Feb. 28, 1939. J. A. BORCK 2,149,238

WIRE SPOOLING MACHINE

Filed March 23, 1936 6 Sheets-Sheet 1

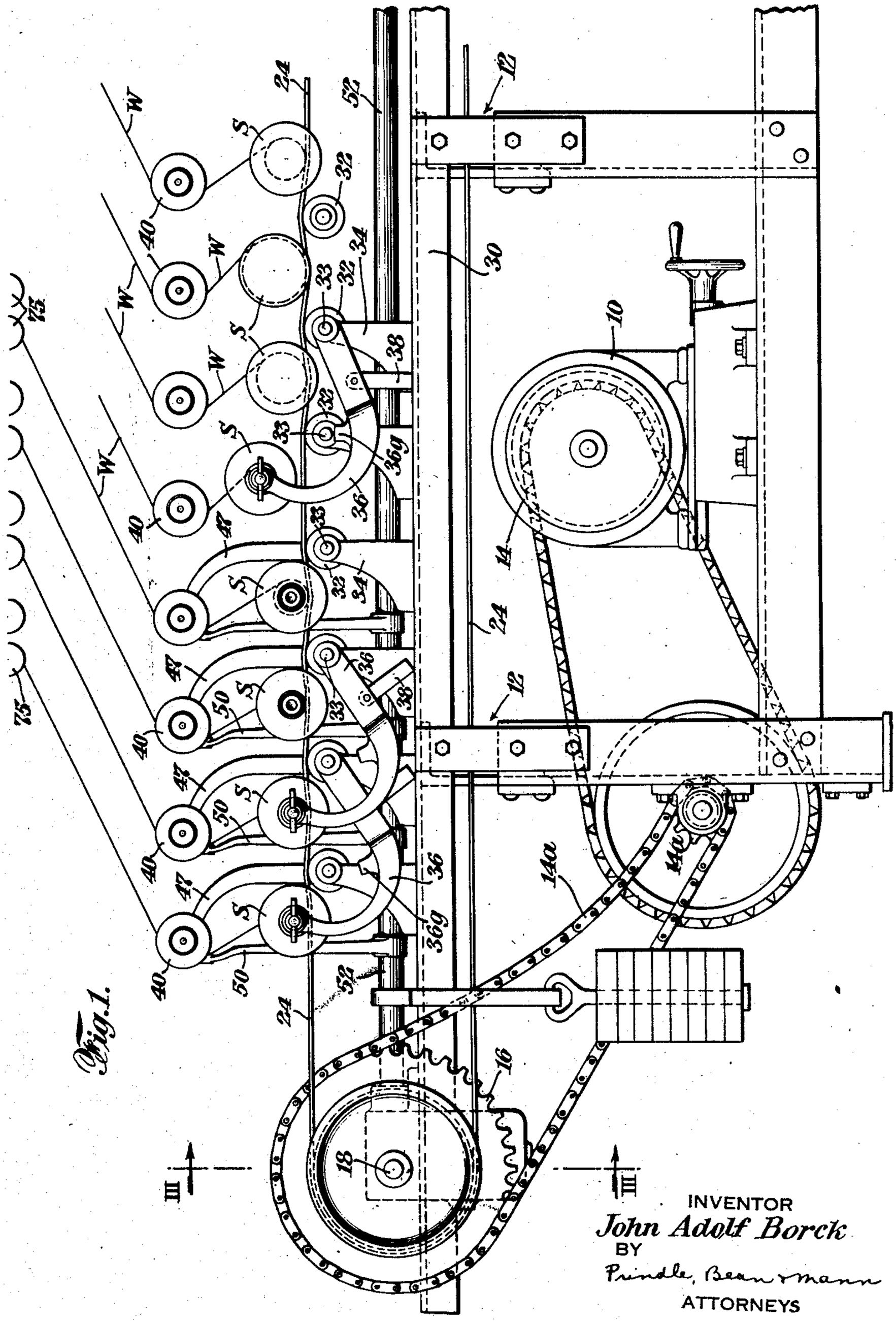

Fig. 1.

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Filed March 23, 1936 6 Sheets-Sheet 2

Fig. 1a.

