Nov. 14, 1939. L. A. WILKIE 2,180,079

CONVERTIBLE SAWING AND ABRADING MACHINE

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Fig. 1

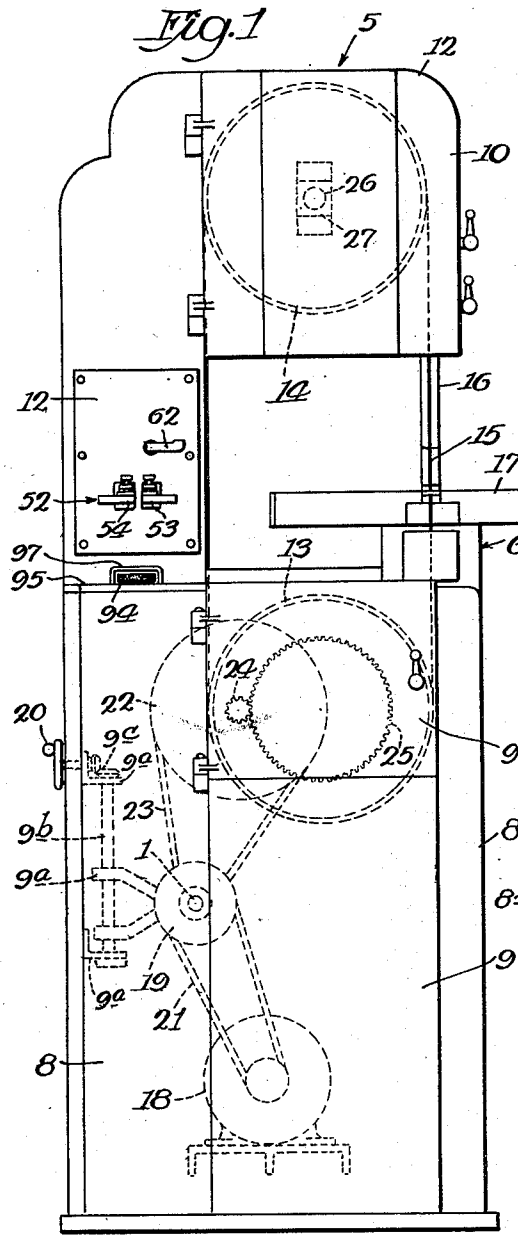
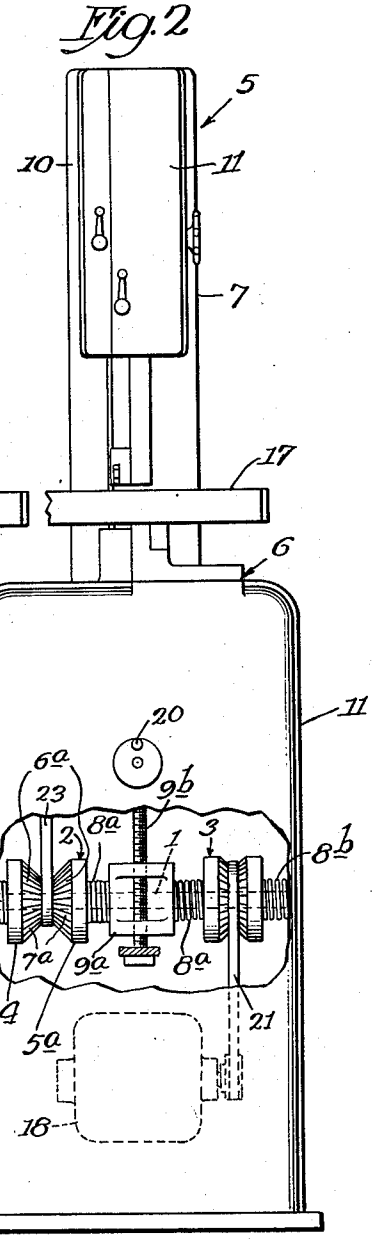


