M. MORRISON.

STRANDING MACHINE.

APPLICATION FILED AUG. 2, 1921.

1,423,776.

Patented July 25, 1922.

7 SHEETS—SHEET 1.

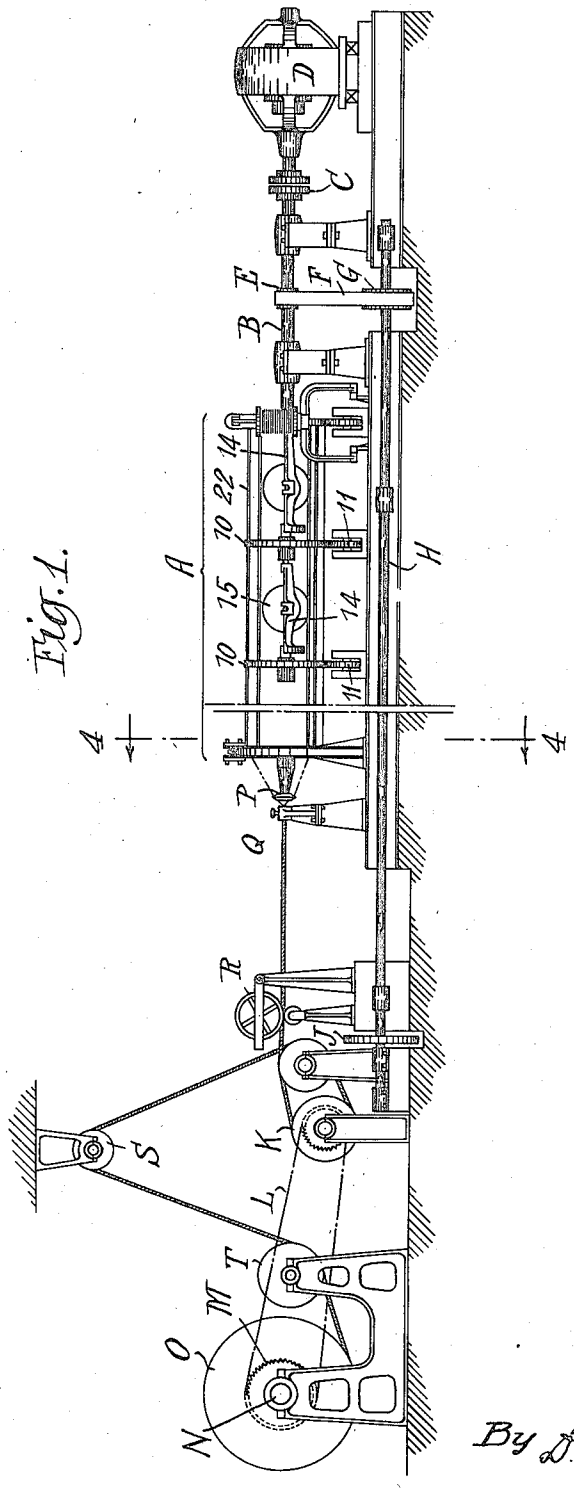


Fig. 1.

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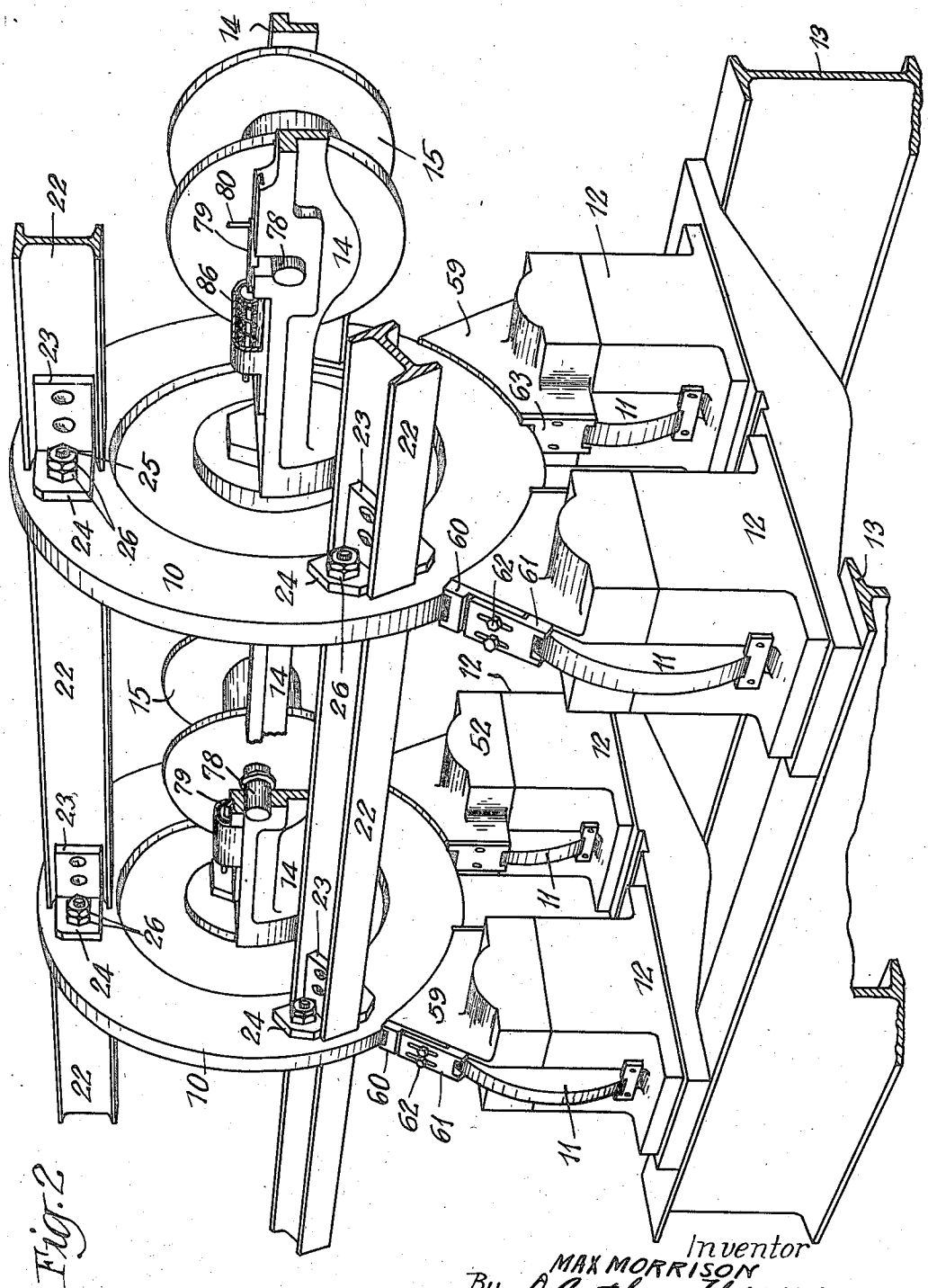