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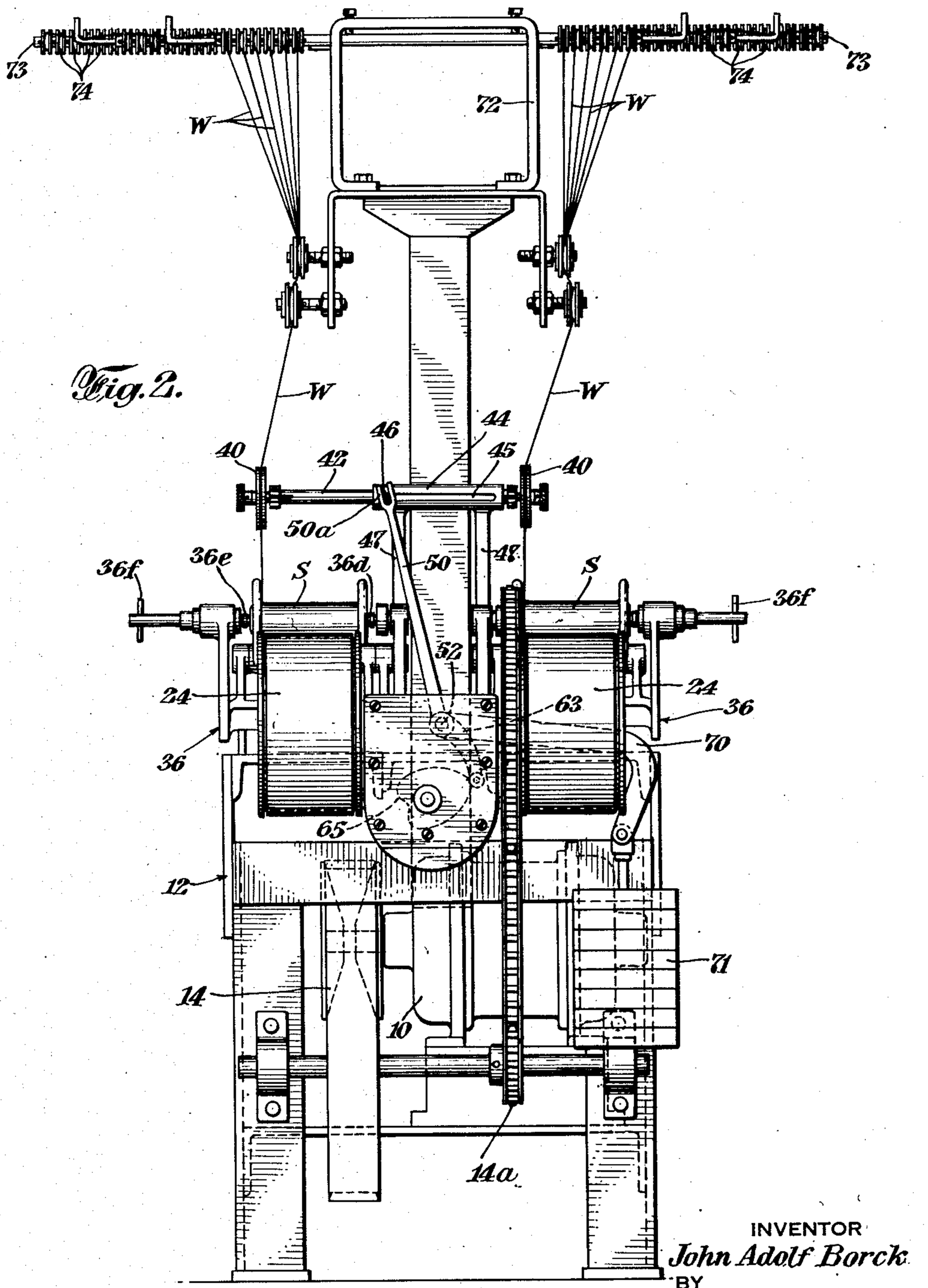
WIRE SPOOLING MACHINE

Filed March 23, 1936 6 Sheets-Sheet 3

Fig. 2.



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Filed March 23, 1936 6 Sheets-Sheet 4

Fig. 3.

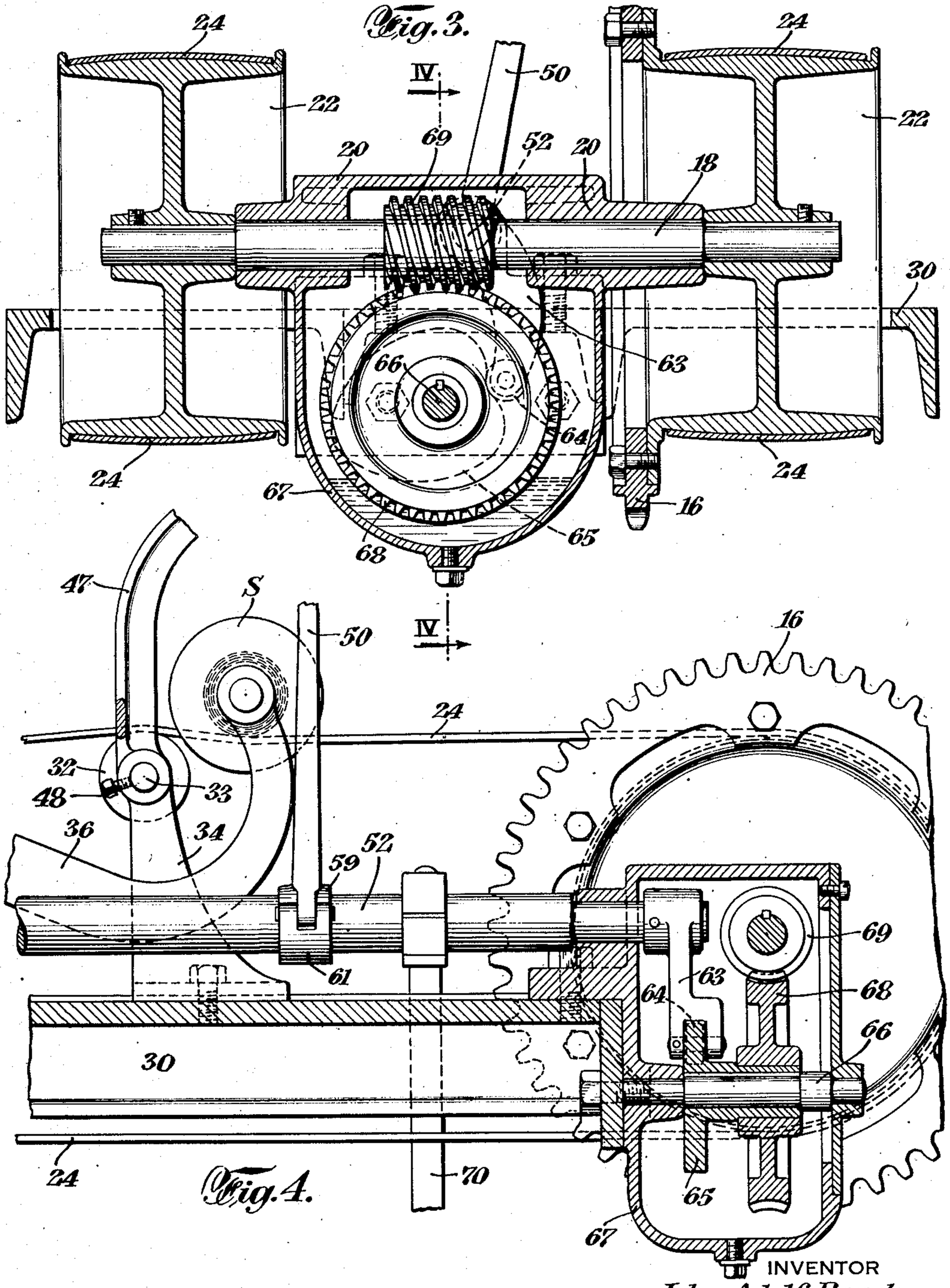

Fig. 4.

