided with spirally disposed or worm-like honing surfaces which operate against the corresponding previously ground edge of strip A with an advancing or so-called wiping action, substantially equivalent to the advancing and sliding angular strokes given to razor blades when being manually honed.

In order to retain the strip A with its ground edges in position to be honed by the

honing rolls guides for the strip are provided as follows: Two plates 78 are secured together, as by screws 79, (Figs. 14, 15, 16 and 18), which plates are supported within the corresponding head 52 by means of screws 80 in position for the passage of strip A between the plates. The opposing surfaces of the plates are recessed longitudinally at 78^a to receive hardened facing strips 81, (Figs. 16 and 17), the ends of which strips are bent laterally at 81^a and inserted in grooves 78^b in the corresponding plate 78, pins at 82 securing the facings to the plates. In the construction shown in Fig. 14, where the upper ground edge of strip A is exposed to the honing rolls 48, 49, the plates 78 do not extend above said edge, whereas in the form shown in Fig. 18, where the honing rolls 50, 51 operate against the lower ground edge of strip A, the plates 78 are made sufficiently high to accommodate openings 78^b for the entrance of said rolls, the facings 81 being above said rolls, so that the lower ground edge of strip A may extend into the spaces provided at 78^b for honing the lower ground edge of strip A.

Instead of having the heads 52 rigidly supported, in manner before described, said heads may be movably supported and balanced so as to automatically touch strip A and vibrate as may be necessary in case the edges of the strip should not be perfectly straight or the strip be irregular in width where it passes between a pair of honing rolls. Means for such purpose are shown in Figs. 22, 23 and 24 arranged as follows: Each head 52 is vertically slidable in a corresponding guide 83 supported by the respective brace 62. The heads 52 have pins 84 projecting through slots 83^a in guides 83, which pins enter lever 85, centrally pivoted at 86 upon an arm 87 carried by one of the braces 62, which lever is provided with adjustable counter weights 88 to balance the parts, (Fig. 22). A balancing beam or arm 89 is pivotally supported at 90 upon arm 87 and is provided with an adjustable counterweight 91, the upper arm 89^a of said beam or lever being shown slotted at 89^b to receive a pin 92 extending from lever 85 and eccentrically disposed respecting the axis of said lever at 86. A shaft 56' is provided with a universal joint 93, (Fig. 22), connecting with the shaft of the corresponding pulley 70 that is journaled upon bracket 94 carried by one of the rods 2, (Fig. 22). There is a corresponding universal joint 93 for a shaft 56' of each pair of honing rolls. The arrangement described is such that the weights 88 and 91 will be set in such a way that the corresponding honing rolls will operate against strip A in a flexible manner but with sufficient pressure, lateral resilient resistance being afforded by the springs 60, as before de-

scribed. Should the strip A passing between the honing rolls be deflected or not be straight when encountering one or another of the honing rolls the latter may move or float with respect to the strip to accommodate the same, since the lever 85 may tilt appropriately, the balancing weights always tending to restore lever 85 and the honing rolls to the normal operative position, whereby to avoid the objection that the honing rolls might not operate upon some parts of the strip A. The beam 89 serves to resist sudden movements of lever 85 and to steady said lever.

Any suitable means may be provided for propelling strip A through the machine between the grinding disks and the honing rolls. A pair of feed rolls 95, 96 is carried by shafts 97, 98 journaled in bearings on an arm of a bracket 99 carried by a brace 100 supported by rods 2, (Figs. 1, 2 and 3). The shaft 98 is shown adjustable laterally to adjust said roll 96 respecting roll 95. The shaft 98 is shown mounted in a journal box 101 slidable in way 102 in bracket 99, said journal box having pins 103 projecting through slots 104 in bracket 99, (Figs. 3 and 4): A spring 105 in way 102 bears against bracket 99 and against journal box 101, which spring is opposed by an adjusting screw 106, whereby the position of roll 96 respecting roll 95 may be adjusted for creating the desired pressure upon strip A between said rolls for feeding the strip. Shaft 97 is provided with gear 97' meshing with gear 98' on shaft 98, whereby said shafts will rotate at equal speeds, and shaft 97 is also furnished with a worm gear 107 and with a pulley 108. The gear 107 is in mesh with a worm 109 whose shaft 110 is journaled on bracket 99 and provided with a sprocket wheel 111 receiving chain 112 from sprocket 113 on drive shaft 18, (Fig. 1), whereby the rolls 95, 96 are appropriately driven to feed the strip A at the desired speed.

