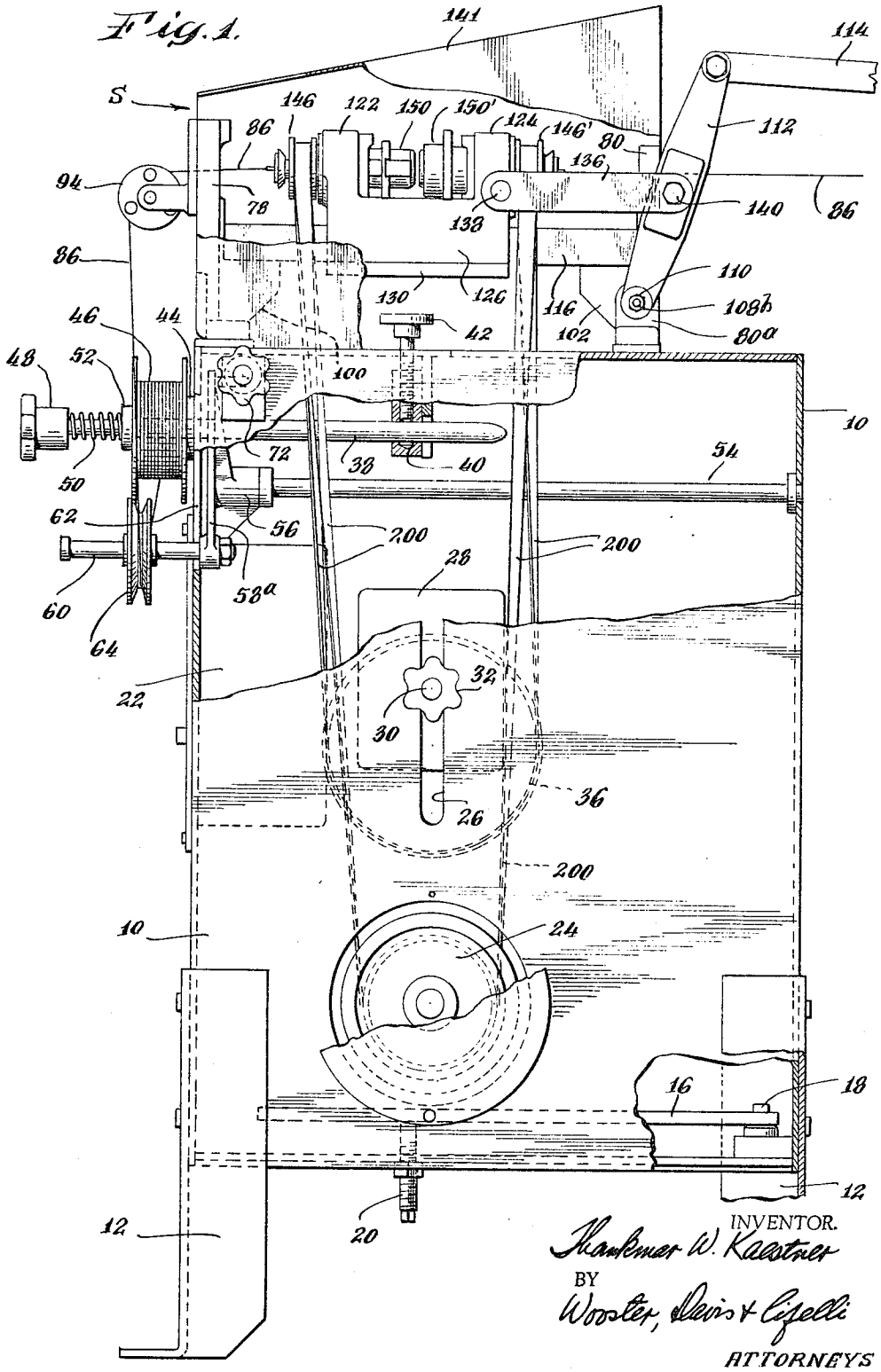
Oct. 11, 1966 T. W. KAESTNER 3,277,682

WIRE STRAIGHTENERS

Filed Aug. 30, 1963 5 Sheets-Sheet 1

Fig. 1.



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WIRE STRAIGHTENERS

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Fig. 8.

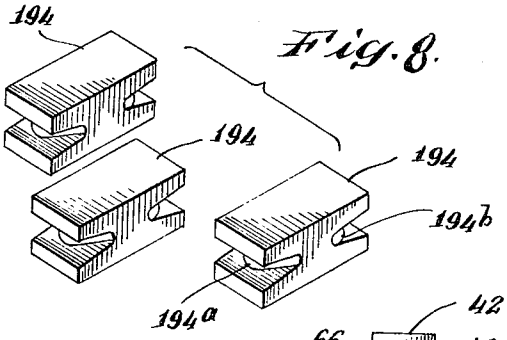


Fig. 2.

