

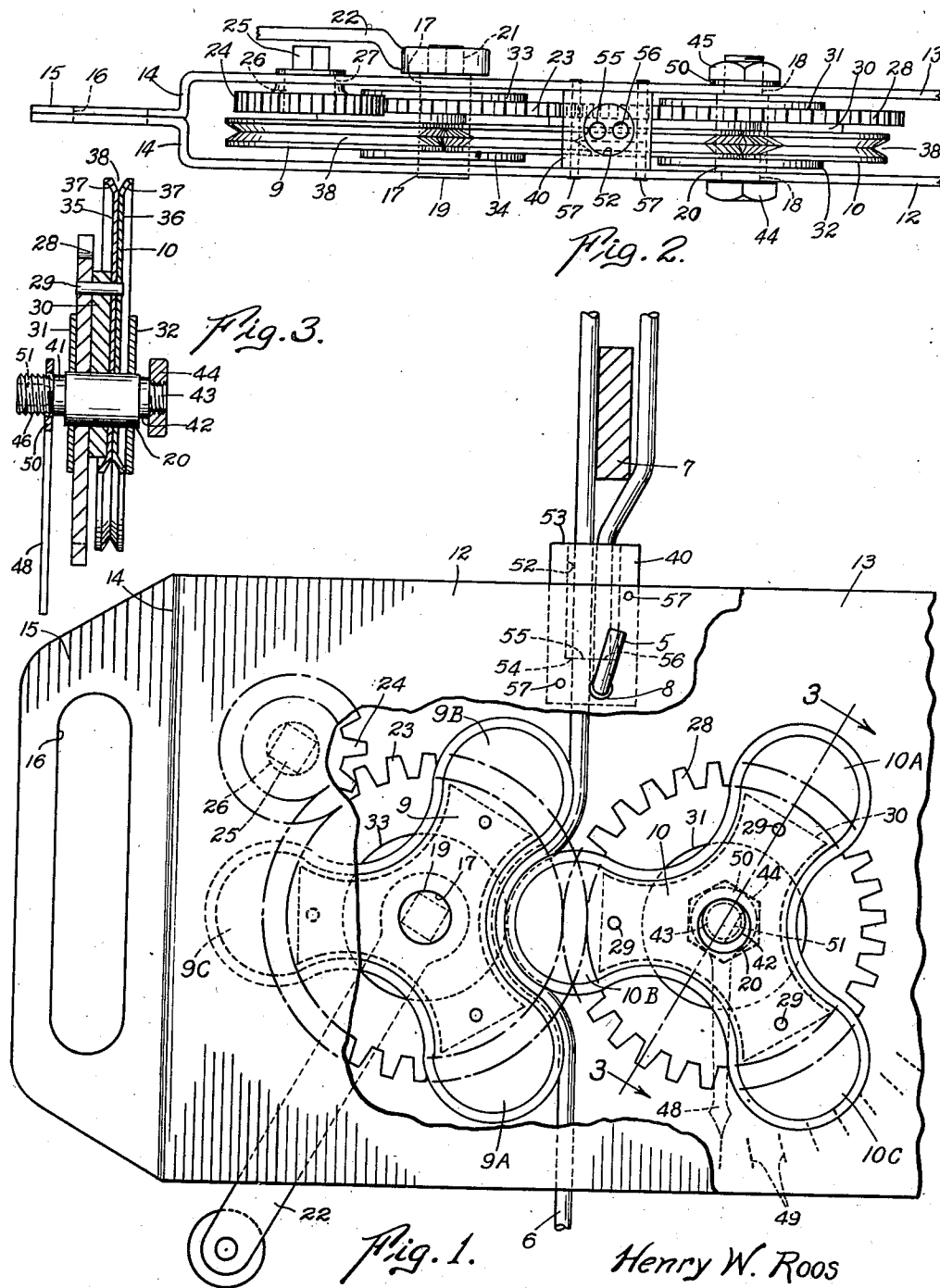
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RUNNING WIRE TIGHTENER OR REELING APPARATUS

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## RUNNING WIRE TIGHTENER OR REELING APPARATUS

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14 Claims. (Cl. 140—102.5)

This invention relates to a wire tightener or reeling apparatus, such as may be employed for tightening wire or cable or other fastening means about boxes, bales, construction forms, and bundles of various types, or which may be used in continuously reeling in or paying out wire, cable, or cords of various kinds.

