J. L. & S. A. SMITH.

REEL SWITCH MECHANISM FOR ROD MILLS.

APPLICATION FILED AUG. 27, 1918.

1,295,224.

Patented Feb. 25, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

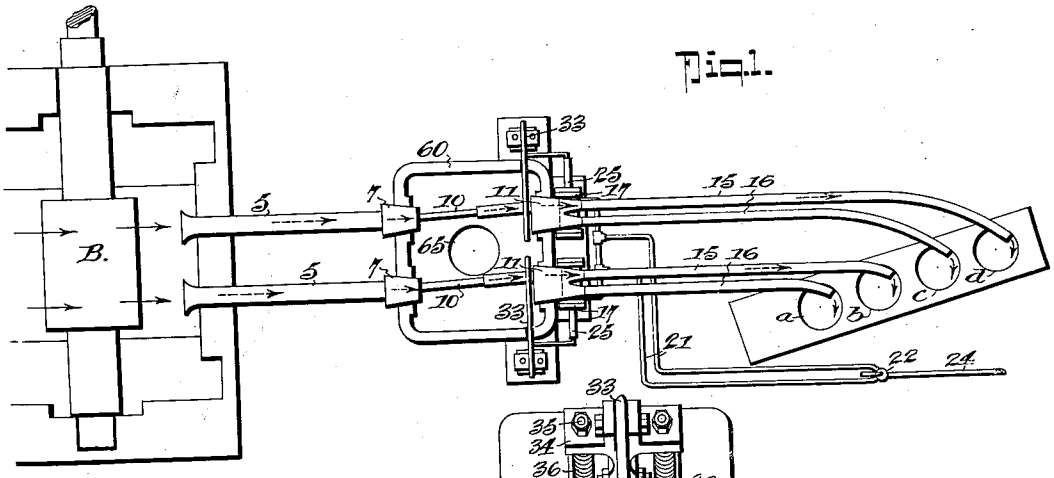
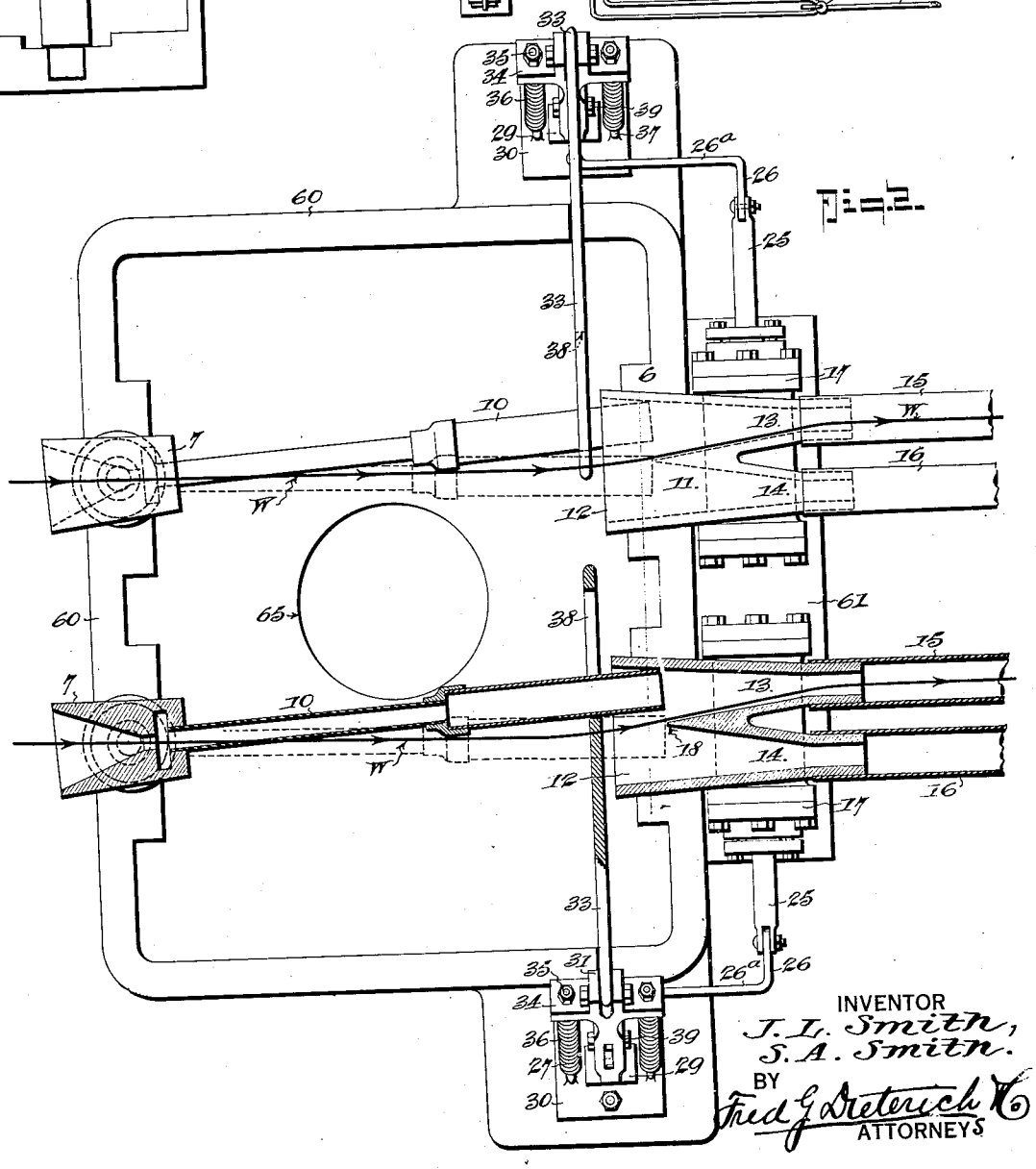