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WIRE STRAIGHTENERS

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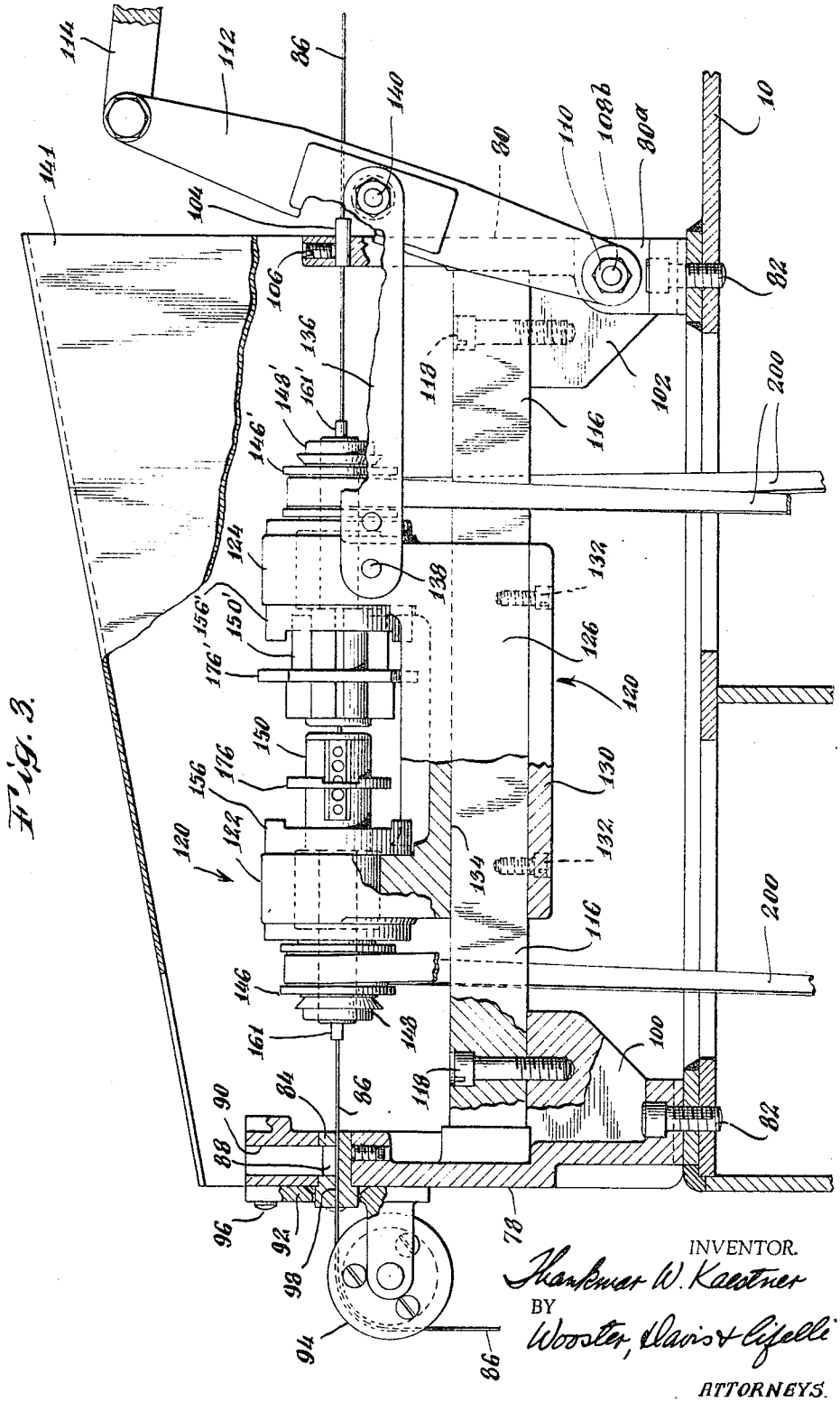


Fig. 3.

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WIRE STRAIGHTENERS

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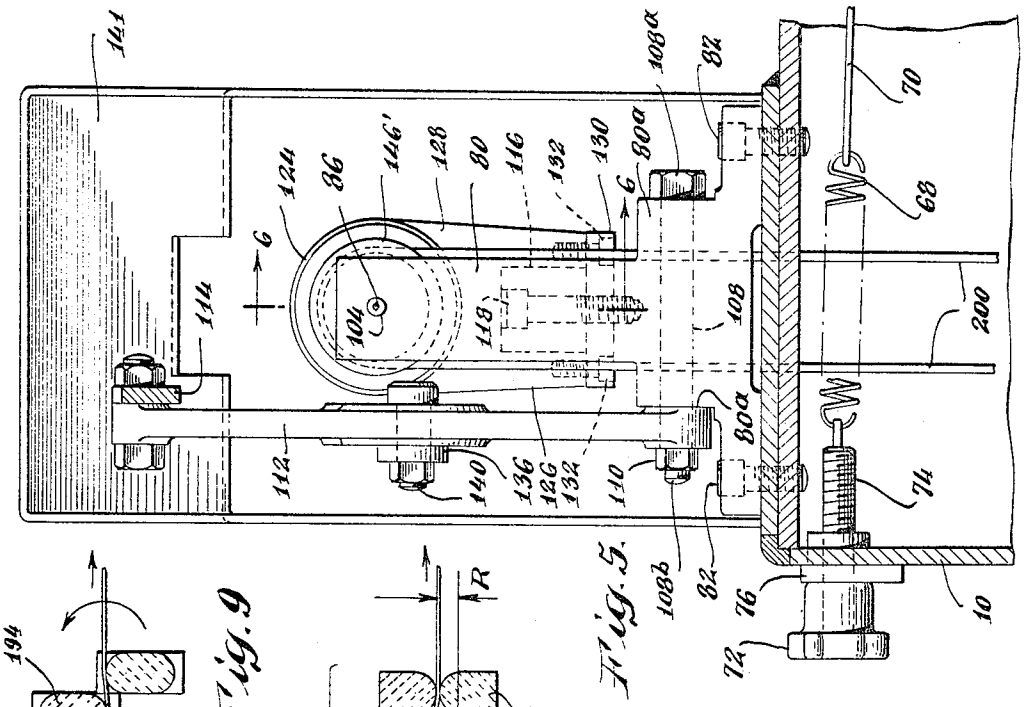


Fig. 5.

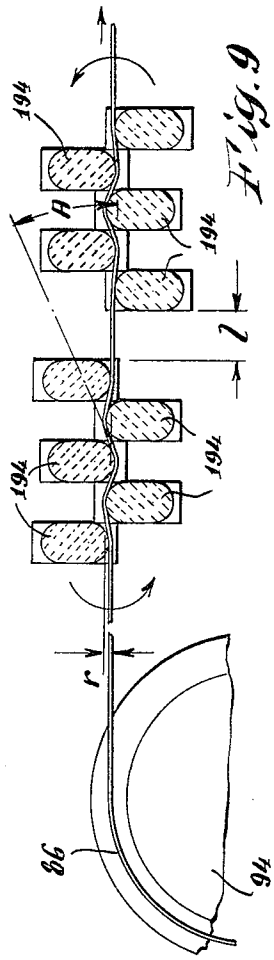


Fig. 9.