An object of the invention is to provide a wire tightener or reeling apparatus, which, unlike known devices for the same purposes, has a range of operation such that the wire or cord may be reeled in or paid out continuously over an indeterminate range, rather than being limited to a rather short pulling range.

Another object of the invention is to provide a device of the character stated which is highly simplified in construction, rendering it easy to manipulate and inexpensive to manufacture.

Another object is to provide a device of the kind referred to, the majority of its parts being capable of fabrication from sheet metal with the use of a press, rather than by more costly methods of manufacture.

Another object of the invention is to provide a running or continuous wire tightener comprising a special type of rotary puller so designed and dimensioned as to eliminate slippage and chafing of the wire or cable reeled in or paid out by the rotary pullers.

A further object is to provide a device of the character stated, in which is incorporated adjustable means accommodating the rotary pullers to wires or cables of different diameters and materials.

The foregoing and other objects are attained by the means described herein and disclosed in the accompanying drawing in which:

Fig. 1 is a fragmental elevational view of the device of the invention, with parts broken away in the interest of clarity of the disclosure.

Fig. 2 is a top view of the device illustrated by Fig. 1, the bar 7 and the wires embracing said bar being omitted.

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 1.

Prior to the present invention, various forms of tools have been developed for the tightening and twisting of tie-wires or other wires to be joined by twisting them together, but in the majority of instances such tools have had very limited applicability to wire tightening and twisting problems due to the incorporation of parts or mechanisms having a relatively short pulling range. The previously known tools accordingly were useful only under circumstances calling for

a relatively short pull followed by a twist, for tightening the wire or cable about an object encircled by the wire or cable. With such tools, it was not possible to use the apparatus as a running tightener or reel, and for that reason it often occurred that most of the slack in the wire had to be taken up by the twist, making an unnecessarily long twist which subsequently had to be clipped off.

With the tool of the present invention, it is possible to form a very short twist, and to remove practically all slack from the wire or cable before imparting the twist thereto. With the present tool, it is possible also to apply it to a wire as a winch so as to draw in an indeterminate length of wire whenever necessary for removing unusual amounts of slack therein. Moreover the present device may be used purely as a winch whenever desired, so that objects thereby may be reeled or dragged substantial distances with the use of this device.

Referring to the accompanying drawing, the characters 5 and 6 may be considered the opposite ends of a wire loop, which loop includes a stationary post or other support 7 together with possible other objects encircled by the loop. The wire end 5 preferably passes through an aperture 8 in the frame or housing of the tool, or is otherwise held thereby, while the longer end portion 6 is gripped between the working surfaces of a pair of rotary pullers indicated generally by the characters 9 and 10. In the interests of simplicity and economy, the frame or housing may be constituted of a pair of sheet metal plates 12 and 13 spaced apart so as to accommodate the rotary pullers and their associated elements, the plates being bent inwardly at the locations 14 and fastened together by welding or the like for the purpose of providing a handle 15 which may be equipped with a hand hole 16. It should be understood that a handle with a hand hole should preferably be furnished at the right hand end of the tool as well as at the left hand end which the drawing illustrates. The body of the frame or housing 12—13 may be shaped otherwise than as a rectangle, herein shown.

Each side 12 and 13 of the frame or housing is drilled or punched at the locations 17—17 and 18—18 to receive the transverse shafts 19 and 20 respectively. One of the ends 21 of shaft 19 may be squared or otherwise adapted for the reception of a handle or equivalent actuator indicated at 22, this being furnished for imparting rotational movement to the shaft 19 within its bearings 17—17. Within the confines of the

frame or housing, shaft 19 has fixed thereto the rotary puller 9, which in turn is fixed relative to a gear 23. Upon rotating the shaft 19 by means of handle 22, the puller 9 and gear 23 are caused to rotate in unison. Shaft 19 carries also suitable spacing elements which will be referred to more particularly in the description of the other rotary puller indicated at 10.