Fig. 2

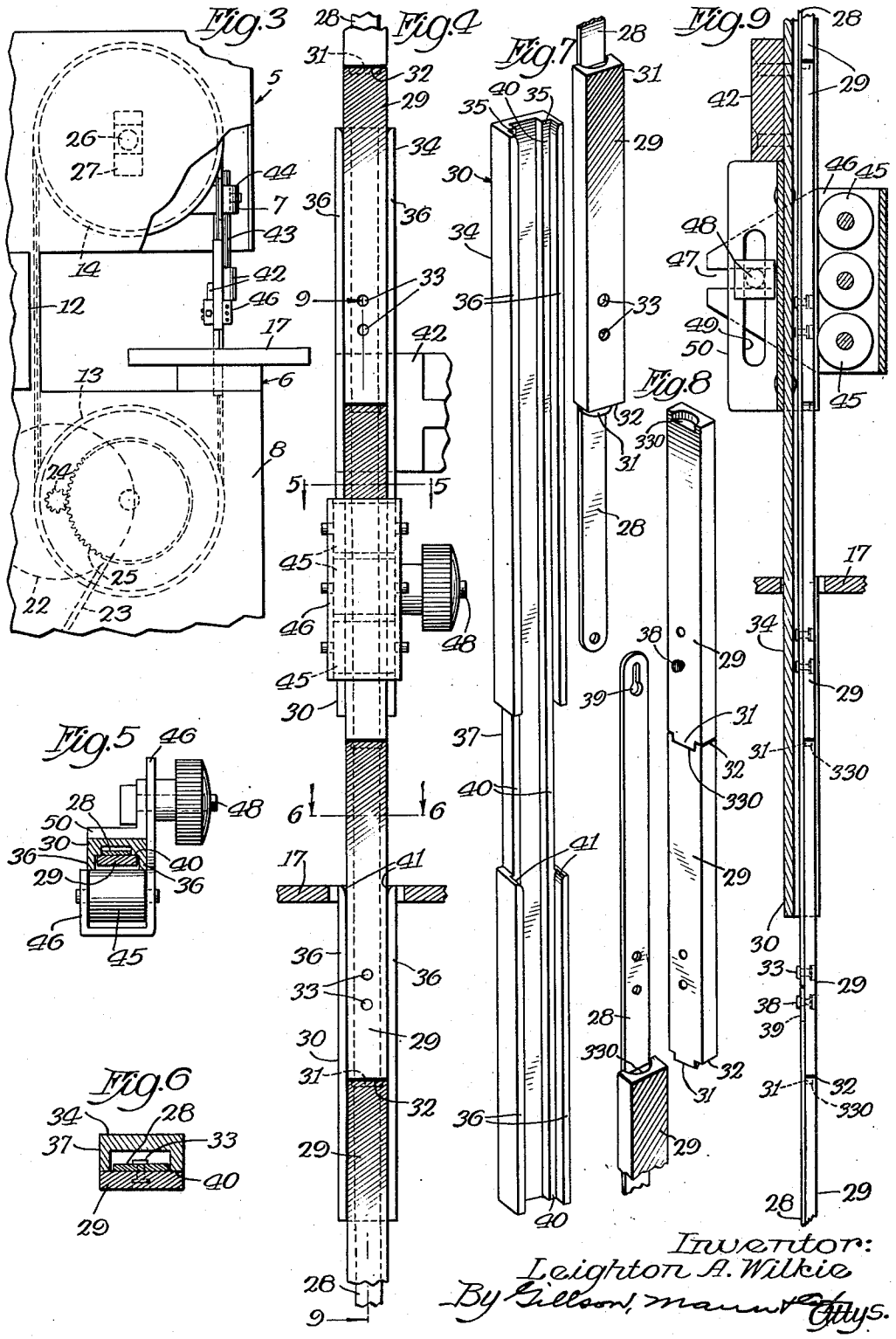


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CONVERTIBLE SAWING AND ABRADING MACHINE

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Fig. 10

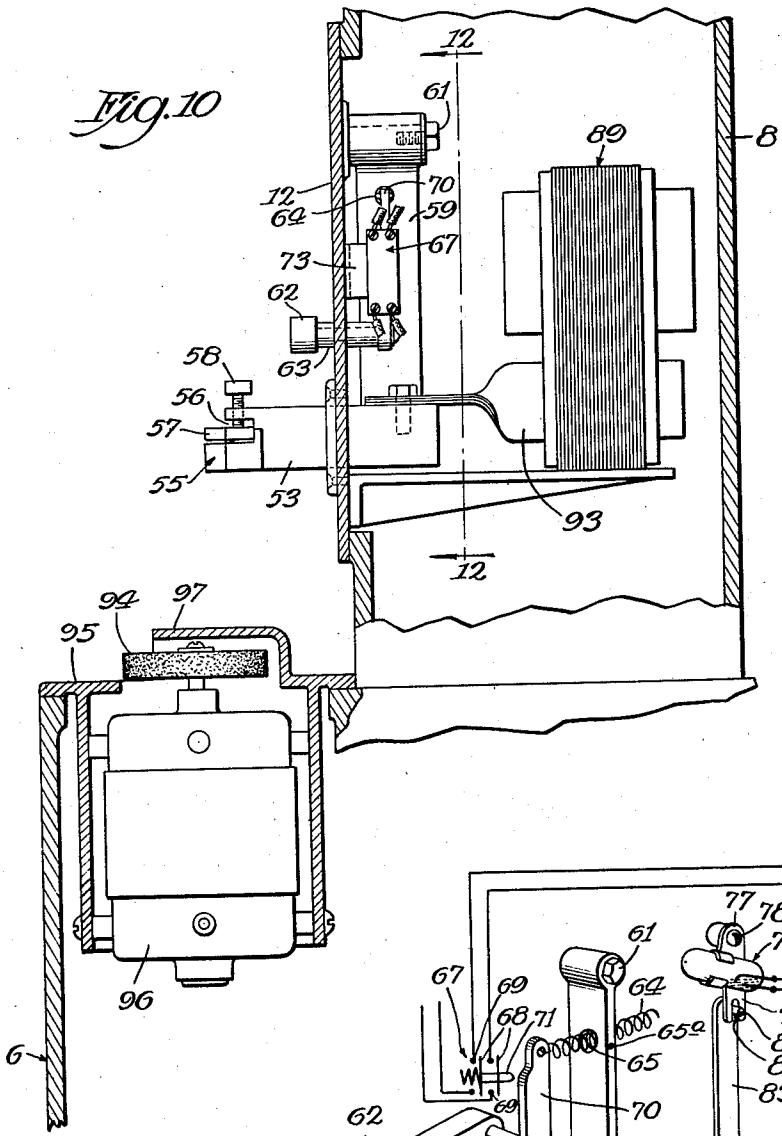
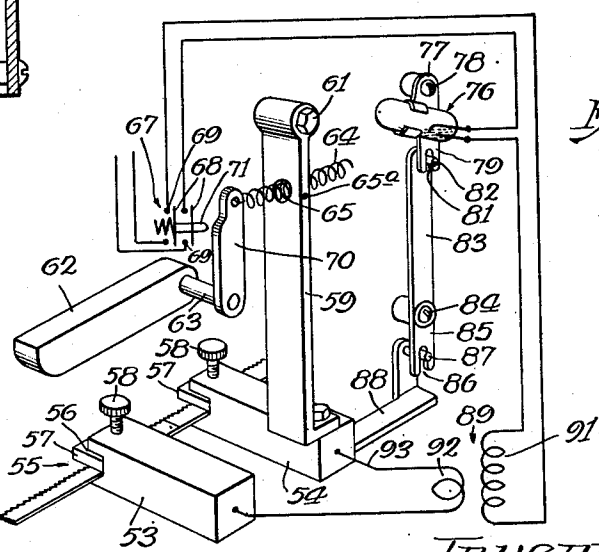


Fig. 11



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CONVERTIBLE SAWING AND ABRADING MACHINE

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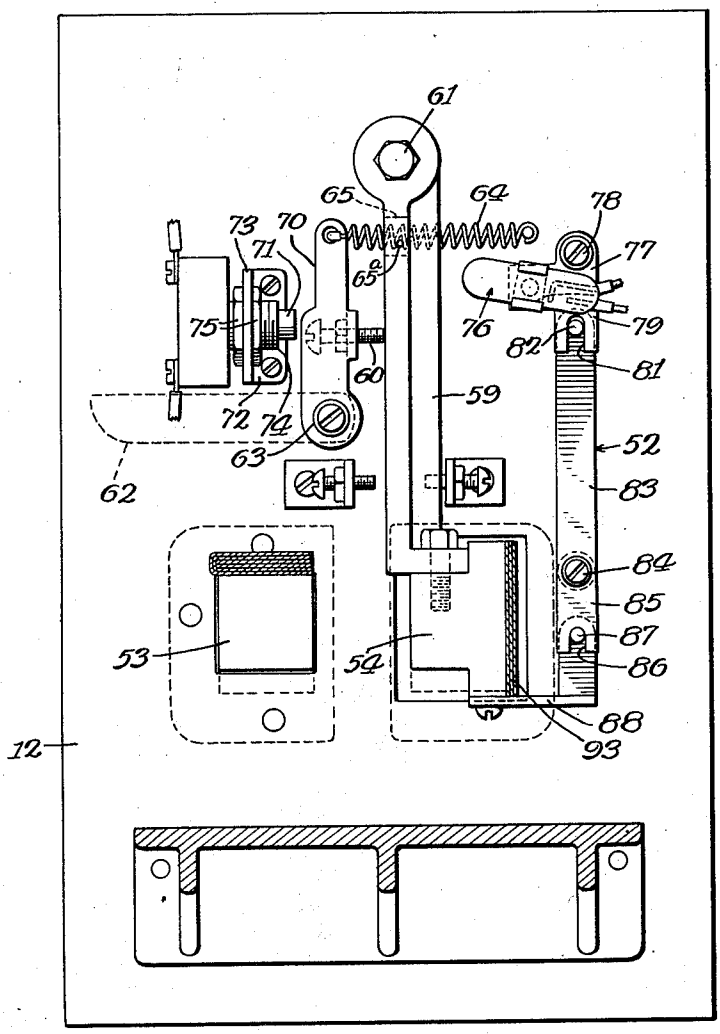


