Jan. 6, 1953 F. E. HENDRICKSON 2,624,158

BUFFING MACHINE

Filed Oct. 26, 1949 2 SHEETS—SHEET 1

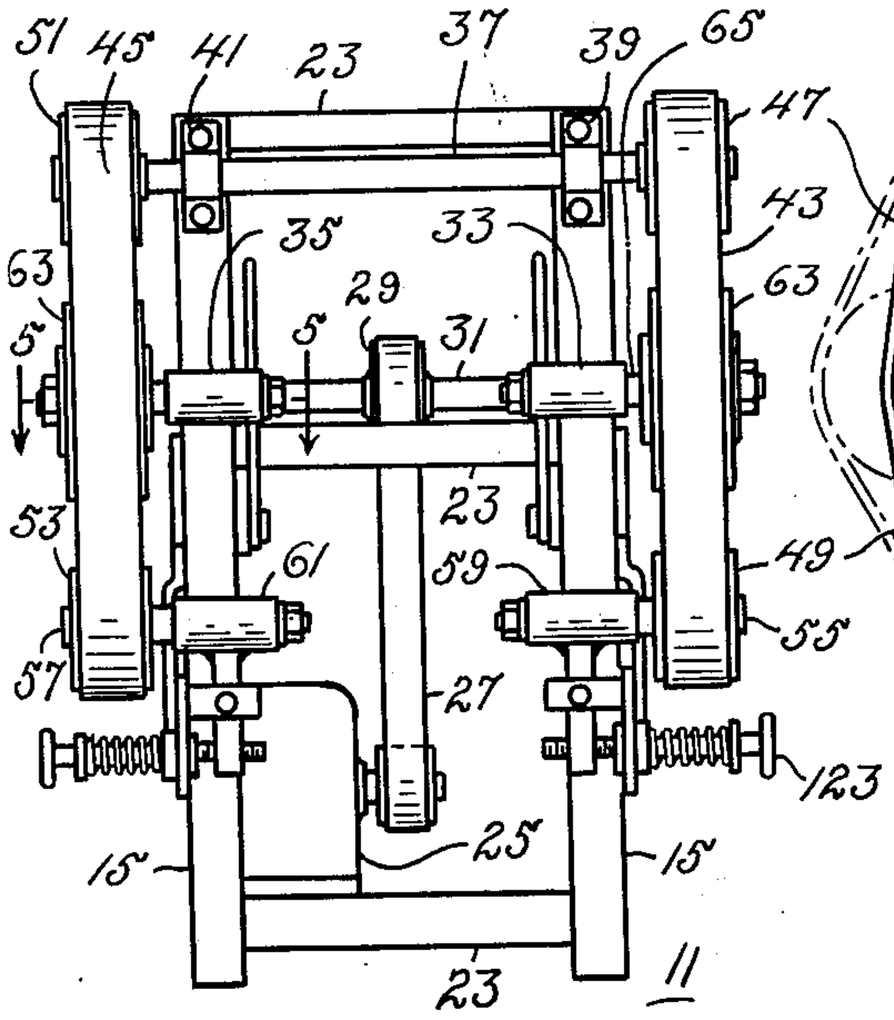