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

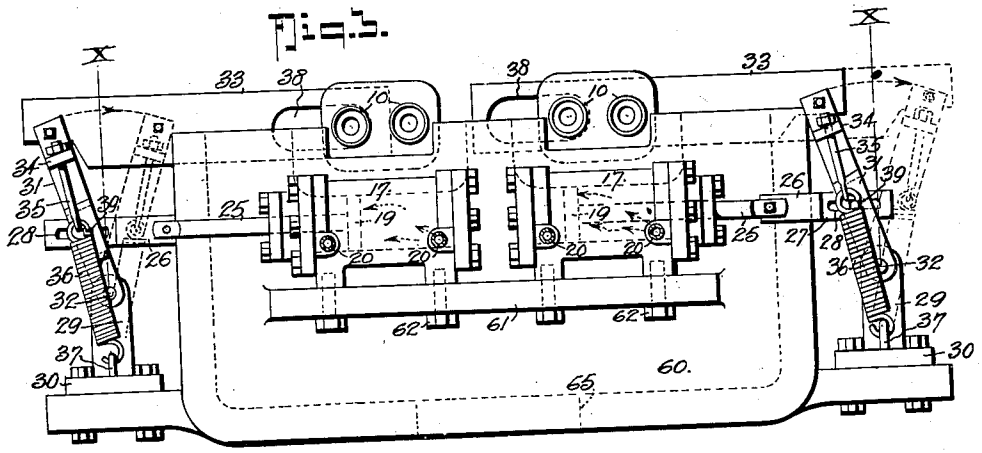


Fig. 4.

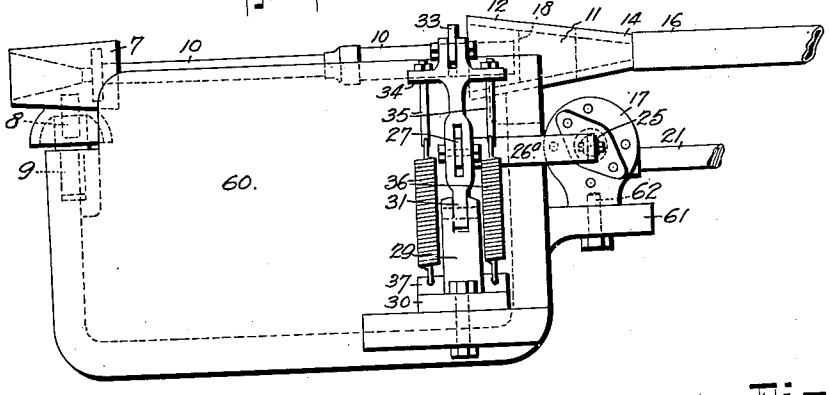
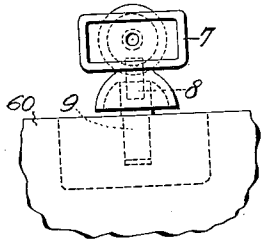