As is most clearly illustrated by Fig. 1, an extra gear 24 may be furnished, its teeth meshing with the teeth of gear 23 so that the handle 22 may be applied to the angular end 25 of gear shaft 26 whenever the effect of a reduction gear is needed for the pulling of extremely heavy loads. The shaft 26 may be merely a stud passing through an aperture 27 of housing wall 13, the reduction gear 24 being fastened on one end of the stud interiorly of the housing, while the angular end 25 projects exteriorly for accommodating the handle 22 whenever necessary. It should be noted that gear 24 is made smaller than gear 23 for increasing the power applied to the rotary pullers by way of the handle or other actuator 22.

The intermeshing gear 28 carried by shaft 20, has its teeth constantly engaged with the teeth of gear 23, so that the rotational movement applied to gear 23 will be transmitted to gear 28. Gear 28 is fixed relative to the rotary puller 10, in substantial parallelism therewith preferably through the mediums of pins or rivets 29 which pass through these elements. Between the gear and the rotary puller there is interposed a suitable spacing means 30, which conveniently may be in the form of a three legged spider as illustrated by the line 30 of Fig. 1. The pins, rivets, or other fasteners 29 pass through the gear 28, the spider 30, and the rotary puller 10. Between the gear 28 and the adjacent face of plate 13, a suitable spacing washer 31 may be mounted upon the shaft 20, and a second spacing washer 32 likewise may be interposed between the rotary puller 10 and the adjacent face of plate 12. These spacing washers may be omitted if desired, although they are conducive to the smooth and noiseless operation of the wire tightener. Washers similar to those indicated at 31 and 32, are shown also at 33 and 34 upon shaft 19, where they perform the same service.

A detailed description will now be given of one of the rotary pullers. The rotary pullers being identical, a description of the one indicated at 10 will suffice for both.

With particular reference to Fig. 3, the rotary puller 10 will be seen to consist of a pair of sheet metal plates 35 and 36 the peripheral edges of which are flared outwardly as at 37 so that when the plates are placed back to back, there will be formed a peripheral groove 38 running all the way around the rotary puller. Plates 35 and 36 may be welded or otherwise secured together, if desired, but under ordinary circumstances the pins 29 if tightly fitted and peened will ordinarily suffice to hold the plates in fiatwise abutment. Fig. 3 shows the spacing spider 30 and the spacing washers 31 and 32 previously referred to, along with gear 28. By referring to Fig. 1, it will be observed that the rotary puller has preferably the shape of a tri-lobe wheel, the lobes of which are indicated by the characters 10A, 10B and 10C. These lobes are equally spaced apart and radiate from the center of shaft 20. For best results in the operation of the device of the invention, it is imperative that the diameters of the lobes be equal, and that the centers of all the lobes be at a distance from the center of shaft

20, equal to a lobe diameter. This limitation of proportions establishes the contour of the recesses or indented portion between adjacent lobes, so that a lobe of the other rotary puller 9 will, upon rotation of both rotary pullers, travel within the recessed portion of the puller 10 uniformly spaced from its periphery, with a rolling action devoid of slippage such as would tend to apply opposing tensile forces to the wire gripped by the rotary pullers.

Another important consideration is that the centers of shafts 19 and 20 be spaced apart a distance approximately two lobe diameters, the only variation in this distance to be that necessary for slightly adjusting the rotary pullers to the thickness of the wire or cable fitted between them.

As will readily be understood by reference to Fig. 1, rotation of the rotary puller 9 in a clockwise direction will, through gears 23 and 28 effect corresponding rotation of the rotary puller 10 but in an opposite direction. As lobe 10B moves down to leave the recess between lobes 9A and 9B, it will continuously roll along the wire 6. Of special notice is the fact that in thusly rolling along the wire, the lobe 10B cannot slip relative to the periphery of the rotary puller 9 and thereby chafe or elongate any portions of the wire. The gripping action will be continuous, and any length of wire may be drawn in past the rotary puller. It should be appreciated that the wire 6 will at no time be free to slip because the engagement of the lobes thereon is forceful and uniform in all relative positions of the lobes of both rotary pullers.

After the rotary pullers have been rotated sufficiently to remove all slack from the wire undergoing tightening, the handles 15 at opposite ends of the frame or housing may be grasped for rotating the entire tool bodily relative to the post or other support 7, thereby to establish a twist of the wire ends that embrace the stationary support. In order that the twist may be most easily performed, there may be provided between the walls 12 and 13 of the frame or housing, a wire guide or block 40 including means to shear the wire ends after the twist has been completed. This will be explained in greater detail hereinafter.