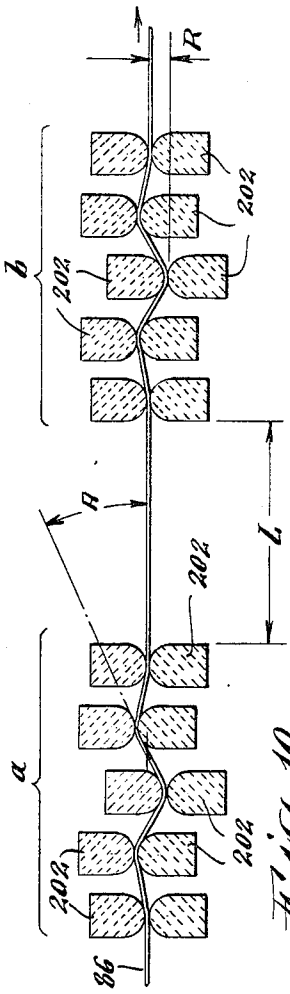


Fig. 10. (PRIOR ART)

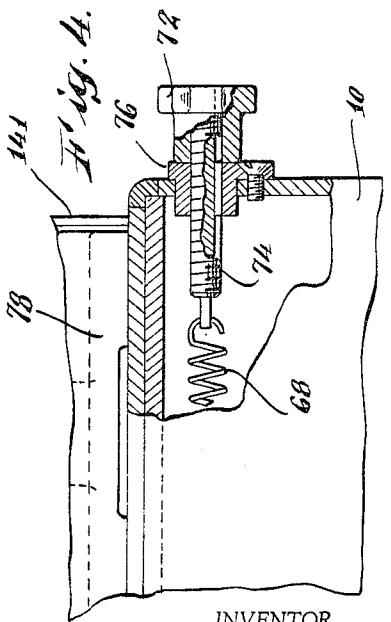


Fig. 4.

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WIRE STRAIGHTENERS

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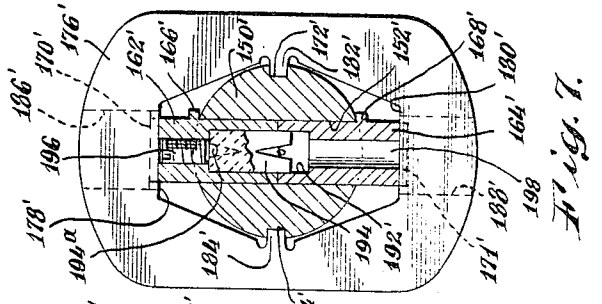


Fig. 7.

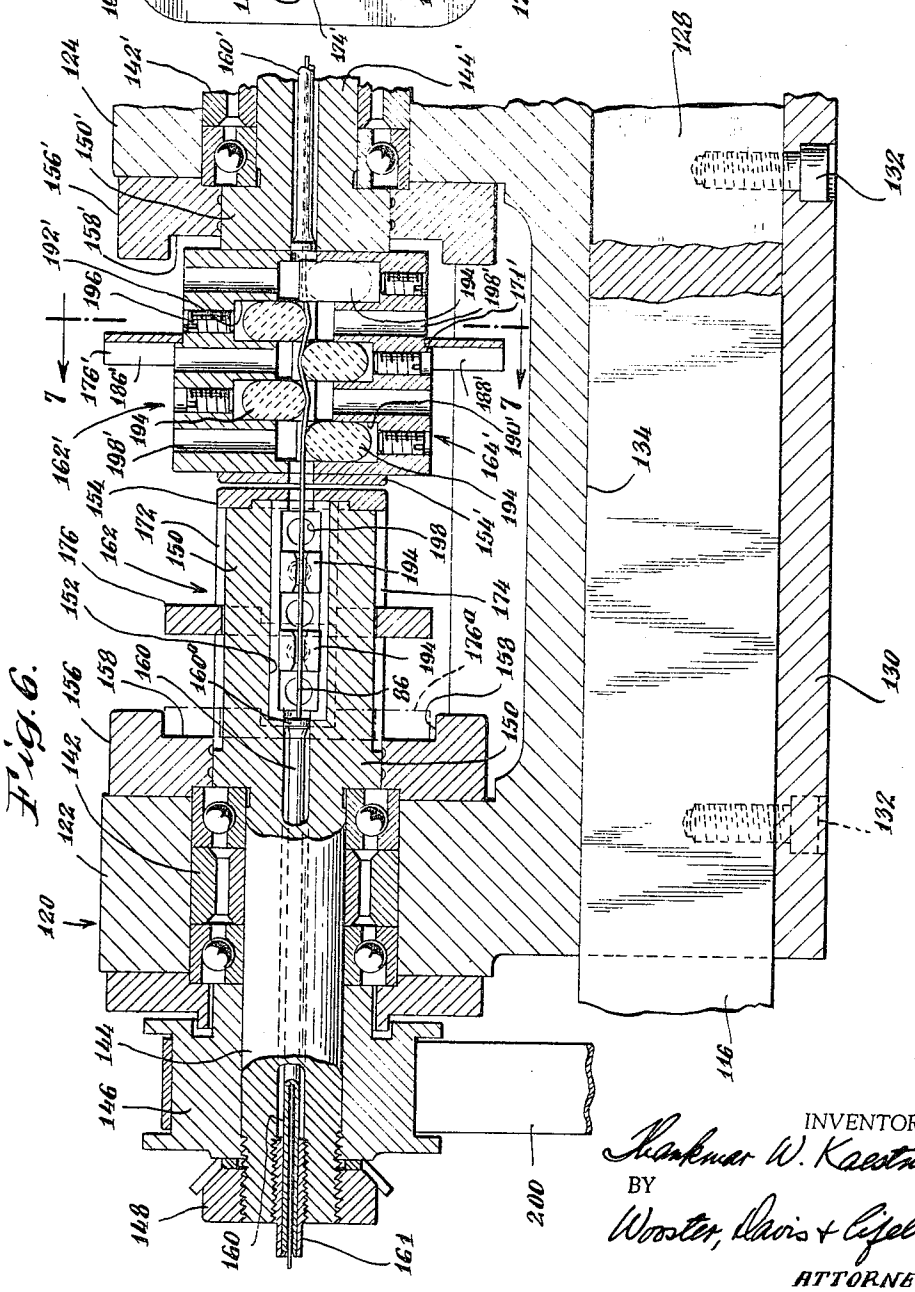


Fig. 6.

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United States Patent Office 3,277,682 Patented Oct. 11, 1966

3,277,682

WIRE STRAIGHTENERS

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Filed Aug. 30, 1963, Ser. No. 305,797
17 Claims. (Cl. 72—79)

This invention relates to wire straightening and, more particularly, to that type of apparatus known in the art as rotary wire straighteners as opposed to roll straighteners.