Fig. 2

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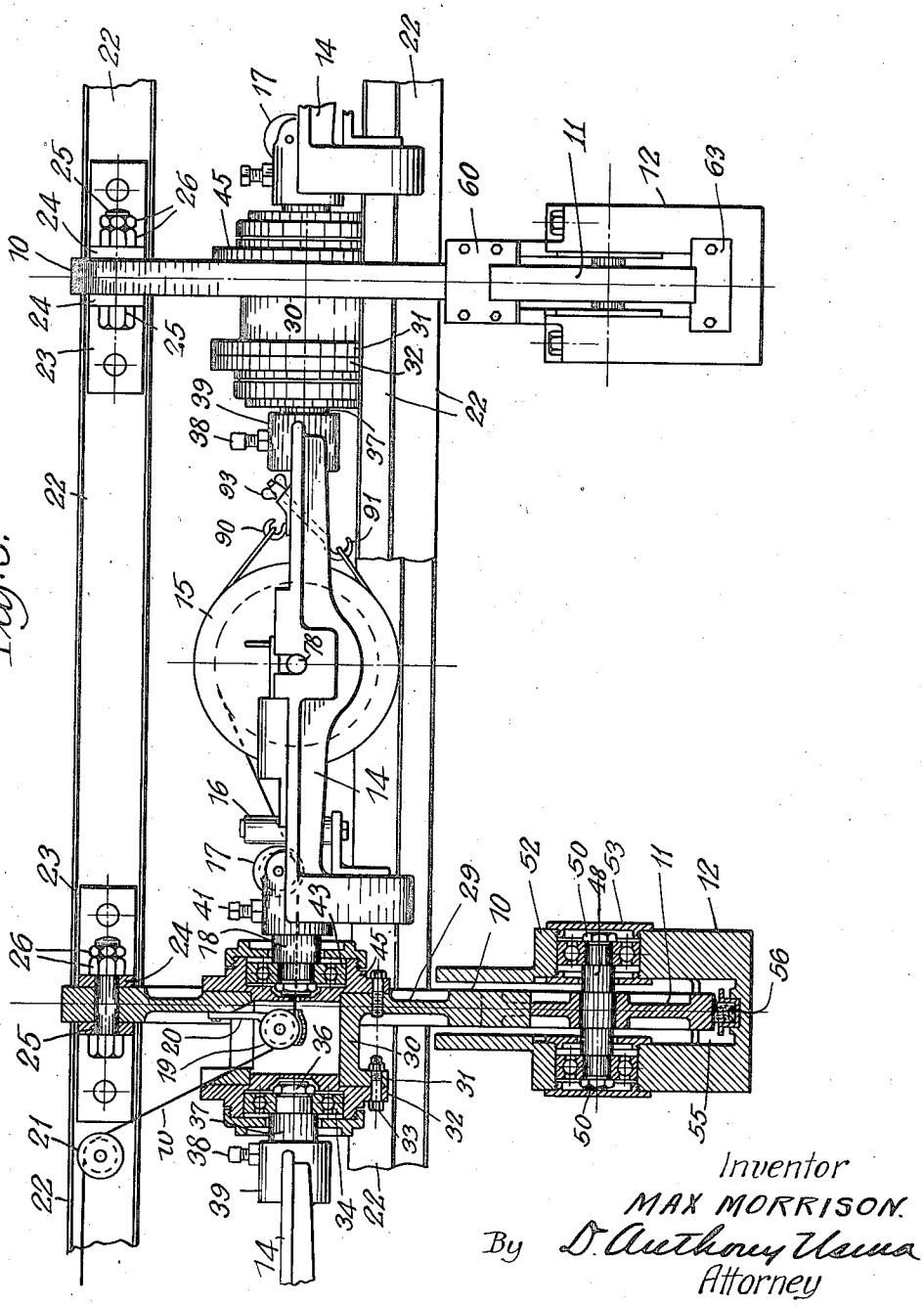
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7 SHEETS—SHEET 3.

Fig. 3.



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7 SHEETS—SHEET 4.

Fig. 4.