Fig. 12

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CONVERTIBLE SAWING AND ABRADING MACHINE

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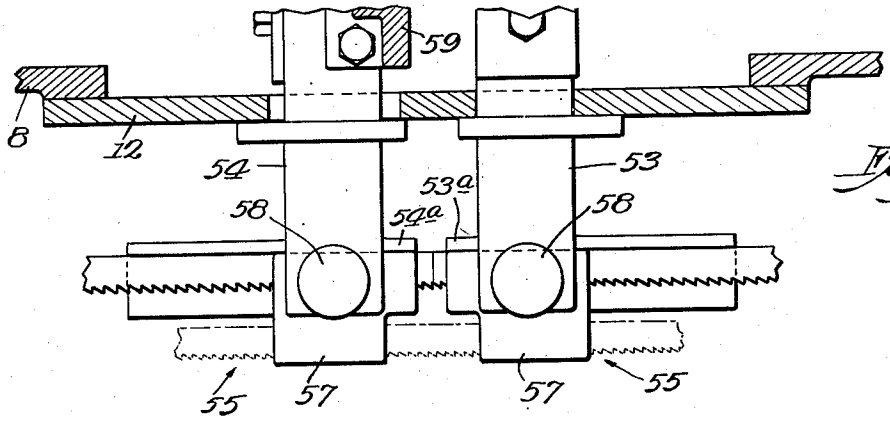


Fig. 13

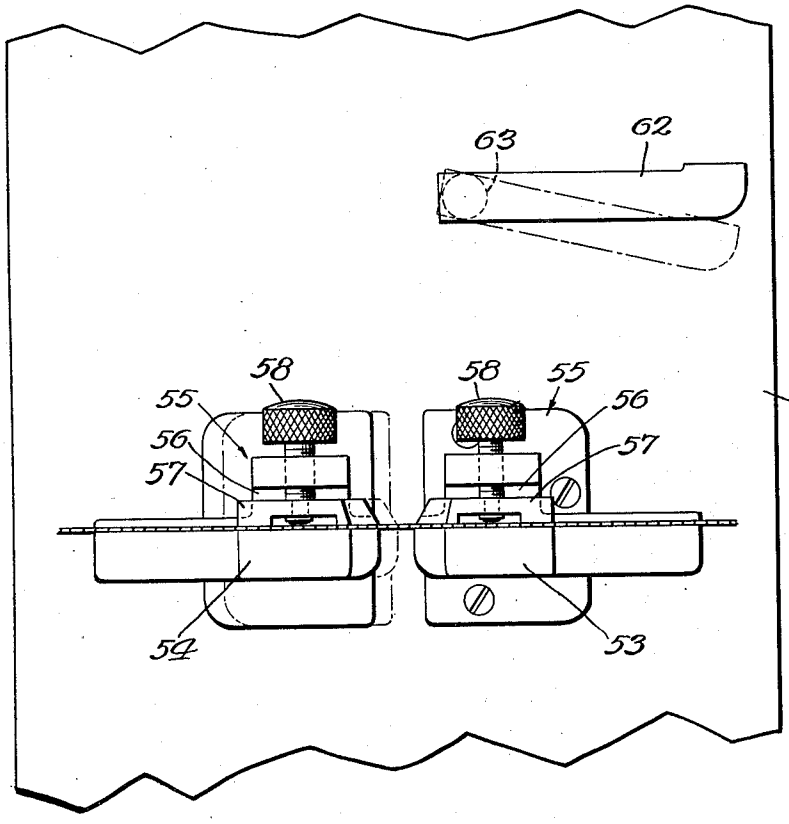


Fig. 14

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Patented Nov. 14, 1939 2,180,079

UNITED STATES PATENT OFFICE

2,180,079

CONVERTIBLE SAWING AND ABRADING MACHINE

Leighton A. Wilkie, Minneapolis, Minn., assignor to Continental Machines, Incorporated, Minneapolis, Minn., a corporation of Minnesota

Application January 7, 1938, Serial No. 183,764
In Canada February 22, 1937

27 Claims. (Cl. 29—76)

This invention relates to a convertible machine for abrading, polishing, sawing, and the like; and constitutes a continuation in part of the copending application of Leighton A. Wilkie, filed May 27, 1935, Serial No. 23,554.

The invention has for one of its objects, the provision of a new and improved machine that may be readily converted into a band saw, a filing or abrading device, or a polishing machine, as occasion may require.

Another object of the invention is the provision of a new and improved convertible sawing and abrading device together with novel means for welding the ends of the band when the same is severed or becomes broken.

A further object of the invention is the provision of new and improved means for facilitating the removal and replacement of bands for performing various different operations by the same band operating mechanism.

A further object of the invention is the provision of a new and improved convertible abrading, polishing and sawing mechanism that is simple in construction, efficient in operation, composed of few moving parts, easily assembled, that is compact and comparatively light in weight, and that may be readily changed from one type of operating mechanism into another.

Other and further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a side elevation of the machine showing the same as being used as a band saw device;

Fig. 2 is a front elevation thereof, with parts broken away;

Fig. 3 is a side elevation of the machine showing the same converted into an abrading or filing machine;

Fig. 4 is a front elevation of a portion of the band and abrading device together with its guides and a portion of the table;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is a section on the line 6—6 of Fig. 4;

Fig. 7 is a perspective view of the guide or backing member and a portion of the band;

Fig. 8 is a perspective view of two adjacent file elements;

Fig. 9 is a vertical section on the line 9—9 of Fig. 4;

Fig. 10 is a vertical section of the machine, with parts broken away, showing the welding and grinding mechanism;

Fig. 11 is a diagrammatic view showing the welding mechanism;

Fig. 12 is a section on the line 12—12 of Fig. 10;

Fig. 13 is a top plan view of the holding members for the welding mechanism, with parts broken away; and

Fig. 14 is a side elevation of a portion of the machine, with parts broken away; but showing the holding mechanism and control lever for the welding device on an enlarged scale.

