Dec. 24, 1935. H. A. OWEN ET AL 2,025,174

SPINNING FRAME

Filed July 2, 1935 2 Sheets-Sheet 1

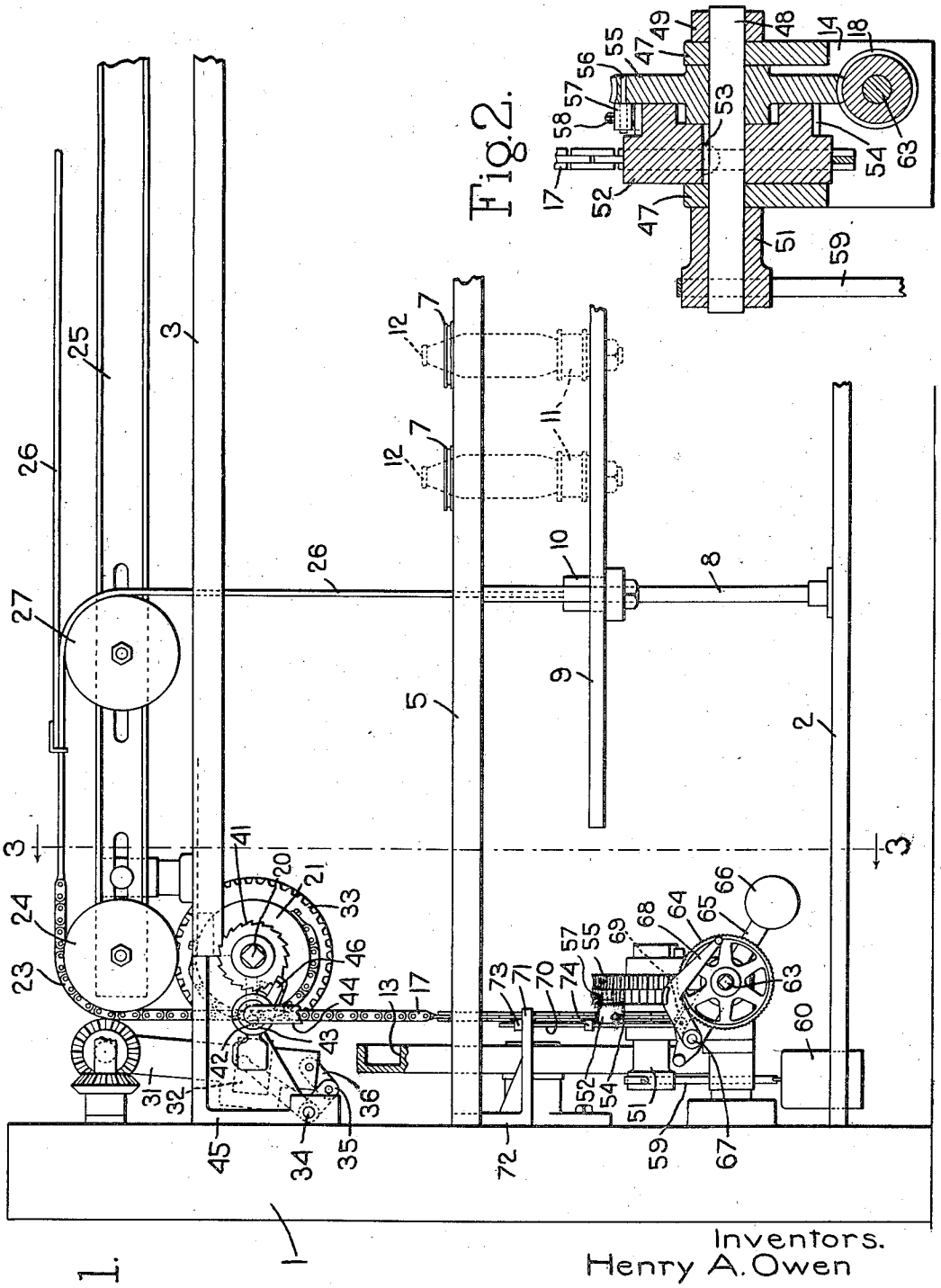


Fig. 1.

Fig. 2.