Fig-2

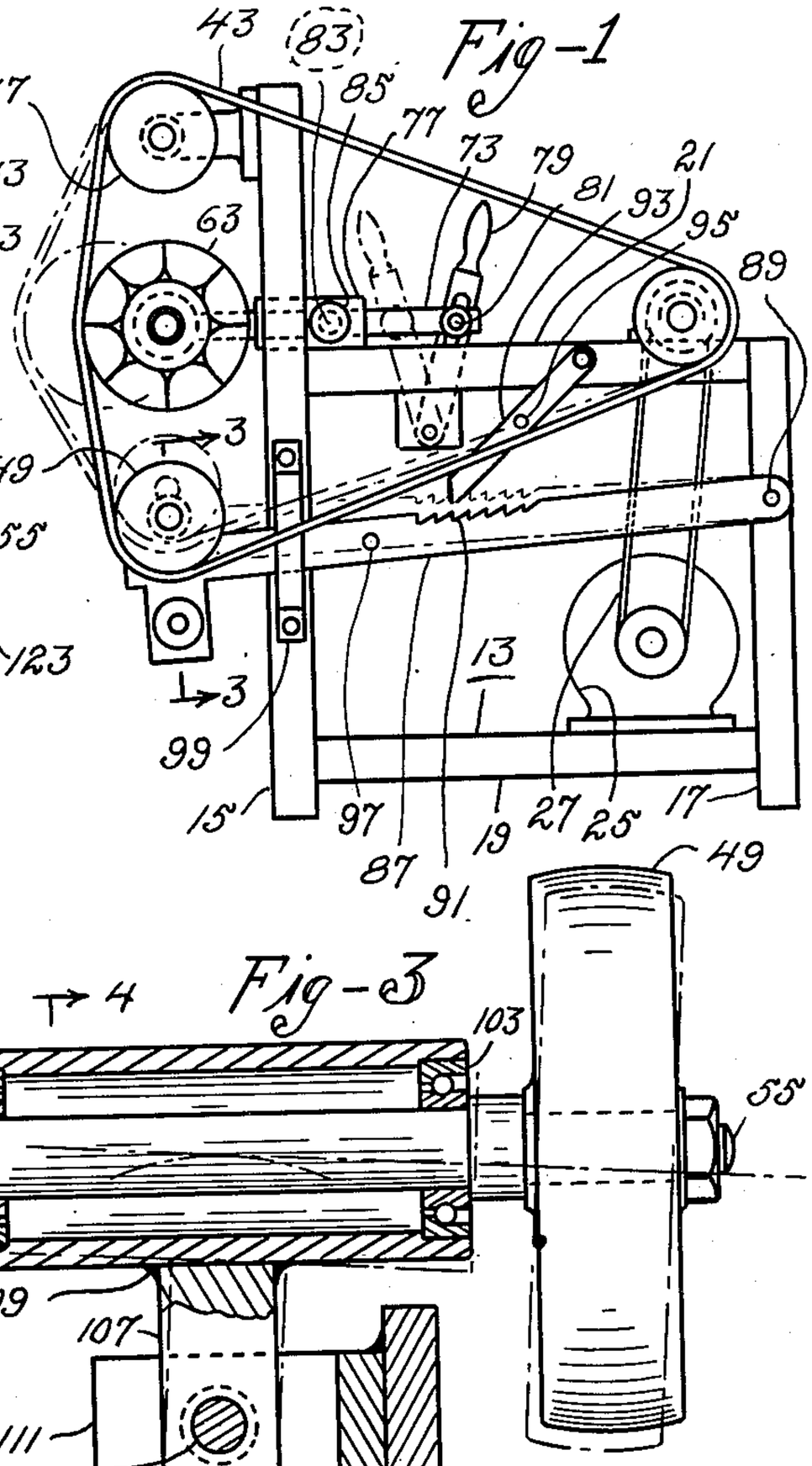

Fig-1

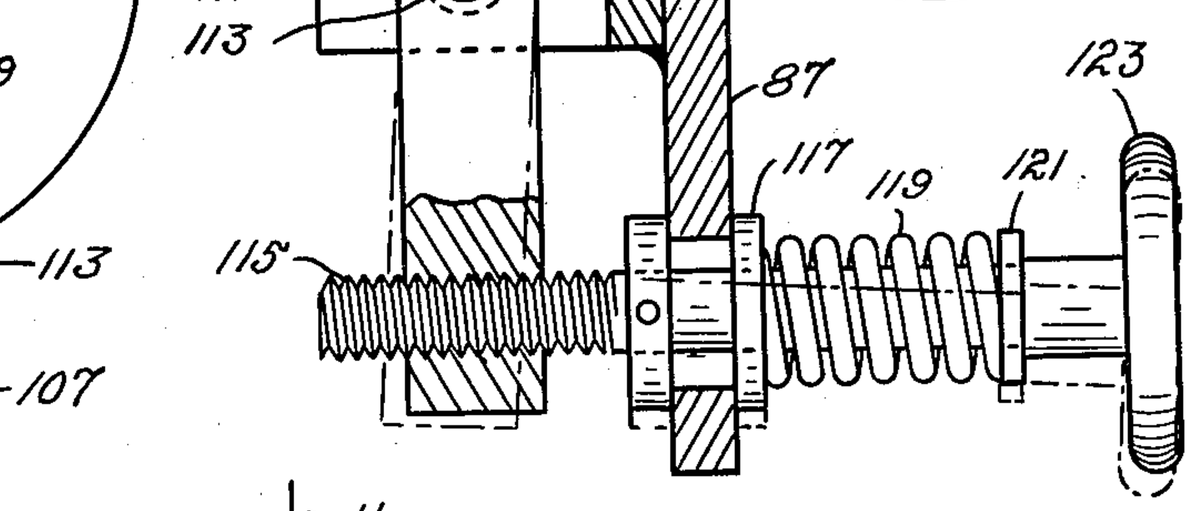

Fig-3