As was previously mentioned herein, it is desirable to provide the tool with means whereby wires, cords, or cables of different diameters, within reasonable limits, may be accommodated by the peripheral grooves of the rotary pullers. One simple form of means for this purpose consists in furnishing the shaft 20 with eccentric end portions 41 and 42 (Fig. 3) these end portions being received in the bearings 18—18 of the side plates 12 and 13. The extreme end of the shaft at the eccentric bearing portion 42 may be threaded as indicated at 43 to carry a nut 44 adapted to bear against the side plate 12 when a locking nut 45 is tightly screwed onto the opposite threaded end 46 of the shaft. Thus by loosening the locking nut 45 a wrench may be applied to the nut 44 for shifting the intermediate eccentric portion 20 of the shaft toward and from the center of the other shaft 19 that carries the rotary puller 9. After the proper spacing is secured between the peripheries of the rotary pullers, so as to accommodate a given wire size, the locking nut 45 may be tightened so as to maintain the adjustment. Thereafter the crank or other actuator 22 may be applied to either the shaft 19 or the shaft 26, for rotating the rotary puller 9, and other gears 23 and 28, transmitting the

rotational movement to the second rotary puller 10. Any wire such as 6 passing through the constricted space between the pullers will be deliberately kinked and advanced beyond the frame or housing of the device, without weakening the wire by forming cuts or ridges in its surface. In other words, the tool operates effectively without serrations or other gripping means within the peripheral grooves of the rotary pullers, and for this reason the wire is at no time subjected to such mutilation as would reduce its diameter and impair the strength thereof during the tightening or reeling operation. Of course, the walls of the peripheral grooves formed by the tri-lobed plates of the rotary pullers might be suitably roughened, if desired, without necessarily impairing the operation of the tool in general.

One important feature of the device herein disclosed, is that the rotary pullers be furnished preferably with only three lobes each, with the diameters of the lobes equal to the distance from their centers to the center of rotation of the rotary puller. If a lesser or greater number of lobes be formed on the rotary puller, it will be discovered that the rolling action occurring between the lobes of one puller and the recesses of the other, will be accompanied by an undesirable slippage or scraping action of a lobe upon the surface of the wire. In cases where the slippage is not too objectionable, such as in the pulling of rope or other soft material, the number of lobes may be increased or decreased, retaining the intertwining action of the lobes to advantage. The rotary pullers shaped and dimensioned as taught herein, will be free of such slippage and will exert purely a rolling action upon hard material such as wire or cable to be tightened.

As is most clearly indicated by Figs. 1 and 3, the device may be provided with an indicator 48 cooperating with suitable index markings on the frame to visually indicate the eccentricity of shaft 20 necessary for the accommodation of different wire sizes. The index markings 49, which are preferably applied on an exterior face of a housing wall such as 13, may be graduated and marked to read directly in wire sizes. As a simple form of means for mounting the indicator 48, the hub 50 of the indicator or pointer may be formed with a central aperture which is out of round, or shaped to fit a flat 51 formed on the screw threaded end 46 of shaft 20. By this means, the indicator or pointer will be caused likewise to rotate with the shaft when the shaft is adjusted rotatably to shift its eccentric position.

As was previously mentioned herein, the device may be provided with a wire guide or block 40 to assist in the formation of a suitable twist of the wires when the tool is rotated bodily by means of the handles 15. This guide or block 40 may consist merely of a rectangular metallic element bored as at 52 throughout a portion of its length, from the nose end 53 to a point 54 which constitutes the bottom of the bore. The bore is made sufficiently large to accommodate the wires when twisted together. The bottom of the bore is drilled to provide apertures 55 and 56, which are most clearly shown in Fig. 2, these being receptive of the wires 6 and 5 respectively. The edges of the apertures 55 and 56 interiorly of the bore 52, are sharp and will accordingly perform a shearing action upon the wires at the bottom of bore 52, whenever the twist becomes sufficiently tight and extensive to fill the bore. The aperture or channel 56 preferably is