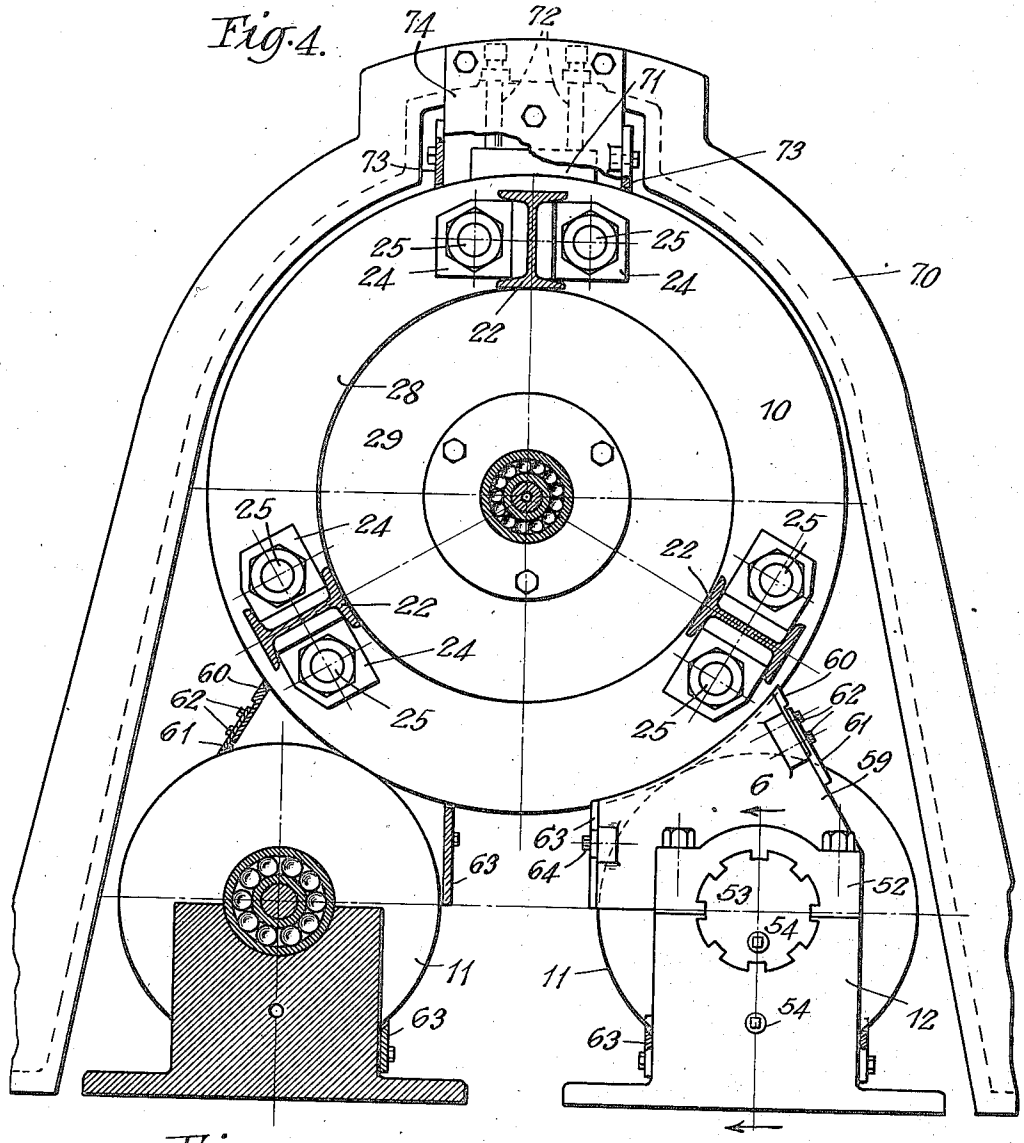
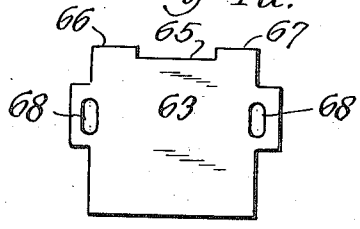


Fig. 4a.



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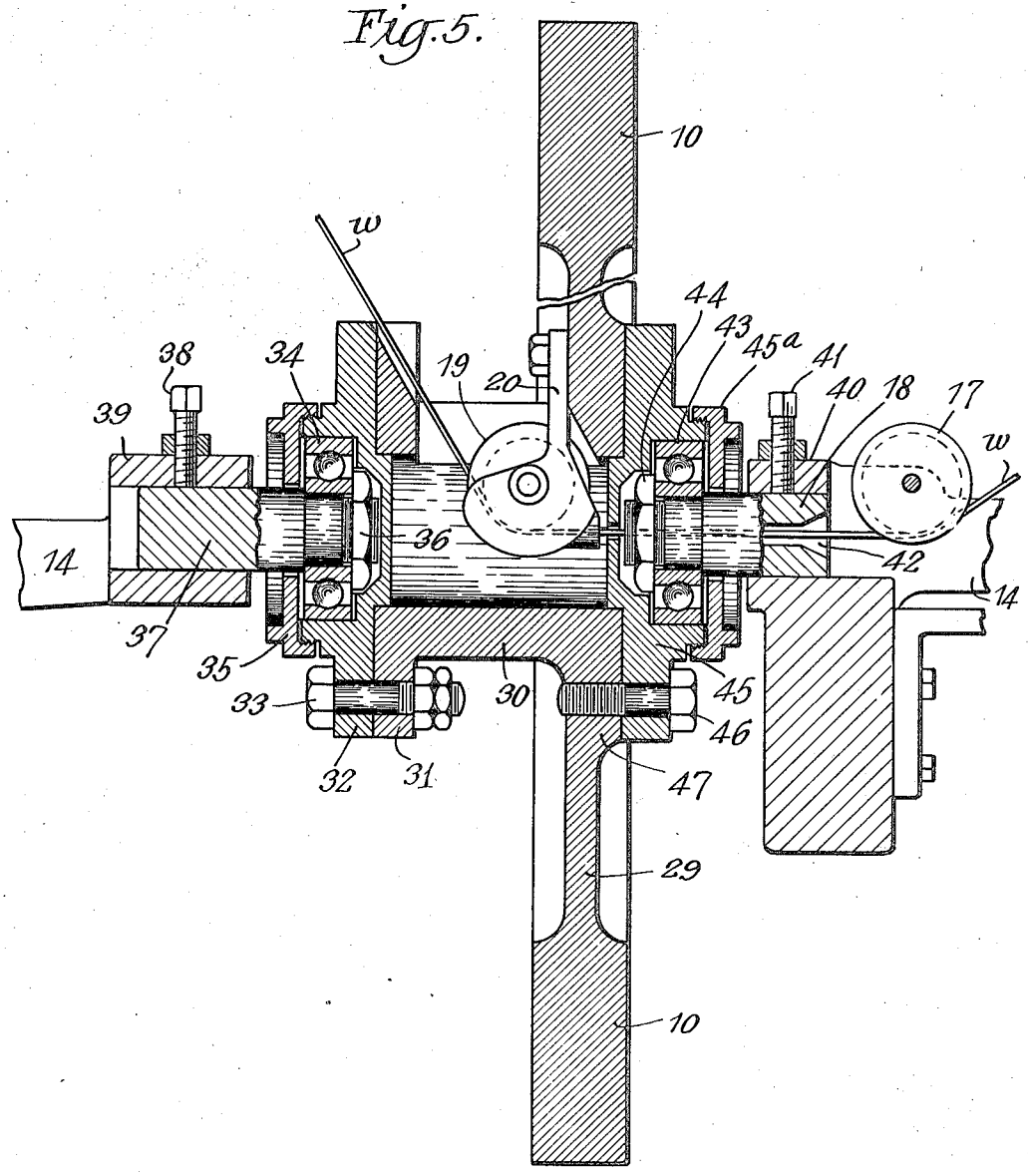
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7 SHEETS—SHEET 5.

