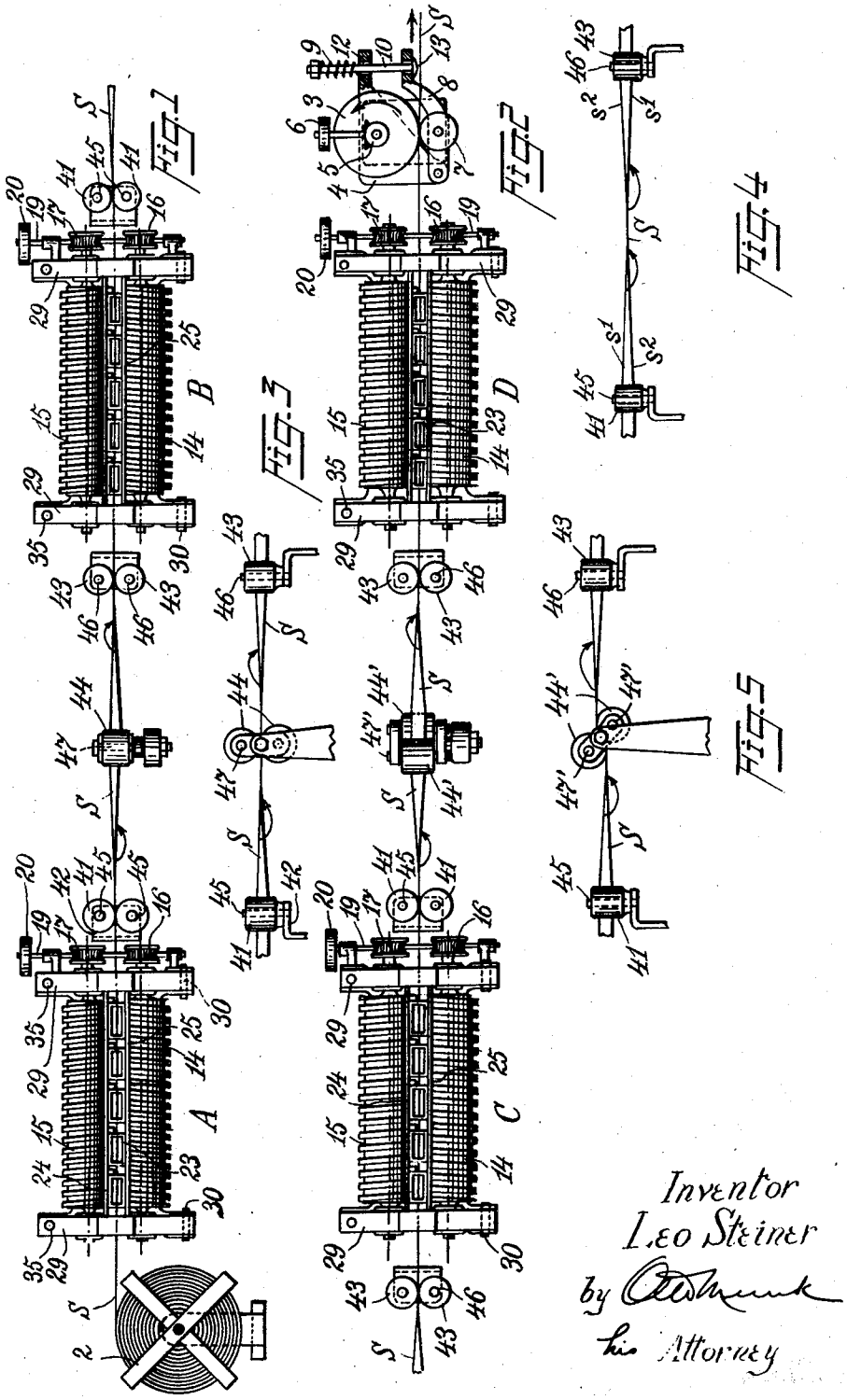
July 4, 1939. L. STEINER 2,164,959

SHARPENING METAL STRIPS

Filed April 21, 1937 4 Sheets-Sheet 1



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SHARPENING METAL STRIPS

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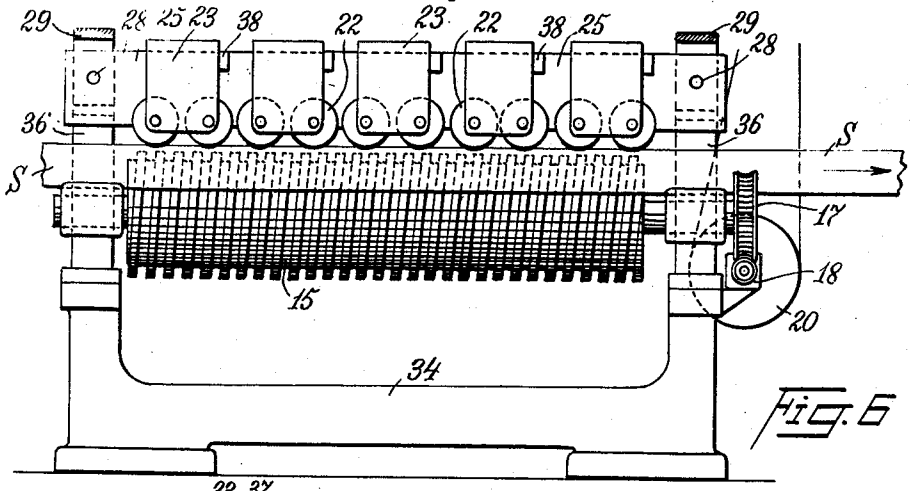


Fig. 6

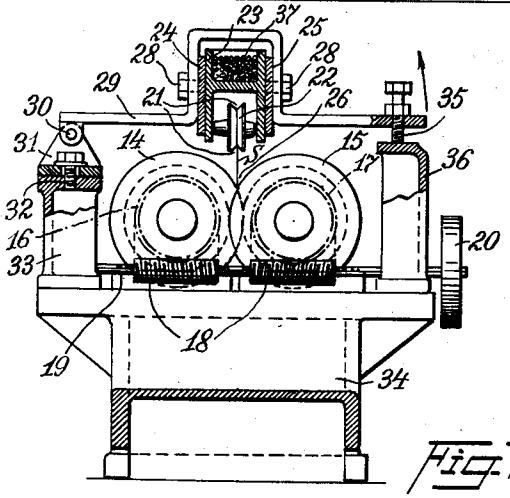


Fig. 7

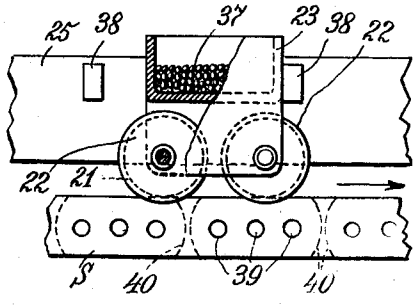


Fig. 8

