This invention relates to improvements in machines adapted to sharpen one or more edges of a strip of steel while it travels through the machine, including grinding devices for rough grinding the edge and honing devices for finishing the edge of the strip.

One of the objects of the invention is to provide means for determining the width of the metal strip after it has been ground by grinding devices.

Another object of the invention is to provide means to automatically indicate the extent of wear occurring at honing disks that operate upon the ground edges of the metal strip so that appropriate adjustment of the disks with respect to the strip may be made as required.

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

Reference is to be had to the accompanying drawings forming a part hereof, wherein

Figs. 1 and 3 are side elevations of a machine embodying the invention;

Figs. 2 and 3 are side views of the devices for gauging the width of the strip after it has been ground;

Fig. 4 is a view looking from the left hand side of Fig. 3;

Fig. 5 is a plan view illustrating honing devices and the gauges for determining the wear on the grinding disks;

Fig. 6 is a longitudinal section, enlarged, through part of Fig. 5;

Fig. 7 is a sectional detail of part of Fig. 6.

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

The numeral 1 indicates the main frame of the machine which may be of any desired construction, the same being shown provided with a drive shaft 2 which may be operated by pulley 3 and belt 4 from a power source 5, or in any other desired manner. The frame 1 is shown provided with side bars 1a upon which various parts of the machine are mounted. At 1a is indicated a strip of steel to be sharpened on one or both edges; the same being shown mounted upon a reel 6 in the usual way, supported on one of the bars 1a, (Fig. 1). At 7 grinding devices are located which may be of any well known character adapted to grind one or both edges of strip 1a as the latter travels through the machine. In the example illustrated pipes 8 communicate with the grinding devices for delivering a stream of fluid thereto in a known way. Any suitable means may be provided for continuously propelling the strip 1a through the machine, such as a pair of spaced rollers at 9 gripping the strip therebetween and driven by gearing 10 operated by belt 11 driven from pulley 12 on drive shaft 2. Means for such purpose are illustrated in my application for Letters Patent filed January 19, 1928, Ser. No. 247,528.

In order to gauge the width of the strip after one or both of its edges have been ground, devices illustrated in Figs. 1, 2, 3 and 4 are provided as follows: Upon support 13 secured upon one of the bars 1a of the main frame, arms 14 and 15 are pivotally supported, respectively, at 16 and 17, which arms project over the strip 1a and are normally spaced therefrom, as illustrated in Fig. 2. Said support and arms are spaced from a grinding device in the direction of travel of the strip as indicated by the arrow a in Fig. 1. A lever 18 is pivotally supported at 19 upon the support 13 and provided with spaced projections 20 and 21 located between the arms 14' and 15' adapted to be engaged, respectively, by the projections 20 and 21 for operating said arms. A spring 22 attached to and cooperative with the arms 14 and 15 normally tends to draw the outer portions of the arms toward and into engagement with corresponding edges of strip 1a. A spring 23 cooperative with support 13 and lever 18 normally tends to move said lever into posi-
tion for cooperation of its projections 20 and 21 with the inclined surfaces 14' and 15' of arms 14 and 15 to keep said arms out of engagement with the strip A that travels between said arms, (Fig. 2). Upon one of the arms, such as arm 14, is mounted a suitable gauge 24 shown provided with a graduated dial 25 and a pointer 26 to sweep over the dial, the gauge having a stem 27 adapted to cooperate with an abutment 28 on the arm 15 when the arms 14 and 15 approach. The abutment 28 is shown in the form of a screw threaded in arm 15 and which may be retained in set position by a nut 29, which abutment may be adjusted relatively to the stem 27 to control the operation of the pointer as required. The gauge may be similar to that illustrated in Fig. 7. Since in the drawings devices are illustrated adapted to grind opposite edges of strip A, strip gauging devices are indicated adjacent to each of the grinding devices in the direction of travel of the strip, (Fig. 1). In the normal position of the grinding devices illustrated in Fig. 2 the arms 14 and 15 are separated from strip A so that the latter may travel freely between the arms. When it is desired to gauge the width of the strip the lever 18 will be operated, as illustrated in Fig. 3, to release its projections 20 and 21 from the arms 14 and 15, whereupon the spring 22 will draw said arms into contact with the edges of the strip. During the approach of the gauge 24 toward the abutment 28 the latter will engage the stem 27, causing operation of the pointer 26 with respect to dial 25 in such a way that said pointer will indicate graduations on the dial from which may be determined the width of the strip between its edges, so that the operator may, as required, adjust the grinding devices to maintain the strip within desired limits of width. When an indication on the dial has been read the lever 18 will be released and the arms 14 and 15 will be spread by the projections 20 and 21 to release the strip. The contact of the arms 14 and 15 with the sharpened edge or edges of the strip will not interfere with the latter.