The equipment for modern machine shops requires various types of mechanism for performing numerous kinds of operations required from time to time in the normal functioning of the shop, such, for instance, as sawing, abrading, polishing and the like. It is common practice to provide separate machines for the different operations but such an arrangement is objectionable for numerous reasons.

Additional floor space must be provided and where the work space is limited, this is a serious problem. Furthermore, the expense of providing a separate machine for performing each operation is a very serious consideration, especially with the more modest shop owner. Then, too, with too many machines, those while not in use will be more or less in the way of the operator in using the other machines.

The present invention seeks to overcome these difficulties by the provision of a single mechanism occupying a minimum of space that may be readily and easily changed from a machine for performing one type of work to another with a minimum of time and expense. In order that this may be done expeditiously, the device is made complete with all the necessary mechanism for effecting the change. This mechanism includes a welding device and grinder whereby in the change from filing to sawing where the saw is inserted through a closed opening, for instance, the change may be readily made. In making the change, the saw is severed, then inserted through the opening in the work and the ends welded, the welded part tempered and the weld ground, after which the band is trained around the pulleys. The entire time consumed in making the change will not be more than from one to three minutes.

Referring now to the drawings, the reference character 5 designates generally the combined sawing, abrading and filing machine which comprises a base 6, Figs. 1, 2 and 3, on which is mounted the motor and operating mechanism for the device and on which is mounted an overhanging arm portion 7. The base 6 and arm portion 7 are housed within a casing 8 which conforms roughly to the form of the device. The lower portion of the casing is provided with a

side door 9 and the upper portion with the doors 10 and 11. The intermediate portion of the casing is provided with an opening covered by a closure or closure plate 12 on which the welding mechanism is mounted as will presently appear. The base and overhanging arm support the vertically alined pulleys 13 and 14 as is usual in such constructions.

As shown, a band saw blade 15 is trained about the pulleys 13 and 14 in the usual manner, Figs. 1 and 2. A conventional saw band guide 16, adjustable through the bracket 44, is provided, and the base has the conventional table 17 mounted on the same through which the saw band extends. The bracket 44 is shown in Fig. 3 and is rigidly mounted in the frame of the machine. The pulleys 13 and 14 are operated by a suitable motor 18 mounted on the base 6 within the casing 8 as shown in dotted lines in Fig. 1. This motor is geared to a change speed mechanism 19 by a belt or chain 21 and this in turn is geared to a drive pulley 22 by a suitable belt or drive chain 23. The change speed device is manually adjusted by a suitable hand wheel 20 as will presently appear. A pinion 24, keyed to the shaft of the pulley 22, meshes with a gear 25 on the shaft on which the pulley 13 is mounted. It will thus be seen that by means of this arrangement, the pulley 13 is geared down and that its speed is considerably reduced from that of the motor shaft. The journal 26 for the shaft of the pulley 14 is adjustably mounted in the slot 27 in a portion of the arm 7 of the apparatus in the usual manner. Since this is conventional, it is not thought necessary to further illustrate or describe the same. It is by means of this adjustment that tension may be placed on the band for operating the same and the tension released whereby the band may be attached and detached as will presently appear.

When it is desired to employ the device as a filing machine as shown in Figs. 3 to 9, inclusive, the saw band 15 is removed from the pulleys and the guide 16 is also removed from the supporting bracket 44 and a file band and a backing member are applied as will presently appear.

The filing mechanism, Figs. 3 to 9, inclusive, comprises an endless flexible metallic band 28 to which a plurality of file elements 29 are attached. The adjacent ends of the file elements 29 interengage. Each file element 29 has a reduced portion 31 extending forwardly therefrom and this reduced portion forms a shoulder 32 extending transversely across the outer surface of the file element. The extension 31 is curved on its outer surface, as shown more clearly in Fig. 7 of the drawings. The contiguous end of the adjacent file element is provided with a corresponding recess 330 for receiving the extension 31. By providing the outer surface of the projection 31 with a curved surface for engaging a corresponding recess 330 in the continuous end of the adjacent file element, the ends of the filing elements are guided into alinement. In other words, the convex surface of each projection, which may be considered as a surface converging outwardly, engaging the recess having what may be considered as surfaces diverging inwardly, cooperates with said recess to guide the contacting ends of the file elements into perfect alinement. The recess 330 and projection 31 of adjacent file sections interfit in such a manner as to prevent relative lateral movement of the ends of the file elements relative to each other and during the passage of the file band across the working zone. The shoulder 32 of the following file element abuts the adjacent end of the preceding file element thereby forming substantially continuous filing surfaces.

The file elements are secured to the band by any suitable means such as the rivets or screws 33 which engage an end portion of the file elements and rigidly connect the same to the bands. The file elements are connected to the band adjacent to the advancing ends thereof in order that the end having the projection 31 will be held adjacent the band while moving around the pulleys whereby the reduced portion will be in position to be properly engaged by the free end of the following file on the straight run of the band.

Since the file elements are attached to a metal band, there is no stretching of the band and consequently, the surface of the filing element will remain smooth and continuous.

Suitable means are provided for resisting the yielding movement of the file elements when the work is forced against the same during the operation of the machine. In the form of the construction shown, a backing member 30 is employed for this purpose. This backing member comprises a channel element 34 having rabbets 35 in the inner side of each flange 36 forming ledges 40 on which the file elements or the file band, if it be made as wide as the file elements, may travel. The depth of these rabbets is such that the flanges 36 will extend alongside the filing elements 29 at each side edge thereof for guiding the same in their movement. The depth of the groove beyond the ledges 40 is such that sufficient clearance for the band 28 is provided.

The intermediate portion of the channel member 34 of the portion opposite the table 17 has its sides removed as at 37 on each side thereof so that the width of the backing member 30 will not be greater immediately above the table than that of the file elements whereby the use of the endless file in corners and the like will be permitted. In order to facilitate the attachment and removal of the band 28, the same is split and has one end provided with a keyhole slot 39 that is adapted to engage a headed pin 38 on one of the file elements. In connecting the ends of the band, the end portions are disposed at right angles to each other and engaged flatwise with the pin entering the large end of the keyhole. After sliding the pin into the narrow end of the keyhole, the two end portions are swung into alignment with the ends of the band abutting, this being permitted by the rounded ends of the band.