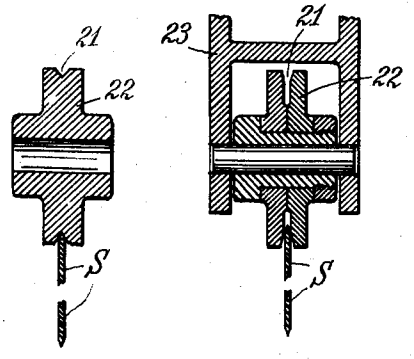


Fig. 9

Fig. 10

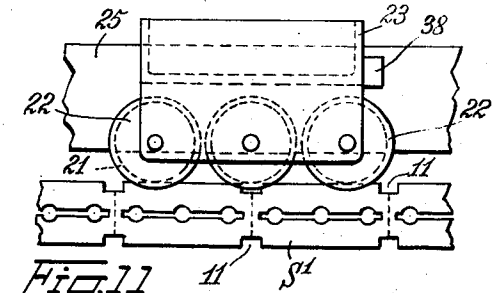


Fig. 11

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SHARPENING METAL STRIPS

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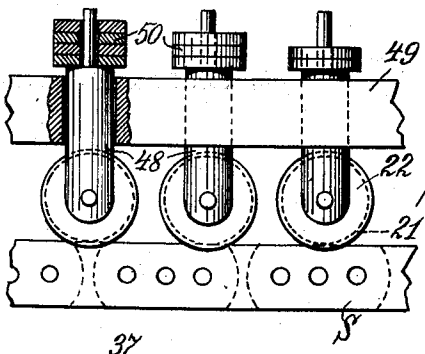


Fig. 12

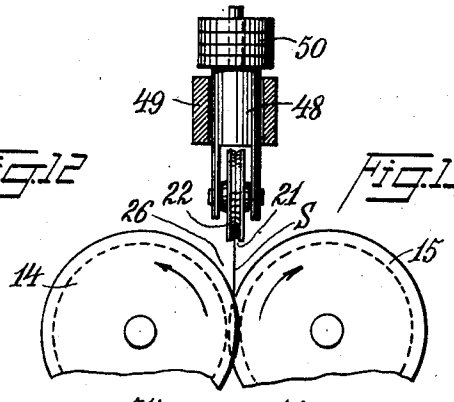


Fig. 13

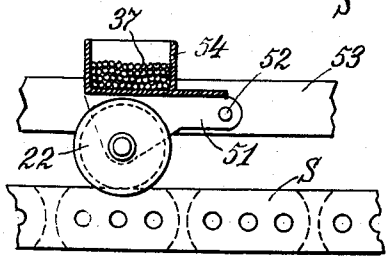
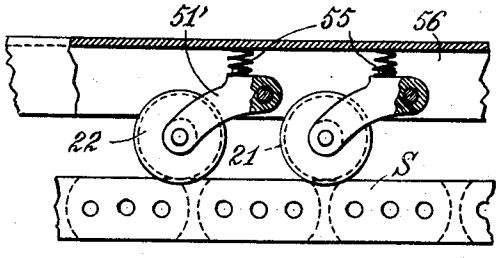