Fig. 5.



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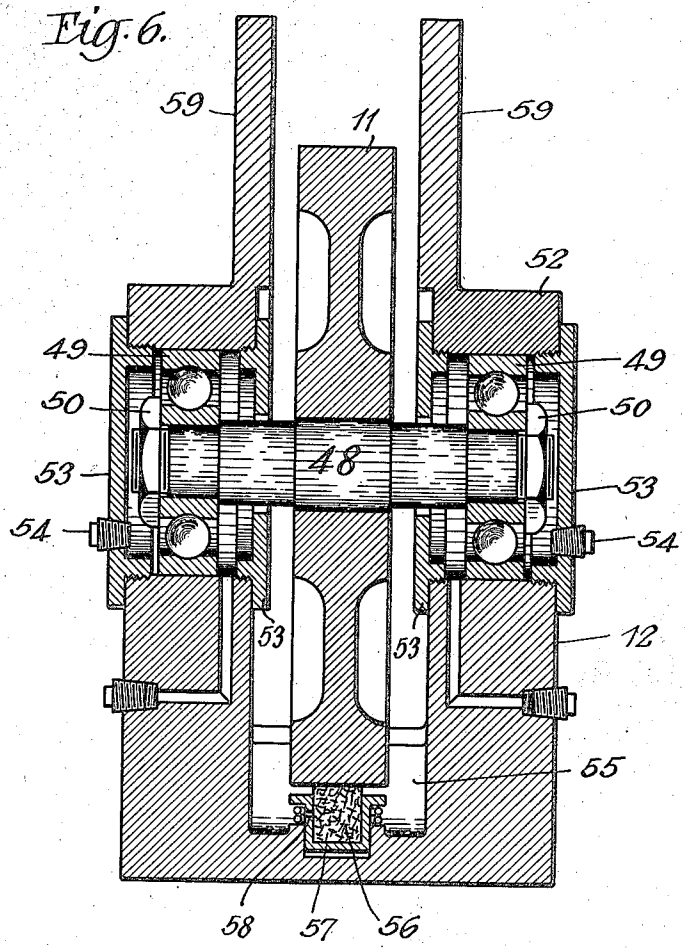
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7 SHEETS—SHEET 6.

Fig. 6.



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7 SHEETS—SHEET 7.

Fig. 7.

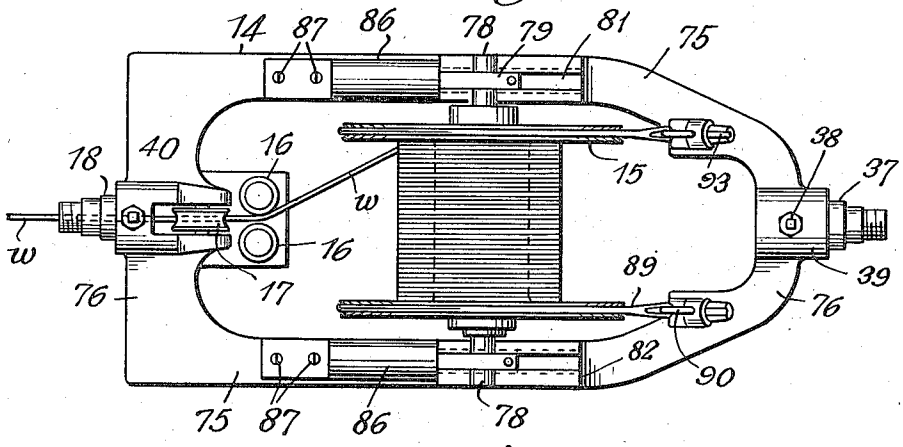


Fig. 8.