In the operation of the device, the file elements will ride on the shoulders or ledges 40 formed by the rabbets 35 as shown in Fig. 6, and the band 28 will be disposed in the slot below the rabbets, the slot being of such depth as to provide sufficient clearance for the overlapping ends of the band. When in operation, the files move downwardly along the backing member 34 and the inner edges of the flanges 36 are bevelled outwardly as at 41 to assist in guiding the ends of the file elements into the channel at the lower end of the narrow portion 37 of the backing member.

Suitable means are provided for raising and lowering the backing member 34. As shown, a bracket 42 attached to the backing member has an upwardly extending arm 43, Fig. 3, which is adjustably mounted in the bracket 44 on the frame of the machine.

Appropriate means are also provided for holding the band and file elements in position in the backing member 34. As shown, a plurality of rollers 45 mounted in a U-shaped bracket 46 for engaging the forward side of the file elements are provided for this purpose. The bracket 46 has one arm extended and provided with a horizontal slot 47 in which is adapted to engage an adjusting bolt 48, Fig. 5. The bolt also extends through a vertical slot 49 in a bracket 50 rigidly secured to the back of the backing member 34 which will permit not only an inner and outer movement of the bracket 46 and rollers 45, relative to the backing member 30, but will permit the same to be adjusted vertically.

In sawing and abrading metal, the speed of the band must be varied for various kinds of metals and for the different tools employed. It has been found that the speed of the bands for filing or sawing soft metals is many times greater than when operating on hard material. For instance, while the velocity of the band in operating on chrome steel of a given thickness should be approximately 75 feet per minute, the speed of the band may be increased to as much as 400 feet per minute when operating on softer metal of the same thickness. Likewise, the speeds of the band will depend on the kind and thickness of the metal and the like.

Furthermore, the speed at which the saw band or abrading band operates most advantageously is within comparatively narrow limits. Experience has shown, for instance, that the convential stepped pulley for securing the different speeds does not give that variation in speeds required to operate most efficiently under the various operating conditions to which devices of this nature are subjected.

In Figs. 1, 2 and 3 is disclosed a device with which any variation of speed of the abrading or sawing band within limits, may be obtained. In the form of construction shown, which is by way of example only, the change speed device 19 comprises a shaft 1 on which are keyed a pair of expansive pulleys 2 and 3. Each pulley comprises a pair of complementary sections 4 and 5a slidable along the shaft 1. Each section is cone-shaped on its inner side and each cone comprises a series of projections 6a alternating with recesses 7a and the projections and recesses of one section are adapted to engage the recesses and projections, respectively, of the other section, somewhat like the teeth of a gear. Springs 8a and 8b at opposite sides of each pulley normally force the sections together to form V-shaped grooves in which the conventional V-shaped belts 21 and 23 are adapted to engage. Suitable means are provided for simultaneously tightening the belt 21 and loosening the belt 23 and vice versa for obtaining a fine adjustment or change of speed of the saw or abrading belt.

In the construction shown, brackets 9a, through which a threaded rod 9b extends, constitute the journal of the shaft 1. The rod 9b is journaled in suitable brackets secured to the casing 8 and is rotated by a hand wheel 20 through bevel gears 9c, Fig. 1. When the handle 20 is operated in one direction, the bracket 9a will travel upward carrying with it the pulleys 2 and 3. As the pulleys move upward, the tension on the band 23 is released whereby the springs 8a and 8b will force the two sections of the pulley 2 toward each other thereby increasing the effective diameter of the pulley 2. The movement of the shaft 1 will place more tension on the V-belt 21 and this in turn will crowd the sections of the pulley 3 outward against the tension of the springs 8a and 8b whereby the effective diameter of the pulley 3 will be decreased. As a result of these changes in these two pulleys, the speed of the saw or abrading band will gradually increase. The opposite effect is obtained by turning the handle 20 in the opposite direction. With such an arrangement, the finest adjustment in speed may be obtained.

In the use of integral endless bands, as for instance in sawing, it is desirable that means be provided for connecting the ends of the band when the same become broken or when it is desirable to sever the band in order to insert the same in a closed opening for operating therein. The apparatus is provided with means for accomplishing this result thereby reducing the time necessary to repair the band to a minimum.

In connecting the ends of steel bands, it has been proposed to braze the same but this requires the ends of the band to be scarfed and overlapped thereby consuming time and labor and a material shortening of the band. The present invention contemplates the use of a welding device for butt welding the ends of the band. Means are also provided for removing the flash or reducing the welded part to the desired thickness after the welding operation. In the form of the device selected to illustrate one embodiment of the invention, a welding mechanism 52, housed in the rear portion of the casing 8 and mounted on the removable plate 12 is provided. This mechanism has a fixed terminal 53 and a movable terminal 54, Fig. 11, extending to the exterior of the casing as shown in Fig. 1. These terminals are each provided with clamping members 55 for clamping the ends of the band fixedly to the terminals 53 and 54. These clamping members may be of any suitable form, but as shown on the drawing, the terminals 53 and 54 are provided at their outer ends with slots 56, Fig. 11, in which is movably mounted a clamping block 57 which is adapted to be forced downwardly against the ends of the band for clamping the same against the lower marginal surface of the slot. Suitable screws 58, swiveled at their lower ends in the blocks 57, are provided for this purpose. The terminals have inwardly extending projections 53a and 54a, Fig. 13, adjacent the inner ends of the slots for shortening the gap between the terminals at that point whereas the outer ends of the terminals are much farther apart. The former is desirable for welding and the latter for annealing, as will presently appear.

The movable terminal 54 is rigidly connected to a swinging arm 59, Fig. 11, which is pivoted as at 61 to the plate 12, Fig. 10. A spring 64 normaly holds the movable terminal 54 out of contact with the stationary terminal 53. While in use, the movable terminal is held inwardly by a control lever 62. The lever 62 is rigidly connected to a shaft 63 extending through and pivoted in the closure plate 12. An arm 70, rigidly secured to the shaft 63 and connected to the inner end of the spring 64, is adapted to be moved forwardly by the handle 62 for moving the arm 59 forwardly, and with it, the terminal 54, as will presently appear. The arm 70 is preferably provided with an adjustable contact screw 60 which engages the arm 59 as clearly shown in Fig. 12 of the drawings. This screw is adapted to be adjusted to the desired length for causing the proper movement of the arm 59 when

engaged by the screw 60 upon the release of the lever 62. The arm 70 is held rearwardly by the spring 64 which, in the construction shown, extends through an enlarged opening 65 in the terminal supporting arm 59. A pin 65a extending transversely through the spring 64 serves to connect each end portion to the arm 59. The lever 62 is located outwardly of the plate 12, Figs. 1, 11 and 12, constitutes a means for moving the terminal 54 for causing it to swing inward to bring the ends of the band into contact as will presently appear.