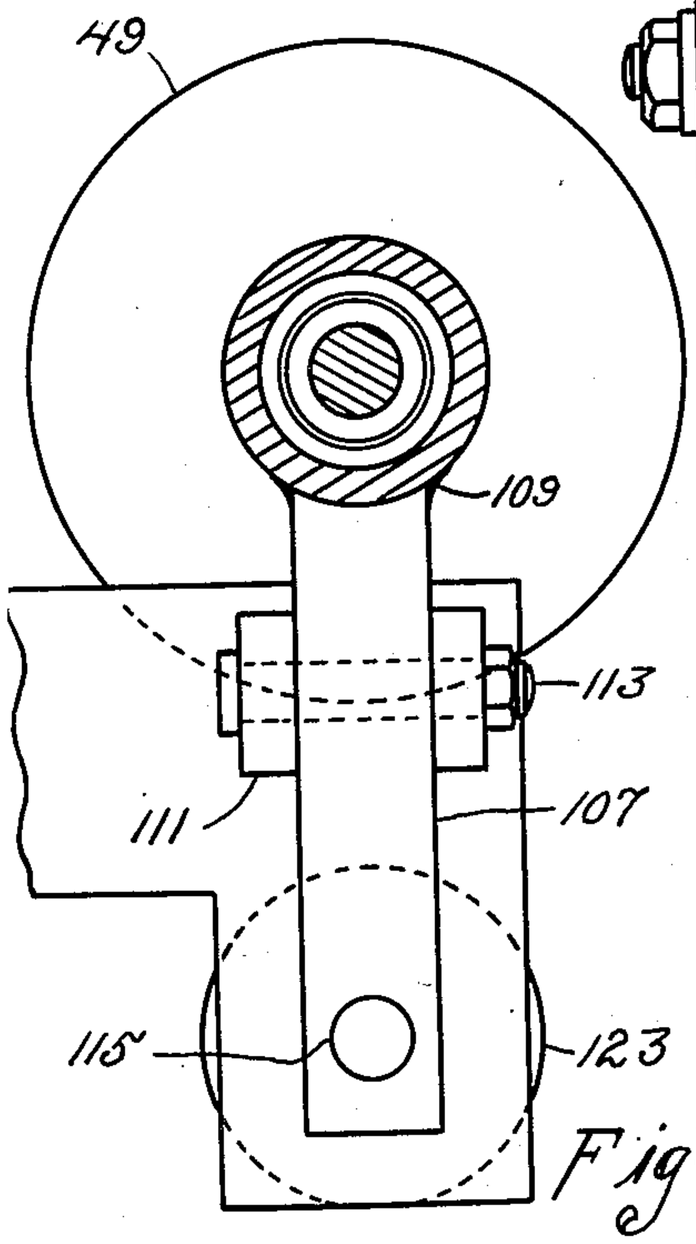

Fig-4

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Jan. 6, 1953 F. E. HENDRICKSON 2,624,158