Fig. 14



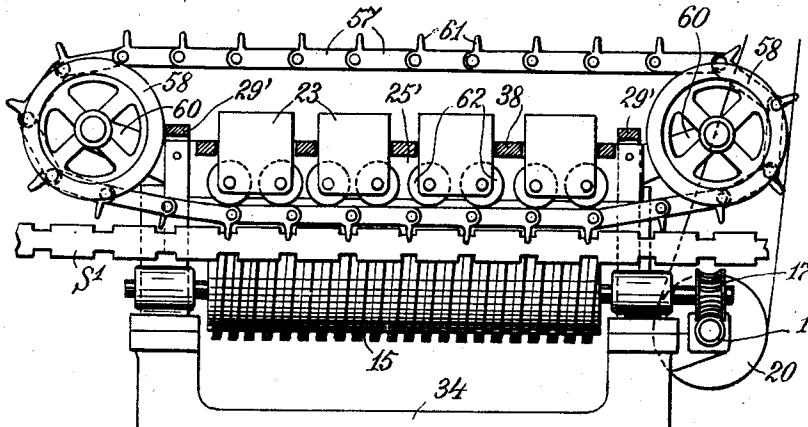


Fig. 15

Fig. 16

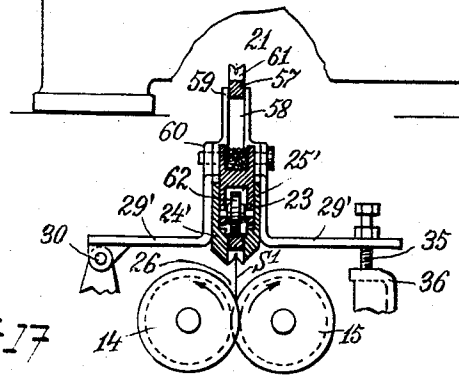


Fig. 17

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SHARPENING METAL STRIPS

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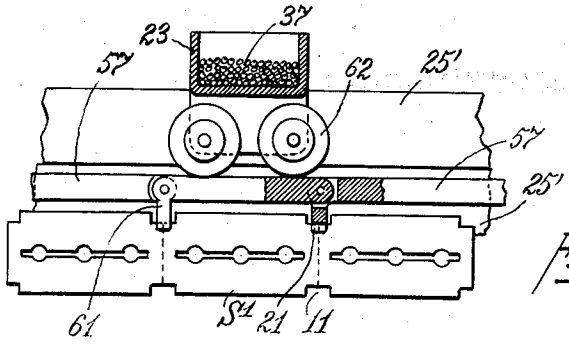


Fig. 18

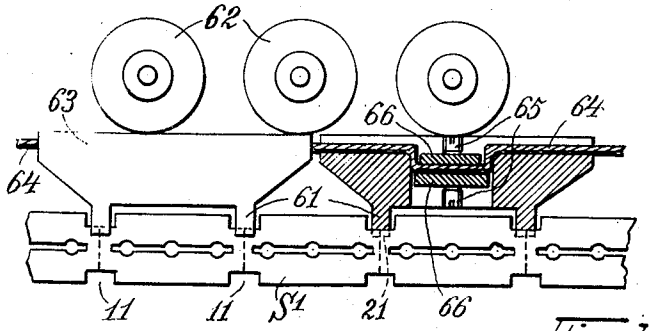


Fig. 19

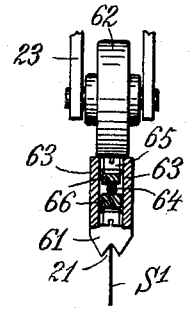


Fig. 20

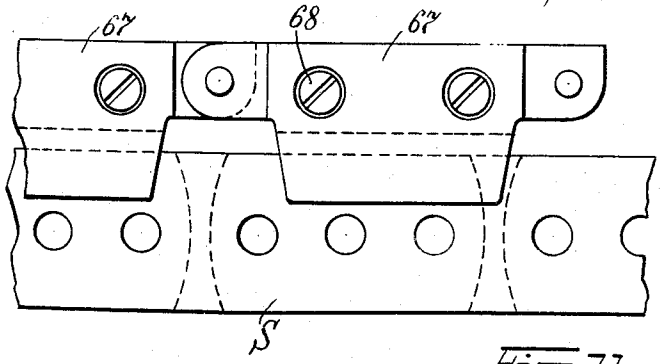


Fig. 21

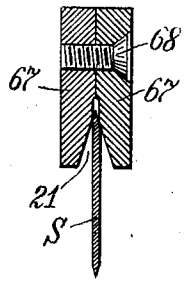


Fig. 22

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UNITED STATES PATENT OFFICE

2,164,959

SHARPENING METAL STRIPS

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Application April 21, 1937, Serial No. 138,141
In Germany and Great Britain May 2, 1936