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WIRE SPOOLING MACHINE

Filed March 23, 1936 6 Sheets-Sheet 5

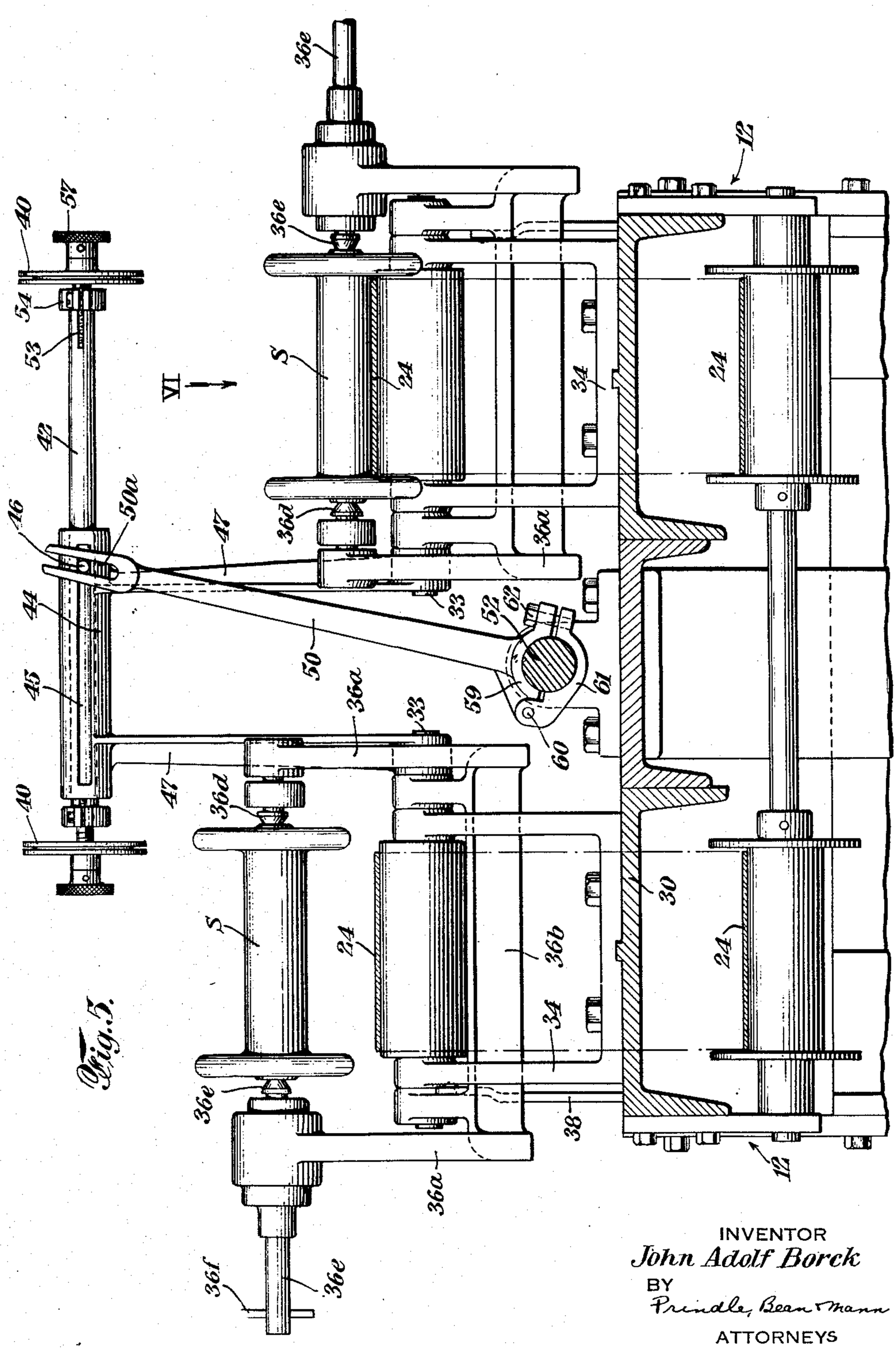

Fig. 5.