directed angularly from the bottom 54 of the bore 52 so as to meet the aperture 8 of the side wall 12 of the frame, this being for the purpose of leading end 5 of the wire to a location exteriorly of the side wall, where the wire may be turned for anchoring it against forces tending to pull the wire out of the guide or block 40. The guide or block may be secured between the walls 12 and 13 of the tool in any suitable manner, such as by means of pins or rivets 57. It is to be understood that the tool of this invention may be operated with the use of any suitable type of twist guide, or without a twist guide, as desired. If the twist guide be omitted, the end 5 of the wire will merely pass through the aperture 8 of the side wall of the frame. As to the indicator illustrated at 48, attention is directed to the fact that such indicator is only exemplary of many possible forms of means for visually informing the operator of the tool that the pullers are adjusted for accommodating wires of one size or another.

It is to be understood that the device of the invention is capable of various other modifications and changes in structural details, falling within the scope of the appended claims, and that the invention accordingly is not to be limited to the precise structure herein disclosed except as the claims may define such express limitations.

What is claimed is:

1. In a device of the class described, a frame having opposite ends each including a hand grasp portion whereby the frame is to be rotated for twisting a wire, means within the confines of the frame for reeling in an indeterminate length of wire, and means on the frame to hold one end of said wire during the reeling and twisting operations.

2. In a device of the class described, the combination which comprises a frame including sides apertured to provide a set of bearings, a transverse shaft rotatable in the set of bearings, means for rotating said shaft, a pair of rotary pullers each constituted of a tri-lobed wheel having a grooved periphery with the lobes equally spaced apart and separated by peripherally grooved recesses, the lobes and recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their grooved peripheries for reception of wire or cable to be advanced by the pullers, and means for anchoring a wire or cable end to the frame of the device.

3. In a device of the class described, the combination which comprises a frame including sides apertured to provide a set of bearings, a transverse shaft rotatable in the set of bearings, means for rotating said shaft, a pair of rotary pullers each constituted of a tri-lobed wheel having a grooved periphery with the lobes equally spaced apart and separated by peripherally grooved recesses, the lobes and recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally for rotational movement, means transmitting rotation of one puller to the

other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their grooved peripheries for reception of wire or cable to be advanced by the pullers, the diameter of each puller lobe being equal to the distance from the center of a lobe to the center of rotation of the puller on which the lobe is situated, and the distance between puller centers being approximately twice the diameter of a lobe.

4. In a device of the class described, the combination which comprises a frame including sides apertured to provide two sets of bearings, a transverse shaft in each set of bearings, means for rotating one of the shafts, a pair of rotary pullers each constituted of a tri-lobed wheel having a grooved periphery with the lobes equally spaced apart and separated by peripherally grooved recesses, the lobes and recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally on the remaining shaft for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their grooved peripheries for reception of wire or cable to be advanced by the pullers, and means for varying the distance from one shaft to the other, for accommodating the grooved peripheries of the pullers to wires or cables of different diameter sizes.

5. In a device of the class described, the combination which comprises a frame including sides apertured to provide two sets of bearings, a transverse shaft in each set of bearings, means for rotating one of the shafts, a pair of rotary pullers each constituted of a tri-lobed wheel having a grooved periphery with the lobes equally spaced apart and separated by peripherally grooved recesses, the lobes and recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally on the remaining shaft for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their grooved peripheries for reception of wire or cable to be advanced by the pullers, the diameter of each puller lobe being equal to the distance from the center of a lobe to the center of rotation of the puller on which the lobe is situated, and the distance between puller centers being approximately twice the diameter of a lobe, and means associated with one of the shafts for varying the distance between puller centers.

6. In a wire tightener, the combination which comprises a frame including means for the attachment thereto of one end of a wire to be tightened, a passage in the frame for the entry of another wire end into the frame interior, and means within the frame for continuously reeling in the wire end last mentioned throughout an indeterminate range of advancement, said attachment means being adjacent to the passage in order to maintain the wires in juxtaposition for twisting them together upon bodily rotation of the frame.

7. In a wire tightener, the combination which comprises a frame including means for the attachment thereto of one end of a wire to be tightened, a passage in the frame for the entry of another wire end into the frame interior, and means within the frame for continuously reeling in the wire end last mentioned throughout an indeterminate range of advancement.