Means are provided to retain the upper and lower ground edges of the strip in proper relation to the honing rolls as the ground strip travels with relation to said rolls, since the ground and honed edges must not come in contact with any obstructions. Means are shown located on opposite sides of and between the several pairs of honing rolls, such means being indicated generally at B, (Figs. 1 and 2). Since each set of devices at B is similar a description of one set will suffice by reference to Figs. 28 to 32. A guide C extends lengthwise of the machine, the same being shown carried by a support D having a depending extension D' provided with a vertical slot D² receiving a bolt E from an arm F' projecting upwardly from a brace F that extends transversely across the machine and is suitably secured to the longitudinal rods

2. The guide C is shown provided with two parallel guideways C' formed by means of spaced walls C² and a cover plate C³ secured on the guide by screws and having a depending rib C⁴, (Fig. 31). In each of the guideways C' is located a slidable member G which is normally drawn automatically in the direction of the grinding rolls opposite to the direction of travel of strip A. While any suitable means may be provided for drawing the slide members G, as stated, the same are shown connected by flexible connections H that pass over pulleys H' and have weights H² to operate said connections and slide members. The pulleys are shown pivotally supported upon arms H³ extending from support D. Each slide G is shown provided with a dog I that is pivotally supported upon the slide at I'. At the outer or free end the dog is provided with a nose or projection I² adapted to pass through a hole in the ground strip A, a shoulder I³ on the dog stopping the latter against the strip. The strip is shown provided with spaced holes A', between certain of which holes the strip may be severed to produce the blades after grinding and honing the strip. The nose I² is preferably rounded for ready cooperation with the strip and its holes. The guide C and cover C³ are provided with opposing longitudinal slots of sufficient height to permit the strip A to slide therebetween without engaging the ground or honed edges of the material of the guide or the cover plate, (Fig. 31). The walls of the depending rib C⁴ are provided with longitudinal slots C⁵ through which the corresponding dog I may operate, there being a dog I pivotally supported upon each slide member G and oppositely disposed so as separately to cooperate with strip A. The inner end of the dog is provided with a lug or projection I⁴ adapted to cooperate with a trigger or swinging member J that is pivotally supported upon the corresponding slide G at J' and is provided with spaced ears or stops J² adapted to cooperate with a corresponding projection I⁴, (Fig. 29). A spring K is shown connected at one end with the pivot I' and at the opposite end with a pin K' supported at the free or outer end of the trigger J. The outer walls C² of guide C are provided with longitudinal slots C⁶ through which the trigger J projects and said walls are provided with stops or abutments L at opposite ends of slot C⁶ against which the corresponding trigger J may engage, (Figs. 29 and 30).

Since there are two slides G operative independently each carrying a dog I and a trigger J, oppositely disposed with respect to the strip A, the dogs may operate independently with respect to the strip, and such dogs are so arranged that when their noses I² enter a hole A' in strip A they will serve to maintain in or align the strip in a desired

horizontal plane vertically disposed to keep the strip in proper operative relation to the grinding rolls. The slides G with their dogs will be so positioned initially with respect to strip A that one of the dogs will be in advance of the other, as toward the left in Fig. 29, for movement with strip A. Assuming that strip A is moving in the direction of the arrow in Fig. 29, and nearly at the end of the stroke of the upper slide G, the lower dog I will be in engagement with a hole in the strip at the right in Fig. 29. When the trigger J of the dog at the left in Fig. 29 engages the adjacent stop L said trigger will be tilted on its pivot, and during continued travel of slide G with the strip, by reason of the engagement therewith of dog I, the trigger will be gradually tilted until its spring K passes beyond the pivot J', whereupon the trigger will snap quickly to the opposite side and the corresponding projection J² will engage the projection I⁴ and cause the corresponding dog I to be released from the strip, the parts then assuming the position substantially as shown in dotted lines in Fig. 29. Upon release of said dog from the strip the corresponding weight H² will cause the slide with its dog and trigger to move to the right in Fig. 29, free from the strip. During such periods the other dog, being in engagement with a hole in the strip, will be propelled to the left in Fig. 29, until its trigger J is tilted to release the dog from the strip in manner before described. During the aforesaid travel of slide member G to the right with the corresponding dog disengaged from the strip the corresponding trigger J will move into engagement with the companion stop L, (at the right in Fig. 29), whereupon the trigger J will be tilted toward the full line location in Fig. 29, and the corresponding projection J² will engage the projection I⁴ of dog I to move the same toward the strip so that its nose will engage a hole in the strip when the latter next approaches such nose, so that continued travel of the strip will cause such dog to engage and retain the strip in proper position with respect to the honing rolls. The relation and spacing of the parts is such that one of the dogs I will always remain in engagement with a hole in the strip while the other dog is being shifted from or toward the strip, the operation of the two slide members G and the dogs being substantially alternate back and forth. By having a set of the strip-supporting devices as described on opposite sides of each pair of honing rolls assurance is had that the strip will be maintained with its corresponding ground edge in proper relation to a pair of honing rolls.