Fig. 5.



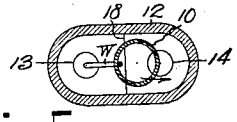


Fig. 6.

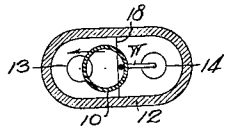


Fig. 7.

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UNITED STATES PATENT OFFICE.

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REEL-SWITCH MECHANISM FOR ROD-MILLS.

1,295,224. Specification of Letters Patent. Patented Feb. 25, 1919.

Application filed August 27, 1918. Serial No. 251,706.

To all whom it may concern:

Be it known that we, JOHN L. SMITH, a citizen of the Dominion of Canada, and SHERIDAN A. SMITH, a citizen of the United States, both residing at Hamilton, in the Province of Ontario, Dominion of Canada, have invented a new and Improved Reel-Switch Mechanism for Rod-Mills, of which the following is a specification.

Our invention, which generally relates to improvements in wire rod mills of the continuous Morgan type, more particularly has for its purpose to provide a comparatively simple and inexpensive construction of switch mechanism that is especially designed for controlling the direction of movement of the rods as they pass, under a very high speed, from the final or delivering rolls to the stand of reels, and so, that the rods, as they follow one another, may be run closely together and be guided from entering the same reel or, in other words, so that the rod following the one being reeled, is shifted to enter another of the stand of reels and be reeled as the last filled reel is being removed.

Another object of our invention is to provide, in a switch mechanism of the character stated, means for shifting the guides or tubes that lead the rods to the stand of reels and which, at predetermined times, is adjusted for effecting initial shifting of the switch pipes for bringing the said pipes over to aline with another of the guides or tubes that lead to the reel stand and which, during the interim that the last end of the length of rod being reeled up passes through the entry end of the switch head and the approach of the front end of the next or following line of rod enters into the said head which, after passing into a guide or tube that directs it to a next reel to wind on the said reel as the other reel on which the preceding line of wire has been wound, is removed and replaced.

With other objects in view that will hereinafter appear, our invention embodies an improved switch mechanism for the general purposes stated that consists of the peculiar features of construction and novel combination of parts, all of which will be hereinafter fully explained, specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view of our switch mechanism, a portion of the last or delivery rolls "B" being also shown.

Fig. 2 is a plan view, parts being in horizontal section, the several parts being positioned for directing the rod wires *w* to the reels *b*—*d*, as shown in Fig. 1.

Fig. 3 is a front elevation of the switch mechanism looking in the direction of the arrow on Fig 4.

Fig. 4 is a side elevation looking in the direction of the arrow on Fig. 2.

Fig. 5 is a rear elevation of one of the rotatable bell mouth switch pipe receivers, hereinafter specifically referred to.

Figs. 6 and 7 are cross sections taken substantially on the line 6—6 of Fig. 2, illustrating the action of the switch pipe.

In the drawings, we have shown a practical arrangement of our invention adapted for use in a rod mill of the continuous type that includes a reel stand having four reels and the switch mechanism C constructed for handling two lines of rod wire with the rod guides therefor designated 10—10, adapted for being shifted into alternate engagement with relatively to the reels *a*—*c*, *b*—*d*, respectively.

It is obvious, however, that the switch mechanism may be designed for operating on a single rod guide to be shifted so as to deliver, alternately, into either of a pair of reels.