BUFFING MACHINE

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2 SHEETS--SHEET 2

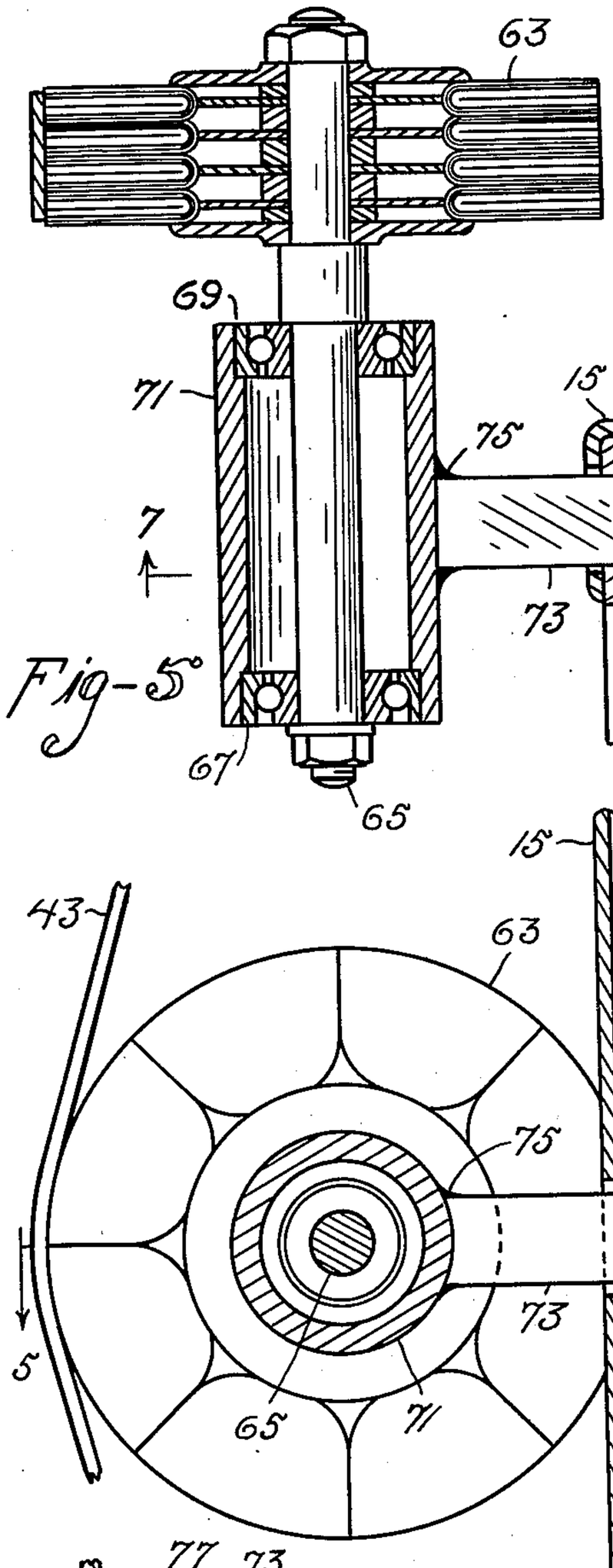

Fig-5

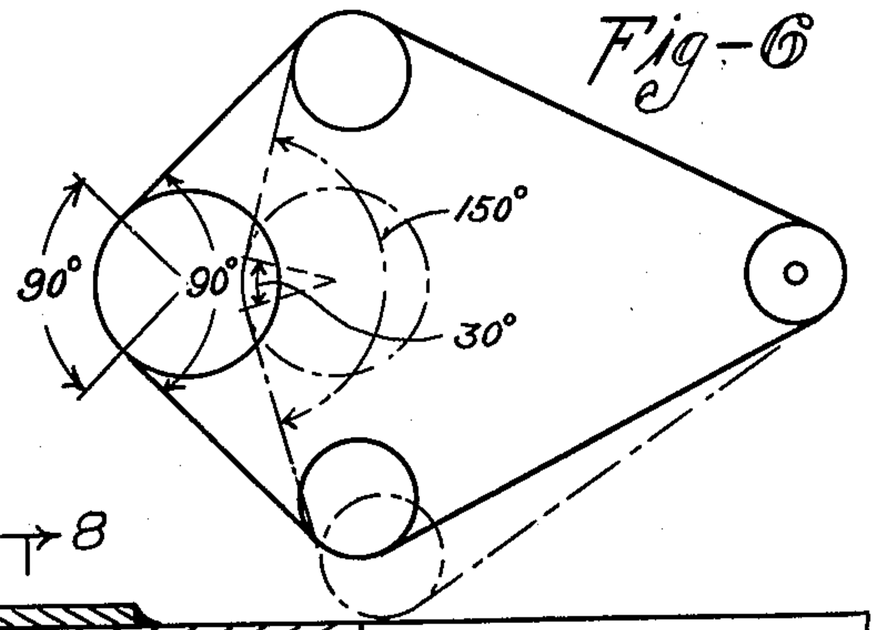

Fig-6

Fig-7

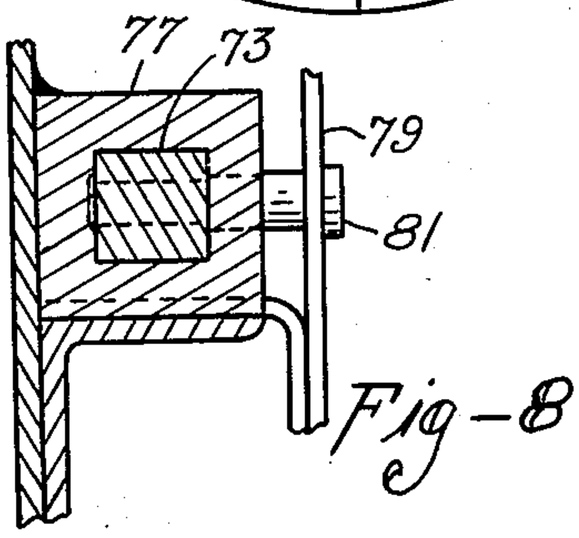

Fig-8

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Patented Jan. 6, 1953

2,624,158

UNITED STATES PATENT OFFICE

2,624,158

BUFFING MACHINE

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Continuation of application Serial No. 680,455, June 29, 1946. This application October 26, 1949, Serial No. 123,568

7 Claims. (Cl. 51—141)

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My invention relates to polishing and buffing machines and particularly to such machines provided with a polishing belt running over a work wheel. This application is a continuation of my prior, co-pending application, for Polishing Machine, Ser. No. 680,455, filed June 29, 1946, now abandoned.

One object of my invention is to provide a polishing machine comprising a polishing belt, with improved means for starting up a new belt on a partially resilient work wheel.

Another object is to provide a polishing machine for supporting an abrasive belt on highly flexible work wheels and on wheels that develop substantial belt-supporting stability only when running.

Another object is to provide an improved machine for polishing irregularly-shaped pieces.

Another object is to provide an improved abrasive belt machine for polishing manually supported pieces and irregular pieces.

Another object of my invention is to provide a polishing machine comprising a polishing belt, with improved means for aligning the belt on the belt aligning pulleys.

Another object of my invention is to provide a polishing machine having a polishing belt, with improved means for adjusting the work wheel so that the front side thereof will project proper amounts beyond the front surfaces of the adjacent aligning pulleys.

Still another object of my invention is to provide a polishing machine comprising a polishing belt, the belt operating over a work wheel with manually-adjustable means for adjusting the position of the work wheel after the start of the belt and of the machine.

Other objects of my invention will either be apparent from a description of one form of device embodying my invention or will be set out in the course of such description and particularly set forth in the appended claims.

In the drawings,

Figure 1 is a view in side elevation of a belt polishing machine embodying my invention;

Fig. 2 is a front elevational view of the machine shown in Fig. 1;

Fig. 3 is a sectional view, on an enlarged scale, taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view therethrough, taken on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal sectional view taken on the line 5—5 of Fig. 7;

Fig. 6 is a diagrammatic view showing different positions of the work wheel relative to the two aligning pulleys;

Fig. 7 is a fragmentary, sectional view taken on the line 7—7 of Fig. 5; and,

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Fig. 8 is a sectional view therethrough taken on the line 8—8 of Fig. 5.