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WIRE SPOOLING MACHINE

Filed March 23, 1936 6 Sheets-Sheet 6

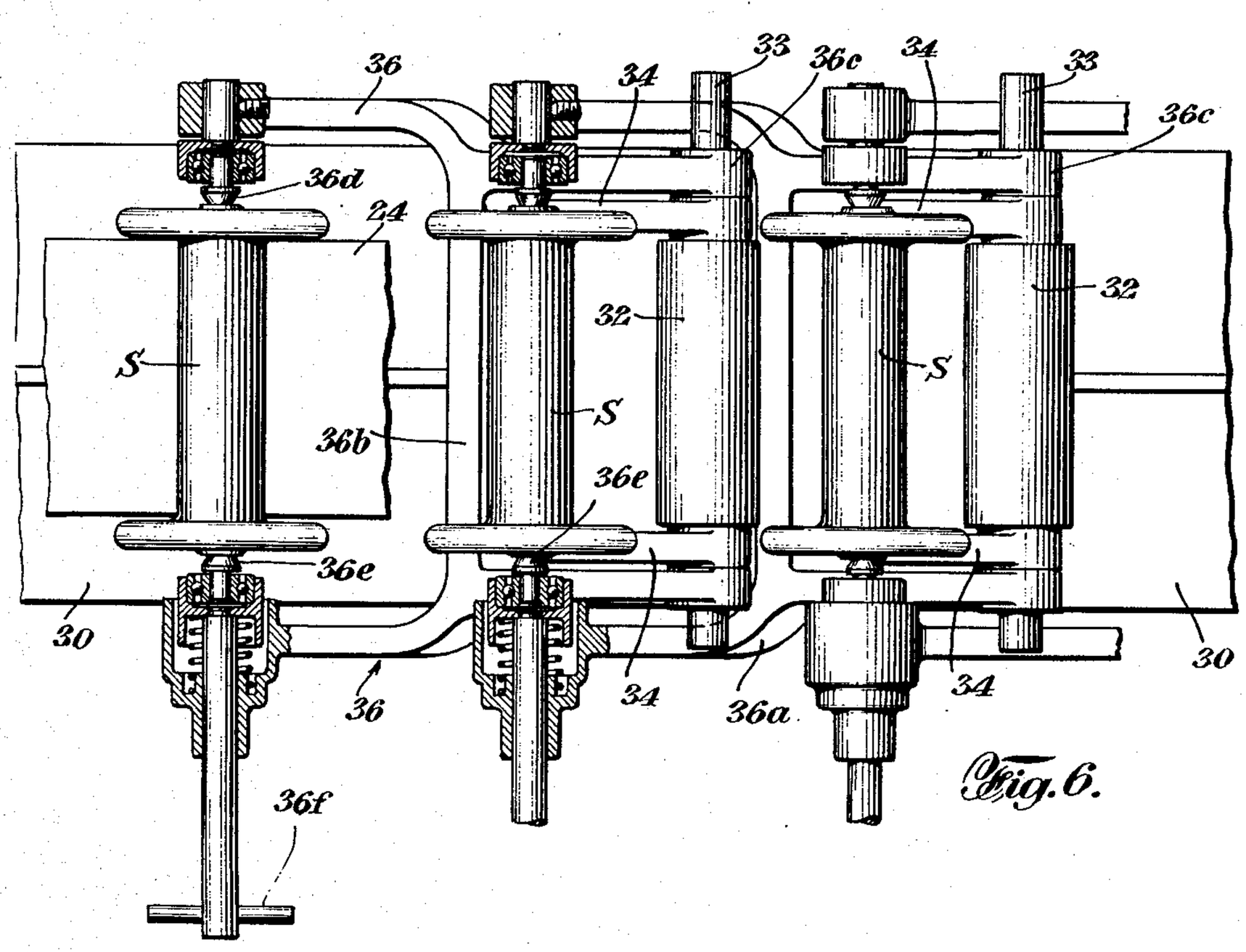

Fig. 6.

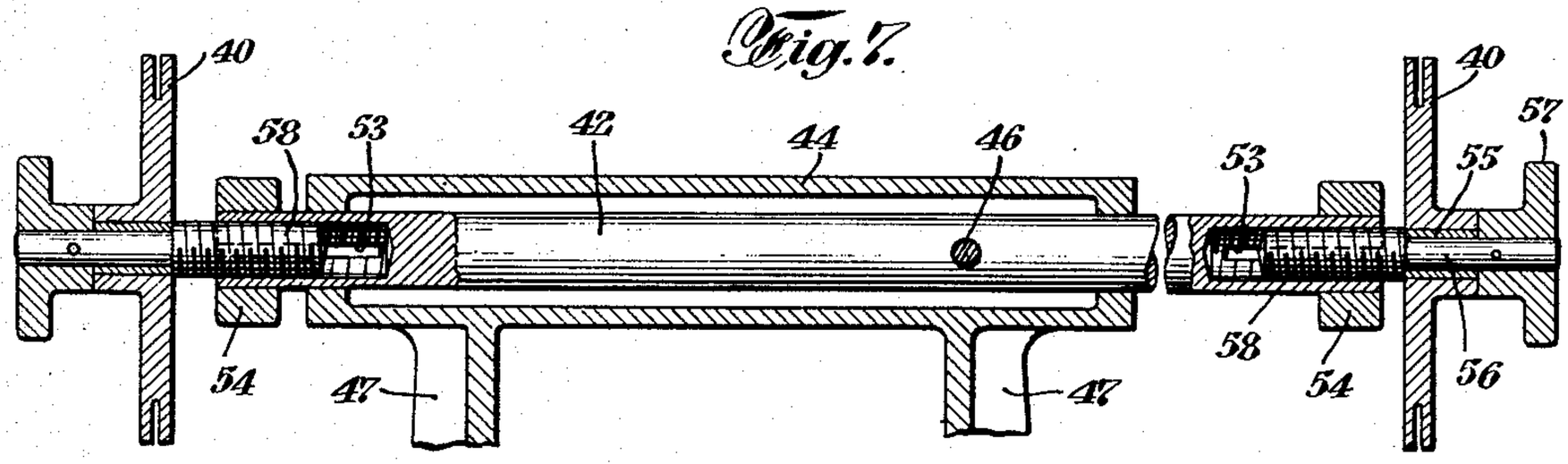

Fig. 7.