10 Claims. (Cl. 51—80)

This invention relates to sharpening machines and more particularly to machines adapted to grind or abrade and hone or polish one or both edges of a metal strip for the purpose of making razor blades by dividing the sharpened strip into suitable lengths.

The chief object of the invention is to obtain a fine cutting edge which is uniform throughout the length of a very long strip. Another object of the invention is to provide a machine in which both sides of an edge of the same longitudinal portion of the strip are simultaneously operated on between a pair of rolls rotating in opposite directions. A further object of the invention is so to guide the strip between the sharpening rolls as it is fed along them that, although it is confined to the plane of symmetry of the wedge-shaped channel formed between the sharpening rolls, it is not bound to a predetermined position in relation to the sharpening rolls, but it is allowed full freedom of movement in transverse direction so that it will automatically choose and occupy its most appropriate position. Still another object of the invention is to provide a strip-sharpening machine in which all the operations from the coarse grinding to the finest finishing touch may be performed by means of sharpening units constructed, disposed and actuated in substantially the same manner. A further object of the invention is to facilitate the adjustment of the several sharpening units in relation to each other by a novel method of feeding the strip through the machine.

The invention comprises also novel details of construction that will be hereinafter set forth, reference being had to the accompanying drawings in which—

Fig. 1 is a diagrammatic plan view of a portion of a machine embodying the invention, and Fig. 2 is a similar view of the remainder of the same machine, the whole machine as shown, by way of example, in Figs. 1 and 2 being composed of four sharpening units, each of which comprises a pair of rolls.

Fig. 3 is a diagrammatic side view showing a portion of the metal strip as fed from the rear or delivery end of the first sharpening unit to the forward or feed end of the second unit, Fig. 4 is a similar view showing a portion of the strip as fed from the rear or delivery end of the second unit to the forward or feed end of the third unit, and Fig. 5 is a similar view showing a portion of the strip as fed from the rear or delivery end of the third unit to the forward or feed end of the fourth unit, the first and second units of the embodiment of the machine, as shown by way of example, operating both on one and the same edge of the strip and the third and fourth units operating both on the opposite edge of the strip.

Fig. 6 is a diagrammatic side view partly in section of an embodiment for any one of the sharpening units; Fig. 7 is a similar end view of the same unit, and Fig. 8 is a detail view on a larger scale and partly in section of part of the strip guide as shown in Figs. 6 and 7.

Fig. 9 is an axial section through one of the guide rollers engaging the strip at an edge still unsharpened and Fig. 10 is a similar illustration of a guide roller in engagement with a previously sharpened edge of the strip.

Fig. 11 is a detail view corresponding to Fig. 8 but showing another embodiment of the roller guiding means for the strip.

Fig. 12 is a detail view similar to Fig. 8 but showing a further embodiment of the roller guiding means for the strip, and Fig. 13 is a cross-section of the same embodiment.

Fig. 14 and Fig. 15 are detail views similar to Fig. 8 but showing still further embodiments of the roller guiding means.

Fig. 16, Fig. 17 and Fig. 18 are views, respectively corresponding to Fig. 6, Fig. 7 and Fig. 8, of another embodiment for any one of the sharpening units, an endless chain being, in this embodiment, provided for guiding the strip.

Fig. 19 is a detail view similar to Fig. 18 but showing another construction of the guide chain, and Fig. 20 shows the same construction of the chain in cross-section.

Fig. 21 and Fig. 22 are views, respectively corresponding to Fig. 19 and Fig. 20, of a further construction for the guide chain.