At a suitable position along frame 1, beyond the grinding devices in the direction of travel of the strip, any suitable devices for aligning or maintaining the strip in proper relation to honing devices may be provided, as indicated at 30. Suitable devices for such purpose are illustrated in my said application.

Honing devices for the ground edges of the strip A are illustrated in Figs. 1, 5, 6 and 7. Pairs of honing disks 31 are indicated on opposite sides of strip A, one pair for each ground edge, since in the illustration opposite sides of the same edge of the strip are ground and honed. Each disk 31 is secured upon a corresponding shaft 32 journaled in bearings in supporting arm 33 carried by a corresponding rod 34 of the main frame. To each shaft 32 a pulley 34 is attached and driven by a belt 33 operated by a corresponding pulley 36 secured on shaft 2, (Figs. 1 and 5). In order that both disks 31 will rotate in the same direction at the same speed each shaft 32 is shown provided with a gear 37 in mesh with a corresponding gear 38 on shaft 39 journaled in a bearing on arm 33, to provide connection at 40 between shafts 39 causing their joint and uniform operation. Each disk 31 is normally spring-pressed toward the appropriate edge portion of strip A, for which purpose shaft 32 is slidable in its bearings in the corresponding arm 33 and normally pushed with its disk 31 toward strip A by means of a coiled spring 41 that operates against a stop 42 on shaft 32 and against a nut 43 adjustably carried by the adjacent arm 33 by means of screw threads at 44, (Fig. 6). A spring-pressed pin 45 operative in a branch on arm 33 is advanced through radial grooves 46 on nut 43 for retaining the latter in set position. The nut 43 carries a gauge 47 that is cooperative with shaft 32 to indicate the relation of the corresponding disk 31 to strip A during honing of the latter. In the form illustrated the gauge 47 is carried by a sleeve 48 that is attached to a guide 49 for a pin 50 that is slidable in a bore in said guide, the guide being shown adjustably connected to nut 43 by threads at 51 and to be secured in adjusted position by nut 52, (Figs. 6 and 7). The one end of pin 51 bears against shaft 32 and the opposite end of said pin is a slidable pin 53 having a head 54 normally pressed by spring 55, within the bore of sleeve 48, against the pin 50. The stem 47a of gauge 47 bears against the pin 53 and through the medium of pins 53 and 50 said stem is operative against shaft 32. The gauge 47 may be of any desired variety. In Fig. 7 the stem 47a is shown provided with a toothed rack 56 cooperative with a pinion 57 on a shaft 58 of pointer 59 which sweeps over the dial 60 of the gauge. A spring 61, cooperative with the dial structure and with the rack 56, normally draws said rack in such a position as will tend to locate the pointer at zero or any other desired position on the dial. When the honing disk 31 is initially set in a desired position against a ground edge of strip A the pointer of the dial will be in a certain desired position, say at zero, (Fig. 7). As the honing disk wears away by contact with strip A the spring 41 will press the disk toward the strip, and since the disk and its shaft 32 will advance toward the strip due to the wear of the disk the pins 50 and 53 will follow the shaft by reason of the operation of spring 55, and the stem 47a of the gauge will follow the pin 53 so that the mechanism of the gauge will cause the pointer to travel with respect to the dial, whose graduations will indicate
the wear on the honing disk. When the gauge indicates a certain amount of wear of the honing disk the nut 43 will be adjusted toward disk 31, whereby to adjust or increase the tension of spring 41 to compensate for the wear on the disk, thereby pressing it toward strip A. Such adjustment has the effect of moving the gauge toward strip A relatively to the stem 47a of the gauge in such a way that the rack and pinion will restore the pointer to zero, or adjustment may be made for such purpose at the threads 51 as required. The gauges 47 will individually indicate the extent of wear on the corresponding honing disk 31 so that at the appropriate time the operator, from observation of the gauge, may be apprised of the extent of wear on a disk 31 and may make suitable adjustment of said disk and of the gauge to restore the pointer to zero on the dial, which zero position of the pointer will indicate to the operator that the required adjustment of the corresponding honing disk respecting strip A has been made.