It is desirable that the parts be so arranged that when the lever 62 is depressed, it will operate a switch for closing the welding circuit through the abutting ends of the band. Means are also provided for automatically opening a switch in the welding circuit when the welding operation is complete. In the form of the construction shown, Figs. 11 and 12, the switch 67 is closed by the arm 70 which will force the movable elements 68 of the switch against the fixed contacts 69 when the lever 62 is pressed downward. In practice, the arm 70 is adapted to engage a spring pressed button 71, Fig. 12, for closing the switch when it is depressed and to open the switch when it is released.

The switch 67 is adjustably secured in position on the wall closure plate 12 by any suitable means. As shown, a bracket 72, Fig. 12, having an outstanding flange 73 is secured to the wall of the closure plate 12. The flange 73 is provided with an opening through which a threaded stem 74, secured to the switch 67, extends. This stem is adjustably mounted by means of the nuts 75 on the stem 74 at each side of the flange 73. By means of these nuts, the position of the button 71 may be brought nearer or farther from the arm 70.

Any suitable mechanism is provided for automatically opening a switch in the primary of the welding circuit when the welding operation is completed. In the form of the device shown in Figs. 11 and 12, a mercury switch 76 is employed for this purpose. The switch 76 has an upstanding arm 77 pivoted as at 78 to the closure plate 12 and has a lower extending arm 79 provided with a slot 81 which is adapted to be engaged by a pin 82 on the upper end of a swinging arm 83, pivoted at its lower end as at 84. The arm 83 has an extension 85 which is slotted as at 86 for engaging the pin 87 on an arm 88 carried by the movable terminal. The parts are so proportioned that when the movable terminal 54 is moved inward by the lever 62, the inward swinging of the arm 59 will cause the arm 83 to move about the pivot 84 and this in turn will tilt the mercury bulb switch 76 and open the circuit which is normally closed when the device is not in operation.

A suitable transformer 89, Figs. 10 and 11, having a primary winding 91 having the switches 67 and 76 therein and a secondary winding 92 connected with the terminals 53 and 54 are employed for furnishing the current for performing the welding operation. Since the details of the transformer and the wiring arrangement constitute no part of the present invention, it is not thought necessary to illustrate and describe the same more in detail other than to state that the lead 93 of the secondary winding 92 that is connected with the movable terminal 54 is preferably flat as shown in Fig. 10 so as to provide sufficient flexibility to permit the proper movement of the terminal block 54.

In the operation of the device, the two ends of the band to be welded are inserted in the inner ends of the slots beneath the projections 53a and 54a and are clamped in position in end to end alinement, the lever 62 is depressed for forcing the lever 59 inward for closing the switch 69 and held in lowered position whereby the tension of the spring 64 will cause the ends of the band to be yieldingly forced against each other. As the abutting ends of the saw are softened, the pressure will cause them to shorten due to the swedging of the heated ends. The tension of the spring 64 will cause said block to move farther and farther inward until it tilts the mercury switch 76 sufficient to open the circuit. The lever 62 is then released and the set screws 58 unscrewed, which will permit the arm 59 to be retracted by the spring 64. The band is now welded but is very hard. In order to temper the weld, the band is slid forward to the outer ends of the slots as shown in dotted lines in Fig. 13 and again clamped in position after which the lever 62 is depressed for an instant until the weld becomes blue in color and is then released. This reheating for an instant to a blue color anneals the welded portion.

After the welding operation, it is necessary to remove the flash or enlargements at the weld. The welding operation causes a thickening of the band and this thickened portion must be reduced before the band can be used. Suitable means are provided for grinding the band to the proper dimensions. As shown, a grinder 94 is mounted on the ledge 95 and operates about a horizontal axis. The grinder may be mounted on the armature shaft of the motor 96 which operates the grinder. A shield 97 is preferably provided for the grinder 94.

It will thus be seen that a combination device is provided which may be readily and easily changed so as to perform various operations at a minimum of time, labor and expense.

While the device is described as being convertible into a band saw or filing machine, it is understood that it may be used as a polishing device or sanding machine depending on the nature of the band and elements used therewith.

It is thought from the foregoing taken in connection with the accompanying drawings that the construction and operation of my device will be apparent to those skilled in the art, and that changes in size, shape, proportion and details of construction may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. In an abrading device, a pair of pulleys, a metallic one piece band trained about said pulleys, means for rotating one of said pulleys, file elements rigidly connected to said band, the adjacent ends of said file elements interfitting and having their ends abutting continuously across said elements along a line at right angles to the edges of said band. and means on the adjacent ends of said band for detachably connecting the same together whereby said band may be inserted in closed openings for filing the interior thereof and for removing the band and elements from said openings.

2. In an abrading device, a thin flexible steel band, abrading elements, means for securing an intermediate portion of each element to said band, the adjacent ends of said elements being provided with interfitting portions on the inner surfaces and with their outer surfaces abutting

along a straight line at right angles to said band continuously across said elements.

3. In an abrading device, a flexible band, abrading elements, means for securing the intermediate portions of said elements to said band, and overlapping interfitting connections between the adjacent ends of said elements, the joint between the abrading surfaces being straight and at right angles to the center line of the band and extending entirely across said elements.

4. In a convertible metal filing and sawing machine, a frame, a pair of pulleys mounted in vertically spaced relation on said frame, a work table rigidly mounted on said frame between said pulleys and having an opening therethrough, a thin metal band trained about said pulleys and extending through said opening, a backing member having means at its ends only for preventing the lateral movement of said band, said thin metal band having file elements thereon movable along said guides, the edgewise stiffness of said band preventing lateral movement of said band and filing elements between the ends of said backing member, means for detachably mounting said backing member on said frame whereby said backing member and band may be removed, and a saw band mounted on said pulleys.

5. An abrading device comprising an endless flexible steel band, means for supporting and moving said band, abrading elements secured to said band, a band guide comprising a channel member having a rabbet in the inner surface of each flange for guiding said band and elements and having portions of said flanges removed from the exterior of said flanges adjacent to the points where the work is applied to the abrading elements whereby said band will be guided in its movement from the ends of the guide and said elements will be exposed for abrading said work at the point where said portions of the flanges are removed.

6. In an abrading device, a channel member having ledges on the inner surfaces of the flanges for receiving a band of file elements and having the sides of the flanges between the ends of the channel member removed to a depth equal to the thickness of the flanges outwardly of said ledges to form a reduced portion in said member no wider than said file elements.