Since the upper and lower edges of strip A are ground and honed simultaneously it is desirable that the finished strip should be wound upon the take-up reel 4 in a flatwise

direction, so as not to injure the finished edges of the strip. Said take-up reel is shown vertically disposed and strip A is deflected or turned, as it advances, at an angle of 90° to its plane of passage at a point near the delivery end of the machine to cause the strip to wind flatwise on the take-up reel. Any suitable means may be provided for such purpose. A roll 114, in double cone-like form or hollow, is journaled upon a fork 115 supported by a brace 116 carried by rods 2, (Figs. 1 and 2), said roll being located in an angular position respecting the plane of strip A so as to engage the same and turn it to a substantially 90° angle for winding upon the take-up reel 4. The shape of roll 114 is such as not to injure the honed edges of strip A. The belt 7 passes from pulley 108 over suitably disposed idle pulleys 118, 119, 120 and 121 supported by a bracket 122 carried by one of the rods 2 to guide said belt over pulley 6, whereby the take-up reel is rotated in proper timing respecting the grinding and honing rolls, (Figs. 1 and 5).

A pipe 123 may supply water to casing 8 from which casing the water may be drained by a pipe 124 to a sewer, said water serving for cooling the grinding disks and washing away particles resulting from the grinding. Pipe 123 may supply tank 125 from which a pipe leads and is provided with nozzles 127 to discharge water through covers 52^b of the chambers 52^a of the heads 52. Said heads are provided with bores at 52^c, (Fig. 15), communicating with outlet pipe 128 which may lead to a sewer, or to a tank 129 to conserve the water. From tank 129 a pipe 130 leads to a pump 131, (Fig. 1), driven by belt 132 from a pulley 133 on shaft 18. From pump 131 a pipe 134 returns the water to the upper part of tank 125, whereby a circulation of water may be maintained through the chambers 52^a for cooling the honing rolls and strip A and washing away debris.

The strip A having been placed in position in the machine, passing from the reel within casing 3 to take-up reel 4 with the feed rolls 95, 96 adjusted to propel the strip, the grinding disks and the honing rolls will be adjusted in proper relation to the strip. When the machine is started the grinding rolls will first grind along opposite sides of the upper and lower edges of the strip and when such ground edges of the strip travel between the honing rolls the latter will act to hone the upper and lower ground edges of the strip on opposite sides, the grinding disks and honing rolls operating simultaneously upon the strip as it travels. The strip having the honed edges will be wound upon reel 4 and such reel may be removed from the machine and the strip may be cut into any desired lengths for producing razor

blades or the like. By means of the invention described so-called double-edged razor blades may be produced expeditiously from previously hardened steel without requiring the blades to be hardened after they are sharpened, whereby the cost of manufacturing such double-edged blades is minimized.

Having now described our invention what we claim is:

1. A sharpening machine comprising means to guide and propel a strip to be sharpened, a plurality of pairs of grinding disks for the strip located edgewise perpendicularly to the plane of the strip, each pair of disks being diagonal respecting the plane of the strip to engage opposite sides thereof, blocks supporting the grinding disks, means slidably supporting the blocks of each pair of disks including adjustably supported frames for equally adjusting the corresponding pair of disks at the same angle respecting the strip, and means to retain said frames in set position with the corresponding pair of grinding disks in angular relation to the plane of the strip.

2. A sharpening machine comprising means to guide and propel a strip to be sharpened, a plurality of pairs of grinding disks for the strip, a frame for each pair of grinding disks, rods carried by said frames, blocks adjustably supported by said rods, said blocks being provided with bearings for supporting the disks, and means adjustably supporting said frames for adjusting the corresponding disks around the plane of the strip at the same angle respecting the strip.

3. A sharpening machine comprising means to guide and propel a strip, a plurality of pairs of honing rolls, heads rotatively supporting said honing rolls, one pair of honing rolls being supported on a level higher than the other pair, guiding means for the heads, a lever operatively connected with said heads, and balancing means associated with the lever for normally retaining said rolls in operative relation with the corresponding side edges of the strip.

4. A sharpening machine as set forth in claim 3, provided with gearing to rotate the corresponding pair of rolls, a universal joint connected with each gearing, and means to rotate the universal joints.