8. In a wire tightener, the combination which comprises a frame including means for the attachment thereto of one end of a wire to be tightened, a passage in the frame for the entry of another wire end into the frame interior, means carried by the frame for frictionally gripping and reeling in the wire end last mentioned throughout an indeterminate range of advancement, and means for selectively adjusting the gripping force of the frictional gripping and reeling means.

9. In a wire tightener, the combination which comprises a frame including spaced substantially parallel side walls, and means within the frame confines for frictionally gripping and advancing a wire fed thereto, a guide in advance of the gripping and advancing means, said guide comprising a bored block supported between the side walls of the frame with its bore substantially aligned with the gripping and advancing means, said bore having a bottom apertured for receiving two wire ends to be twisted together upon bodily rotation of the frame, and means for the anchorage of one of the wire ends to preclude retraction thereof from the guide.

10. In a wire tightener, the combination which comprises a frame including spaced substantially parallel side walls, and means within the frame confines for frictionally gripping and advancing a wire fed thereto, a guide in advance of the gripping and advancing means, said guide comprising a bored block supported between the side walls of the frame with its bore substantially aligned with the gripping and advancing means, said bore having a bottom apertured for receiving two wire ends to be twisted together upon bodily rotation of the frame, and means for the anchorage of one of the wire ends to preclude retraction thereof from the guide, said wire receiving apertures having sharp edges disposed within the guide bore for shearing off the wire ends upon completion of the twisting operation.

11. In a device of the class described, the combination which comprises a frame including sides apertured to provide a set of bearings, a transverse shaft rotatable in the set of bearings, means for rotating said shaft, a pair of rotary pullers each constituted of a tri-lobed wheel having a grooved periphery with the lobes equally spaced apart and separated by peripherally grooved recesses, the lobes and recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their grooved peripheries for reception of wire or cable to be advanced by the pullers, means for varying said space between the grooved peripheries of the pullers and for visually indicating at the frame exterior the size of said space, and means for anchoring a wire or cable end to the frame of the device.

12. In a device of the class described, the combination which comprises a frame including sides apertured to provide a set of bearings, a transverse shaft rotatable in the set of bearings, means for rotating said shaft, a pair of rotary pullers each constituted of a tri-lobed wheel having a frictional periphery with the lobes equally spaced apart and separated by arcuate recesses, the lobes and arcuate recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their complementary peripheries for reception of a length of material to be advanced by the pullers, the diameter of each puller lobe being equal to the distance from the center of a lobe to the center of rotation of the puller on which the lobe is situated, and the distance between puller centers being approximately twice the diameter of a lobe.

13. In a device of the class described, the combination which comprises a frame including sides apertured to provide two sets of bearings, a transverse shaft in each set of bearings, means for rotating one of the shafts, a pair of rotary pullers each constituted of a tri-lobed wheel having a frictional periphery with the lobes equally spaced apart and separated by arcuate recesses, the lobes and arcuate recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally on the remaining shaft for rotational movement, means transmitting rotation of one

puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their complementary peripheries for reception of a length of material to be advanced by the pullers, and means for varying the distance from one shaft to the other, for accommodating the complementary peripheries of the pullers to materials differing in thickness.

14. In a device of the class described, the combination which comprises a frame including sides apertured to provide two sets of bearings, a transverse shaft in each set of bearings, means for rotating one of the shafts, a pair of rotary pullers each constituted of a tri-lobed wheel having a frictional periphery with the lobes equally spaced apart and separated by arcuate recesses, the lobes and arcuate recesses of one puller interfitting with the recesses and lobes of the other puller as the pullers are rotated, one puller being fixed to that shaft which includes the means for rotating it, the other puller being mounted centrally on the remaining shaft for rotational movement, means transmitting rotation of one puller to the other puller at uniform speed but in opposite directions, and maintaining a space between the lobes and the recesses of the pullers at their complementary peripheries for reception of a length of material to be advanced by the pullers, the diameter of each puller lobe being equal to the distance from the center of a lobe to the center of rotation of the puller on which the lobe is situated, and the distance between puller centers being approximately twice the diameter of a lobe, and means associated with one of the shafts for varying the distance between puller centers.

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