Sept. 27, 1949. L. ILLMER ET AL 2,483,283

REVERSIBLE GRINDER MACHINE FOR REELABLE STRAND STOCK

Filed Jan. 29, 1947

3 Sheets-Sheet 1

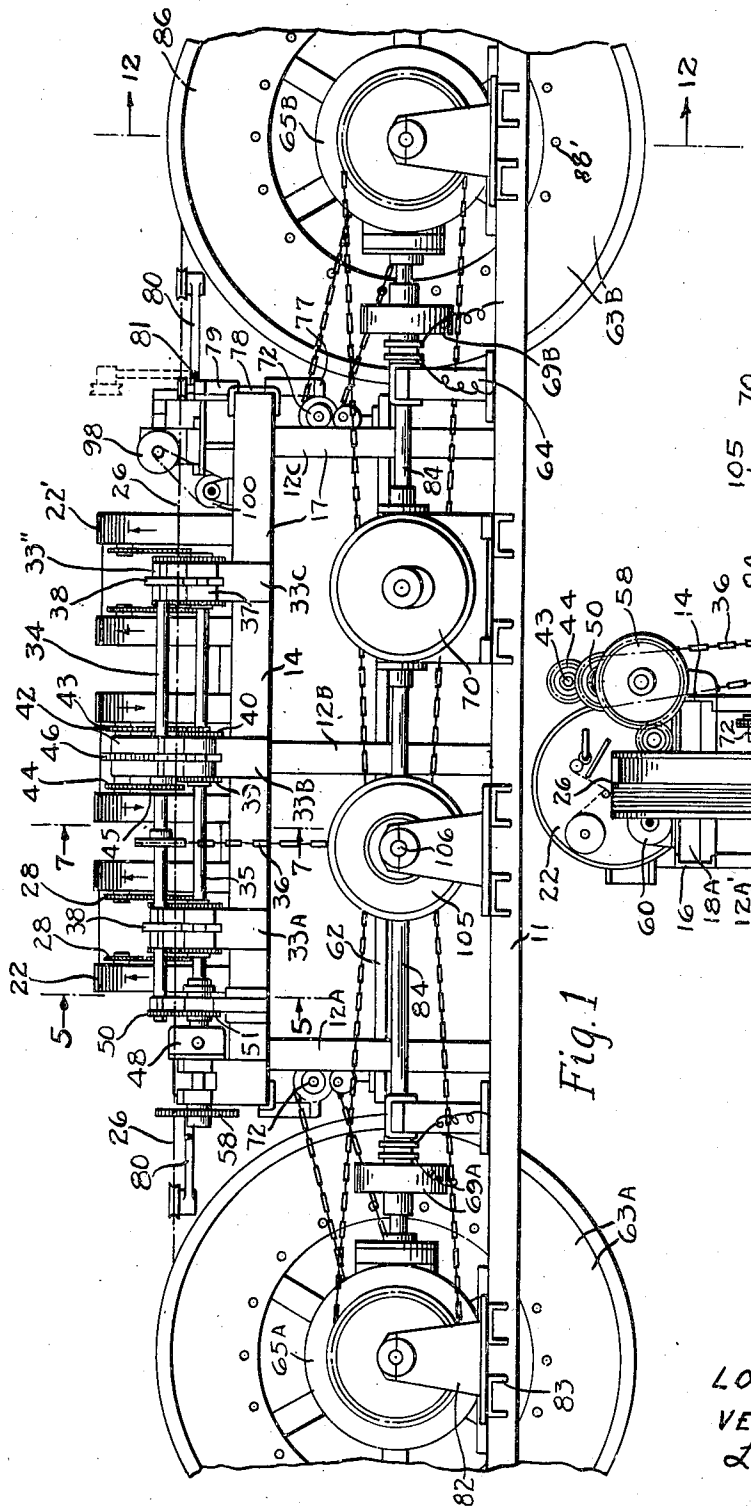


Fig. 1

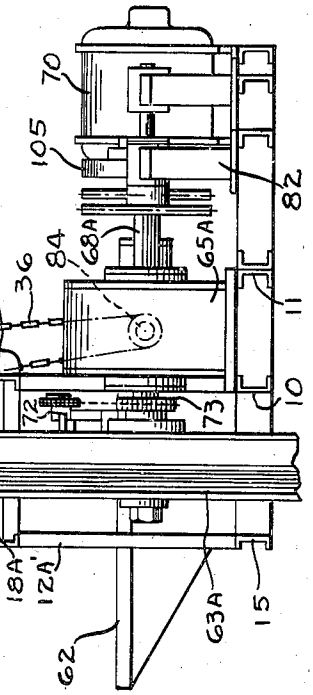


Fig. 2.

INVENTORS:
LOUIS ILLMER
VERNON R. PALLAS
Louis Illmer
ATTORNEY.