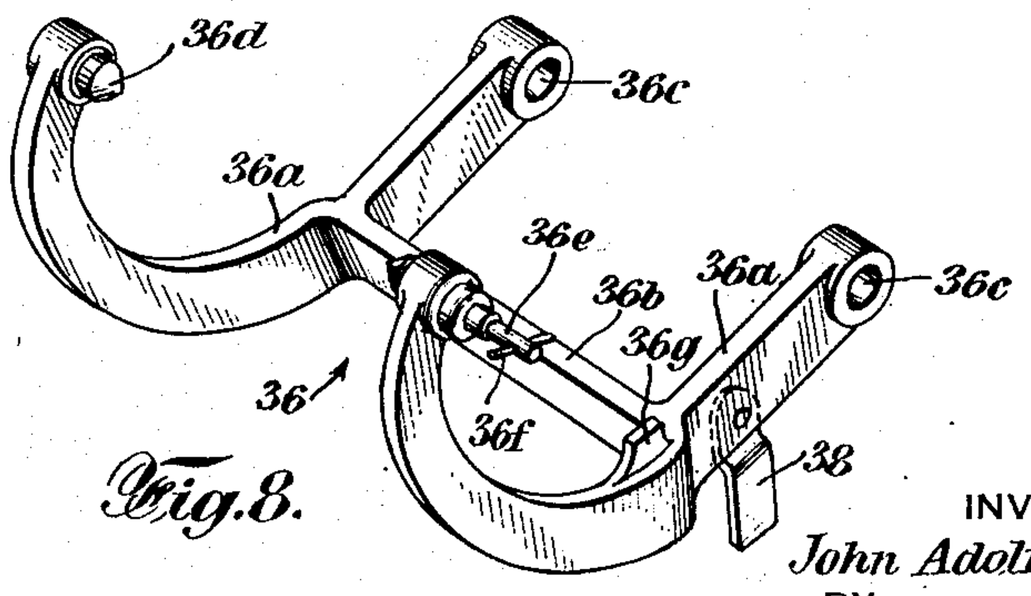

Fig. 8.

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UNITED STATES PATENT OFFICE

2,149,238

WIRE SPOOLING MACHINE

John Adolf Borck, Nutley, N. J., assignor to Eastwood-Nealley Corporation, Belleville, N. J., a corporation of New Jersey

Application March 23, 1936, Serial No. 70,312

12 Claims. (Cl. 242—25)

My invention relates to a multiple strand spooling machine and is especially adapted to take-up and spool simultaneously the wires or strands as fast as they are delivered to it from a continuous annealing furnace.

Some of the objects of the machine are to spool the wires at a uniform linear speed regardless of the amount of wire on the various spools; to properly and individually tension the wires in such a machine; to attain large spooling capacity in a compact machine with simplified spool-supporting and driving means as well as simplified traverse operating means; and to provide readily effected, important adjustments of the traverse means for the proper laying on of the wires on the spools.

With these and other objects and advantages in view which will be evident to those skilled in the art from the following disclosure, the invention consists in the construction, combination and arrangement of parts hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof, and which show for the purpose of illustrative disclosure, but without limiting the invention to the details thereof, a preferred embodiment of the invention, it being expressly understood that various changes may be made in practice within the scope of the claims without digressing from the inventive idea.

In the drawings:

Figs. 1 and 1A placed end to end constitute a side elevation of the machine, Fig. 1A being a side elevation of the input end of the machine;

Fig. 2 is an end elevation of the output end of the machine;

Fig. 3 is a cross sectional view on the line III—III in Fig. 1 on a larger scale looking in the direction of the arrows and showing the belt-driving and rocker-shaft operating means;

Fig. 4 is a partly sectional, partly elevational view on the line IV—IV in Fig. 3, looking in the direction of the arrows;

Fig. 5 is a partly sectional, partly elevational view on the line V—V in Fig. 1A on a larger scale, looking in the direction of the arrows;

Fig. 6 is a plan view, partly in horizontal section, seen from the view point of the arrow VI in Fig. 5 and shows a portion of the machine including a part of one of the belts and some of the spools and rolls and their supports;

Fig. 7 is a vertical longitudinal section on a larger scale of the traverser there shown; and

Fig. 8 is a perspective view of one of the spool carriers detached.

The machine is driven by an electric motor 10 supported in underneath position on the frame 12 of the machine. A variable speed unit 14 and speed-reducing chain and sprocket gearing 14a (Fig. 1) connects the motor with a large sprocket 16 on the horizontal transverse shaft 18 (compare Figs. 1, 2, 3 and 4) at the output end of the machine. This shaft turns in bearings 20 (Fig. 3) on the machine frame. 22 designates two pulleys secured one on each end of the shaft. The aforesaid sprocket wheel 16 is secured to the rim of one of these pulleys (Fig. 3) so that the electric motor 10 drives both of said pulleys at speeds which are variable because the variable speed unit 14 which is of a well known adjustable cone disc type, as shown in Figs. 1 and 2, permits the imparting of variable speed to the shaft 18 through the said variable speed device and sprocket gearing 14a without requiring variation of the speed of the motor 10.

Two endless belts 24 extend lengthwise of the machine driven by the aforesaid pulleys 22, one by each pulley. These belts pass around idler pulleys 26 at the input end of the machine having individual bearings supported on the table of the machine and adjustable lengthwise thereof as by the screw means 28 to and from the belt driving pulleys 22 to take up or adjust slack in the belts.

The upper stretch of each belt runs above the table 30 of the machine and the lower stretch below the table, which latter is supported on, and in fact forms part of the frame of the machine.

Under the upper stretch of each belt are rollers 32 (Fig. 1) freely turning on axles 33 supported on stationary brackets 34 supported on the table or machine frame. These rollers are idlers and support the upper stretch of the running belt. The spools about which it is the purpose of the machine to wind on the wires W are designated S and rest upon the upper stretch of the belts, some on one belt and some on the other. It will be understood that the spools S are not part of the machine, but are insertable into individual carriers 36 forming part of the machine, so that the core or body portion of the spools rest on the given belt with the spool ends or flanges straddling the width of the belt. Thus the traveling belts drive and rotate the spools resting thereon and wind the wires W thereabout. The linear speed of the wires is the same as the belt speed so that the winding-on tension of all the wires is substantially uniform regardless of the fact that the rotary speed of the spools will be individually different depending on the extent to which they are empty or filled with wire. The individual spools when filled are removable without stopping the machine and replaceable by empty spools.