Abrasive belts have been employed with rigid wheels, rubber faced wheels, and even sewed fabric wheels, as for example in the so called "back-stand idler" arrangement, but in such machines the work wheel was required to support and guide the belt and so was necessarily of a firm or rigid construction even though it might have a slightly-yielding, belt-contacting face.

In accordance with my present invention I employ a belt-backing work wheel, or back-up wheel, of a highly flexible segmental construction that develops substantial belt-supporting stability only while running. I have found that a belt on such a wheel yields to the pressure of work and folds the belt over convex protuberances and into hollows of the work piece.

Further, my present invention provides a machine, and method of operation thereof, for starting up a belt on such a wheel wherein the flexible work wheel is required to support the belt only after it has attained a speed at which it develops sufficient belt-supporting stability.

Referring first of all to Figs. 1 and 2 of the drawings, I have there illustrated, particularly in Fig. 1 of the drawings, a view in side elevation of a belt polishing machine designated generally in its entirety by 11. While I have shown a polishing machine comprising a pair of polishing belts, I do not desire to be limited thereto, but an early device of this kind built by me was provided with two polishing belts, so that such assembly has been shown here for illustrative purposes. The machine 11 comprises a skeleton frame 13 consisting of vertically extending angle bar members 15 and 17 as well as horizontal lower angle bar members 19 and upper angle bar members 21 together with upper and lower horizontal cross angle bar members 23. The assembled members 15, 17, 19, 21 and 23 are suitably secured together as by welding so as to provide a skeleton frame, members 15 being longer than members 17.

An electric motor 25 of suitable size and speed is adapted to be mounted upon the lower angle bar members 19 and 23 and is adapted to drive by a belt 27, a driving pulley 29 mounted on a shaft 31. Shaft 31 is supported by bearings which are secured to the upper angle bars 21.

I provide further an upper shaft 37 which is rotatably supported as by a plurality of bearings 39 and 41 which are suitably secured against the front surface of the forward vertical bars 15 at the upper end thereof. Polishing belts 43 and 45 are adapted to operate over a pair of spaced aligning pulleys 47 and 49 on the right-hand side of the frame as seen in Fig. 2 and over aligning

pulleys 51 and 53 on the left-hand side of the frame. Pulleys 47 and 51 are adapted to be suitably rotatably secured on shaft 37. The lower belt aligning pulleys 49 and 53 are adapted to be supported on short shafts 55 and 57 which are adapted to be rotatably supported by bearings 59 and 61 which are adapted to be specially mounted as will hereinafter appear.

I provide also a pair of work wheels 63 which are preferably of the kind disclosed and claimed in my co-pending application, S. N. 657,804, filed March 28, 1946, to which application reference may be made for the details of construction of the work wheels. Generally speaking, work wheel 63 is partially resilient and is of the self-ventilating type. Each work wheel 63 is supported on a short shaft 65 which is supported as by a pair of ball bearings 67 and 69, these ball bearings being mouned in a hollow tubular member 71. Member 71 is adapted to be rigidly supported on a square member 73 to which it may be welded as by seams 75 of welding material. Member 73 is adapted to project through a hollow square member 77 which is supported by the front end of the horizontal bar 21. Member 73 is adapted to be adjusted longitudinally of its length in member 77 by a lever arm 79 and a pin 81 secured to member 73 and is adapted to be held in any fixed position relative to member 77 by a short shaft 83 having a hand wheel 85 thereon so that when by means of lever arm 79 work wheel 63 has been pushed outwardly as far as it is deemed wise to push the same, rod 73 may be locked in a given position. Lever arm 79 is pivotally mounted at its lower end, on a plate 82 secured to bar 21, and a pivot pin 84. Each of the lower belt aligning pulleys 49 and 53, and their shafts 55 and 57, are mounted on a substantially horizontal bar 87, the rear end of which is pivotally mounted on one of the rear vertical bars 17, as by a pin 89. Lever arm 87 is provided with a plurality of notches 91 intermediate its ends at its upper side and a short arm 93 is pivotally mounted on one of the upper bars 21 and is provided with a laterally projecting stud or short shaft 95 so that when arm 87 is moved down by a short rod 97 secured to arm 87, it may be locked in its adjusted position by short arm 93 engaging one of the notches 91. A vertical guide bar 99 is secured to the outside of one of the vertical bars 15 so that arm 87 may be held in desired operative position to provide the desired tension on the polishing belt.