Sept. 27, 1949. L. ILLMER ET AL 2,483,283

REVERSIBLE GRINDER MACHINE FOR REELABLE STRAND STOCK

Filed Jan. 29, 1947

3 Sheets-Sheet 2

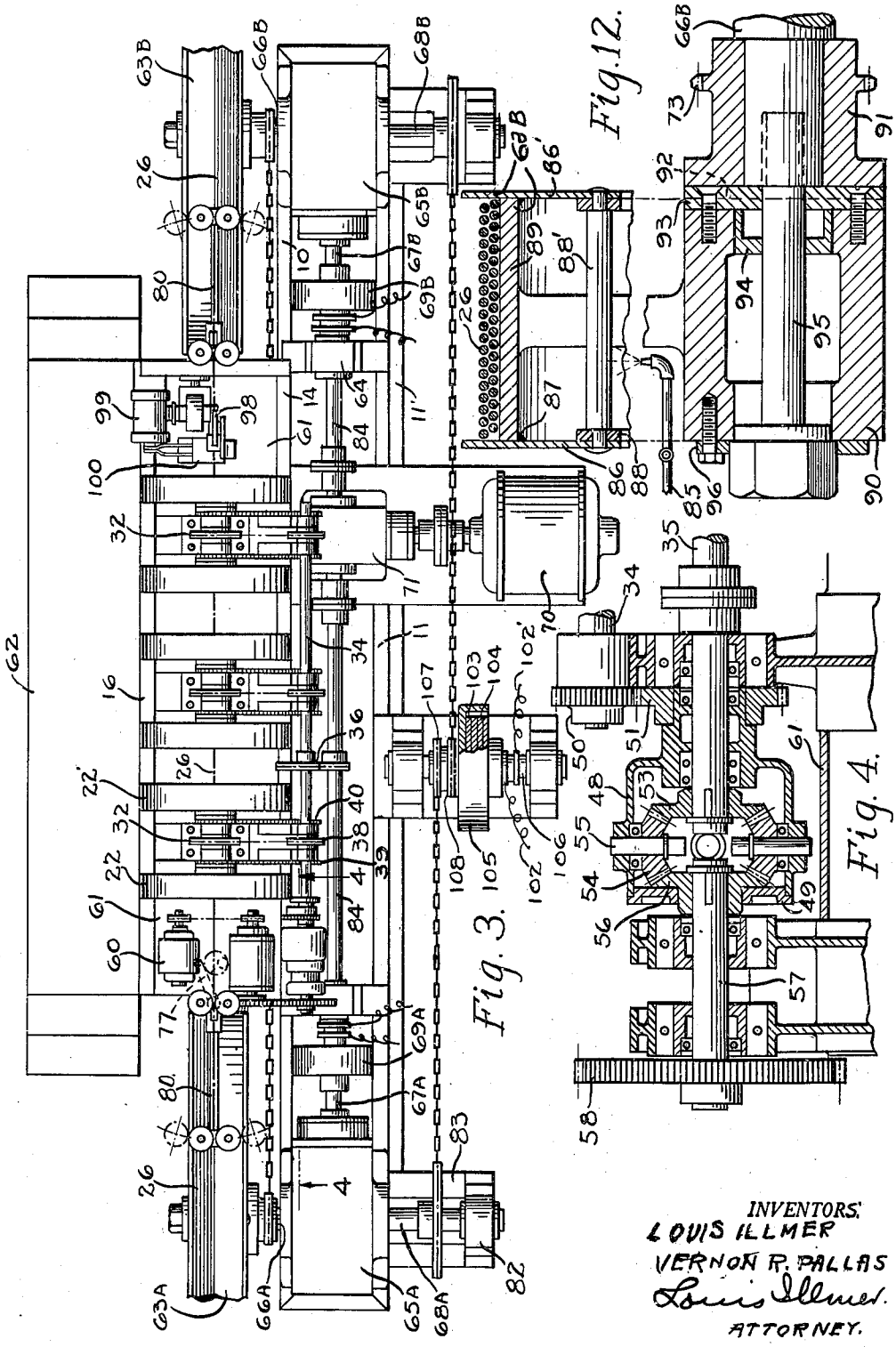


Fig. 12.

Fig. 3.

Fig. 4.

INVENTORS:
LOUIS ILLMER
VERNON R. PALLAS
Louis Illmer
ATTORNEY.

Sept. 27, 1949. L. ILLMER ET AL 2,483,283

REVERSIBLE GRINDER MACHINE FOR REELABLE STRAND STOCK

Filed Jan. 29, 1947 3 Sheets-Sheet 3

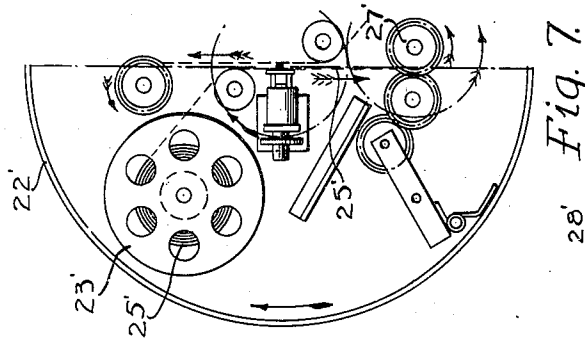


Fig. 7.

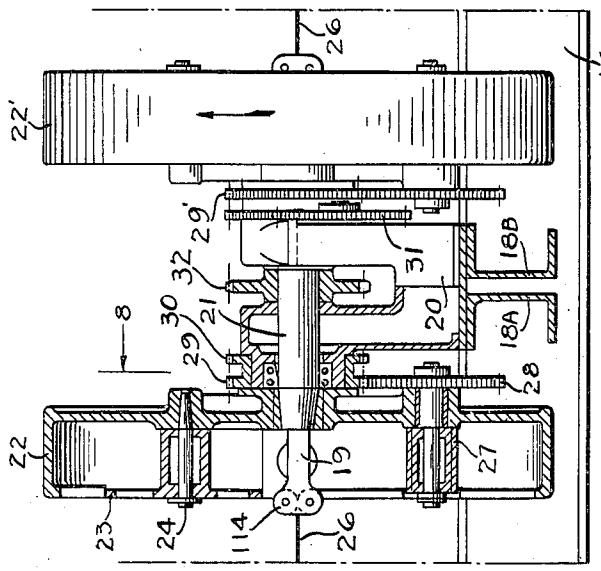


Fig. 6.

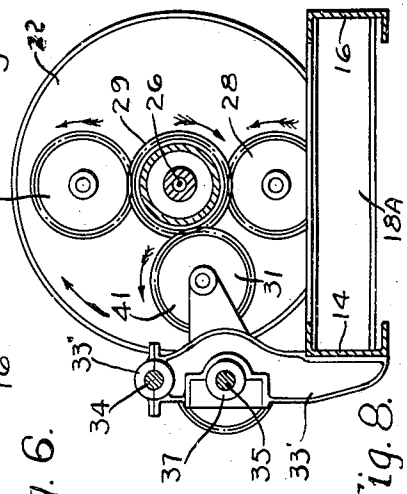


Fig. 8.