One of the spool carriers 36 is shown in Fig. 8 as a separate unit before it has been assembled into the machine. Each carrier consists of a pair of parallel curved arms 36a rigidly joined by a

cross piece 36b. Bearings 36c at one end of said arms receive the ends of the same axle 33 upon which turns one of the previously described belt supporting idlers 32. The other end of said arms support (as best shown in Fig. 6 as compared with Fig. 8) freely rotatable spindles or centers 36d and 36e, the latter of which is resiliently endwise operable to enable the spool to be engaged with the centers to support it for free rotation thereon, and to be disengaged and removed therefrom at will. Each endwise movable spindle or center 36e has a cross piece or handle 36f through its outer end for operating it during the insertion and removal of a spool.

Figs. 1 and 1A show how the spools S alternate with the rollers 32, the former on top of and the latter below the upper stretch of the drive belts. The length and weight of the carriers 36 pivotally supported at 33 are such that the supported spools are maintained in frictional driven contact with the belt. Each carrier has a prop-piece 38 pivotally depending from one of its arms. When the carrier is pivoted upwardly in order to lift its spool out of driven contact with the belt, this prop 38 pivots into a vertical position as shown at the right in Fig. 1 to support the carrier out of operation, so that a filled spool can be removed and replaced by an empty spool, whereupon the prop 38 may be manually swung to one side as shown at the left in Fig. 1, permitting lowering of the carrier and spool into belt-driven relation. A boss 36g on an arm of each carrier acts as a stop limiting the aforesaid upward pivoting of the carrier substantially higher than its prop supported position by striking against the axle 33 of the overlying belt supporting roller 32 as shown at the right in Fig. 1.

Over each spool S is a freely rotatable traverse pulley 40 for guiding the wire in layers onto the spool. For this purpose the support on which each traverse pulley rotates is automatically reciprocated lengthwise relatively to the spool. The machine is built so that the supported spools S on the two belts are in axially alined pairs across the machine so that the traverse pulley 40 for a spool on one side of the machine, may be and is mounted on the same traverse rod 42 that supports the traverse pulley 40 for the alined spool on its opposite side of the machine, all as shown for instance in the end elevational view, Fig. 2, of the machine. There are as many traverse rods 42 as there are pairs of cross alined spools and these reciprocate endwise in stationary sleeves 44 supported on upright arms 47 pivoted at their lower ends to a relatively stationary part of the machine, as for example in the illustrated machine to the projecting inner ends (as shown in Fig. 5) of the axles 33 on which the belt supporting rollers 32 rotate. Also see one of these arms 47 in Fig. 4. It will be seen from Figs. 2 and 5, that these stationary sleeves 44 and their supports 47 are located in the central longitudinal zone of the machine between and for the most part above the plane of the spool-driving belts and related parts.

Suitable means is provided, such as the screw means 48 for individually adjusting the angular position of each sleeve-support 47 about the alined axles 33 so as to raise or lower each sleeve 44 for an adjustment purpose to be later explained. The wall of each sleeve is formed with a longitudinal slot 45 wherein is slidably received a pin 46 projecting from the side of its traverse rod 42. This pin 46 is long enough to project between the tines of a fork 50a on the upper end of an arm 50 which is fixed to a rocker shaft 52, Figs. 2 and 5. This rocker shaft 52 oscillates the forked arm 50 through an arc crosswise of the machine and it in turn reciprocates endwise the related traverse rod 42 and the supported traverse pulleys 40 for delivering the wire in proper layers on the alined spools on the two sides of the machine. The height of the pin 46 (Fig. 5) in the fork determines the throw or extent of the aforesaid endwise reciprocation of the related traverse rod 42 and of the supported traverse pulleys 40 relatively to the length of the spools for properly laying the wire onto the spools; and said aforesaid position of the pin in the fork and therefore throw, are regulatable by adjusting the previously referred to screw means 48, Fig. 4.

Another adjustment for the proper laying on of the wire is shown in Figs. 5 and 7 and consists of means for adjusting the position of the traverse pulleys 40 along the traverse rods. The illustrated means for this purpose consists of the following: each end of each traverse rod 42 is axially bored out and screw-threaded. Its wall is formed with a slot 53; and it is surrounded by a screw-operated clamping band 54. Each traverse pulley 40 is bushed at 55 and rotates freely on a pin 56 between a knob 57 secured to the pin and a shoulder formed by a larger diametered screw-threaded portion 58 of the pin which engages the screw-threaded socket in the traverse rod. The foregoing is a convenient means for adjusting the position of the traverse pulleys lengthwise of this traverse rod. To do so, the clamps 54 are loosened, the knobs 57 are rotated to effect the proper adjustment, and this adjustment is then maintained by tightening the clamps to compress the slotted wall of the sockets against the threaded portions 58 of the pins. This operation can be performed without stopping the machine.

It will be understood that the rocker shaft 52 extends substantially the full length of the machine as shown in Figs. 1 and 1A and that it supports and operates as many forked arms 50 as there are traverse rods 42 and pairs of alined spools S. As a further adjustment, each forked arm is individually adjustable along the rocker shaft as well as angularly about the axis of said shaft. For this purpose the lower end of each arm is formed with a half-concave part 59 to which is pivoted at 60 a complementary half concave part 61, the two parts having their free ends joined by a screw bolt 62, so that the forked arms can be securely clamped in any adjusted position on the rocker shaft.