As is well known in the manufacture of wire rods in a continuous rod mill, in which the rods run close together, a finished rod runs about 1200 to 1500 feet long and takes about 40 seconds to go through the mill and this allows a reel to be emptied and started again before another or the following rod passes through the mill.

Referring now more particularly to Figs. 1, 2, 3 and 4, 60 designates a suitable frame that is located in advance of the final or delivery rolls B.

Since the construction and operation of each set of the switch devices that operate the two lines of rod lengths as they pass from the rolls B, are identical, a detailed description of one set of such devices will suffice for both.

The frame 60, is trough-shaped in cross section, the reason for which will presently appear, and has its rear wall vertically extended with the upper edge thereof posi-

tioned for supporting a bell mouth guide 7 in the horizontal plane of the opposing faces of the rolls B for receiving the guides 5 through which the rod W passes as it travels from the said rolls B.

The guide 5 is of a smaller diameter than the bell mouth guide 7 so that it has lateral play within the said guide 7 during the shifting operation of the switch mechanism.

Guide 7 is swivelly mounted on a stud bearing 8 in turn mounted on a post 9 fixedly held on the top edge of the frame wall 6, and in practice said post 9 is suitably covered so as to be free from water or scale.

A switch pipe 10 is fixedly attached at its entrant end to the bell mouth guide 7 and its front end extends into and coöperates with the switch head 11 having a laterally elongated bell mouth 12 into which the front end of the switch pipe 10 extends and in which the said pipe has lateral motion.

The switch head 11 also has a pair of forwardly extending tapering rod passages 13—14 with which the entry ends of a pair of guide tubes 15—16 connect and which extend out to and have their ends shaped and positioned for discharging the rods into the reel cylinder.

As is best shown in Fig. 2, the two tapering rod passages 13—14 have their entry ends in communication with the laterally extended bell mouth 12 and the said passages at their entry ends are separated by an abutment edge or point 18 that extends partially up and constitutes a middle division point of the bell mouth 12 (notice particularly Figs. 6 and 7).

By reason of tapering the rod passages 13 and 14 from their entry to their delivery ends, a wedge-like division is formed between the said passages and thereby separates the guide tubes 15—16 sufficiently to provide for the proper positioning of the said tubes with respect to the two reels *a*—*b* as they are shifted for delivering the rapidly moving rod lengths to the said reels alternately.

So far as described, it will be apparent (particularly by referring to Figs. 1 and 2) that when the switch pipe 10 is in the position shown in full lines in the said figures the rod passes through the tube 13 and discharges onto the reel *b* and when the switch pipe is moved clear over to position in line with the tube 14 it delivers to the reel *a*, and during the time in which the said reel *a* is filling, the reel *b* is removed, emptied and returned to the operating position.

One of the purposes of our improved construction of switch mechanism is to provide for running the rod lengths closely together, and since the rods travel at a high rate of speed it is essential that the final movement of the switch pipe that shifts from one position (say in line of the passage 13 to the other position, in line with the passage 14,) be positive and instantaneous the moment the end of that rod length being reeled passes out of the outlet end of the switch pipe or tube 10 and before the front end of the next rod length passes through the said outlet end of the pipe 10.

Referring now particularly to Figs. 3 and 4, it will be noted a cylinder 17 is located in front of the adjacent wall of the frame 60, extends transversely under the switch head 11 and is fixedly secured by bolts 62, to a horizontal bracket 61 that projects from the wall of the frame as shown.

19 designates a piston that works within the cylinder 17 and has movement between the opposite end ports 20—20 with which connect the branch pipes 21—21 that extend to a valve casing 22 in which is located a three-way valve 23 and which communicates with a fluid supply pipe 24 in which is contained the fluid pressure, air, steam, or water.

Valve 23, in practice, is located at such point adjacent the reel stand, that the operator who handles the reels may readily manipulate the valve 23 to let the fluid pressure into either end of the working cylinder, as will be clearly understood from the diagram Fig. 1 of the drawings, from which it will be noticed that under a proper shifting of the valve the fluid pressure may be in the direction shown by the full line arrows or in the reverse direction, as indicated by the dotted line arrows.

25 designates the piston rod or stem and it extends through and is slidable in a central aperture in the outer head of the cylinder 16.