In the embodiment shown in Figs. 1 to 5, the machine consists of four sharpening units A, B, C, D operating simultaneously on different longitudinal portions of one and the same strip S which is supplied in a coil on a reel 2 suitably arranged for rotation in a well known way at the feed end of the machine in front of the first sharpening unit A. The strip is unrolled from the reel 2 and drawn through the whole machine by a pulling device suitably arranged in a well known way at the delivery end of the machine in rear of the fourth sharpening unit D. This pulling device as shown, by way of example, in Fig. 2 consists of a pulley 3 rotatably mounted on an upright 4 and a presser roller 7 rotatably mounted in an arm 8 which is pivotally connected at one end with the upright and forced by the

adjustable tension of a spring 9 through the intermediary of a rod 10 towards the pulley 3. The rod 10 is reciprocative in a projection 12 from the upright 4 and bears with a head 13 upon the free end of the arm 8. The pulley 3 is rotated in the direction of the arrow by a bevel gear 5 having driving connection with a pulley 6 which is driven by a motor not shown. Friction between the pulley 3 and the strip S which is flatwise engaged between pulley 3 and pressure roller 7 causes the strip to be propelled in the direction of the arrow.

While the strip S travels through the four sharpening units in succession, both its edges are ground and honed so that when it leaves the machine, it need only be divided into suitable lengths to obtain double-edge razor blades. One edge of the strip is ground in unit A and honed in unit B, and the opposite edge of the strip is ground in unit C and honed in unit D.

Each sharpening unit, whether employed for grinding or for honing, consists of a pair of rolls 14, 15 which, in a well known manner, form a wedge-shaped channel between them and rotate in opposite directions, preferably against the edge to be sharpened. The honing units may differ from the grinding units only in that the rolls of the honing units have smoother surfaces or the abrading granules incorporated in the paste applied to the rolls may be coarser for the grinding units.

In all the sharpening units as shown by way of example in the different figures of the drawings, helically grooved rolls are so arranged in pairs that the helical grooves of one roll mesh with the helical projections on the other roll and vice versa. However, rolls with annular grooves or rolls with substantially smooth surfaces in contact with one another along a generatrix may, if desired, be substituted for the helically grooved rolls. Worm-wheels 16, 17 secured on one end of the rolls mesh with a duplex worm 18, the shaft 19 of which carries a pulley 20 driven by a motor not shown in the drawings. That portion of the duplex worm which meshes with one worm-wheel 16 is of right hand turn, and the portion in mesh with the other worm-wheel 17 is of left hand turn so that the two rolls will rotate in opposite directions.

To proceed now to the description of the sharpening unit in the embodiment shown in Figs. 6 to 8, the strip S is drawn through the unit in the direction of the arrow and while its inner or lower edge is operated on by the rotating rolls 14, 15, its outer or upper edge is guided in circumferential grooves 21 of a plurality of rollers 22. According as the edge to be engaged in the roller grooves 21 is still in its original dull condition or it has previously been sharpened in another sharpening unit, the grooves 21 have a cross-section according to Fig. 9 or Fig. 10, respectively. In both cases, the grooves have inwardly tapering side walls which will engage with the sides of the strip edge. In order to facilitate the formation of the deep and very narrow bottom portion of the groove 21 as shown in Fig. 10, I have composed the roller of two halves. Pairs of the rollers 22 are rotatably mounted in a frame 23 formed like the body of a carriage and these frames are so guided between the smooth confronting sides of two parallel guide rails 24, 25 as to prevent any deviation of the rollers 22 and their grooves 21 from the plane of symmetry of the wedge-shaped channel 26 formed between the operating surfaces of the rolls 14, 15, but to allow free movement of the rollers in the direction of the width of the strip to be operated on.

The guide rails 24, 25 are stationary during the sharpening operation. They are secured at both their ends by screw bolts 28 to cross-beams 29, suitably formed and pivotally mounted at one end each upon a pivot 30. The bearing 31 of each pivot 30 is adjustable crosswise to the axes of the rolls 14, 15 by means of a bolt 32 operative in a slot for securing the bearing in adjusted position to an upright 33 fixed upon the frame 34. By such adjustment of the bearings 31 the rollers 22 may be brought in the plane of symmetry of the wedge-shaped channel 26 formed between the rolls 14, 15 when the latter have been adjusted or re-adjusted. The other ends of the cross-beams 29 rest each with a set-screw 35 upon an upright 36 fixed on the frame 34, likewise for the sake of adjustment in relation to the rolls 14, 15. The pivotable arrangement of the cross-beams 29 facilitates also the introduction of the strip S into the machine.

As the rolls rotate against the edge operated on, friction tends to force the strip out of the channel 26 and sufficient pressure must be applied upon the strip to counteract this tendency. For this purpose the frames 23 of the rollers 22 are formed in their upper portions as containers for granular lead 37 or other weights. On the inner side of one of the guide rails, stops 38 are provided for each frame 23 to limit the movement of the rollers 22 in the longitudinal direction of the strip.