7. In a device of the class described, a base, a pair of vertically spaced pulleys mounted on said base, a metallic flexible band trained about said pulleys, and abrading elements mounted on said band, said elements having overlapping interengaging connections between the adjacent ends of adjacent elements so formed that the joints between the meeting ends of the abrading elements on the abrading surface are substantially normal to the center line of the band.

8. In combination, a base, a support on the base, a pair of pulleys spaced vertically and edgewise on said support, a work rest on said support between the pulleys, a steel band trained about said pulleys, abrading elements secured to the outer side of said band, a guide device for said band extending above and below said work rest, the upper and lower ends of said guide device being in the form of channels having side flanges between which the connected band and abrading elements slide so that the guide device supports the connected band and abrading elements against the inward flatwise pressure of work against the abrading elements and against edgewise displacement, the portion of the guide device between its channeled ends being no wider than said abrading elements whereby the stiffness of the band transversely thereof alone prevents edgewise displacement of the connected band and abrading elements between said channeled ends.

9. In a device of the class described, a frame, pulleys arranged in a vertical plane one above the other, a one piece thin metallic band trained over said pulleys, file elements having their intermediate portions rigidly secured to said band and having the inner portions of their adjacent ends interlocking on the vertical runs of the band, a work table in the working zone between said pulleys and having an opening through which said band extends, a backing member for said band in said working zone, said member extending above and below said table and having its ends provided with flanges extending outwardly alongside the side edges of said file elements for guiding the same, the portion of said guide in said working zone being no wider than said elements, a support for said member, means for removably mounting said support on said frame, said band being severed and having means for detachably connecting the severed ends together whereby said backing member and band may be removed, and another band mounted in its stead.

10. In a device of the class described, a frame, a pair of pulleys supported on said frame in spaced relation in a vertical plane, a substantially horizontal table supported by said frame between said pulleys and providing a working zone above the same, a one-piece flexible metallic band trained over said pulleys and extending through an opening in said table, file elements each secured to said band at points between its ends and having a filing surface on the side opposite said band, the adjacent ends of said elements being provided with semi-circular projections and cooperating recesses interlocking therewith and located inwardly of the filing surface, the outer sides of said elements abutting in the working zone to form a continuous filing surface, and a backing member on the inner side of said band for resisting inward pressure applied to the work during the operation of the device.

11. In an abrading device, a flexible band, file elements having abrading surfaces, means for securing the intermediate portions of said elements to said band, the outer surfaces of adjacent elements abutting to form a continuous filing surface while in use, and overlapping interfitting connections between the adjacent ends of said elements, said interfitting connections being wholly beneath the abrading surfaces of said elements.

12. In an abrading machine, the combination of, a pair of vertically spaced pulleys, a table in the space between said pulleys. said table having an opening therethrough, a metal ribbon-like band trained over the pulleys and having one run thereof passing through said opening, file elements, means for securing the file elements at their medial portions to said band, interfitting connections between the adjacent ends of the file elements for holding the file elements in longitudinal alignment, a backing member extending above and below the table for supporting the connected band and file elements against the pressure of work applied to the file elements, side guides at the ends only of said backing member for supporting the connected band and file elements against edgewise displacement above and below the working zone but not in it, the intermediate portion of said backing member being no wider than said file elements, and the stiff-

ness of the band against edgewise flexure supporting the connected band and file elements against edgewise displacement in the working zone between said side guides.

13. In an abrading machine, the combination of, a work supporting table having a hole therethrough, the space directly above the table constituting a working zone, a pulley above the table, a pulley beneath the table, a one-piece ribbon-like metal band trained over said pulleys and passing through the hole in the work supporting table, abrading elements attached medially of their ends to said flexible band to be successively carried thereby through the working zone, rigid guide means supporting said band and abrading elements adjacent to the working zone but not in the working zone against edgewise displacement out of their intended path, and a rigid backup support for the connected band and abrading elements, said rigid backup support extending substantially across the working zone and being sufficiently narrower than said rigid guide means to have no portion thereof extend beyond the side edges of the abrading elements whereby the abrading elements may enter corners of work without interference from the backup support, said connected band and abrading elements being supported against edgewise displacement in crossing the working zone solely by the stiffness of the band against edgewise flexure.

14. In an abrading machine, the combination of, edgewise spaced pulleys, a one-piece metal band trained about said pulleys and moving with a straight run through a distance between said pulleys, said band being flatwise flexible to enable it to follow the curvature of the pulleys, but being wide enough to be edgewise inflexible, a plurality of abrading elements carried by said band to be successively movable thereby through said space, means for supporting work in juxtaposition to the abrading elements as they move through said space so that said space constitutes a working zone, guide means adjacent to but entirely outside the working zone for supporting the band against edgewise displacement during its travel through the working zone, and a backup support for supporting the band and the abrading elements carried thereby against flatwise displacement by the pressure of work applied to the abrading elements, said backup support extending across the working zone and being sufficiently narrow than said rigid guide means to have no portion thereof extend beyond the side edges of the abrading elements whereby the abrading elements may enter corners of work without interference from the backup support.

15. In an abrading machine, the combination of, edgewise spaced pulleys, a one-piece metal band trained about said pulleys and moving with a straight run through a distance between said pulleys, said band being flatwise flexible to enable it to follow the curvature of the pulleys but being wide enough to be edgewise inflexible, a plurality of abrading elements carried by said band to be successively movable thereby through said space, means for supporting work in juxtaposition to the abrading elements as they move through said space so that said space constitutes a working zone, guide means adjacent to but entirely outside the working zone for supporting the band against edgewise displacement during its travel through the working zone, and a rigid supporting member having a longitudinally continuous surface along which the band and abrading elements travel, said supporting member being disposed in the working zone to support the abrading elements against the pressure applied thereon by the work, and being sufficiently narrower than said rigid guide means to have no portion thereof extend beyond the side edges of the abrading elements whereby the abrading elements may enter corners of work without interference from the supporting member.

16. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible so that a portion of the band spanning the distance between two supports which hold the same against edgewise displacement is held by the inherent stiffness of the band itself against edgewise motion, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, means above and beneath but not in the working zone for supporting the band against edgewise displacement, and a continuous backup support extending through the working zone between said supporting means to support the band and abrading elements against flatwise displacement in the working zone, said backup support being no wider than the abrading elements so as not to interfere with proper functioning of the abrading elements in corners of work.

17. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible so that a portion of the band spanning the distance between two supports which hold the same against edgewise displacement is held by the inherent stiffness of the band itself against edgewise motion, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, means above but not in the working zone for supporting the band and the abrading elements thereon against edgewise displacement, and a backup support extending substantially through the working zone and having a longitudinally continuous surface along with the band and abrading elements slide to be supported against flatwise displacement, and said backup support being no wider than the abrading elements so as not to interfere with proper functioning of the abrading elements in corners of work.

18. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, a backup support having a longitudinally continuous surface along which the band and abrading elements slide, means rigidly mounting said backup support with the ends thereof extending above and beneath the working zone, said backup support being no wider

than the abrading elements, and means rigidly connected with said backup support at least at one end thereof and projecting beyond the side edges thereof to engage over the sides of the connected band and abrading elements and thereby support the band and abrading elements outside the working zone against edgewise displacement, said means engaging the connected band and abrading elements for an extent long enough to insure that the inherent stiffness of the band against edgewise flexure holds the same and the abrading elements against edgewise displacement in the working zone.

19. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, a backup support having a longitudinally continuous surface along which the band and abrading elements slide, means rigidly mounting said backup support with the ends thereof extending above and beneath the working zone, said backup support being no wider than the abrading elements, and means directly connected with said backup support at the opposite ends thereof to be disposed above and beneath the working zone and projecting beyond the side edges of the backup support to engage over the sides of the connected band and abrading elements and thereby support the band and abrading elements outside the working zone against edgewise displacement, said last named means providing two supports close enough together that the portion of the connected band and abrading elements spanning the distance therebetween is held against edgewise displacement by the inherent stiffness of the band itself.

20. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible so that a portion of the band spanning the distance between two supports which hold the same against edgewise displacement is held by the inherent stiffness of the band itself against edgewise motion, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, a backup support having a longitudinally continuous surface along which the band and abrading elements slide, means rigidly mounting said backup support with the ends thereof extending above and beneath the working zone, said backup support being no wider than the abrading elements, and rigid side walls connected with said backup support at least at one end thereof but outside the working zone, said side walls being so positioned and spaced apart that the abrading elements slide closely therebetween whereby the connected band and abrading elements are held against edgewise displacement in juxtaposition to the working zone.

21. In an abrading machine, the combination of, edgewise spaced pulleys, a flat ribbon-like one-piece metal band encircling the pulleys, said band being wide enough to be edgewise inflexible so that a portion of the band spanning the distance between two supports which hold the same against edgewise displacement is held by the inherent stiffness of the band itself against edgewise motion, a plurality of abrading elements carried by the band, means for supporting work to be acted upon by the abrading elements, said means being located in juxtaposition to one stretch of the band as it passes from pulley to pulley so that the space adjacent to the work supporting means constitutes a working zone, a backup support having a longitudinally continuous surface along which the band and abrading elements slide, means rigidly mounting said backup support with the ends thereof extending above and beneath the working zone, said backup support being no wider than the abrading elements, and spaced walls rigidly connected with the backup support at the ends thereof to be positioned above and beneath the working zone but not in the working zone, said walls being spaced apart a distance to receive the abrading elements therebetween and slidably engage the side walls thereof to thereby support the connected band and abrading elements against edgewise displacement above and beneath the working zone.

22. In a device of the class described, a base, a pair of vertically spaced pulleys mounted on said base, a metallic flexible band trained about said pulleys, abrading elements mounted on said band, and means projecting from one end of each element interposed between said band and the adjacent end of the adjacent element when said elements are in longitudinal alignment so that the latter element laps over said projecting means, said lapping portions of the elements interengaging to prevent relative lateral movement of said elements.

23. In a filing machine, a frame, a pair of vertically spaced pulleys carried by said frame, a thin flatwise flexible metallic band trained about said pulleys, file elements secured to said band, a table providing a working zone around one stretch of the band between said pulleys above, and in proximity to, said table, guides for engaging the side edges of said file elements adjacent to but not in said working zone for preventing lateral edgewise movement of said elements, the edgewise stiffness of said band between said guides preventing lateral edgewise movement of said band and elements in said working zone, and means for resisting rearward flatwise movement of said band within said working zone, said last named means being no wider than said elements.

24. In a filing machine, a frame, a pair of vertically spaced pulleys carried by said frame, a carrier trained about said pulleys and having substantially straight stretches of travel between the pulleys, file elements mounted on said carrier, the adjacent ends of said elements having an overlapping and interlocking connection, said connection comprising a projection on one element spaced below the plane of the filing surface, said projection having diverging side walls and being engageable in a complementary recess in the other element whereby the latter element laps over the projection and a continuous filing surface is provided with the overlapping interlocking connection disposed wholly below said filing surface, and whereby said connections automatically guide the elements into longitudi-

nal alignment as they leave the pulleys and begin their straight stretches.

25. In a filing machine, a frame, a pair of vertically spaced pulleys carried by said frame, a thin flexible metallic band trained about said pulleys, file elements secured to said band, a working table secured to said frame between said pulleys, guides engaging the side edges of said file elements adjacent to, but spaced from, said table, and a backing member at the level of said table for resisting the inward movement of said band and elements during the filing operation and extending above the table to form a working zone, said member at said level being no wider than said elements.

26. In a filing machine, a series of files of uniform and equal width, interengaging connections between the ends of the files by which they are held in longitudinal alignment with their side edges flush, means for connecting the files to form an endless file band, said means being flexible in a direction flatwise with respect to the files but inflexible in a direction edgewise with respect thereto, spaced means mounting and driving the file band to cause one stretch thereof to move through a working zone, a work support in said working zone for supporting work to be pressed against the filing surface of the file band as it passes through the working zone, spaced side guides having close sliding engagement with the side edges of the files to support the file band against edgewise displacement, means rigidly mounting said side guides adjacent to but not in the working zone, and a backup support in the working zone having a continuous longitudinal surface along which the file band slides to be supported against inward flatwise motion in response to the pressure of work thereon, said backup support being no wider than the files so as not to interfere with the functioning thereof in corners of work.

27. In a filing device, a supporting frame, a pair of vertically spaced pulleys supported on said frame, a band trained about said pulleys, a table mounted on said frame in a plane between said pulleys and provided with an opening through which said band extends, abrading elements on said band, means engaging the side edges of said elements adjacent said table for preventing lateral movement of said elements and means at said table for preventing rearward movement of said band during the filing operation, said last named means being no wider than said elements.

LEIGHTON A. WILKIE.

CERTIFICATE OF CORRECTION.

Patent No. 2,180,079. November 14, 1939.

LEIGHTON A. WILKIE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, first column, line 52, claim 14, for the word "narrow" read narrower; same page, second column, line 54, claim 17, for "with" read which; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of December, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)