26 designates an angle member that pivotally joins with the outer end of the piston rod 25 (see Figs. 2 and 3) and has its extension 26^a formed with an angled portion 27 which extends outwardly in a plane parallel with the piston rod 25 and has a horizontally elongated slot 28, the purpose of which will presently appear. Upon the outer upright bearing 29, bolted to a bracket 30 that extends laterally from the adjacent wall of the frame 60 is pivotally mounted a vertically positioned throw lever 31, adapted, when moved to a point just beyond the perpendicular, relatively to its pivotal bearing, for being thrown laterally under spring tension devices, the construction of which and the operation thereof is best indicated in Fig. 3.

It will be noticed, in the said Fig. 3, that the upper end of the throw bar or lever 31, is forked and pivotally connected, at 32, to the arm 33 that controls the shifting of the switch pipe 10. The lever 31 also has a pair of oppositely projected apertured bracket lugs 34—34 in each of which is slid-

ably mounted an adjusting screw bolt 35. Each of the bolts 35—35 connects with the upper end of light tension coiled tension springs 36—36, the lower ends of which are joined with eyes 37—37 on the bearing 30, as is clearly shown in Figs. 3 and 4.

The arm 33, that governs the throw of the switch pipe 10, has an elongated slot 38 through which the said pipe 10 passes and the said slot 38 is of such length that when the arm 33 is thrown, in the manner to be presently explained, provision is made that it may be moved beyond the vertical center to which it is thrown under the piston controlled means.

At this point, it should also be stated, that the elongated slot 28, in the angled portion 27, of the piston shifted member 26 is of such length that when the throw lever 31 has been swung to the vertical position, in either direction, under piston action, that the cross bolt 39 on the lever 31, which passes through the said slot 38, moves relatively freely within the said slot under the final throw movement of the lever effected by the tension devices.

It will be noticed, particularly in Figs. 1 and 2, the switch pipe is made smaller at the entry end so it is impossible for the rod to hit against the dividing abutment or point 18 in the bell mouth of the switch head.

It should be here stated assuming the rod being worked is $\frac{3}{16}$ inches in diameter, and the same red hot, the tension springs that cooperate with the lever 31 should not be adjusted too tightly as the switch pipe 10 would then be liable to act as a brake and cause the rapidly passing rod to cobble.

When the last end of the rod reaches the point 18, the switch pipe hesitates a fraction of a second before it shifts over the remaining distance. Now, if the rods were run but one inch apart, and traveling at the fast rate of speed hereinbefore stated, the front ends would be liable to hit the point 18, as before mentioned, but by forming the switch pipe 10 of lesser diameter at the entry end with the other end engaging the rod as it does, causes the rod to belly, see Fig. 2, and therefore the rod following will go straight and miss the point 18, regardless of the switch pipe hesitating.

Say the rod, indicated in solid black lines on Fig. 2, enters the reel on which it winds, the man in charge of the reel stand adjusts the control valve, which causes the valve pressure in the cylinder to shift the piston and through its connections with the throw lever 31 causes the said lever to move over in the direction of the arrow to just pass the center designated by the line X, see Fig. 3, and when it is so moved the springs tend to pull the said lever 31 and the switch, by the shifting arm 33, until the switch pipe causes the rod to bear on the point 18 in the double bell mouth of the switch head at which point the said rod bears until the last end thereof passes it and then the spring tension of the levers 31 pulls the said levers 31 and the switch arm over to the final extent of the throw to the position indicated in dotted lines on Fig. 3, which causes the switch pipe 10 to swing to the wall of the bell mouth and instantly come into a clear alinement with the other passage 14 and thereby direct the front end of the next rod length to take the tube 16 and pass to its respective reel.

After the next following bar has been directed to take the passage 14 and the tube 16, as before stated, the cylinder control valve is again shifted to cause the piston, through its connection with the throw lever 31, to push the said lever back or in reverse direction, until past the center line X and then the tension devices will tend to pull the lever 31 farther in the said reverse direction and hold the rod up against the bell mouth division, the same as was done while passing the preceding or last reeled rod lengths through the passage 14 and the tube 16.