The means for rocking the rocker shaft to operate as described all of the traverse mechanisms simultaneously for guiding the wires onto all of the spools, is best shown in Figs. 2, 3 and 4, and is as follows:— a crank arm 63 on the end of the rocker shaft supports a roller 64 which bears against the periphery of a heart-shaped cam 65. This cam is keyed to a short shaft 66 supported in suitable bearings in an oil containing casing 67 supported on the machine frame. A worm-wheel 68 fixed to the same short shaft is driven by a worm 69 keyed to the heretofore described belt drive-shaft 18, Fig. 3, on which are the belt driving pulleys 22. Finally means is provided for keeping the aforesaid roller 64 of the cam-follower arm 63 of the rocker shaft in contact with the periphery of the rotary cam, said means consisting of an elbow-shaped arm 70 best shown in the end view (Fig. 2) fixed at one end to the rocker shaft and supporting a depend-

ing stack of weights 71 (compare Fig. 1) at its other end.

The foregoing completes the description of the machine except for the means for guiding the individual wires into the end of the machine shown in Fig. 1A and for individually tensioning them on their way to the traverse pulleys and the spools. An upper frame work 72 is supported by suitable standards from the main machine frame well above the table at the input end (Fig. 1A) of the machine. Compare Fig. 2. This upper framework supports transversely extending horizontal rods or axles 73 on which freely turn numerous wire-guiding pulleys 74, one for each wire coming into the machine. Ordinarily these wires will come direct from an annealing furnace not shown, and after passing over the aforesaid guide pulleys will fan out and pass through the tensioning means. The latter for each wire consists of a group of guide pulleys 75. These pulleys are individually rotatably supported on the frame work. In the illustrated embodiment, there are four pulleys 75 in each group at the corners of a square, the wire being threaded zig-zag as shown in Fig. 1A about the pulleys and thence passing to one of the traverse pulleys 40 and the spool S upon which it is to be wound. The drag on the wire due to its zig-zag or circuitous path through the group of pulleys 75 serves to tension it. The more pulleys 75 in use and the more zig-zag or angular the path, the greater the tensioning. A greater number of pulleys in each group than that shown may be used. Substantially correct tensioning is necessary if the wire is to be spooled by the machine in smooth even layers. The tension that should be employed is determined by the diameter of the wire and its nature and temper.

Describing now the operation of the machine as a whole, the wires W are individually threaded over the pulleys 74 at the input end of the machine (Fig. 1A) and are then passed around the tensioning pulleys 75 shown in that figure and then over the traverse pulleys 40, after which their free ends are attached to the spools S inserted between the spindles or centers of the carriers 36 with the body of the spools resting on the belts 24. The electric motor 10, Fig. 1, being in operation, drives the belts 24 and thereby rotates the spools and winds the wires thereon. To throw any spool out of operation, it is only necessary to swing its carrier upwardly to the extent permitted by its stop 36*g*, whereupon its prop 38 automatically drops into place and supports the carrier with the spool out of contact with the belt. An empty spool can now be inserted, a wire connected to it and then lowered into rotary contact with the belt by swinging the prop 38 to one side out of its propping position.

The drive is such as heretofore explained that the linear spooling speed of all of the wires is uniform and substantially the same as the belt speed. This makes it possible to run the machine continuously regardless of the amount of wire on the spools and to change the spools as they individually become fully wound without interrupting the winding-on operation of the other spools.

The same pulley shaft 18 that drives the belts also drives the heart-shaped cam 65 which in turn operates the rocker shaft 52 that extends lengthwise of the machine between the two belts and reciprocates all of the forked arms 50 and all of the traverse rods 42 and the supported traverse pulleys 40 for the spools on both sides of the machine. This is a very efficient compact construction giving large spooling capacity, limited only by the length of the machine, which may be made longer or shorter depending on the capacity desired.

The adjustments heretofore described for the forked arms 50 on the rocker shaft, for the height of the pins 46 in the forks of said arms, and for the positioning of the traverse pulleys 40 on the traverse rods, when once made, need not be changed except for a change in the diameter of the wires or some other essential change in the operating conditions.

The machine is especially suited as a take-up machine to spool the plurality of wires delivered from a continuous annealing furnace, or an enameling or tinning oven, or the like.

What I claim is:

1. In a spooling machine, the combination of a horizontally running belt and a pivotally supported carrier extending horizontally below the level of the upper stretch of the belt and longitudinally of the same for a spool having centers at the edges of said upper stretch for detachably supporting the spool for free rotation in straddling position bearing down on the belt.

2. In a spooling machine, the combination of a horizontally running belt, a pivotally supported carrier extending horizontally below the level of the upper stretch of the belt longitudinally of the same in overlapping relation for a spool having centers at the edges of said upper stretch for detachably supporting the spool for free rotation in straddling position bearing down on the belt, said carrier extending downwardly from its pivotal support and thence upwardly for supporting a spool on said upper stretch as aforesaid.

3. In a spooling machine, the combination of a horizontally running belt; and a pivotally supported carrier mounted below the upper stretch of the belt for a spool having centers at the edges of the belt for detachably supporting the spool for free rotation in straddling position bearing down on the belt, said carrier consisting of a fork disposed horizontally below the level of said upper stretch pivoted at one end for free up and down pivoting, and having tines at its other end adapted to extend above said upper stretch at opposite edges thereof where said tines are equipped with the aforesaid centers.

4. In a spooling machine, the combination of a horizontally running belt; and, extending horizontally below the level of the upper stretch of said belt, pivotally supported carriers for spools having centers at the edges of said upper stretch for detachably supporting the spools for free rotation in straddling position bearing down on the belt; and a series of idler rollers under said upper stretch of the belt spaced apart in support thereof, and severally located at the pivotal points of support of the respective carriers, the individual length of the carriers being such that the aforesaid spools carried by them rest on the belt over spaces between the next pair of idler rollers in the series of said rollers.