The manufacturer of wire products customarily buys the wire he requires rolled upon a spool or reel. Before this wire can be fed to the wire forming machinery where it is shaped into the final product, it must first be straightened to remove the curve it has acquired from reel storage. One method of achieving this straightening is to pass the wire through a rotary wire straightener. The operation of a prior art rotary wire straightener may be understood by considering the wire to pass through the center of a hollow shaft. Extending inwardly from the sides of the shaft are a number of pairs of straightening blocks. One block of each pair extends radially inwardly from the side of the shaft in directly opposed relationship to a similar block that extends inwardly from the opposite side of the shaft. The two blocks of each pair are formed and spaced in such a manner as to provide a wire passage between them. The pairs of blocks are positioned axially along the shaft and are adjusted so that a wire which passes through the passageway thus formed is forced to snake or acquire a sinuous configuration as it passes between the pairs of straightening blocks. The wire is then caused to move longitudinally through the shaft by external means which also keeps the wire taut. As the wire moves longitudinally through the shaft the shaft is caused to rotate. The straightening blocks also rotate, giving a cranking motion to the wire which efficiently straightens it.

Rotary wire straighteners of the foregoing type are relatively successful in straightening large size wire. The term "large size wire" refers to wire having a diameter greater than approximately .032 inch. When prior art rotary wire straighteners are used to straighten wire much smaller than this (depending on the wire material) they tend to twist and break the wire and give unsatisfactory straightness. The prior art straighteners are also time consuming to adjust and are difficult to rewire when small diameter wire breaks during the straightening operation.

In order to overcome some of the above difficulties when straightening smaller wire, it has been proposed to employ counter-rotating straighteners. Straighteners of this type comprise a pair of assemblies of the type referred to above wherein the two shafts are aligned but rotate in opposite directions, the wire passing through one set of straighteners and then through another set. Although counter-rotating straighteners of this type neutralize the torque on the wire between the counter-rotating shafts, they have otherwise proved relatively unsuccessful because they, by their design, continued to twist the wire, and small wire in particular, to destruction. Furthermore, the equipment is large and expensive and special problems arise when straightening small diameter, easily breakable wire because it is difficult to rethread the wire.

Because of the present trend toward miniaturization, it has become important to provide suitable means for straightening small diameter wire. A simple reduction in size of the straightener is not sufficient. The reason for this is that a wire's resistance to torsion and bending is proportional to its diameter raised to the third power (d^3). Accordingly, a reduction in wire diameter requires a much more drastic reduction in the dimensions of the straightener. The efficacy of a straightener depends on the angle formed between a given segment of the wire and the axis of rotation of the straightener. For wire of a given size and material, this angle should remain constant. However, since the resistance of wire to torsion and bending stresses is inversely proportional to the distance over which the stresses are applied it is important that all sections of wire in a rotary straightener be kept as short as possible, so that the wire can offer a maximum of resistance to the destructive twisting forces relevant in its operation.

Accordingly, it is a primary object of this invention to provide an improved wire straightener.

Other objects are to provide such a straightener which is particularly well adapted to straightening small diameter wire; which is well adapted to the counter-rotating technique; which does not unduly twist the wire; wherein the twisting moment is transmitted over a minimum distance; wherein the straightening blocks are easily adjustable; wherein a wire can easily be rethreaded without affecting the setting of the straightening blocks; wherein the straightening blocks are easily accessible; and wherein the setting of the straightening blocks is easily reproducible.

The manner in which the foregoing objects are achieved will be more apparent from the following description, the appended claims, and the figures of the attached drawings, wherein:

FIG. 1 is a side elevational view of a wire straightening machine in accordance with this invention, portions thereof being broken away;

FIG. 2 is a front elevational view of the machine of FIG. 1, portions thereof being broken away;

FIG. 3 is an enlarged side view of the straightener portion of the machine illustrated in FIGS. 1 and 2;

FIG. 4 is an enlarged detail of a portion of the invention, sections being broken away for clarity;

FIG. 5 is an enlarged rear view of the straightener portion of FIG. 3;

FIG. 6 is a cross sectional view of the straightener portion illustrating the construction of the straightener arbors;

FIG. 7 is a cross sectional view taken along the line 7—7 of FIG. 6;

FIG. 8 is a perspective view illustrating the straightening blocks utilized in the present invention;

FIG. 9 is a schematic illustration showing the manner of operation of the straightener of this invention; and

FIG. 10 is a schematic illustration showing the manner of operation of counter-rotating straighteners in accordance with the prior art.

With particular reference to FIGS. 1 and 2, there is illustrated a wire straightening machine embodying the present invention and comprising a cabinet **10** mounted on a pair of wide legs **12** which may be adjustably positioned on the cabinet **10** in accordance with the ultimate desired height of the machine. Enclosed within the cabinet **10** is an electrical drive motor **14** bolted to a canti-

levered base plate **16** which is secured at the rear of the cabinet by bolts **18** and is rendered vertically adjustable by means of a jack bolt **20**. The motor **14** is designed for quick starting and also includes a brake for stopping the motor rapidly when power is cut off. The front wall of cabinet **10** carries a control box **22** and suitable wiring (not shown) is provided between box **22**, motor **14**, and an external power supply. The shaft of motor **14** carries a three-step pulley **24**. One side wall of cabinet **10** is provided with a vertical slot **26**. An internally mounted bracket **28** includes a clamping screw **30** which extends through slot **26**. A manual clamping nut **32** allows bracket **28** to be vertically positioned relative to the cabinet **10**. On the inner side of bracket **28** there is mounted a shaft **34** which carries an idler pulley **36**. It will be noted that the idler pulley **36** is mounted above the pulley **24** of the motor **14** and the two are mounted to rotate about parallel axes. The axes of rotation of these pulleys are at 90° to the direction of travel of the wire to be straightened, as will be more fully set out below.