5. A Sharpening machine comprising grinding disks, means to propel a strip, plates having a space therebetween for a strip, a block between said plates upon which the strip may slide, a block adapted to bear upon the strip, and means resiliently pressing the second named block toward the strip.

6. A sharpening machine comprising grinding disks, means to propel a strip, plates having a space therebetween for a strip, a block between said plates upon which the strip may slide, a block adapted to bear

upon the strip, means resiliently pressing the second named block toward the strip including an arm pivotally connected with the second named block, a spring cooperating with the arm to press the block toward the strip, and means to remove said block from the strip and retain it out of engagement therewith.

7. A sharpening machine comprising grinding disks, means to propel a strip, plates having a space therebetween for a strip, a block between said plates upon which the strip may slide, a block adapted to bear upon the strip, means resiliently pressing the second named block toward the strip including an arm pivotally connected with the second named block, a rod connected with the arm, guiding means for the rod, a spring normally pressing the arm to press the second named block toward the strip, and means cooperative with the rod to move the second named block from the strip and retain it out of operative relation thereto.

8. A sharpening machine comprising sharpening devices for a perforated strip, independent aligning devices operative in the apertures of the strip for maintaining an edge of the strip in cooperative relation to the sharpening devices, and means to cause travel of the strip along the sharpening devices, the aligning devices being located on opposite sides of the strip to operate independently of one another in the apertures of the strip.

9. A sharpening machine comprising honing rolls for a strip, means to propel the strip, and supporting means for the strip movable therewith including means to release the supporting means from the strip.

10. A sharpening machine comprising honing rolls for a strip, means to propel the strip, a reciprocative member provided with means to engage and support the strip while traveling therewith, means to release the first named means from the strip, and means to return said member with its supporting means for re-engagement with the strip.

11. A sharpening machine comprising honing rolls for a strip, means to propel the strip, a reciprocative member operative in the direction of the strip and provided with means to engage and support the strip, means to retain the first named means in connection with the strip and release said means therefrom, spaced stops cooperative with the second named means to cause the first named means to engage and to release the strip, and means to operate said member in the direction opposite to the travel of the strip.

12. A sharpening machine comprising honing rolls for an apertured strip, means to propel the strip, a slide member operative parallel to the strip, a dog pivotally carried by said member and having a nose to engage apertures of the strip, means to cause the dog

to engage and to release the strip, spaced stops to operate said means, and means to propel the member with its dog in a direction opposite to the travel of the strip.

5 13. A sharpening machine comprising honing rolls for an apertured strip, means to propel the strip, a slide member operative parallel to the strip, a dog pivotally carried by said member and having a nose to engage
10 apertures of the strip, a trigger pivotally carried by the slide member and having spaced projections to engage a projection on the dog, a spring cooperative with said trigger and positioned to extend on opposite sides of the
15 pivot of the trigger for retaining the dog in and out of engagement with the strip, spaced stops to actuate the trigger in opposite directions, and means to move the slide member in a direction opposite to the travel of the
20 strip.

14. A sharpening machine comprising honing rolls for a strip, means to propel the strip, and separately and alternately movable means adapted to engage and support
25 the strip and release the same during its travel.

15. A sharpening machine as set forth in claim 14, in which the separately movable means are located on opposite sides of the
30 strip.

16. A sharpening machine comprising honing rolls for a strip, means to propel the strip, slide members on opposite sides of the strip provided with dogs to engage the strip,
35 means to retain the dogs in engagement with the strip and release the dogs from the strip, and means to move said members and dogs automatically in the direction opposite to the travel of the strip.

17. A sharpening machine comprising honing rolls for a strip, means to propel the strip, slide members on opposite sides of the strip provided with dogs to engage the strip, a trigger pivotally carried by each slide member and provided with spaced projections to engage a projection on the corresponding dog, spaced stops for each of the triggers to tilt the latter, a spring connected with each of the triggers normally tending to retain a projection of each trigger in engagement with a projection of the corresponding dog, and means to move the slide members automatically independently in the direction opposite the direction of travel of the strip.

18. A sharpening machine comprising honing rolls for a strip, means to propel the strip, a guide extending along the strip, a slide member on the guide, means normally tending to move the member in the direction opposite to the travel of the strip, the guide having a slot on the side near the strip, a dog pivotally carried by the slide member operative in said slot and having a nose to engage apertures in the strip, said dog having a projection, a trigger pivotally carried by the slide member and having spaced projections to cooperate with the projection of the dog, a side wall of the guide having a slot receiving said trigger, a spring connected with the trigger operative to retain either of its projections in engagement with the projection of the dog to retain the dog in or out of engagement with the strip, and spaced stops positioned to engage the trigger to tilt it.

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