5. In a spooling machine, the combination of a horizontally running belt; and a pivotally supported carrier for a spool having centers at the edges of the belt for detachably supporting the spool for free rotation in straddling position bearing down on the belt, said carrier consisting of a fork disposed horizontally below the level of said upper stretch pivoted at one end for free

up and down pivoting, and having tines at its other end adapted to extend above said upper stretch at opposite edges thereof where said tines are equipped with the aforesaid centers, there being a plurality of said forks in close-up file-formation with the tines of one fork overlapping the pivoted-end of the next fork in the line.

6. In a spooling machine, the combination of two horizontal belts running side by side with a middle zone between the belts extending lengthwise of the machine, spool carriers for cooperation with said belts, the spools when in said carriers being alined in pairs across the width of the machine, a rocker shaft in said central zone of the machine extending lengthwise thereof below the upper stretch of the belt, a traverse rod and a support therefor for each of said alined pairs of spools, located cross-wise of said central zone above the rocker shaft, means on said supports for mounting and permitting endwise reciprocation of the traverse rods longitudinally of the alined axes of the spools, arms on said rocker shaft extending to said traverse rods for reciprocating them endwise as aforesaid from the rocker shaft, and means adjustably connecting said arms to the rocker shaft for individual angular adjustment about the axis of the shaft.

7. In a spooling machine the combination of two horizontal belts running side by side with a middle zone between the belts extending lengthwise of the machine, spool carriers for cooperation with said belts, the spools when in said carriers being alined in pairs across the width of the machine, a rocker shaft in said central zone of the machine extending lengthwise thereof, a traverse rod and a support therefor for each of said alined pairs of spools, located cross-wise of said central zone above the rocker shaft, stationary sleeves on said supports in which said traverse rods are movably borne for permitting endwise reciprocation of the traverse rods longitudinally of the alined axes of the spools, arms on said rocker shaft extending to said traverse rods for reciprocating them endwise as aforesaid from the rocker shaft, means for adjusting the effective operative length of said arms to vary the throw of the traverse rods, and wire guiding pulleys on the traverse rods at the alined spools.

8. In a spooling machine the combination of two horizontal belts running side by side with a middle zone between the belts extending lengthwise of the machine, spool carriers for cooperation with said belts, the spools when in said carriers being alined in pairs across the width of the machine, a rocker shaft in said central zone of the machine extending lengthwise thereof below the upper stretch of the belt, a traverse rod and a support therefor for each of said alined pairs of spools, located cross-wise of said central zone above the rocker shaft, means on said supports in which said traverse rods are movably borne for permitting endwise reciprocation of the traverse rods longitudinally of the alined axes of the spools, arms, one for each traverse rod independently adjustable on said rocker shaft and extending to said traverse rods for reciprocating them endwise as aforesaid from the rocker shaft, and wire guiding pulleys on the traverse rods at the alined spools, and means for adjusting the positions of said pulleys along said rods.

9. In a spooling machine, the combination of a horizontally running belt, spool carriers enabling the supported spools to rest on and be driven by the belt, a rocker shaft extending lengthwise of the belt at an edge thereof below the upper stretch of the belt, a traverse rod and a support therefor for each of said spools, located crosswise above the rocker shaft, means on said supports in which said traverse rods are movably borne for permitting endwise reciprocation of the traverse rods longitudinally of the axes of the respective spools, arms on said rocker shaft extending to said traverse rods for reciprocating them endwise as aforesaid from the rocker shaft, and means adjustably connecting said arms to the rocker shaft for individual angular adjustment about the axis of said shaft.

10. In a spooling machine, the combination of a horizontally running belt, spool carriers enabling the supported spools to rest on and be driven by the belt, a rocker shaft extending lengthwise of the belt at an edge thereof below the upper stretch of the belt, a traverse rod and a support therefor for each of said spools located crosswise above the rocker shaft, means on each of said supports in which said traverse rods are movably borne for permitting endwise reciprocation of the traverse rods longitudinally of the axes of the respective spools, arms on said rocker shaft having connection with said traverse rods which is adjustable lengthwise of said arms for reciprocating the traverse rods as aforesaid to an adjustable extent, and wire guiding means on the traverse rods at the respective spools.

11. In a spooling machine, the combination of means including a belt for supporting and driving the spool which is to receive wire thereon, a traverse rod supported for endwise reciprocation longitudinally of the axis of said spool, a longitudinally slotted sleeve for operatively supporting as aforesaid the traverse rod, said rod having a pin projecting from its side through said slot, an oscillatory pivoted arm mounted below the upper stretch of the belt and extending above the same and having a slotted portion engaging said pin for effecting the aforesaid reciprocation of the traverse rod from the oscillatory pivoted arm, and means for adjusting the traverse rod support to vary the distance of the aforesaid pin from the pivot of the oscillatory pivoted arm for adjusting the throw of the traverse rod; and a wire guiding means on the traverse rod.

12. In a spooling machine, the combination of means including a horizontal belt for supporting and driving the spool which is to receive wire thereon, a traverse rod supported for endwise reciprocation longitudinally of the axis of said spool, a longitudinally slotted sleeve for operatively supporting as aforesaid the traverse rod, said rod having a pin projecting from its side through said slot, an oscillatory pivoted arm mounted below the upper stretch of the belt and extending above the same and having a slotted portion engaging said pin for effecting the aforesaid reciprocation of the traverse rod from the oscillatory pivoted arm, a pivoted supporting arm on which the aforesaid sleeve is supported, and means for adjustably pivoting said supporting arm to adjust the location of the aforesaid pin relatively to the aforesaid slotted portion and thereby adjust the throw of the traverse rod, and a wire guiding means on the traverse rod.

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