Passing through the front wall of cabinet **10** is a wire spool arbor **38**. The inner end of the arbor **38** passes through a clamp **40** mounted on the top of cabinet **10** and is fixed in position by means of a releasable clamping screw **42**. A pad **44** on the front of cabinet **10** encircles the spool arbor **38** and the wire spool **46** which is rotatably mounted on the arbor **38** bears against the pad **44**. The outer end of arbor **38** is threaded to carry a tension adjusting nut **48** which compresses a coil spring **50** against a thrust bearing **52** which bears against wire spool **46**. The front and back walls of the cabinet **10** support the ends of a shaft **54**. That end of shaft **54** which is supported by the front of cabinet **10** carries a sleeve bearing **56** which forms the pivotal portion of an L-shaped crank **58**. The longer arm **58***a* of crank **58** extends in a generally horizontal direction from the pivot bearing **56** and carries at its opposite end a shaft **60** which extends through a slot **62** cut in the front wall of the cabinet **10**. The shaft **60** is fixed relative to the arm **58***a* and an idling tension pulley **64** is mounted for free rotation around and movement along the shaft **60**. Arm **58***b* of crank **58** extends in a generally vertical direction from the pivot bearing **56** and its opposite end is connected between stressed coil springs **66**, **68** which extend between the left and right sides of the cabinet **10**. Arm **58***b* is connected directly to the end of spring **66** and, by means of a suitable linking wire **70**, to the end of spring **68**. The tension adjusting knob **72** is threaded and screwed to the end of a bolt **74** which is secured to the end of spring **68**. Bolt **74** includes a keyway and is advanced into or out of the cabinet **10** by reason of its engagement with keyed bushing **76**.

Mounted atop cabinet **10** is the straightening mechanism proper which is here given the general designation S. The straightening mechanism S is shown in enlarged detail in FIG. 3, to which reference may be had for a more complete understanding of its construction. The straightening mechanism includes an entry bracket **78** and an exit bracket **80**, each of which is securely mounted to the top of cabinet **10** by means of suitable bolts **82**.

The entry bracket **78** includes an opening in which is positioned a cylindrical bushing **84** which is drilled to provide a passageway **98** for an entering wire **86**. The central portion of bushing **84** is milled away to provide a lubrication pocket **88** which communicates with the top of entry bracket **78** by virtue of a further vertical opening **90**. The front of entry bracket **78** carries the base **92** of an anti-twist wire roll **94**. The base **92** is secured to the bracket **78** by means of suitable bolts **96** which are so arranged that the roll **94** can be positioned to rotate about either a vertical or a horizontal axis. Also included in the base **92** is an opening which encircles bushing **84** and permits wire strand **86** to pass from the roll **94** through the bushing. The inner side of bracket **78** is provided with a shelf **100** for a purpose to be shortly explained.

The exit bracket **80** carries on its inner side a shelf **102** which is generally similar to shelf **100**. The upper portion of bracket **80** is drilled to receive a wire exit bushing **104** mounted therein by a suitable set screw **106**. The base portion **80***a* of bracket **80** is drilled to receive a pivot pin **108** as is best illustrated in FIG. 5. Pivot pin **108** is secured in position by means of its hexagonal head **108***a* and its threaded end **108***b* which carries a nut **110**. Mounted on pivot pin **108** between nut **110** and the base portion **80***a* of exit bracket **80** is the end of a lever arm **112**. Pivotally secured to the opposite end of lever arm **112** is an oscillating drive member **114**.

The shelves **100**, **102** of entry bracket **78** and exit bracket **80** support the opposite ends of a slide bar **116** which is of generally square cross section and is secured to the shelves by means of suitable countersunk bolts **118**. A straightener cradle housing **120** is mounted for reciprocation along slide bar **116**. The cradle housing **120** may be of cast metal and carries an entrance bearing housing **122** and an exit bearing housing **124** which are separated from one another, as illustrated in FIG. 3. The lower portion of cradle housing **120** includes depending side walls **126**, **128** which straddle the slide bar **116**. The cradle housing is further secured to the slide bar by means of a lower plate **130** which is affixed to the side walls by means of suitable bolts **132**. The saddle **134** that is formed between the side walls **126**, **128** on the body of the cradle housing **120** forms a bearing surface and may be suitably grooved for efficient lubrication. A driver arm **136** is secured to cradle housing **120** by a suitable pivot pin **138** and to the midpoint of lever arm **112** by a drive pin **140**. The straightening mechanism S is covered by a safety guard **141**.

The construction of the wire straightener mechanism is most clearly shown in the enlarged views of FIGS. 6 and 7. The entrance bearing housing **122** encloses a ball bearing **142** which rotatably supports a hollow entrance shaft **144** on the outer (left) end of which is mounted a drive pulley **146** which is keyed to shaft **144** and secured by means of a lock nut **147** mounted on the threaded end of the shaft. The inner end of the entrance shaft **144** is slotted so as to form an arbor **150** having a rectangular opening **152** extending diametrically through it. The extreme right hand end of the arbor **150** is enclosed by a circular end plate **154**. The arbor **150** is further encircled by a bearing shield **156** mounted on the inner surface of the entrance bearing housing **122**. Bearing shield **156** is generally disc-shaped but includes a milled recess **158** which has a width greater than that of the arbor and extends diametrically across the face of the shield. Enclosed within the hollow shaft **144** is a tubular wire guide **160**. The wire guide **160** has a flared end **160***a* which communicates with the opening **152** in arbor **150** and is supported within the shaft at its left end by a threaded sleeve **161**.

In direct alignment with the entrance shaft **144** and its arbor **150** is a similarly constructed exit shaft and arbor which is in reversed relationship but of otherwise similar construction. Accordingly, the elements of the exit shaft and its arbor which are mounted within the exit bearing housing **124** are given similar numbers but with a prime (') added. Thus it will be noted from FIG. 6 that the exit bearing housing **124** encloses a rotating shaft **144'** which supports an arbor **150'** and is otherwise similar to the mechanism previously described. In the illustration of FIG. 6, the shafts and arbors are shown in positions rotated 90° from one another in order to more clearly illustrate the internal construction. It is important to note that the inner ends of the arbors are separated from one another by a minimum distance. Each of the arbors **150**, **150'** encloses within its central opening a pair of opposed wire-straightening "magazines." Each such pair includes a two-block magazine **162**, **162'**