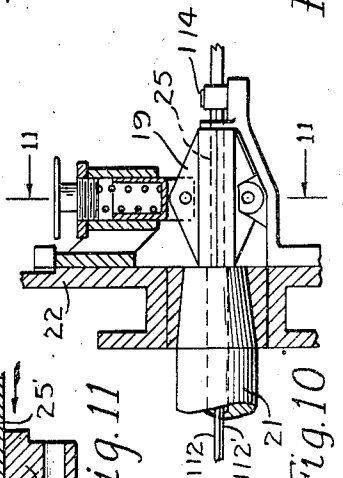


Fig. 10

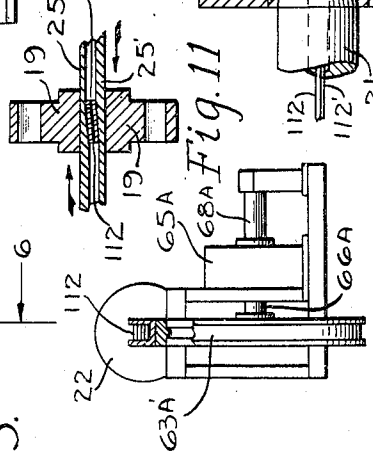


Fig. 11

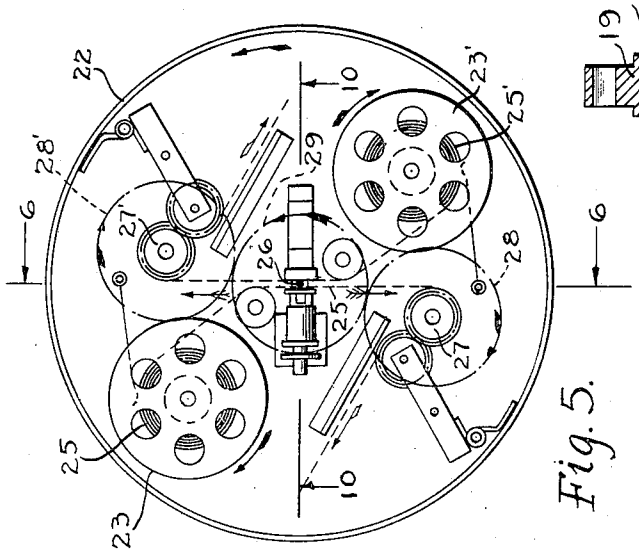


Fig. 5.

Fig. 9.

INVENTORS:
LOUIS ILLMER
VERNON R. PALLAS
Louis Illmer
ATTORNEY.

Patented Sept. 27, 1949

2,483,283

UNITED STATES PATENT OFFICE

2,483,283

REVERSIBLE GRINDER MACHINE FOR REELABLE STRAND STOCK

Louis Illmer, Cortland, N. Y., and Vernon R. Pallas, Randolph, Ohio

Application January 29, 1947, Serial No. 725,114

19 Claims. (Cl. 51—71)

1

The present invention broadly relates to a novel strand grinding machine of the heavy duty surfacing type, and is more particularly directed to improved equipment adapted to abrasively treat a long length of alloy wire, narrow strip or the like reelable stock in one or more passes. Our machine preferably drags its work piece horizontally between power driven, reversible reels and is designed to intensively pregrind or to rapidly polish high tensile stock which when passed longitudinally at a sufficiently high travel rate, of itself furnishes the necessary velocity for vigorous cutting action when applying a slowly advancing abrasive agency such as paper backed tape.

The object of our invention is to devise an effective simplified grinder unit adapted to economically process diametrically large sized reelable wire or ribbon stock in successively reversed passes and to provide for an improved framework of rolled structural steel together with sundry design features whereby to compactly install grinder heads on a low first cost basis; also to afford refined strand reeling equipment of the heavy duty type including associated brake devices and other adjuncts that permit of speedy reel reversals without pernicious shock.

Reference is had to the accompanying three sheets of drawings representing an illustrative exemplification, and in which:

Fig. 1 is an elevational side view of an assembled wire grinder of the indicated character, and Fig. 2 shows one end view thereof.

Fig. 3 is a top or plan view of the Fig. 1 assembly, and Fig. 4 a fragmental detail taken cross-sectionally along 4—4 of Fig. 3.

Fig. 5 depicts a front face view of a left-hand head layout as seen from 5—5 of Fig. 1, and Fig. 6 a cross-sectional view taken along 6—6 of Fig. 5 to reveal certain mounting details of our rotating heads.

Fig. 7 is taken in partial section along 7—7 of Fig. 1 and shows a tape feed disposition similar to Fig. 5 but arranged as a reversed right-hand head layout.

Fig. 8 is a rear view of our grinder head as taken along 8—8 of Fig. 6.

Fig. 9 shows a modification of Fig. 2 in that our abrasive machine is arranged to treat ribbon stock.

Fig. 10 indicates the type of our opposed tape backing jaws particularly as applied to ribbon stock as taken along 10—10 of Fig. 5, and Fig. 11 is a transverse detail taken along 11—11 of Fig. 10.

2

Fig. 12 diagrammatically shows a fragmental section of one demountable stock reel as taken through its center line 12—12 of Fig. 1.

Referring more specifically to these disclosures, our grinder arrangement may include a built-up framework fabricated from rolled structural steel comprising a pair of laterally spaced channelled base rails 10 and 11 of which the primary median rail 10 longitudinally underlies the entire machine length to uphold a weight portion of both reel axles 68A and 68B. Said primary rail also imparts rigidity to our grinder framework and counteracts reel momentum while being rapidly reversed. The flanges of the respective rails may be opposed in the Fig. 2 fashion. During shop erection, these several base rails serve to preassemble and fit all working parts thereon. They may be fabricated in single piece lengths or in equivalent sectionalized lengths that are to be grouted upon a common foundation.

Erected in substantial coplanar registry with said primary rail 10 are a plurality of rolled structural uprights such as 12A, 12B, etc. (see Fig. 1) whose tips may be spanned by a channelled stringer beam 14 rolled to a uniform cross-sectional profile throughout its length and having a substantial web depth. A laterally interbraced shorter base rail 15 lies parallel to the primary rail 10. Said shorter rail likewise has erected thereon a series of similar uprights 12A', 12B', etc. that may register with their respective mates 12A, 12B, etc. A companion beam 16 spanningly seats upon the uprights 12A', 12B', etc. in parallelism with the like stringer 14 disposed above the axis level of said reels. The elongated webs of such complementary beams are preferably turned outwardly as in Fig. 8 and all such frame components may be welded together into a unitary superstructure erected upon said rails.