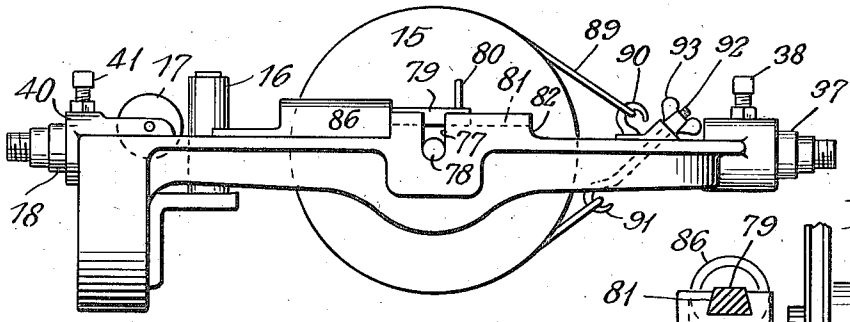


Fig. 10.

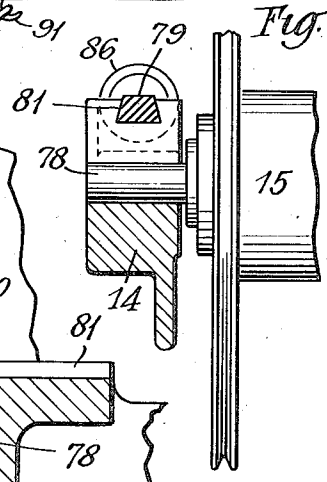
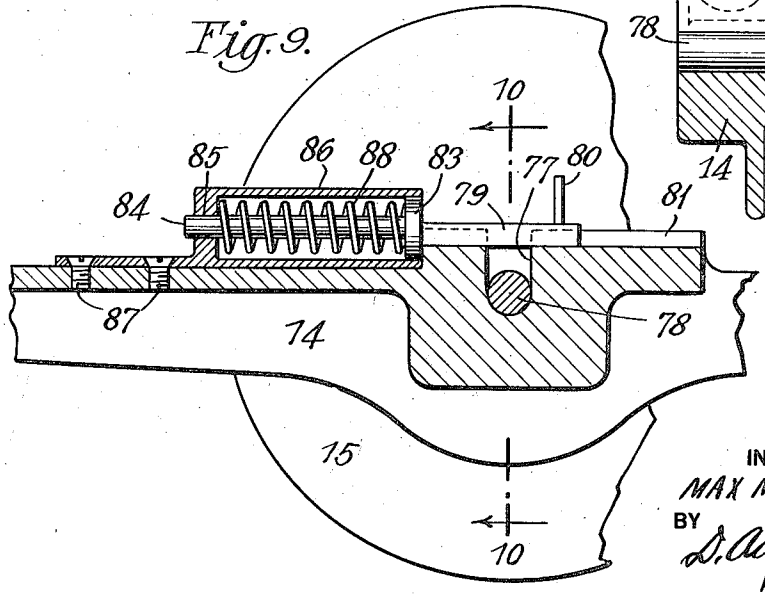


Fig. 9.



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UNITED STATES PATENT OFFICE.

MAX MORRISON, OF TRENTON, NEW JERSEY, ASSIGNOR TO THE AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, A CORPORATION OF NEW JERSEY.

STRANDING MACHINE.

1,423,776. Specification of Letters Patent. Patented July 25, 1922.

Application filed August 2, 1921. Serial No. 489,322.

To all whom it may concern:

Be it known that I, MAX MORRISON, a citizen of the United States, and resident of Trenton, New Jersey, have invented certain new and useful Improvements in Stranding Machines, of which the following is a specification.

This invention relates to structural improvements in machines used for forming wires into strands or for forming strands into wire ropes. The machine is provided with means for supporting a multiplicity of wire supplying reels, comprising a rotary flyer having a twisting head through which the wires from the several reels are threaded and passed through a die-stand in which the strands or rope is slightly compressed to the desired pitch or lay. The completed strand or rope is measured in the usual manner, by a measuring wheel provided for that purpose, and is drawn out of the machine by the usual pull-out and passes over a take-up and is wound for storage on a suitable reel.

One of the objects of the invention is to provide a flyer for a stranding machine which will not be twisted out of true alignment when operated at high speeds. Another object is to provide a machine of this class having a flyer which consists of a multiplicity of rotatably mounted discs which are connected to one another by separate structural members which can be removed individually, thereby making it unnecessary to dismantle the entire flyer in order to replace or repair one or more of the flyer discs. A further object is to provide individual connecting members for the discs of the flyer which members are shaped and constructed so as to present greater resistance to bending or twisting than members heretofore used for this purpose. A further object is to provide guards adapted to prevent broken wires from being caught between the discs of the flyer and the rollers on which the discs are mounted. A still further object is to construct the reel supporting cradles with latches adapted to automatically spring to closed position to ensure that the reel will not fall out in the event that the cradle is accidentally inverted. A further object is to provide a machine having rolls for supporting the flyer which rolls are mounted on anti-friction bearings and provided with means for lubricating the bearing surface or periphery of these rollers. Another object is to combine and co-ordinate the various devices shown and described so as to effectively perform the functions set forth.

An embodiment of the invention is illustrated in the accompanying drawings in which—

Fig. 1 is a diagrammatic side elevation of a stranding machine, a central portion of the flyer being broken away as indicated by broken lines;

Fig. 2 is a perspective view showing a portion of the flyer and two of the reel supporting cradles carried thereby;

Fig. 3 is a side elevation of a portion of the flyer with certain parts shown in vertical section to more clearly illustrate certain structural details;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1;

Fig. 4ª is a detail of a guard;

Fig. 5 is an enlarged detail in vertical section showing one of the discs of the flyer and a portion of two reel supporting cradles associated therewith;

Fig. 6 is a detail section on line 6—6 of Fig. 4;

Fig. 7 is a detail plan view of one of the reel supporting cradles;

Fig. 8 is a side elevation thereof;

Fig. 9 is an enlarged view of a portion of the cradle showing the spring latch which is adapted to hold the reel against accidental displacement;

Fig. 10 is a section on the line 10—10 of Fig. 9.