The trough-like frame 60 has an aperture 65 in the bottom thereof for draining off the water when cooling the operating parts.

What we claim is:—

1. In a rod mill of the character stated; a plurality of reels, means for rapidly conveying rod lengths to the reels, a switching device for shifting the rod lengths to direct the rods to one or another of said reels, said device including operating instrumentalities for effecting the initial shift and including means governed by the passing rod lengths for completing the shift, as the end of the preceding rod leaves the shifting device.

2. In a rod mill of the character stated; a plurality of reels, means for rapidly shifting the rod lengths whereby to direct a closely following rod to one of said reels as the end of a preceding rod length is being wound on its selected reel, and further means for holding the final end of a rod length from cobbling as it passes from the switching element.

3. In a continuous rod mill, the combination with a plurality of rod take-up reels and means for rapidly advancing the rod lengths that follow in close relation; of a pair of guide passages, a tube for each passage, each of the said tubes discharging on a selected one of the said plurality of reels, a shiftable guide through which the rod lengths pass and by which they are alternately moved first in line with one of said passages and then in line with the other of the said passages and means for effecting the shifting of said shiftable guide, and means

governed by the passing rod lengths for controlling the final operation of the shift of said guide.

4. In a continuous rod mill, the combination with a plurality of rod take-up reels and means for rapidly advancing the rod lengths that follow in close relation; of a pair of guide passages, a tube for each passage, each of the said tubes discharging on a selected one of the said plurality of reels, a shiftable guide through which the rod lengths pass and by which they are alternately moved first in line with one of said passages and then in line with the other of the said passages, and means for holding the rod lengths from cobbling as they discharge through either of the said passages.

5. In a rod mill of the character stated, in which is provided a plurality of reels, means for rapidly conveying rod lengths to the reels, said means comprising a duct and shiftable switch tube through which the rods pass and a plurality of distributing tubes through which the rod is directed by the switch tube to the respective reels; the combination with the switch tube, of a manually controlled mechanism for initiating the "throw over" of the switch tube and automatic means for completing the throw over at the instant the following end of the preceding rod passes out of the switch tube.

6. In a rod mill of the character stated, in which is included a plurality of take-up reels and means for driving rod lengths following in close relation toward the take-up reels; of a rod delivery tube for each reel, a shiftable guide through which the rod lengths pass, means for effecting movement of the said guide in alternate directions at predetermined times whereby to direct the advancing rod length to its selected rod delivery tube, and a following rod length to another selected rod delivery tube.

7. In a rod mill of the character stated, in which is provided a plurality of reels, means for rapidly conveying rod lengths to the reels, said means comprising a duct and shiftable switch tube through which the rods pass and a plurality of distributing tubes through which the rod is directed by the switch tube to the respective reels; the combination with the switch tube of manually controlled means for initiating the throw over of the switch tube, and means governed by the passing rod lengths for effecting the completion of the final throw over of the switch tube.

8. In a reel switch mechanism for continuous rod mills, a plurality of reels, a separate rod delivery tube for each reel, a switch pipe through which the rod lengths travel in succession, means for shifting the switch pipe and holding its delivery end in contact with the rod as it passes into the delivery tube to one reel and other means that complete the switching movement of the switch pipe as the last end of one rod leaves it whereby to aline with the delivery tube to another as the front end of the next rod length advances through the said pipe.

9. In a continuous rod mill, which mill includes a plurality of rod take-up reels, a single guide through which the finished rod lengths travel in close relation; a pair of tubular guides, one for each of said reels through which the rod lengths are delivered to their respective reels, means for shifting the rod lengths as they pass from the single guide, alternately into one or the other of the pair of tubular guides, as the last end of one of the rod lengths passes into one of the said tubular guides, whereby to direct the following rod lengths into the other tubular guide.