A plurality of rolled cross channel irons such as 18A, 18B, etc. may bridge said pair of stringer beams 14 and 16 (see Fig. 6) but these beams may also be otherwise interbraced. Such built up rolled structural steel framework members are arranged to effect a material reduction in shop costs over equivalent pattern cast members, particularly if in need of considerable machine work. All principal journals for our machine preferably run as ball or roller bearings to reduce frictional losses and said skeletonized framework is otherwise admirably suited to meet heavy duty wire grinder requirements.

A rotatable grinder head assembly may be disposed crosswise of each pair of said transverse channel irons and is preferably upheld by the

comparatively short pedestal 20. The outturned cup rims of said abrasive heads are interspaced to leave ample servicing room between next adjacent head assemblies. Each such assembly may comprise a tubular spindle 21 having reversely disposed cup-shaped heads 22 and 22' respectively affixed to the spindle ends with their mouths faced outwardly. Fig. 1 only shows three such installed head units, but to meet heavy duty steel works requirements in handling ¼" alloy wire for a 5% weight reduction in comparatively few passes, it is intended to provide for some six or more abrasive head assemblies in tandem. The layout of each such head except for certain modifications, follows the teachings of the Pallas Patent No. 2,033,392 of March 10, 1936, to comprise duplex tape supply spools 23 and 23' rotatably mounted upon stanchions such as 24 affixed to the disc web of each cupped head. The respective spools may separately carry a supply of 20 grit or the like roll tapes 25 and 25'. These tapes are individually fed outwardly over suitable guide rollers between the opposed spring backed jaws of the pivoted type such as 19, into abrasive engagement with the single wire work piece strand 26 that may be loosely threaded through the several spindles 21.

These tapes are thence respectively led to one of the continuously driven feed rollers 27 or 27' as in Fig. 5. Said rollers may respectively cooperate with a spring retained pressure agency to fortify the tape grip of such positively driven feed rollers. As indicated in Fig. 6, each feed roller shank may be journaled through a head disc bore and have the overhung end thereof provided with a planetary head gear such as 28 or 28'. The respective planetary gears mesh with a driven common master gear 29 of identical pitch diameter. Said master gear is shown rotatably mounted about the spindle axis in a bearing portion of the pedestal 20 (see Fig. 6). Conjoined with said master gear, is a laterally offset supplementary gear 30 which in turn meshes with a separate intermediate gear 31. The resulting gear train is such that the abrasive tapes of each head will be advanced in opposite arrowed directions (see Fig. 5). When slowly fed, each tape may become substantially spent in a single pass through its cutting zone, whereupon it may be lodged as waste within the head rim confines and intermittently removed or be wound upon an offtake spool.

Mounted lengthwise of said series of tandem heads, are a succession of short upright brackets 33A, 33B, 33C, etc. (see Figs. 1 and 2), serving to seat an upper head drive shaft 34 and a lower tape feed shaft 35 in parallelism. Said head shaft may be chain connected at 36 to rotate in unison with the cross-shaft 84 presently to be defined in detail. Each such bracket may be provided with a faced depending foot portion 33' affixed flatwise to the vertically disposed web of the stringer 14 (see Fig. 8). The top of the alternate brackets 33A and 33C may be provided with a liftable cap 33'' for the unobstructed dismantling of the head shaft 34 upwardly. Intermediate its foot and cap region, each such bracket may further be equipped with an inset, laterally removable cap block 37 for dismounting the tape feed shaft 35 sidewise.

The upper portion of certain upright brackets may be forked to introduce an interposed sprocket 38 affixed to the drive shaft 34 and which sprocket chain drives the principal spindle sprocket 32. On the respective opposite sides of each such bracket, the feed shaft 35 mounts the complementary spur gears 39 and 40 which may each alignedly mesh with an appropriate intermediate spur gear 31. The last named gears may be pivoted to a common prop arm 41 integrally supported by its bracket to provide for two laterally spaced trains of tape feed spur gears for each head assembly.

In order to obviate abnormal tortional wire twist, next adjacent head assemblies may be rotated in reverse directions as indicated by arrows in Fig. 1. To this end, the cap of every alternate bracket such as 33B may be raised to provide for a demountable crown block 42 (see Fig. 1) which may be provided with a stub shaft 43. Said shaft may be driven off the head shaft 34 by the reversing spur gears 44 and 45 of equal diametral size whereby the master gear 29 and head disc 22 are made to rotate in a common direction. The elevated stub shaft sprocket 46 may be chain connected to its spindle sprocket 32 to maintain all heads at identical speeds.

One end of the head drive shaft 34 may be equipped with a pinion 50 to mesh with a driven spur gear 51 of twice the pinion diameter and arranged to circumscribe the corresponding extended end of the main feed shaft 35. As detailed in Fig. 4, a tubular differential housing or unit 48 may have said spur gear 51 keyed to the nave of a contracted housing neck end as shown. The extended end of the main feed shaft may affixedly carry the primary bevel gear 53 disposed interiorly of such bell-shaped housing. Two or more planetary idler bevel gears such as 54 may be mounted in balanced relation upon individual studs such as 55 to cooperate with the bevel gear 53. A mated secondarly bevel gear 56 may be mounted on the axially aligned auxiliary slow speed shaft 57 entered into the mouth of the housing 48 to complete a differential gear train. A demountable stay plate 49 may radially brace said mouth against gear tooth reaction. The outer free end of the last named shaft may carry a change gear 58 which meshes with a smaller like gear on the slow speed output shaft of a large-ratio gyro reducer 59 (see Fig. 3). Such compact reducer may be independently driven by an electric motor 60 through a chain drive or may be direct connected thereto.

It will be observed that in Fig. 4, an elevated floor 61 may span coresponding end regions of the stringer beams 14 and 16 and have the gyro equipment accessibly installed thereon. An elongated servicing platform 62 disposed alongside the base region of our grinder, places such equipment and the elevated grinder heads on an easy reach level. Said stepped platform may be extended sidewise into interposed relation beneath the elevated stringer beams and their underlying base rails 10 and 15 for compactly stowing certain adjuncts thereon.