Referring first to Fig. 1, the machine consists generally of a flyer A which is rotated at a high rate of speed by a shaft B which is connected by a flexible coupling C with the armature shaft of a motor D. The shaft B carries a sprocket E which is connected by a silent chain F to a similar sprocket G carried on the shaft H which carries a gear J at the opposite end by means of which motion is transmitted by suitable gearing, not shown, to the pull-out K which in turn is connected by a chain drive L to a sprocket M on the shaft N to which is secured a winding drum O.

The flyer A is made up of a multiplicity of circular discs 10 which are rotatably supported on rolls 11 carried in bearings 12 which are mounted on longitudinally extending structural beams 13. Between ad-

jacent discs, cradles 14 are mounted in bearings, to be hereinafter described, which permit the discs 10 to rotate without rotating the cradles. Each cradle carries a reel or bobbin 15 which supplies the wire *w* or strand from which a strand or rope is to be formed. Wire from each reel 15 passes between a pair of guide rollers 16, Fig. 7, and under a guide sheave 17 and through an axial opening in the trunnion 18 at the forward end of the cradle 14, Figs. 3 and 5. The wire then passes under a guide sheave 19 carried by a bracket 20 secured to the disc 10. From each sheave 19 the wire is trained over a guide sheave 21 carried by the connecting members 22 which join the discs to one another. There are a great number of these wire supplying reels used in forming strands. A stranding machine for making a nineteen wire strand would naturally employ nineteen reels, 15. In Fig. 1 only two such reels have been illustrated in order to show the machine on a readable scale. The wires *w* from the several reels are guided in the manner above described, and are threaded through suitable openings formed in discs 10 and all pass through the end disc and converge toward the central twisting head P, Fig. 1, which as it rotates forms the wire into a strand as will be understood. The twisted strand then passes through a die-block Q and under the measuring wheel R around the pull-out K over the idlers S and T. The completed strand or rope is wound up on the drum O.

The above describes a typical arrangement of known forms of stranding machines, or similar machines known as rope laying machines which are adapted to twist strands together to form them into a cable. This invention is not directed broadly to the arrangement for twisting the wires to form strands or rope, therefore, further description of the twisting operation and mechanism therefor will be unnecessary.

This invention is chiefly directed to structural improvements now to be pointed out. In a stranding machine employing, for example, nineteen reels, it is clear that the flyer will necessarily be of great length. The distance between the discs 10 is approximately two and one-half to three feet, therefore in a nineteen strand machine, it will be seen that the length of the flyer will be from forty-seven to fifty-seven feet. It will be appreciated that it is important to keep the discs 10 which support the cradles in perfect parallelism so that they run true on their supporting rollers 11. Heretofore the discs 10 have been held together by long rods which pass through openings near the periphery of the discs and extended continuously from one end to the other of the flyer. Pipes or tubes were slipped over these rods to space the discs from one another and jam nuts were threaded on these tubes or spacers to hold them in juxtaposition. These tie-rods were usually spaced 120 degrees apart around the disc to permit access to the cradles for inserting and removing the wire supplying reels. In practice such a structure has proven to be very unsatisfactory. The stresses in starting and stopping tended to twist the flyer out of shape thereby throwing the discs out of position and causing undue wear and noise and finally serious break downs. By using a continuous rod of great length extending from one end of the flyer to the other, it is apparent that in order to remove any of the discs 10 for replacement or repair, it was necessary to pull out these rods which were approximately fifty feet long and practically dismantle the entire flyer in order to replace or repair one of the discs.

In my improved machine I overcome the above disadvantages by connecting the discs 10 to one another by individually removable connecting members 22. These members are formed of structural beams offering great resistance to twisting or bending. To each end of the members I secure brackets 23 which are formed with angular flanges 24 which abut the side faces of the discs 10. The flanges 24 and the discs 10 are drilled and reamed for the reception of snugly fitting bolts 25. In Figs. 3 and 4 it will be seen that bolts 25 pass through flanges 24 abutting against opposite faces of the discs 10 and are securely held by jam nuts 26. The bolts 25 are located a considerable distance from the central axis of the beam 22 and, therefore, this connection offers a greater resistance to bending or twisting out of alignment than would be offered by the mere round rods passing through the disc, such as heretofore used. It will also be appreciated that in order to remove one of the discs 10, it is merely necessary to remove one set of the adjacent connecting members 22 from the disc in question whereupon the disc may be readily removed. While I have shown the connecting members 22 in the form of I-beams having connection flanges 24 riveted thereto, it is to be understood that these flanges may be formed integral if desired or the connecting member may be of channel or other desired shapes. Flyers formerly constructed, which were tied together by long round rods, above mentioned, have necessarily been driven from both ends by gearing which was connected by means of a long shaft extending the full length of the flyer. Even as thus driven it has been found that in starting, the ends of the flyer would move before the center would, which of course, showed that to overcome the inertia of the parts a twisting or bending strain was imparted to the spacer rods. With my improved connecting members, formed of structural shapes and secured to the discs

by means of angle brackets as described, the flyer forms a perfectly rigid structure which has great resistance to bending and twisting strains, and in fact, practical operation has demonstrated that it can be driven with good results from one end.