10. In a continuous rod mill, which mill includes a plurality of rod take-up reels, a single guide through which the finished rod lengths travel in close relation; a pair of tubular guides, one for each of said reels, through which guides the rod lengths are delivered to their respective reels, means for shifting the rod lengths as they pass from the single guide, alternately, into one or the other of the pair of tubular guides, as the last end of one of the rod lengths passes into one of the said tubular guides, whereby to direct the following rod length into the other tubular guide, said means including a pivoted switch pipe located between the single guide and the two tubular guides and valve controlled fluid pressure means for shifting the said switch pipe into alinement with one or the other of the tubular guides.

11. In a continuous rod mill, which mill includes a plurality of rod take-up reels, and a single stationary guide through which the finished rod lengths are advanced in close relation; a pair of tubular guides one for each of the pair of reels into which the said tubular guides deliver the rod lengths, a switch pipe located between the single guide and the two tubular guides, the said pipe having a bell mouth receiver at the entry end, said receiver being pivotally mounted with its mouth extending over the delivery end of the single guide, and means for swinging the switch pipe laterally, at predetermined times, and for holding its discharging end in alinement with either one or the other of the two tubular guides that convey the rod lengths to their respective reels.

12. In a continuous rod mill, which mill includes a plurality of rod take-up reels and a single stationary guide through which the rod lengths are advanced in close relation; a pair of spaced tubular guides, one for each of the pair of reels, a switch head having a bell mouth with which the entry end of the tubular guides communicate, the said head

including a wedge-shaped division whose opposite walls form rod guides and which merge and terminate at the front face of the bell mouth, a switch pipe located between the said bell mouth of the switch head and the stationary guide, the said switch pipe having its entry end always extended over the delivery end of the stationary guide, the said entry end being pivotally supported whereby the delivery end of the pipe is adapted for movement within the bell mouth of the switch head, a throw bar connected with the switch pipe for shifting it in lateral direction, a positively operating means for imparting an initial movement of the switch pipe whereby to swing it from alinement with one of the tubular guides toward the other tubular guide and move the passing rod into engagement with the adjacent rod guide wall in the switch head.

13. In a continuous rod mill, which mill includes a plurality of rod take-up reels and a single stationary guide through which the rod lengths are advanced in close relation; a pair of spaced tubular guides, one for each of the pair of reels, a switch head having a bell mouth with which the entry end of the tubular guides communicate, the said head including a wedge-shaped division whose opposite walls form rod guides and which merge and terminate at the front face of the bell mouth, a switch pipe located between the said bell mouth of the switch head and the stationary guide, the said switch pipe having its entry end always extended over the delivery end of the stationary guide, the said entry end being pivotally supported, whereby the delivery end of the pipe is adapted for movement within the bell mouth of the switch head, a throw bar connected with the switch pipe for shifting it in lateral direction, a positively operating means for imparting an initial movement of the switch pipe whereby to swing from alinement with one of the tubular guides toward the other tubular guide and move the passing rod into engagement with the adjacent rod guide wall in the switch head, and other means for completing the initially shifted movement of the switch pipe as the last end of the rod passes from said switch pipe whereby to shift the front end of the next following rod in line with the other tubular guide.

14. In a reel switch mechanism for continuous rod mills, the combination with a stationary guide through which the rod lengths are rapidly passed in close relation, a pair of take-up reels, a pair of tubular guides, one for each reel and which deliver the rod lengths into their respective reels, a switch head having a laterally extended bell mouth in communication with the two tubular guides, a swingable switch pipe having its entry end in constant communication with the stationary guide and its delivery end projected into the bell mouth that connects the two tubular guides, the said switch pipe having its entry end formed of a lesser diameter than its exit end, a member connected with the switch pipe, and means for moving the said member in a plane at right angles to the switch pipe whereby when motion is imparted to said member, the switch pipe is transferred from alinement with one of the tubular guides to aline with the other tubular guide.

15. In a reel switch mechanism of the character stated, the combination with a stationary guide through which the rod lengths travel, a pair of take-up reels and a pair of tubular guides, one for each reel and which guides deliver the rod lengths into their respective reels; of a swingable member whose entry end is constantly in communication with the stationary guide and whose delivery end is adapted for being alternately moved to aline with the entry ends of one or the other of the tubular guides, a switch member shifting arm, means for shifting the said arm whereby to move the switch member laterally from one tubular guide tube to the other guide tube as the rod length is passing therethrough, and other means that operate to complete the lateral movement of the switch member the instant the end of the rod length passes from the said switch member and as the following rod length passes into said switch member.