When the motor 60 is shut down and the bevel gear 56 remains stationary, the speed imparted to the tape feed shaft 35 will be identical with that of the head drive shaft 34 whereby the mated planetary gears 28 and 28' while traveling about the master gear 29, will not rotate either feed roller 27 or 27' although the feed shaft section 35 continues to revolve at grinder head speed. When however, the motor 60 is made operative, this will modify the rotation of the bevel gear 53 and thereby advance all the tapes to the work piece at a fixed predetermined rate. An altered change gear ratio establishes a different tape feed rate in accordance with requirements. As devised, the

motor 60 may be automatically shut down by remote control during each work piece reversal period and thus obviate needles tape wastage.

Referring now to our refined rapidly reversing reeling equipment for passing wire products, attention is directed to Fig. 12. Such inherently light weight pair of slow speed reels 63A and 63B may respectively be mounted upon the parallel axles disposed transversely beyond the respective stringer beams 14 and 16 (see Fig. 3). Each such axle is alternately driven by the housed widely separated bevel gear or conventional right angular speed reducer units 65A and 65B, respectively equipped with a slow speed outlet shaft 66A or 66B and a perpendicular high speed input shaft 67A or 67B. Each such housing may rest across the laterally spaced rails 10 and 11 (see Fig. 2). The housings 65A and 65B each comprise a pair of axially aligned roller bearings that respectively mount their outlet shafts therethrough. It will be noted that rail supported housings constitute pillow blocks for their respective reels.

Said outlet shafts may also be integrally extended away from their respective reels to constitute a tail shaft portion 68A or 68B disposed to mount a sprocket thereon. An outboard bearing 82 supports the free tail shaft end which may rest upon a pair of transverse base rails such as 83 welded rectangularly to a supplementary rail 11' to constitute a skeletonized unitary subbase or platen upon which to affixedly erect associated components of our grinder machine as a frame superstructure collectively designated 17 in Fig. 1.

As will appear from Fig. 3, each inturned end of the reversed reducer input shaft 67A or 67B may be equipped with an independently controlled electromagnetic or equivalent clutch such as 69A or 69B and which clutches are alignedly interconnected by the long split-ended cross-shaft 84. The last named shaft may be mounted upon plural pedestals such as 84 that respectively straddle the base rails 10 and 11 in close adjacency with its clutch as shown. A main grinder motor 70 may chain drive said cross shaft or operate through a gear reducer unit 71 that may also be mounted on the rails 10—11 and be interposed between the remotely controlled clutches 69A and 69B.

When one or the other of said clutches is made operative in succession by automatic remote controls hereinafter identified, the suspended work piece 26 will be alternately transferred from reel to reel. A long batch length of heavy wire stock exceeding one half ton in weight is herein afforded for abrasive treatment to minimize the need for frequent reel reversals. It is preferred to operate with the inherently light weight reels 63A and 63B, which when loaded, may have the transferred wire wound therearound in reasonably deep layers. To facilitate such winding, we resort to level winder means of the actuated rocker arm type, preferably including an independent vertical worm gear reducer unit 72 (see Fig. 1) for each reel as erected upon the platform 62. The horizontal high speed inlet shaft of such speed reducer may be chain driven by its axle sprocket 73 (see Fig. 2) and a pair of change gears permit of definitely altering the rotative speed of the associated upright slow speed outlet shaft. A disc cam such as is indicated by dotted outline in Fig. 3, may be carried by each reducer outlet shaft to cooperatively oscillate the roller carrying lever 77. Said lever is shown fulcrumed to the lower end of the oscillatory vertical shaft 78 mounted in the bearing bracket 79. The upper vertical shaft end synchronously swings the level winder rocker 80 equipped with mated work piece guide rollers to laterally shift the reeled wire into layer formation. Said rocker may be rule jointed at 81 to allow of lifting its reel overhung outer end into its raised dotted position (see Fig. 1) and thereby clear a newly installed reel while replenishing a treated wire batch.

The identical diametral dimension given to our wire reels 63A and 63B should be kept in an appropriate relation to the treated wire size and to the normal travel rate at which such wire is being transferred, preferably at a velocity of several thousand feet per minute. A conventional pyramidal three roller wire straightener may be used to rectify any excessive crimp set the wire may suffer as it leaves a reel, but it is preferred to hold each reel to a sufficient diametral size to obviate the need for such appurtenances.

Referring further to Fig. 12, this shows a six arm standard non-crowned, cast iron pulley type of reel 63B. The considerable coarse grit drag that may be exerted by our plural tape backing jaws 19, may subject the work piece to a relatively high tension stress. When numerous coils are tightly wrapped upon a reel, such combined wire stress may set up excessive radial loading on the rim span portion suspended as a beam between the extremities of next adjacent arms.

Additional wire layers accumulatively augment the cited beam crushing effect. In order to reenforce our loaded beam span against collapse without unduly adding rotating weight to such bound reel rim 89, we preferably provide for relatively thin duplex sheet steel plates or centrally apertured side discs 86 and 86' which may be continuously welded to a rim edge at 87 as an armour and to form a water sealed joint. The respective inner disc edges may be interbraced by the complementary reenforcing rings such as 88 having multiple stay bolts 88' riveted therebetween to impart lateral stability to the loaded discs. The outer perimeter of said discs may or may not be extended radially beyond the rim confines to constitute mated flanges.

Such perimetrically fast running reels afford considerable inherent air-cooling capacity for an intensively abraded wire. Said complementary side discs may further serve to entrap without spill onto the coiled wire, any water discreetly injected interiorly of the rotating reel rim through the controlled spray nozzle piping 85 as a supplementary cooling agency.

The hub 90 of each reel may be demountably attached to the end of a corresponding slow speed reducer outlet shaft 66B by the flanged coupling 91 to provide for a vertical flange parting face 92 indicated in dotted outline (see Fig. 12). An interposed two-part radial key 93 transmits power to the reel hub 90. A centering bush 94 may be mounted at the keyed end of the hub bore and have a solitary reel securing bolt 95 entered therethrough as shown, the tip of such elongated bolt shank being firmly anchored into an axially tapped hole extending into the end of the shaft 66B. An enlarged bolt head may be centered into the other end of the hub bore and secured in place by the demountable retaining plate 96. When uncoupled by withdrawing said bolt, either reel may be freely lifted directly upwardly and be replaced by a spare reel of similar design loaded with untreated wire stock. Said spare reel when installed, is intended to replenish a previously completed wire batch.