and a three-block magazine, of which only magazine **164'** located in the exit arbor is indicated in FIG. 6. The four magazines have similar external appearances, being rectangular prismatic metal blocks having cross sectional dimensions which permit their insertion into the opening of their respective arbors. Each of the magazines is provided with a lip **166'**, **168'**, as shown in FIG. 7. This lip extends the length of the magazine and abuts against the arbor when the magazine is inserted into the central opening so that the two magazines of a pair meet at the center line of the arbor, as illustrated in FIG. 7. The outermost surface of each of the magazines includes a step **170'**, **171'**, the magazines thus being thicker toward the inner end of the respective arbors. Each of the arbors **150**, **150'** is provided with a keyway **172**, **172'**, **174**, **174'**. The keyways of each pair are diametrically opposed to one another and lie in a plane rotated 90° from the central plane of the magazine-containing opening in the respective arbor. This is illustrated most clearly in FIG. 7. The magzines are retained within the arbors by means of identical retaining rings **176**, **176'**. The retaining rings are generally oblong in shape. Ring **176'** is illustrated in FIG. 7 and will be described. Its central opening is essentially hexagonal so as to define a pair of opposed straight edges **178'**, **180'**, which engage the outer surfaces of the magazines **162'**, **164'** at the respective steps **170'**, **171'**. Each of the retaining rings further includes a pair of keys **182'**, **184'**, which engage the corresponding keyways **172'**, **174'** to retain the ring in a fixed circumferential relationship relative to the arbor. The outer width of the rings is such that they may be easily slid into the milled recesses **158**, **158'** of the bearing shields **156**, **156'**. In addition to these features, each of the retaining rings **176**, **176'** is milled along its diameter so as to provide a pair of opposed radial recesses **186'**, **188'** of a width greater than the thickness of the retained magazines. It is important to note from FIG. 6 the relationship between a pair of magazines and its retaining ring, arbor, and bearing shield. For example, the central recess of the arbor **150'** is positioned axially from the inner surface of milled recess **158'** a distance that is greater than the thickness of that portion of retainer ring **176'** underlying the radial recesses **186'**, **188'**. Accordingly, when the arbor **150'** is rotated by 90° the ring **176'** will be slidable into the milled recess **158'** and each of the magazines **162'**, **164'** will then be removable from their arbors through either recess **186'** or **188'**. This is illustrated in FIG. 6 by means of the broken lines **176***a* which outline such a position of the left hand retaining ring **176**.

As has been stated, each of the magazines **162**, **162'**, **164**, **164'** essentially comprise a prismatic metallic block of rectangular cross section. The magazines **162'**, **164'** contain axially displaced rectangular passages **190'**, **192'**. These passages extend outwardly from the inner surface of the magazine and each contains a wire straightening block **194**. The recesses and blocks of the two and three block magazines are so disposed that the ends of the blocks contained in opposing magazines interlock with one another, as shown in FIG. 6. Each of the blocks **194** is backed by a recessed adjusting screw **196** which is threaded into the magazine in an opening which communicates with the radial recess for the corresponding block. The additional passages **198** have no functional purpose but serve to lessen the weight of the magazines. The construction of the wire straightening blocks **194** is most clearly illustrated in FIG. 8 wherein three interlocking blocks are illustrated but separated from one another for ease of viewing. Each block is essentially a square prism having a polished half-round groove **194***a*, **194***b* in each end. The blocks are double-ended in order that they may be reversed to equalize wear and reduce the necessity for replacement. The blocks may be made of any suitable materials, for example, sintered ceramic, Stellite, carbide, nylon, Teflon, or lignum vitae.

Referring back to FIG. 1 to complete the description of the apparatus, a flat belt **200** passes with a 90° twist from the three-step pulley **24** of motor **14** upwardly and over the drive pulleys **146**, **146'**. The belt then passes downwardly from each of pulleys **146**, **146'** and passes around the idler pulley **36**, once again with a 90° twist. Accordingly, it will be obvious that as motor **14** rotates, the belt **200** will impart opposite rotation to the pulleys **146**, **146'**, causing counter-rotation of the arbors **150**, **150'**.

Before proceeding to a detailed discussion of the operation of the invention, attention is directed to FIGS. 9 and 10 which illustrate the principles which render this invention a great advance over the prior art. FIG. 10 illustrates the prior art in the field of counter-rotating wire straighteners. In the prior art apparatus of FIG. 10, the wire **86** being straightened passes between successive pairs of axially spaced straightening blocks **202**. The blocks designated *a* are located within one arbor and the blocks designated *b* are located within another arbor, the two arbors being counter-rotated. Each of the arbors includes a section of hollow shaft at either end. Accordingly, they cannot be positioned closely together but are separated a distance L. Furthermore, the individual pairs of blocks within each arbor are separated from one another. The angle A shown in FIG. 10, known as the "bending angle," is the important consideration in straightening wire. The distance R is the cranking distance or moment arm and twisting of wire **86** tends to occur as a result of the rotational forces applied to the wire at distance R. The long span of wire along distance L also presents essentially no resistance to twisting.

In FIG. 9 a schematic diagram of the straightener of the invention is illustrated. In this straightener, rather than having opposing pairs of blocks, the blocks **194** on opposite sides of wire **86** are interlocked so as to substantially reduce the axial length taken by the blocks along the wire. The angle A required for straightening the wire is maintained at the same value as shown in FIG. 10. However, the moment arm tending to twist the wire is substantially reduced from R to *r*, because of closer block spacing. Furthermore, since the two arbors are positioned closely adjacent one another, the distance **1** between the counter-rotating sets of straightening blocks is also substantially reduced. The short space of wire along distance **1** provides substantial resistance to twisting in this case.