16. In a reel switch mechanism of the character stated, the combination with a stationary guide through which the rod lengths travel, a pair of take-up reels and a pair of tubular guides, one for each reel and which guides deliver the rod lengths into their respective reels; of a swingable switch member whose entry end is constantly in communication with the stationary guide, and whose delivery end is adapted for being alternately moved to aline with the entry ends of one or the other of the tubular guides, a switch member shifting arm, means for shifting the said arm whereby to move the switch member laterally from one tubular guide to the laterally from one tubular guide over to the other tubular guide as the rod length is passing therethrough, the said means including a valve controlled fluid pressure piston, a pivoted throw lever, connections that join the said lever with the piston and other connections that join the pivoted lever with the switch member.

17. In a reel switch mechanism of the character stated, the combination with a stationary guide through which the rod lengths travel, a pair of take-up reels and a pair of tubular guides, one for each reel and which guides deliver the rod lengths into their respective reels; of a swingable

switch member whose entry end is constantly in communication with the stationary guide and whose delivery end is adapted for being alternately moved to aline with the entry ends of one or the other of the tubular guides, a switch member shifting arm, means for shifting the said arm whereby to primarily move the switch member laterally from one tubular guide to the other tubular guide as the rod length is passing therethrough, the said means including a valve controlled fluid pressure piston, pivoted lever connections that join the said lever with the piston and other connections that join the pivoted lever with the switch member.

18. In a reel switch mechanism of the character stated, the combination with the stationary guide through which the rod lengths travel, a pair of take-up reels and a pair of tubular guides, one for each reel and which guides deliver the rod lengths into their respective reels; of a swingable switch member whose entry end is constantly in communication with the stationary guide and whose delivery end is adapted for being alternately moved to aline with the entry ends of one or the other of the tubular guides, a switch member shifting arm, means for shifting the said arm whereby to primarily move the switch member laterally from one tubular guide to the other tubular guide as the rod length is passing therethrough, the said means including a valve controlled fluid pressure piston, pivoted lever connections that join the said lever with the piston, other connections that join the pivoted lever with the switch member, and other means that are set for action by the movement of the pivoted lever that effects the primary lateral shifting of the switch member for effecting a final shifting of said switch member.

19. In a reel switch mechanism of the character stated, the combination with the stationary guide through which the rod lengths travel, a pair of take-up reels and a pair of tubular guides, one for each reel and which guides deliver the rod lengths into their respective reels; of a swingable member whose entry end is constantly in communication with the stationary guide and whose delivery end is adapted for being alternately moved to aline with the entry ends of one or the other of the tubular guides, a switch member shifting arm, means for shifting the said arm whereby to primarily move the switch member laterally from one tubular guide to the other tubular guide, as the rod length is passing therethrough, the said means including a valve controlled fluid pressure piston, pivoted lever connections that join the said lever with the piston, other connections that join the pivoted lever with the switch member, other means set into action by the movement of the pivoted lever that effects the primary lateral shifting of the switch member for effecting a final shifting of said switch member, the said other means comprising tension spring devices that operate to effect a swing of the pivoted lever independent of its piston operated connections whereby to bring the switch member into alinement with the desired one of the tubular guides as the rod length now traveling through the other tubular guide leaves the said switch member.

20. In a reel switch mechanism for continuous rod mills, the combination with a stationary guide through which the rod lengths are rapidly passed, a pair of take-up reels, a pair of tubular guides one for each reel and which discharge the rod lengths into their reels; of a switch member through which the rod lengths pass, and whose entry end is constantly in alinement with the single stationary guide, manually controlled means adapted for being set into action for primarily swinging the switch member, while the last end of the rod is passing therethrough and through one of the tubular guides, over toward the other tubular guide, and other means that operate to impart a final movement of the switch member when the rod end passes therefrom, whereby to shift the front end of the following rod length into alinement with the other tubular guide.

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