The strip as shown in Fig. 8 is provided with regularly spaced apertures 39 and its thickness is reduced along curved transverse lines 40 at which it will be broken into a number of three aperture blades after the sharpening operations. While the strip travels between the rotating rolls 14, 15, it is so guided with its inner edge in the channel 26 formed between the rolls and with its outer edge in the circumferential grooves 21 of the rollers 22 that it cannot deviate from the plane of symmetry of the channel 26. At the same time, weight 37 charging the rollers will cause the strip to be pressed into the acute-angled bottom portion of the channel 26 so that the inner edge of the strip will exactly assume the shape of the bottom portion of the channel, whereby a fine cutting edge which is reliably uniform throughout the length of the strip will be obtained. The charge of the rollers may be varied in the different sharpening units and also at different points of one and the same pair of sharpening rolls when it is desired to vary the sharpening effect. Friction of the traveling strip upon the walls of the roller grooves causes the rollers to rotate, whereby wear of the groove walls will be lessened and equally distributed on the whole circumference of the rollers.

The machine as shown in Figs. 1 to 5 comprises four sharpening units A, B, C, D, of the construction illustrated in, and described in connection with, Figs. 6 to 10. Any portion of the strip S which leaves the first unit A has one of its edges ground to the shape of a cutting edge and might immediately continue its progress through the second unit B which serves to hone the cutting edge formed in the first unit A. In this case, however, satisfactory operation of the machine would require so perfect an adjustment of the pair of honing rolls in unit B in relation to the position of the pair of grinding rolls in unit A as to bring the bottom edge of the wedge-shaped honing channel between the rolls of unit

B into exact alignment with the bottom edge of the grinding channel of unit A and also to establish exact coincidence of the planes of symmetry of these two channels. Now, I conceived the idea that the necessity of such a minute adjustment may be avoided by twisting the strip at one or more points between the units. The twisted portion forms as it were a joint or articulation in the strip whereby inaccuracies in the adjustment of the pairs of rolls to one another are compensated. As unit A and unit B operate on one and the same edge of the strip S, the latter has to be fed to unit B in the same position in which it leaves unit A. This might be managed by giving the strip a twist of 360° between units A and B, but I prefer to twist the strip, at first, by a certain angle, say 90°, and then re-twist it in the opposite sense by the same angle into its original position.

To limit or confined the twist to such strip portions as travel outside the units, I dispose a pair of guide rollers at the opposite ends of units between which the strip is twisted. Thus a pair of rollers **41** engaging the strip flatwise between themselves is rotatably mounted in an upright **42** at the delivery end of unit A and a similar pair of rollers **43** is similarly arranged at the feed end of unit B. Of course, also the oppositely twisted portions must be kept asunder by inserting a pair of rollers **44** between them. It will be understood that while the rollers of the pairs **41** and **43** have their axes **45, 46** parallel to the plane of symmetry of the channel **26** between the rolls **14, 15**, the axes **47** of the rollers **44** must be perpendicular to said plane of symmetry as these rollers **44** engage with a portion twisted by 90° of the strip.

Between the second unit B and the third unit C, the strip is given a twist of 180°, whereby not only a compensating articulation is obtained between units B and C, but at the same time the strip is brought into the proper position to be fed to the next unit C which has to operate on the opposite edge of the strip in relation to that operated on in unit B. Pairs of rollers **41** and **43** are arranged in the rear of the delivery end of unit B and in front of the feed end of unit C, respectively, as, and for the purpose, described in connection with the strip portion traveling between units A and B. From Fig. 4 it appears that as a result of the twist of 180° the opposite edges s^1 and s^2 of the strip change places.

In the very same manner as unit A and B operate on one side of the strip, the units C and D operate on the other edge, and between units C and D the strip is similarly given two twists of 90° in opposite senses as between units A and B. However, in the case as shown in the drawings and as it particularly appears from Fig. 5, there is supposed that the bottom edge of the wedge-shaped channel formed between the sharpening rolls is situated in unit D on a sensibly higher level than in unit C. In such cases the compensatory effect of the twist as above referred to may still be enhanced by arranging the pair of rollers **44'**, which engage the twisted portion of the strip between them in such a manner that the strip is deflected between the rollers **44'** to another level. From Fig. 5 and the corresponding part of Fig. 2 it appears that the axes **47'** of these rollers **44'** are, like the axes **47** of rollers **44** in Figs. 1 and 3, perpendicular to the plane of symmetry of the channel formed between the sharpening rolls **14, 15** but they are staggered in the longitudinal direction of the sharpening rolls, whereby the strip is so deflected between them that it leaves them on a higher level than that on which it is fed to them.

The roller guide shown in Fig. 11 differs from that shown in Fig. 8 only by that three rollers **22** are mounted in alignment on one frame **23**, whereby the roller guide is adapted for strips S^1 with indentations **11** at their edges. The axes of the three rollers are more closely spaced from one another than the indentations **11** to assure that always two rollers at least of a frame engage with unindented portions of the strip.