The operation of the disclosed embodiment of the invention will now be explained. To prepare the machine, the clamping screw **42** is released and the spool arbor **38** is withdrawn from the front of the cabinet **10**. The wire spool **46** is placed on the spool arbor and the arbor replaced in the cabinet and locked by clamping screw **42**. The wire spool then rests between the pad **44** and the spring-loaded thrust bearing **52** so that the freedom of rotation of wire spool **46** is retarded by the amount of loading provided by the coil spring **50**. This is adjustable by means of the tension adjusting nut **48**. The wire **86** from spool **46** passes around the tension pulley **64** on its way to the anti-twist roll **94**. As the arm **58***b* of the L-shaped crank **58** is positioned between the tension springs **66**, **68**, the pulley **64** tends to "float" in a central position, and the tension adjusting nut **72** is adjusted so that tension pulley **64** exerts a desired downward force against the wire **86**. The wire then passes from the tension pulley **64** to the anti-twist roll **94**. The anti-twist roll **94** has a peripheral V groove with a relatively sharp angle so that as wire **86** passes round the anti-twist roll **94** under tension, it is gripped so that twisting forces applied to the departing strand are not passed around the roll to the upcoming portion of the wire strand. From anti-twist roll **94** the wire **86** passes through the opening **98** in bracket **78** through lubrication pocket **88** and continues into the threaded insert **161**, the tubular wire guide

160, and on into the straightener proper. Lubrication pocket 88 and vertical opening 90 are packed with lubricant-soaked waste or similar material for lubricating the moving wire.

The threading of the wire from the wire spool 46 to its entry into the straightener mechanism accomplishes some important functions required for the straightening of thin wires. First, if the drag exerted on the wire spool 46 by thrust bearing 52 and the downward force exerted by the tension pulley 64 are properly adjusted, a pull on the wire as it leaves the straightener will cause a smooth and shock-free acceleration of the wire spool 46. This is because the tension pulley 64 will give in an upward direction until its increasing spring load overcomes the drag and inertia of the spool. Conversely, if the pull on the wire leaving the straightener suddenly decreases or stops, the wire will not become slack because the tension roll will keep it tight. Furthermore, as has been explained, any tendency for the wire to twist and any torque applied to the wire by the straightener mechanism will not pass the anti-twist roll 94.

The four magazines 162, 162', 164, 164' are removed from their respective arbors 150, 150' by sliding the retaining rings 176, 176' into the milled recesses 158, 158' in bearing shields 156, 156'. The magazines are thereby freed for removal radially outward from the arbor. It is also important to note that by this novel construction an effective safety feature is introduced in that the retaining rings 176, 176' not only release their respective magazines, but also lock their arbors against rotation by reason of their insertion into the milled recesses. The magazines may thereupon be removed and the wire can be easily and safely threaded through the wire guide 160, the central portions of the arbors 150, 150', and wire guide 160'. The wire passes through the wire exit bushing 104 to a suitable wire forming machine which is not a part of this invention and which is not illustrated.

When the wire has been threaded, the magazines may be reinserted into their respective arbors. The retaining rings 176, 176' are slid axially against the steps 170', where they retain the magazines in position. The set screws 196 behind the straightening blocks 194 are advanced against the wire 86 so that the former straight line of the wire path is converted to a serpentine path.

The wire 86 is pulled through the straightener by external means which are not illustrated. As the wire advances through the straightener, motor 14 is started and the belt 200 in passing over the drive pulleys 146, 146' imparts counter-rotating motion to the two arbors which thereby rotate the blocks and straighten the wire. As the arbors 150, 150' rotate, the centrifugal force exerted on the magazines causes them to be forced radially outward and against the straight edges 178, 178', 180, 180' of the retaining rings 176, 176'. This causes the retaining rings and magazines to lock firmly together during the straightening process.

In addition to the rotational motion of the arbors, an oscillating motion may be imparted to the cradle housing 120. This may be accomplished, for example, by imparting an oscillatory motion to the drive member 114 from an external source, such as the wire forming machine. This oscillatory motion causes a back-and-forth rotation of lever arm 112 about pivot pin 108 and driver arm 136 imparts linear oscillation to the straightener cradle housing 120 by moving it back and forth along the slide bar 116.

The present invention has a number of important advantages over straighteners known in the prior art. For example, this invention has been found useful for straightening wire having a diameter as small as .004 inch. The magazines containing the straightening blocks are easily removable and are locked in place by a retaining member which also serves as a safety device when the magazines are removed. The setting of the straightening blocks can be easily reproduced by means of a micrometer and interchangeable magazines may be used for different sized wire. The interlocking placement of the straightening blocks is such that there is no intervening open space between them, thus obtaining the shortest possible crank leverage for any given bending angle while retaining the maximum torsional strength of the wire. Furthermore, the use of two arbors which are supported at their outer ends so that the counter-rotating magazines are in close proximity, reduces the twisting tendencies of the wire.

Many other advantages of this invention will also be apparent to those skilled in the art. Accordingly, it is to be understood that the present description merely discloses a single preferred embodiment of the invention and that various modifications and changes will be apparent to those skilled in the art without departing from the spirit and scope of the invention. According, it is to be understood that the foregoing description is illustrative only, rather than limiting. This invention is limited only by the scope of the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A wire straightener which comprises: a plurality of spaced-apart first straightening block means supported for coaxial rotation about a wire relatively longitudinally movable along their axis of rotation, said first straightening block means being spaced along the longitudinal axis of said wire, each of said first straightening block means being positioned to bear radially against said wire in displacing relationship thereto; and at least one second straightening block means supported for rotation about said axis of rotation, positioned to bear radially in displacing relationship against said wire, each of said second straightening block means being positioned in diametric opposition to and substantially filling a space in the axial direction between and substantially contacting adjacent first positioning block means.

2. The straightener of claim 1 wherein said first straightening block means are positioned linearly along the axis of said wire and wherein the wire-bearing surfaces of said first straightening block means are interlocked with the wire-bearing surfaces of said second straightening block means.

3. A wire straightener which comprises: rotatable shaft means defining a wire passage therethrough along its axis of rotation; a plurality of spaced-apart first straightening block means supported by said shaft for rotation therewith, positioned parallel to said axis of rotation, and each arranged to bear radially against a wire contained within said wire passage; and at least one second straightening block means supported by said shaft for rotation therewith, diametrically opposed to said first block means relative to said wire passage and arranged to bear radially against said wire, each of said second block means being positioned substantially filling a space in the axial direction between and substantially contacting adjoining first block means.

4. A wire straightener which comprises: rotatable shaft means defining a wire passage therethrough along its axis of rotation; a first magazine supported by said shaft means for rotation therewith; a plurality of spaced apart first straightening block means enclosed within said first magazine but protruding therefrom to bear radially against a wire contained within said wire passage, said first straightening block means being further positioned linearly along the axis of said wire; a second magazine supported by said shaft means for rotation therewith; at least one second straightening block means enclosed within said second magazine but protruding therefrom to bear radially against the opposite side of said wire, each of said second straightening block means being positioned in diametric opposition to and substantially filling a space in the axial direction between and substantially contacting adjacent first positioning block means; and retaining

means releasably securing said first and second magazines to said shaft means.