Aligning pulleys 49 and 53 may be rotatably supported as by a pair of ball bearings 101 and 103 which are suitably secured in a hollow member 105 which is supported by a short bar 107 which may be made of substantially square shape in lateral section and be secured to member 105 as by welding seams 109. Arm 107 is pivotally supported on a short bar member 111 as by a pin 113, member 107 being adapted to extend substantially vertically. The lower end of member 107 has screw-threaded engagement with a short shaft 115 which is rotatably supported in one of the arms 87 and is held therein by a bearing member 117. A compression spring 119 is located on shaft 115 and abuts at one end against bearing 117 while its other end abuts against a washer 121, which abuts against a small hand wheel 123 secured on shaft 115. It is obvious that turning movement of hand wheel 123 and of shaft 115 in one direction or another will cause a change in the angle of shaft 55 and therefore of aligning wheel 49 relative to the bar 87.

Extended tests on my part with machines of this general type have shown the necessity of certain features hereinbefore described to which further reference will now be made. I have found, for instance, that when using a work wheel to support a polishing belt it is extremely difficult to start up a new belt on a belt polishing machine when using a partially resilient work wheel, if more than a slight amount of pressure is exerted by the polishing belt upon the work wheel before the belt has reached its proper operating peripheral speed. I have also found that when a new polishing belt has been started by means of the method hereinbefore described, the machine can be started and stopped any number of times for the lifetime of the belt without readjusting the pressure of the belt on the work wheel and that the belt will remain aligned on the face of the work wheel while running no matter how unbalanced the pressure of the work may be or from what angle the work piece to be polished may be applied to the belt supported by the work wheel.

Although the flexible work wheel 63 is incapable of properly guiding the belt or adequately sustaining much pressure, the aligning pulleys 47 and 49 serve to keep the belt from running off in spite of the tendency of a work piece to deflect the belt to one side whenever it is applied off balance.

I have further found that in a belt-polishing machine of the type herein described, it is important that the extreme front end of the work wheel project well beyond the front surfaces of the two adjacent alignment wheels, in order to provide room for manipulating the work piece while it is being polished and also to present a sufficiently large and resiliently cushioned surface for larger pieces of work.

I have particularly noticed that the machine will perform most satisfactorily when the included angle formed by the two stretches of the polishing belt over the work wheel is between 90° and 150° and when the diameter of the work wheel is approximately three to four times its width. Reference may be had to Fig. 6 in regard to just what is meant by 90° and 150°. The section of the work wheel contacted by the belt will vary between 30° as a minimum and 90° as a maximum.

I may here again point out that as described in my hereinbefore mentioned co-pending application, the work wheel 63 is made of relatively soft material and is of a sectional, flexible construction having, however, some inherent stability and is preferably of the ventilated type. It is evident that when the machine is not operating that there will be no centrifugal force acting upon the individual sections of the work wheel to tend to hold them extending substantially radially outwardly and to give them substantial belt-supporting stability. When starting up motor 25 and therefore the polishing belt 43, I have found that it is extremely difficult to properly start up a new belt on a belt polishing machine of the kind shown in the drawings if the work wheel has complete freedom from inherent stability as considerable pressure is exerted by the polishing belt upon the work wheel before the belt has reached its proper peripheral speed. For practical operation, I have found that the width of the periphery of the work wheel when running at full speed should be approximately the same as the width of the polishing belt in order to be able to reach corners and bends in the work piece to be polished, and that this width should be from one-fourth to one-half of the diameter of the

work wheel. A narrow wheel tends to give the belt less support so that it is more easily pushed off by the unbalanced application of a work piece, whereas too wide a belt tends to double up in a longitudinal fold if a corner or point of the work piece is pressed deep into it. I have further found that when a new belt is installed and the machine has been adjusted at the initial run by means of the novel features hereinbefore described, the machine can be started and stopped any number of times for the lifetime of the belt and the belt will remain on the work wheel while running no matter how unbalanced the pressure may be that is applied by the work piece against the belt over the work wheel.