According to Figs. 12 and 13, each roller **22** is rotatably mounted in the forked end of a bolt **48**. The bolts are slidably arranged in bores of a guide rail **49** and may be charged as desired by weights **50** formed as disks with central holes so as to be stuck upon the reduced upper ends of the bolts **48**. The bolts may be of circular cross-section, because they are prevented from turning by the engagement of the strip S with the grooved rollers.

According to Fig. 14, each roller **22** is rotatably mounted on an arm **51** pivotable in a vertical plane about a pivot **52** fixed in a stationary guide rail **53**. Each arm **51** carries a container **54** for granular lead **37** or other weights.

The embodiment shown in Fig. 15 differs from that shown in Fig. 14 by that the pivotable arms **51'** are charged by the pressure of springs **55** and the rail **56** has an U-shaped cross-section. The springs may be so tensioned as to allow adjustment of the pressure exerted by them on the arms.

In the embodiment of the sharpening unit as shown in Figs. 16 to 18, the grooves **21** for guiding the outer or upper edge of the strip S^1, instead of being formed on the periphery of rotatable rollers, are provided on the links **57** of an endless chain put around rotatable pulleys **58** provided on both sides with peripheral flanges **59** forming bilateral guides for the chain links. Brackets **60** secured on the cross-beams **29'** hold bearings for the shafts of pulleys **58** at a certain distance beyond the opposite ends of the pair of sharpening rolls **14, 15**. Guide rails **24', 25'** secured to and extending between the cross-beams **29** form additional bilateral guides for chain links traveling near to and along the sharpening rolls **15, 14**. The chain as shown in Figs. 16 to 18 is destined for a strip S^1 with indentations **11** and therefore the pitch of the chain corresponds to the pitch of the equally spaced indentations **11** and from each link projects a lug **61** with a groove **21** to engage an indented portion of the strip. In order to force the strip to be sharpened with sufficient pressure between the sharpening rolls **14, 15**, such links of the chain as are in engagement with the strip are charged by weights or by spring pressure, this charge being transmitted to the links by the intermediary of rollers **62** to reduce friction between the links and the means for charging them. These pressure rollers **62** are disposed and charged in a similar manner as the guide rollers **22** in the embodiment of the sharpening unit shown in Figs. 6 to 8, but they have no circumferential grooves because they do not engage the strip. Engagement of the charged chain links **57** with the progressing strip causes the chain links to follow the movement of the strip so that the individual links **57** will continuously change places to engage in succession with the strip.

In the modified form of the guide chain as shown in Figs. 19 and 20, each link **63** has two

grooved lugs 61 so that in this case the pitch of the chain corresponds to the double of the pitch of the indentations 11. In this case, the links of the endless chain are connected by a cord 64 composed of fine wire strands twisted together to which the links are secured by means of screws 65, washers 66 being inserted between the screw heads and the cord. Thanks to the pliability of the cord, the pitch of the chain may adapt itself to small irregularities in the pitch of the indentations.

In the embodiment of the guide chain as shown in Figs. 21 and 22, the grooves 21 are formed in the bodies of the links 67 along their outer edges, whereby the pitch of the chain will not depend on the pitch of indentations when a strip with indentations is to be guided in the grooves of the links. In Fig. 22 it is supposed that the chain serves for engagement with an edge of the strip previously ground to form a cutting edge and, therefore, the cross-section of the groove corresponds to that of the groove of the roller shown in Fig. 10 and the individual links are composed of two halves secured by screws 68 to one another. Moreover, the links are, in this case, so designed as to have a weight which will suffice to force the strip S into the wedge-shaped channel formed between the sharpening rolls so that the pressure rolls 62 of the formerly described embodiments may be dispensed with.

It will be understood that in machines for sharpening one edge only of the metal strip the shapening units C and D will be omitted.

The relative arrangement of the sharpening units and other parts and the particular details of construction set forth may be varied within the scope of the appended claims, without departing from the spirit of the invention.

The word "sharpening" as used in the specification and claims is to be understood as including grinding, abrading, honing, polishing, burnishing and stropping.

What I claim is:

1. In a strip-shapening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with a plurality of guide members distributed along, and in the plane of symmetry of, said channel and having grooved peripheral portions adapted to engage and bear upon the outer edge of the strip to be sharpened when the inner edge of this strip occupies the bottom portion of said channel, adjustable weighting means adapted to vary the pressure of said guide members upon the strip, and means retaining said guide members in said plane of symmetry but allowing them free movement towards and off said channel.

2. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with a plurality of circumferentially grooved rollers distributed along said channel and adapted to engage and bear upon the outer edge of the strip to be shapened when the inner edge of the strip occupies the bottom portion of said channel, a plurality of frames each carried like a carriage-body by two at least of said rollers, adjustable weighting means charging said frames, and a guide rail extending parallel to said channel and so limiting the movements of said frames as to retain said rollers in said plane of symmetry but allowing them free movement towards and off said channel.

3. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with a plurality of circumferentially grooved rollers distributed along said channel and adapted to engage and bear upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel, a plurality of frames each carried like a carriage-body by three of said rollers, adjustable weighting means charging said frames, and a guide rail extending parallel to said channel and so limiting the movements of said frames as to retain said rollers in said plane of symmetry but allowing them free movement towards and off said channel.

4. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls so opposed with their axes in parallelism that their sharpening surfaces meet along a common generatrix and form between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with an endless chain arranged with its whole extent in the plane of symmetry of said channel and composed of links having grooved peripheral portions adapted to engage and bear with substantial but yielding pressure upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel so as to be therein operated on simultaneously on both sides, a pair of pulleys rotatably mounted in said plane of symmetry to carry said chain and means retaining such links of said chain as occupy positions allowing engagement with the strip in said plane of symmetry but allowing them free movement towards and off said channel.

5. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls so opposed with their axes in parallelism that their sharpening surfaces meet along a common generatrix and form between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with an endless chain arranged with its whole extent in the plane of symmetry of said channel and composed of links having grooved projections adapted to engage and bear with substantial but yielding pressure upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel so as to be therein operated on simultaneously on both sides, a pair of pulleys rotatably mounted in said plane of symmetry to carry said chain and means retaining such links of said chain as occupy positions allowing engagement with the strip in said plane of symmetry but allowing them free movement towards and off said channel.

6. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with an endless chain arranged in the plane of symmetry of said channel and composed of links having grooved peripheral portions adapted to engage and bear upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel, a pair of pulleys rotatably mounted to carry said chain

means retaining such links of said chain as occupy positions allowing engagement with the strip in said plane of symmetry but allowing them free movement towards and off said channel, and adjustable weighting means adapted to vary the pressure of the links upon the strip to be operated on.

7. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with an endless chain arranged in the plane of symmetry of said channel and composed of links having grooved peripheral portions adapted to engage and bear upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel, a pair of pulleys rotatably mounted to carry said chain, a plurality of rollers arranged to bear upon such links of said chain as occupy positions allowing engagement with the strip, means retaining links in said positions for engagement in said plane of symmetry but allowing them free movement towards and off said channel and adjustable weighting means adapted to vary the pressure of said rollers upon the links.

8. In a strip-sharpening machine, a sharpening unit comprising a pair of sharpening rolls forming between them a channel wedge-shaped in cross-section, and means for rotating said rolls in opposite directions, in combination with an endless chain arranged in the plane of symmetry of said channel and composed of links having grooved peripheral portions adapted to engage and bear upon the outer edge of the strip to be sharpened when the inner edge of the strip occupies the bottom portion of said channel, a pair of pulleys rotatably mounted to carry said chain, a plurality of rollers arranged to bear upon such links of said chain as occupy positions allowing engagement with the strip, a plurality of frames each carried like a carriage-body by two at least of said rollers, adjustable weighting means on said frames, and a guide rail extending parallel to said channel and so limiting the movements of said frames as well as of the links on which the frames bear as to retain them in said plane of symmetry but allowing them free movement towards and off said channel.

9. In a strip-sharpening machine of the class described, sharpening units operating at the same time upon different length portions of one and the same strip and comprising each a pair of sharpening rolls forming between them a wedge-shaped channel, means for rotating said rolls in opposite directions and means for maintaining the strip between the rolls in the plane of symmetry of said channel; a pair of guide rollers situated beyond the delivery end of one unit, a second pair of guide rollers situated in front of the feed end of the next unit, and a third pair of guide rollers situated between the first and second ones at a distance from both, the rollers of each pair being adapted to engage the strip flatwise between them, and the axes of the guide rollers being situated for the first and second pairs parallel, and for the intermediate pair substantially perpendicular, to said plane of symmetry.

10. In a strip-sharpening machine of the class described, sharpening units operating at the same time upon different length portions of one and the same strip and comprising each a pair of sharpening rolls forming between them a wedge-shaped channel, means for rotating said rolls in opposite directions and means for maintaining the strip between the rolls in the plane of symmetry of said channel; a pair of guide rollers situated beyond the delivery end of one unit, a second pair of guide rollers situated in front of the feed end of the next unit, and a third pair of guide rollers situated between the first and second ones at a distance from both, the rollers of each pair being adapted to engage the strip flatwise between them, and the axes of the guide rollers being situated for the first and second pairs parallel, and for the intermediate pair substantially perpendicular, to said plane of symmetry, and the axes of the rollers in the intermediate pair being staggering in the longitudinal direction of said sharpening rolls.

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