5. The straightener of claim 4 wherein said shaft defines a keyway on its outer surface parallel to its longitudinal axis and wherein said retaining means is essentially ring-shaped and includes a key projecting inwardly from its inner periphery and mating with said keyway.

6. The straightener of claim 4 wherein said shaft means is supported for rotation at a first end thereof and wherein said magazines are supported at its second end.

7. A wire straightener which comprises: a housing having a first bearing support member and a second bearing support member in spaced relationship from one another; first bearing means retained within said first bearing support member; second bearing means retained within said second bearing support member; first hollow shaft means rotatably supported in said first bearing means; second hollow shaft means rotatably supported in said second bearing means, said first and second shaft means being rotatable about a common axis therethrough; first arbor means supported by said first shaft; second arbor means supported by said second shaft, said first and second arbor means being in essentially juxtaposed relationship for rotation about said common axis; a first pair of releasable magazines supported by said first arbor means; a second pair of releasable magazines supported by said second arbor means, each of said magazines being of box-like configuration; means for retaining the magazines of each pair in diametrically opposed relationship relative to said common axis; means for feeding a wire to be straightened along said common axis and through said hollow shafts; a plurality of wire straightening block means retained within each of said magazines and positioned to bear radially against said wire in alternating interlocking relationship with the straightening block means of the opposed magazine of the pair with the block means retained within one of each pair of said magazines extending into and substantially filling a space in the axial direction between and substantially contacting adjacent block means retained within the other of that pair of said magazines; means for selectively radially positioning each of said straightening block means relative to said wire; and means for rotating said first and second hollow shaft means in opposite directions of rotation.

8. The straightener of claim 7 wherein said means for retaining comprises ring means axially slidable along its arbor means between a magazine locking position and a magazine releasing position.

9. The straightener of claim 8 wherein each of said housing means and arbor means defines a locking recess therein adapted to receive said ring means when in its magazine releasing position to thereby prevent rotation of said arbor means.

10. The straightener of claim 7 wherein each of said straightening block means comprises a rectangular prism having at least one wire forming end defining a groove having a convex wire contacting inner surface.

11. The straightener of claim 10 wherein each of said prisms has two opposed wire forming ends.

12. The straightener of claim 10 wherein each of said magazines is of rectangular prismatic configuration and defines a plurality of internal parallel passageways each having a first end of rectangular cross section adapted to slidably receive the non-wire-engaging end of one of said wire straightening block means; and wherein said means for radially positioning said straightening block means comprises set screw means threadedly inserted into each of said passageways from a second end thereof.

13. A magazine for the retention of wire straightener blocks which comprises: a rectangular prism defining therethrough a plurality of internal parallel passageways, each having a first end of rectangular cross section adapted to slidably receive the non-wire-engaging end of a wire straightening block and a second threaded end; and set screw means threadedly inserted into said second end with the first ends of said internal parallel passageways having a width "A" in the axial direction of the wire being straightened, and with these passageways being axially separated from each other by spaces also substantially of width "A" to accommodate the wire-engaging end of a similar wire straightening block held in alternating internal parallel passageways in a mating rectangular prism magazine.

14. The straightener of claim 7 wherein said wire feeding means comprises anti-twist pulley means positioned to change the direction of movement of said wire prior to its entering said first hollow shaft means, said anti-twist pulley means having a peripheral V-groove thereon adapted to grip said wire when said wire is under tension.

15. The straightener of claim 14 wherein said wire feeding means comprises wire reel support means adapted to rotatably support a wire reel thereon; tension pulley means intermediate said wire reel support means and said anti-twist pulley means; crank arm means mounted for pivotal movement about its crank angle and having said tension pulley means rotatably mounted on a first arm thereof for movement therewith; and tension applying means adjustably spring loading a second arm of said crank arm means to cause said tension pulley means to elastically bear against said wire.

16. The straightener of claim 15 wherein said wire reel support means comprises a longitudinally adjustable support shaft having a spring loaded thrust bearing mounted on a first end thereof in bearing relationship against said wire reel.

17. A wire straightener which comprises: a base cabinet; wire reel support shaft means having a first end positionable within said cabinet and a second end extending outwardly therefrom; clamping means on said cabinet arranged to releasably engage said wire reel support shaft means; coil spring means encircling said wire reel support shaft means and having a first end secured to the second end thereof; thrust bearing means slidably mounted on said wire reel support shaft means intermediate the second end of said coil spring means and said cabinet to bear against a wire reel mounted therebetween; crank arm means having a first arm and a second arm mounted on said cabinet for pivotal rotation about an axis parallel to said wire reel support shaft means; adjustable spring means elastically positioning said first arm; tension pulley means mounted on said second arm to bear against a wire strand from said wire reel means; anti-twist pulley means mounted on said cabinet to change the direction of movement of said wire strand from said tension pulley means, said anti-twist pulley means having a peripheral V-groove thereon adapted to grip said wire; housing means mounted on said cabinet having a first bearing support member and a second bearing support member in spaced relationship from one another; first bearing means retained within said first bearing support member; second bearing means retained within said second bearing support member; first hollow shaft means rotatably supported in said first bearing means; second hollow shaft means rotatably supported in said second bearing means, said first and second shaft means being rotatable about a common axis therethrough; first arbor means supported by said first shaft; second arbor means supported by said second shaft; said first and second arbor means being in essentially juxtaposed relationship for rotation about said common axis; a first pair of removable magazines supported by said first arbor means; a second pair of removable magazines supported by said second arbor means, each of said magazines being of box-like configuration; means for retaining the magazines of each pair in diametrically opposed relationship relative to said common axis; means for feeding a wire to be straightened along said common axis and

through said hollow shafts; a plurality of wire straightening block means retained within each of said magazines and positioned to bear radially against said wire in alternating interlocking relationship with the straightening block means of the opposed magazine of the pair; means for selectively radially positioning each of said straightening block means relative to said wire; and means for rotating said first and second hollow shaft means in opposite directions of rotation.

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