Our grinder machine may be manually reversed by a successive control manipulation of the electromagnetic clutches 69A and 69B, but it is preferred to operate with automatically actuated remote controls of the kind set forth in detail by the Ulmer Patent No. 2,396,852 dated March 18, 1946. As is schematically represented in Figs. 1 and 3 of the present disclosure, such a layout may comprise a metering wheel 98 that rides upon the treated strand 26 and whose measured turns are registered by a pilot unit 99 adapted to actuate the control switches of the clutches 69A and 69B in sequence and otherwise bring about automatic reversal of our reels.

Such instrumentalities are cited to emphasize the advantage of working with light weight reels possessing a comparatively small stored kinetic energy for given strand pass requirements. The present disclosures enable fast running reels to be rapidly brought to near rest by a heavy abrasive work piece drag and thereupon to be promptly accelerated back to normal transfer speed. Our reel refinements aim to minimize the inevitable loss of productive capacity associated with a reversing grinder machine. Assuming the applied power to be suddenly shut off from a driven fast running leading reel clutch, then the trailing reel by momentum drift tends to overtravel in not being simultaneously subjected to a like deceleration by wire drag. This in turn may cause the reel suspended trailing wire portion to slacken abnormally, particularly since an initial wire layer remaining on the trailing reel is obliged to rotate at a faster rate than its wire filled mate.

In order to ameliorate such reel overhaul during reversal, it is preferred to incite engagement of the trailing reel clutch in close succession with the release of the leading reel clutch. The resulting slip-running on part of the energized trailing clutch sets up a countertorque ready to reverse the travel direction of both reels when their momentum has become spent.

To further correct such deficiency, we may also provide for a speed equalizing or differential brake (see Fig. 3) of the remote controlled electromagnetic type timed by the lead wires 102 and 102' placed under the control of the pilot unit 99. Such auxiliary brake may comprise multiple frictional plates of which alternate spring loaded clutch discs such as 103 and 104 may for relative rotations be respectively cleated to their casing 105 and to the horizontal non-split or through mounting shaft 106. A sprocket 107 may be keyed to the last named shaft and another sprocket 108 is keyed to the casing hub, said relatively movable sprockets being respectively chain driven in unison with one of the opposed reel axles 68A and 68B as shown.

In the event a driven reel such as 63A running at full normal speed, should have its electromagnetic clutch 69A cut out preparatory to reel reversal, then the comparatively heavy abrasive drag exerted by our grinder heads upon the leading portion of the suspended wire 26 tends to rapidly decelerate such floating reel. Since no corresponding drag is at the same time acting upon the then trailing reel 63B, the latter will momentarily tend to surge forward at a relatively faster rotative rate. As a result, the trailing suspended wire portion headed toward the grinder heads is likely to become seriously slackened by reel overhaul.

Assuming that our timed differential brake has at this particular instant become operative, a frictional slip will be set up between the next adjacent plates 103 and 104 which strenuously counteracts momentum on part of the trailing reel. This in turn speeds up its mated decelerated reel and serves to slow down both reels in approximate synchronism. The frictional disc drag afforded by such differential brake is preferably kept commensurate with the tape jaw drag exerted on the passed wire.

Such drag may be maintained until a predetermined reduction in reel speed has been reached, whereupon the previously inactive clutch 69B is rendered operative to reverse the reels in unison without material shock effect. Immediately subsequent to such reel slow down period, the gyromotor 60 may be shut down to transitorily cease tape feed and allow of a quickened acceleration in bringing both reels back to normal operative speed. Such practice not only saves tape requirements but promotes productive delivery of our grinder machine.

Referring now to Fig. 9 which shows an end view of our grinder equipped to handle ribbon or the like narrow strip stock. Here a deeply flanged reel such as 63A' may be demountably carried at one end of each reel axle such as 66A having said treated ribbon stock spirally loaded thereon flatwise, the reels being preferably wound with alternate strip stock spirals to constitute the superimposed dual work pieces 112 and 112' of the kind indicated in Fig. 10.

As applied to the treatment of ribbon or the like narrow stock, the respective chain drives for the principal spindle sprocket 32 of each rotating head assembly may be disconnected from the drive shaft 34 so as to constitute a series of stationary heads such as 22 and 22'. These may be appropriately locked into a fixed non-rotatable position with their respective tapes disposed to feed in parallelism with the flat faces of a single narrow strip or the registering similar dual work pieces 112 and 112' as represented in Fig. 11. If desired, certain of said tapes may also be disposed in rectangular relation to simultaneously treat opposed ribbon edges.

The jaw interposed complementary abrasive tapes 25 and 25', may be arranged to bring both exposed faces of said superimposed dual work pieces 112 and 112' into operative contact with their respective tapes for simultaneous grinding. It is emphasized that such tapes of certain successive heads may be advanced crosswise of the ribbon length in opposed directions by reversed head rotation in the Fig. 1 manner.

As shown by arrows in the left-hand Fig. 5 and the right-hand Fig. 7 head layouts, their corresponding abrasive tape pairs may likewise be arranged to drag reversely inward toward the center-line of the treated ribbon stock from opposed edges, to the end that the ground surface may remain substantially flat without pronounced crowning. Such crowning effect may be further reduced by the use of fine grit or a faster than normal tape feed rate.

It will be obvious that although the chain disconnected heads remain stationary for strip grinder needs, the driven feed shaft 35 is still kept operative as described, except that the wire level winder mechanism may for the time be dispensed with. Likewise the use of the bracket crown block 42 is rendered inexpedient. In lieu of the guide rollers on the level winder rocker arm 80, similar guide roller means such as 114 may be interspaced to receive the ribbon edges therebetween (see Figs. 6 and 10).

The foregoing rather explicit structural dis-

closure and its functional behavior will, it is believed, make evident to those skilled in this art, the more outstanding commercial and operative advantages afforded by our strand grinder improvements over the prior art, and we reserve the right to equivalently modify our illustrative features, all without departing from the spirit and scope of our invention, heretofore described and more particularly characterized in the appended claims.