At 62 and 63 are rollers bearing against opposite edges of the sharpened strip A to maintain the strip in a desired position, the roller 63 being pivotally supported upon an arm 64 that is pivotally carried at 65 upon a bracket 66 supported by one of the rods 12 of the main frame, a spring 67 connected with said bracket and with the arm 64 serving to resiliently press rollers 62 and 63 against the edges of the strip, (Fig. 1). The construction described is substantially the same as that set forth in my said application.

When the strip A travels continuously through the machine the width of the strip, as ground, may be ascertained by means of the gauging devices shown in Fig. 2 to enable desired adjustment of the grinding devices to be made, and the character of the honed edges of the strip may be ascertained by means of the gauges 47 to enable adjustment of the honing devices to be made, from time to time, so that there need be little intervening space along a strip that is not accurately ground or honed. The machine set forth is adapted for sharpening the edges of continuous strips of steel adapted for the production of razor blades. The strip may be provided with any desired character of perforations, as indicated in the drawings, or may be perforate if preferred. Any suitable cutting-off devices for the strip, indicated generally at 126, (Fig. 1), may be provided upon the machine, at the delivery end of the sharpened strip, for cutting the strip step by step into blade lengths as the strip travels. Cutting devices for such purpose are well known and may be as illustrated in United States Letters Patent No. 1,632,593, issued June 14, 1927.

While the machine illustrated has two sets of grinding devices and two sets of honing devices the strip, whereby the strip may be sharpened for the production of so-called double-edge razor blades, it will be understood that the machine may be used or adapted for sharpening a single edge of strip A by omitting one set of grinding and honing devices.

Changes may be made in the details of construction and arrangement of parts set forth, within the scope of the appended claims, without departing from the spirit of the invention.

Having now described the invention what I claim is:

1. The combination of means to propel a strip of metal, arms pivotally supported to engage the strip, means to support the strip between and separate from the arms, a gage carried by one of the arms to be operated by the other arm, a spring to cause the arms to engage the strip, and a lever having projections to engage the arms, the arms having portions to be engaged by said projections for spreading the arms to release the strip and for permitting the arms to engage the strip in different positions of the lever.

2. A machine as set forth in claim 1, including a spring cooperative with the lever to normally retain the projections in engagement with the arms for retaining the latter released from the strip.

3. A metal sharpening machine comprising means to feed a strip, a disk to engage an edge of the strip to sharpen it, means to rotate said disk, means slidably supporting the disk for movement toward the strip during wear on the disk, and gauging means operative by and with the disk to indicate the extent of wear on the disk and its movement toward the strip during contact with the strip.

4. A metal sharpening machine comprising means to feed a strip, a disk to engage an edge of the strip to sharpen it, a slidable shaft carrying the disk, means to rotate the shaft and the disk, a spring normally automatically pressing the shaft and disk toward the strip, means to adjust the tension of the spring upon the shaft, and a gauge carried by said adjusting means for operation by and with said shaft for indicating the wear on the disk and its movement toward the strip during contact with the strip.

5. A metal sharpening machine comprising means to feed a strip, a disk to engage an edge of the strip to sharpen it, a slidable shaft carrying the disk, means to rotate the shaft and the disk, a spring normally pressing the shaft and disk toward the strip, means to adjust the tension of the spring upon the shaft, a gauge, supporting means for the gauge carried by said spring adjusting means, and spring-pressed rod means cooperative between the gauge and the shaft for causing operation of the gauge as the shaft moves toward the strip due to wear of the disk during its engagement with the strip.
6. A metal sharpening machine comprising means to feed a strip, a disk to engage an edge of the strip to sharpen it, a slidable shaft carrying the disk, means to rotate the shaft and the disk, a spring normally pressing the shaft and disk toward the strip, a nut cooperative with the spring to adjust its tension against the shaft, a sleeve carried by said nut, a gauge carried by said sleeve, and spring-pressed rod-means slidably carried by the nut and cooperative with the shaft for causing operation of the gauge as the shaft moves toward the strip due to wear of the disk during its engagement with the strip.

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