When a new belt has been installed around the various pulleys **29**, **47**, **63** and **49**, and with lever arm **93** disengaged from arm **87**, the operating handle **79** is moved toward the work wheel just sufficiently to lift the pulley **49** from its lowermost position, thereby causing the polishing belt **43** to exert a very slight pressure on work wheel **63**. The driving motor **25** is then started and the operating handle **79** is gradually moved so as to cause more pressure to be exerted by the work wheel against the polishing belt.

While the work wheel is thus gradually moved forward manually, the operator watches the alignment of the polishing belt upon the work wheel from the front of the machine as seen in Fig. 2. If any tendency to misalignment is observed, the adjusting wheel **123** is turned in the proper direction to bring the polishing belt in perfect alignment with the work wheel. As soon as such alignment has been effected, the operating handle **79** is moved all the way forwardly and the work wheel is locked in this position by means of the locking hand wheel **85**. At this stage the only tension on the polishing belt is caused by the gravity of pulley **49** and lever arm **87**, but this tension is not sufficient for satisfactory operation. Manual pressure is then exerted downwardly on handle **97** on lever arm **87** and at the same time locking lever **93** is pushed downward against the teeth **91** provided in the upper edge of lever arm **87**. Considerable pressure can be obtained by this method and an experienced operator will soon determine just what is the optimum pressure. I provide a biased take-up, or automatic control of the tension of the belt during the starting of the machine, the truing up of the alignment, and the setting of the work wheel; and I provide also means for locking the take-up wheel in an adjusted position during the use of the machine.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof and all such modifications coming clearly within the scope of the appended claims shall be considered as covered thereby.

I claim:

1. In combination in a polishing machine, a plurality of pulleys for a polishing belt comprising two aligning wheels and a work wheel therebetween, said work wheel comprising a hub and a plurality of separate segmental outward-extending sections of flexible material supported thereon, the whole wheel being so flexible that it develops a substantial part of its belt-supporting stability by centrifugal force, a movable support for said work wheel permitting movement thereof transverse the tangent between said aligning wheels sufficient to move said work wheel from a position in which it barely touches a belt on said aligning wheels to a position in which from 30 to 90 angular degrees of the periphery of an uncompressed work wheel engages said belt, another of said plurality of pulleys having a movable support movable for tightening a belt, and means for locking the movable supports of said work wheel and belt-tightening pulley.

2. The combination of the immediately preceding claim wherein said belt-tightening pulley includes means for biasing it in a belt-tightening direction.

3. A polishing machine as set forth in claim 1 in which the diameter of the work wheel is from two to four times the width of its face.

4. The combination of claim 1 wherein there is included a belt on said pulleys having a width substantially equal to the width of the work wheel.

5. In a polishing machine including a pulley stand, the combination with a driving pulley for an abrasive belt and a support for the driving pulley, of, a supporting structure forward of the drive pulley, two forwardly-projecting pulley-supporting brackets thereon for supporting two aligning pulleys one substantially above the other, aligning pulleys on said brackets in position to receive and guide an abrasive belt, means for adjusting one of said brackets about an axis at an angle to the axes of said three pulleys for changing the angularity of its pulley, means for adjusting one of said brackets in a direction to affect the tension of a belt on said pulleys, a work wheel for backing up said belt mounted on said supporting structure between said two aligning pulleys, and means for adjusting the work wheel against the belt for deflecting it from a straight path between said two aligning pulleys.

6. The combination of claim 5 wherein the one of said brackets is adjustable for imposing both said adjustments on the wheel thereon.

7. The method of backing a polishing belt in a polishing machine wherein the belt travels over supporting pulleys and a soft backing pulley having belt supporting stability only when rotated, which method comprises starting the belt running over the pulleys but in only light contact with the backing pulley whereby to start the backing pulley rotating, then moving the backing pulley into firmer contact with the belt to increase the speed of rotation of the backing pulley and supporting the belt under working tension against the belt supporting face of the soft backing pulley when it is rotating substantially at the surface speed of the belt.

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