We claim:

1. A unitary grinder machine comprising a pair of axially interspaced reels adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally dragged movable work piece, a sub-base including a rectilinear primary rail lying beneath the level of the reel axes and having a weight portion of each reel respectively imposed upon opposite rail end regions, motive means driving one of said reels, a skeletonized superstructure including a rolled stringer beam of uniform cross-sectional profile throughout its length that is propped upon said rail in substantial parallelism and which beam length is shorter than the interspacing between the reel perimeters, and plural grinder head means upheld in tandem by such superstructure above the level of the reel axes and respectively brought into operative abrasive engagement with the suspended work piece portion, a driven sectionalized feed shaft affixed to a stringer beam and having a differential gear interposed between contiguous shaft ends, one such shaft section serving to control the feed of abrasive to the plural head means, and a separately motorized gyro-reducer whose slow speed outlet selectively rotates the other shaft section and which reducer when rendered inoperative, interrupts the feed of abrasive to the work piece while said one shaft section continues to rotate.

2. A horizontal grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, motive means driving one of said reels, a platenlike sub-base disposed beneath the axes level of said reels to include a pair of laterally spaced rails of which one such rail is arranged to uphold a weight portion of each reel at the respective rail end regions thereof, a row of uprights erected upon each such rail, mated rolled stringer beams of uniform cross-sectional profile throughout the length thereof and respectively propped upon each such row of uprights to lie above the axis level of said reels, to constitute a superstructure, a plurality of tubular grinder head means collectively carried by said beams and having said suspended strand portion threaded therethrough for abrasive treatment and a driven sectionalized feed shaft having a differential gear bridging contiguous shaft end regions, one such shaft section being arranged to rotate in unison with a reel and the other section being independently motorized to run at a materially slower speed.

3. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, a superstructure including rolled laterally spaced stringer beams each having a uniform cross-sectional profile throughout the lengths thereof and respectively propped upon uprights to lie above the axis level of said reels, pedestal means anchored between said stringer beams, abrasive head means brought into operative engagement with the suspended work piece portion and which head means include a spindle mounted by said pedestal means, a driven head shaft upheld by the superstructure and operatively arranged to rotate said spindle, and a driven sectionalized feed shaft also affixed to said superstructure and having a differential gear interposed between contiguous ends of the feed shaft sections, one such section being rotated in unison with a reel and the other section being independently motorized to selectively run at a materially slower speed.

4. A grinder machine comprising a pair of reels axially interspaced and adapted to have a reelable strand transferably suspended therebetween as a longitudinally movable work piece, a grinder assembly arranged to treat a portion of such work piece by means of abrasive tape and which assembly includes a spindle mounting an abrasive head provided with feed roller means for controllably advancing said tape toward its cutting zone, means driving said head at a sustained rotative speed, a driven sectionalized feed shaft having a differential gear interposed between contiguous ends thereof, one such section being disposed to rotate said feed roller means through a planetary gear train carried by the head, a separately motorized speed reducer whose slow speed outlet is connected to optionally rotate the other feed shaft section and which when stopped does not permit the tape to advance toward its cutting zone although said one shaft section continues to rotate in unison with the sustained head speed.

5. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, a skeletonized superstructure including a rolled stringer beam of uniform cross-sectional profile that is interposed lengthwise between the reel perimeters and propped upon uprights to lie above the axis level of said reels, plural grinder assemblies respectively adapted to abrasively treat the suspended portion of said work piece and disposed in tandem along such beam, said assemblies respectively being provided with a spindle having an abrasive head at each spindle end, brackets corresponding with each such spindle carried by said beam, a spindle actuating head shaft journaled in such brackets, and combined crown block and stub shaft means including reversing gears for one such bracket and arranged to rotate its spindle in a direction opposite to that of a next adjacent spindle.

6. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, a stringer beam interposed lengthwise between the reel perimeters to wholly lie above the axis level thereof, grinder means fastened to said beams and having its abrasive brought into operative engagement with the suspended work piece portion, motorized means intermittently rotating said reels in unison, a level winder mechanism including a rocker affixed to the upper end of an oscillatory vertical shaft mounted at a beam end region and having a roller lever affixed to the depending shaft end, a vertical speed reducer located beneath the beam level and the upstanding slow speed output shaft of which reducer is provided with cooperative means serving to actuate the rocker lever, and

drive means operating the high speed input shaft of said reducer in synchronism with an adjacent reel.

7. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, a stringer beam interposed lengthwise between the reel perimeters above the axis level thereof, grinder means upheld by said beam and having its abrasive brought into operative engagement with the suspended work piece portion, motorized means intermittently rotating said reels in unison, a level winder mechanism including a rule-jointed rocker of which the swinging end overlies a contiguous reel perimeter and is arranged to be lifted away therefrom, and drive means for oscillating said rocker in synchronism with the rotatable movement imparted to said contiguous reel.

8. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, a superstructure including a stringer beam interposed lengthwise between the reel perimeters above the axis level thereof, grinder head means sustained by said beam and adapted to treat the suspended portion of said work piece with abrasive rool tape, plural brackets carried by said beam, a tape feed shaft journaled in said brackets, a shaft supported differential gear train including a planetary gear and also a mated primary gear which is affixed to one feed shaft end, an auxiliary shaft alignedly supported with respect to said feed shaft end to carry a meshing secondary gear arranged to complete said train, drive means rotating said feed shaft through such gear train in unison with the reels, and a separately motorized speed reducer serving to controllably rotate said secondary gear.

9. A grinder machine comprising a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, grinder means adapted to treat the suspended work piece portion with abrasive tape, a tape feed shaft, an overhung open mouthed housing having a nave rotatably embracing said shaft and which housing mounts a planetary gear and a mated primary gear, the latten being affixed to one shaft end, an auxiliary shaft alignedly supported with respect to said feed shaft end to carry a meshing secondary gear arranged to complete a differential gear train, a spur gear affixed to said nave, means driving the feed shaft through the spur gear and in series with said train, stay means radially bracing the housing mouth region with respect to said auxiliary shaft, and a separately motorized speed reducer serving to controllably rotate the last named shaft.