The discs 10 of the flyer each comprise an outer rim 28, a web 29 and hub 30. Each hub 30 is flanged at 31 and a bearing ring 32 is secured thereto by bolts 33. This bearing ring supports a ball bearing 34 which is retained in place by a cap 35 threaded on a suitable extension on said bearing ring. The ball bearing 34 is secured by means of a nut 36 to a trunnion 37 which is secured by means of a set screw 38 in a hub 39 formed at one end of the cradle 14. At the other end of the cradle a hub 40 is formed and provided with a set screw 41 for holding the hollow trunnion 18, previously mentioned, in place. This trunnion is bored out as shown at 42, Fig. 5, to permit the wire *w* to pass therethrough as will be understood. At its end the trunnion 18 has secured thereto a ball bearing 43 by means of a clamp nut 44, this bearing being seated in a supporting ring 45 which is secured by bolts 46 to a central boss 47 formed on the web 29 of the disc 10. It will thus be seen that the cradle 14 is rotatably mounted between the discs 10 on anti-friction bearings so that as the discs of the flyer rotate at a high rate of speed there will be practically no tendency to rotate the cradles. These cradles are designed so that their center of gravity is considerably lower than the axis of the trunnions 18 and 37. The arrangement of trunnions provided with ball bearings, as described, is a marked improvement over the former method of supporting the cradles, in which the trunnions merely projected into bored apertures in the center of the discs. With such an arrangement the trunnions soon became worn and frequently the set screws used to hold them in place worked loose and the trunnion slipped out endwise, thus permitting the cradle to drop, often resulting in wrecking the flyer and frequently injuring the operator.

Reference to Fig. 5 will show that even though set screws 38 or 40, in the improved form of mounting I have devised, becomes loosened, the trunnions 38 and 18 will not be permitted to slip out in an endwise direction because the ball bearings 34 and 43 clamped thereto will prevent such endwise movement. The cap 35 and bearing ring 32 in one instance preventing this movement and the similar members 45 and 45a preventing the movement of the trunnion 18.

For rotatably supporting the flyer, I provide the several rollers 11 which are carried on short shafts 48 having ball bearings 49 secured to the ends thereof as shown in Fig. 6. Nuts 50 being threaded on each end of the shaft 48 to secure the ball bearing against the shoulder formed on the shaft as shown. The ball bearings are mounted in standards 12 having removable caps 52 secured in place by suitable bolts. In alignment with the ball bearings 49, caps 53 are secured to the standards 12 to exclude foreign matter from the bearings and also adapted to retain a lubricant which may be introdued through suitable apertures which are closed by plugs 54. The standards 12 are formed with a chamber 55 adapted to contain an oil or other lubricant, and a spring pressed felt or other packing material 56, is adapted to deposit a fine film of lubricant on the periphery of the supporting roller 11. This felt packing is carried in a cup 57 having apertures 58 formed therein to permit the lubricant to seep through and be absorbed by the packing.

Heretofore broken wires have been the cause of considerable trouble in this class of machinery, often becoming lodged between the discs 10 and the supporting rollers 11, making it necessary to have the machine remain idle while the wires were being removed. Often these broken wires resulted in considerably roughening the surface of the discs of the flyer or of the supporting rolls 10 thus tending to throw the discs out of alignment. To overcome this object, I have provided guards such as shown in Figs. 4 and 4a. The cap of each of the standards 12 is formed with upwardly extending ribs 59 to which I secure guards 60 and 61 by means of bolts 62 passing freely through the guards and being screw threaded into the extensions 59 of each cap 52. The extensions 59 are of the shape shown in Fig. 4 so that they overlap the disc 10, for an appreciable distance, each side of its point of contact with the supporting roll 11. At the inner side of the cap 52 I also secure guards 63 similar to those above described, and which are held in place by suitable bolts 64 as shown. These guards are all of similar construction, therefore, a detailed description of one will suffice for all.

Fig. 4 shows a face view of a guard 63 cut away at 65 so as to provide portions 66 and 67 which project slightly beyond the periphery of the disc 10. The guards are each provided with slots 68 through which the securing bolts pass, and the slotted formation permits the guard to be accurately adjusted with respect to the disc 10, so that it just clears the latter. This clearance is much smaller than the diameter of the wire used in making strands and, therefore, these guards effectively prevent broken wires from being caught between the discs 10 and rollers 11. These guards also serve to prevent an operator from getting his fingers or clothing caught between the rollers.

At certain locations a yoke 70 is pro-

vided having a bearing shoe 71 mounted therein which is held in adjusted position by bolts 72 as shown in Fig. 4. The bearing shoes 71 are provided to overcome the tendency of the flyer to rise off of one of the bearing rollers 11 when rotating at an extremely high speed. I also provide guards 73 and 74 in juxtaposition to the shoe 70 to prevent broken wires being caught at this point.

The reel supporting cradles 14 each comprise side members 75 and end members 76. The end members are formed with the bosses 39 and 40, previously referred to. The side members of each cradle are slotted at 77 to form an open bearing for the shaft 78 of the wire supporting reels 15. While these cradles in normal operation remain practically stationary as the flyer revolves, it has been found necessary to provide means for preventing the reels 15 from falling out when the cradles are accidentally inverted or partially turned over by a broken wire catching in the revolving flyer. Heretofore short bars have been placed over the slot 77 and secured in place by means of tap bolts, but it has been found that even these sometimes work loose and frequently an operator will fail to put in this locking bar at all. It will be appreciated that this mistake can very easily occur, when it is borne in mind that the usual stranding machine employs nineteen of these cradles, each having two bars to be bolted in position. It is obvious that this also consumes a great deal of time.

To overcome the tedious work of removing and replacing numerous locking bars, to positively hold the reels in place, and to enable the reels to be quickly removed when they are empty and replaced by full reels, when the machine is to be again started for a new run, I have devised a latch which automatically closes by means of a compression spring. This latch consists of a dove-tail bar 79 provided at one end with a handle 80 and being guided in a dove-tail groove 81 milled in a lug 82 formed on each side member of the cradle. An enlargement 83 is formed integrally with the slide 79 and has secured thereto a rearwardly extending shank 84 which is guided at 85 in a housing 86 which is secured by means of screws 87 to the side member 75 of the cradle. A compression spring 88 surrounds the shank 84 and is seated at one end against the end of the housing 86 and at the other end against the enlargement 83 and thus tends to normally hold the slide 79 in locked position shown clearly in Fig. 9.

It is clear this type of lock will positively prevent the reel from falling out of the cradle even though the cradle be entirely inverted, the dove-tail formation of the slide being such that it would readily support the reel when the cradle became inverted. It is clear also that to remove the reel it is only necessary to press back first one latch and lift the reel a slight distance and let its shaft rest on top of said latch and then withdraw the latch at the opposite end of the reel and lift that end which frees the entire reel. It will also be appreciated that it is a very simple matter to introduce a new reel, it only being necessary to press back the spring latches and drop the ends of the shaft 78 into the respective open bearing 77 of the cradle after which it will be clear that these latches will spring to a closed position automatically. The flanges of the reel 15 are grooved and a rope or cable 89 is trained around each flange and fastened at one end to a fixed hook 90 carried by the cradle and at its opposite end to another hook 91 formed on the end of a threaded rod 92 which may be adjusted by means of a winged nut 93 so as to put a slight tension on the reels to prevent them from unwinding too rapidly.

In conclusion it will be apparent that I have provided a machine in which the flyer discs are connected by rigid connecting members having great resistance to bending or twisting and which insure that these discs will run true at a high rate of speed. The connecting members are individually removable thus making it an easy matter to remove any one disc without dismantling the entire flyer. It is also apparent that I have provided improved means for preventing broken wires from getting tangled up between the discs and their supporting rollers, and that I have devised a reel retaining latch which is fool-proof and easily and quickly operated. These improvements have been embodied in a full sized machine and have resulted in a great increase in the output per machine in a given time over the output of machines as formerly constructed.

Though I have described with great particularity the specific details of the embodiment shown, it is to be understood that I am not limited thereto as changes in construction, arrangement and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the following claims:

1. In a machine of the class described, a flyer including at least three cradle supporting discs joined to each other by discontinuous connecting members so as to permit the removal of one or more of the discs for replacement or repair without the necessity of dismantling the entire flyer.

2. In a machine of the class described, a flyer including at least three rotary discs, separate members for connecting adjacent discs comprising structural beams shaped to offer great resistance to torsional strains and having flanged connections on the ends

thereof arranged to be secured to the side faces of said discs, and reel supporting cradles rotatably mounted between said discs.

3. In a machine of the class described, a flyer including at least three rotary discs, separate members for connecting adjacent discs comprising I-beams having flanged brackets rigidly secured to the ends thereof and snugly fitting bolts passing through reamed holes in said flanged brackets and said discs and arranged to hold said discs truly parallel and to positively resist the tendency of the flyer to twist or become distorted in use.

4. In a machine of the class described, a flyer including at least three cradle supporting discs joined to each other by staunch torsion resisting members, reel supporting cradles rotatably mounted in said discs, rollers engaging said discs to rotatably support the flyer, and guard members secured in juxtaposition to the rollers and discs to prevent broken wires being caught between said rollers and discs.

5. In a machine of the class described, a rotary flyer including at least three discs joined to each other by individually removable connecting members.

6. In a machine of the class described, a rotary flyer including at least three discs joined to each other by individually removable connecting members, reel supporting cradles having trunnions mounted in ball bearings carried by said discs, and rollers co-acting with said discs to rotatably support the flyer, fixed stands having ball bearings therein for supporting said rollers, said stands being formed with reservoirs adapted to contain a lubricant and means for conveying the lubricant to the peripheries of the rolls.

7. In a machine of the class described, a rotary flyer including at least three discs joined to each other by individually removable connecting members, reel supporting cradles rotatably mounted in said discs, each of said cradles having a pair of spring actuated latches arranged to prevent the reel from falling out if the cradle is accidentally turned over.

8. In a machine of the class described the combination with the discs of a rotary flyer, of cradles comprising side and end members, trunnions removably secured by set screws to said end members, anti-friction bearings bolted to said trunnions and means for securing said anti-friction bearings to the discs so as to prevent endwise movement so that in the event of the set screws being loosened the bearing will prevent the cradles from being thrown out and wrecking the machine.

9. In a machine of the class described the combination with the discs of a rotary flyer, of cradles comprising side and end members, trunnions carried by said end members, anti-friction bearings secured to said trunnions and supported in said discs, wire supplying reels having supporting shafts, bearings formed in the side members of the cradle for supporting said shafts, said side members being slotted to permit the reels to be lifted out of or placed in the cradle and spring pressed latches arranged to normally close said slots to prevent the reels from falling out of the cradles when they are accidentally turned over.

10. In a machine of the class described, a flyer comprising at least three discs connected to each other by individually removable connecting members, means for rotatably supporting said discs, substantially stationary cradles supported on anti-friction bearings carried by said discs, said cradles having side members slotted to form bearings, wire supplying reels having shafts supported in said slotted bearings, bars slidingly supported in said side members and normally bridging said slot to prevent the removal of said reels and yielding means for holding said bars in place.

11. In a machine of the class described, a flyer comprising at least three discs connected to each other by individually removable connecting members, means for rotatably supporting said discs, substantially stationary cradles having trunnions rotatably mounted in said discs, said cradles having side members slotted to form open bearings, wire supplying reels having shafts supported in said open bearings, dove-tail bars slidable in ways formed in said side members and bridging said open bearings, springs for normally holding said dove-tail bars in position over said shafts and casings secured to the side members for enclosing said springs.

In witness whereof I have hereunto signed my name.

MAX MORRISON.