10. A grinder machine provided with a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, each such reel comprising a cast endless rim centered by multiple arms to include a rim beam component that integrally bridges next adjacent arm extremities, a ring shape side plate affixed to reenforce one edge of said rim beam against radial collapse, and grinder head means brought into abrasive drag engagement with the suspended work piece whereby to subject said reeled strand portion to substantial tensile stress.

11. A grinder machine provided with a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, each such reel comprising an endless rim centered by multiple arms to include a rim beam component that integrally bridges next adjacent arm extremities, grinder head means brought into abrasive drag engagement with the suspended work piece, duplex flat rings respectively affixed to the opposed edges of said rim, and stay reenforcement means spanning the apertured inner region of said rings.

12. A grinder machine provided with a pair of driven reels axially interspaced in parallelism and adapted to have a reelable strand portion transferably suspended therebetween as a longitudinally movable work piece, each such reel comprising an endless rim centered by multiple arms to include a rim beam component that bridges next adjacent arm extremities, grinder head means brought into abrasive engagement with the suspended work piece, apertured duplex discs respectively sealed to the opposed edges of said rim, and a controlled spray nozzle agency serving to eject toward the interior confines of such rim.

13. A grinder machine comprising a pair of axles interspaced in horizontal parallelism and each adapted to have a reel mounted thereon with a strand portion transferably suspended between the reel perimeters as a longitudinally movable work piece, one such reel having a tubular hub and an encircling rim, an end face of said hub being overhangingly affixed to one end of its axle by a circumscribing coupling flange respectively providing for conjoined parting faces having a radial key interposed therebetween, a headed single bolt of which the threaded shank extends centrically through the hub and is demountably screwed into the coupling embraced one axle end, and grinder head means brought into abrasive engagement with said suspended work piece portion.

14. A grinder machine provided with a pair of axles interspaced in substantial parallelism and respectively carrying a reel thereon adapted to have a strand portion transferably suspended between the reel perimeters as a work piece, grinder head means brought into engagement with such suspended work piece and exerting an effective abrasive drag upon the leading transferred strand portion, drive means serving to periodically reverse the rotation of said axles, and timed differential brake means comprising relatively movable components that when incited are respectively rendered responsive to a prevailing difference in rotative rates imparted to said reels during a reversal period, the associated slip between said components being applied to set up a counterdrag on the trailing reel during such period.

15. A grinder machine provided with a pair of axles in parallelism and respectively carry a reel thereon adapted to have a strand portion transferably suspended between the reel perimeters as a longitudinally movable work piece, grinder head means brought into abrasive engagement with the transferred work piece and exerting an effective drag upon the leading portion thereof, drive means for periodically reversing the rotation of said axles, said means including an axle interconnecting cross-shaft provided with a

timed clutch at the respective shaft end regions, supplemental brake means comprising a pair of independently rotatable disc components which are respectively connected to rotate in synchronism with a different axle and by slip between said discs arranged to exert a correlated counterdrag on the trailing reel during its reversal period.

16. A grinder machine comprising a pair of reels axially interspaced in parallelism and adapted to have a reelable ribbon or the like relatively narrow strip stock transferably suspended flatwise between the reel perimeters as a work piece, drive means rotating said reels in unison, and a succession of stationary grinder head means disposed in tandem, one such head means being provided with complementary abrasive tapes respectively brought into crosswise operative engagement with the opposed flat faces of the work piece and arranged to simultaneously advance from opposite directions toward a particular strip edge of such treated work piece, another head means being arranged to provide for complementary tapes that reversely approach the aforesaid particular strip edge in a counterwise direction whereby to diminish crowned face grinding.

17. A grinder machine comprising a pair of reels axially interspaced in parallelism and adapted to have dual strip stock portions superimposed flat wise which are transferably suspended and simultaneously dragged lengthwise between the reel perimeters as a work piece, two grinder head means each provided with mated abrasive tapes respectively advanced into operative engagement with the exposed outer flat faces of said dual strip stock portions from opposite strip edges toward the centerline thereof, and means feeding all such tapes simultaneously, corresponding tapes of one such head means being advanced in a contrary direction from those of the other head means.

18. A grinder machine comprising a pair of reels axially interspaced in parallelism and adapted to have a strand portion transferably suspended between the reel perimeters as a work piece, drive means for reversing said reels in unison from a normal rotative speed, grinder head means adapted to treat the suspended work piece with abrasive tape and which means include a feed roller advancing said tape toward its abrasive zone, a differential gear train comprising a driven primary gear together with a secondary gear that cooperatively mesh with an interposed planetary pinion, said gear train being operatively connected to selectively rotate the feed roller, a speed reducer whose output shaft is arranged to rotate said secondary gear, a timed independent motor serving to drive the input shaft of said reducer, and means periodically rendering said motor inactive during each reversal period of said reels and thereby intermittently cease rotation of the feed roller tape advance after a predetermined reduction in the rotative reel speed has been reached.

19. A grinder framework comprising base rail means serving to reversely mount an angular speed reducer unit at the respective rail end regions, each such unit including a slow speed shaft and a corresponding high speed shaft, the latter being respectively directed toward each other in axial alignment, driven cross-shaft means selectively interconnected by clutch means to run either of the high speed shafts, a radially faced flange affixed to a tapped end of one such slow speed shafts, a tubular reel-carrying hub provided with a hub end face that is demountably coupled to said flange face, key means interlocking such mated faces, a headed locking bolt having a shank extending through said hub into threaded engagement with the aforesaid tapped shaft end, a companion reel cooperatively carried by the other of said slow speed shafts and adapted to have a work piece transferably suspended between the reels, and grinder head means interposed between the reel perimeters and brought into abrasive engagement with such suspended work piece.

LOUIS ILLMER.
VERNON R. PALLAS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
338,603	Logan	Mar. 23, 1886
2,033,392	Pallas	Mar. 10, 1936
2,033,393	Pallas	Mar. 10, 1936
2,105,612	Pallas	Jan. 18, 1938
2,263,206	Cornell	Nov. 18, 1941
2,320,142	Illmer et al.	May 25, 1943
2,343,460	Illmer et al.	Mar. 7, 1944
2,394,381	Hoern	Feb. 5, 1946
2,424,465	Illmer	July 22, 1947