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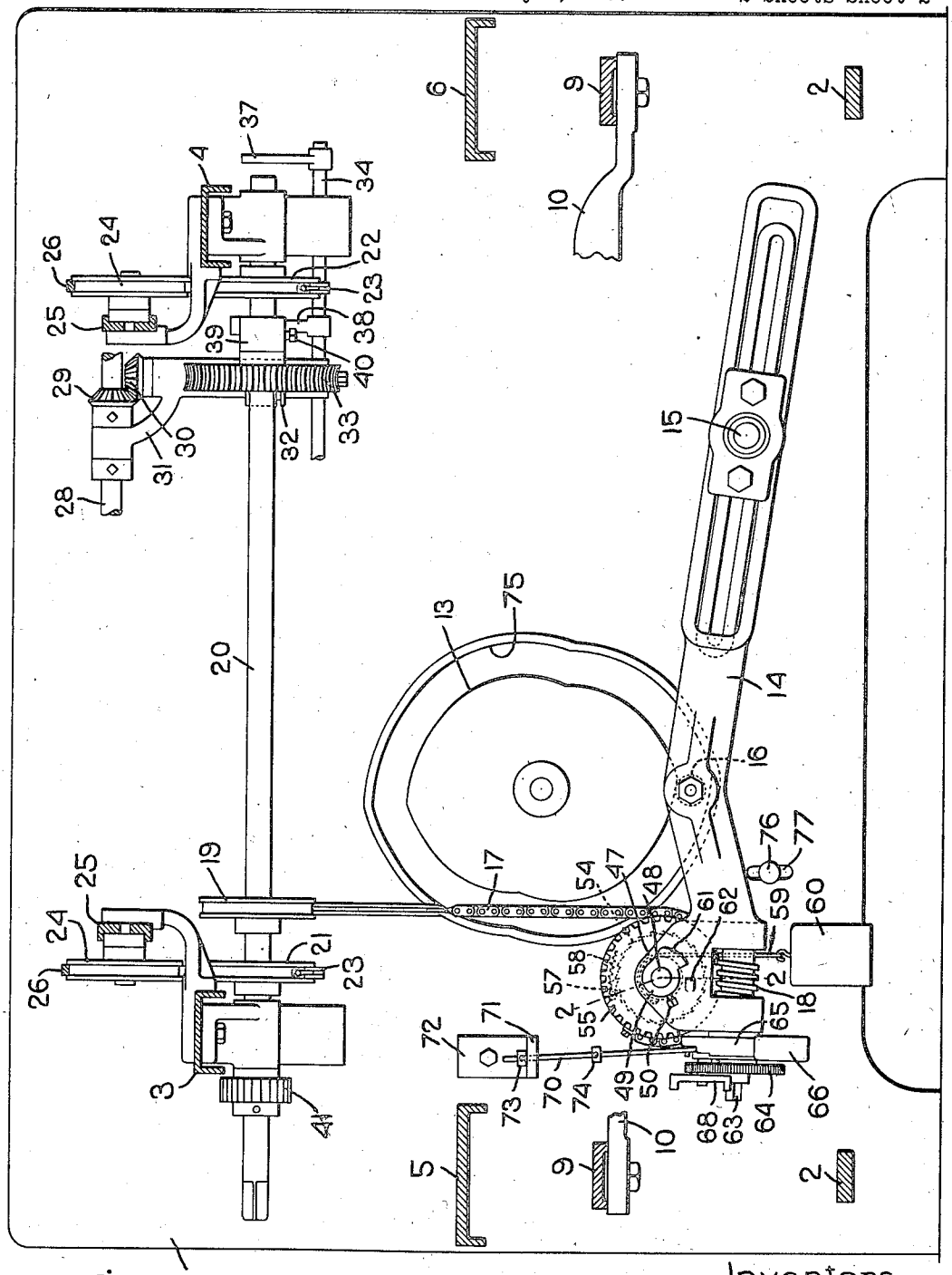


Fig. 3.

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UNITED STATES PATENT OFFICE

2,025,174

SPINNING FRAME

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Application July 2, 1935, Serial No. 29,492

12 Claims. (Cl. 118—5)

This invention relates to spinning machines, and more particularly to that type in which a spindle rail or rails carrying the spindles and yarn receivers are moved vertically with respect to a fixed ring rail carrying the rings to effect the required traverse of the yarn on the yarn receivers.

The patent to Owen, No. 1,824,788, granted September 29, 1931, discloses power driven means brought into operation at the conclusion of the spinning operation when the yarn receivers or bobbins are filled to raise the spindle rail or rails with the full yarn receivers up to the doffing position and means which acts automatically when this position has been reached to disconnect the power driven means and also means to lock the spindle rail in the position to which it has been raised and thus prevent it form dropping back by gravity.

The patent to Owen, No. 2,019,794, granted Nov. 5, 1935, discloses means which enables the spindle rail, when it has thus been raised to a point where it cannot be released by the builder cam with the machine adjusted for the normal traverse, to be readily released and restored to the control of the builder cam for the next spinning operation.

In both of these prior disclosures it will be recognized that the builder chain is left slack when the spindle rail has been lifted to doffing or other predetermined raised position and before the spindle rail can be released from its raised position, the builder chain must first be wound up manually and the builder arm thus brought accurately into proper position relatively to the builder cam for beginning the next spinning operation.

The present invention has for its object to provide for automatically taking up the slack in the builder chain caused by the raising of the spindle rail and its load to doffing or other predetermined raised position so that when the spindle rail is released from this position for the succeeding spining operation, there will be no material drop of the spindle rail and it will pass at once under the control of the builder cam.

The present invention has for its further object to present a construction of spinning frame in which, after the spindle rail has been brought to doffing position and the full yarn receivers have been removed and replaced with empty yarn receivers, all that the operative has to do is to release the spindle rail from its raised position and start the frame in operation, whereupon the succeeding spinning operation will commence with the parts all in proper operative relation.

The nature and objects of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

As the general construction and operation of a spinning frame of the type in which a preferred embodiment of the present invention is herein shown is well known and is further disclosed in the aforesaid patents, and also in the patent to Owen, No. 1,842,565, granted January 26, 1932, it is only necessary herein to illustrate and describe those features of the spinning frame with which the present invention is particularly concerned.

In the drawings:

Fig. 1 is a front elevation of a portion of the spinning frame partially in cross section illustrating a preferred form of the present invention.

Fig. 2 is a detail in vertical cross section taken on the line 2—2 of Fig. 3.

Fig. 3 is a somewhat fragmentary view in transverse section taken on the line 3—3 of Fig. 1.

In the spinning frame illustrated, end frames such as 1 constitute the major supporting members of the frame and these end frames are connected by suitable girders 2, 3 and 4. The ring rails 5 and 6 extend longitudinally between and are secured at their ends to the end frames and support in the usual manner the spinning rings 7. These ring rails are also supported intermediate their ends by vertical guide rods 8 seated on the girders 2. The spindle rails 9 are mounted to move vertically and are guided upon the vertical guide rods 8 and, as shown in the aforesaid patents, are connected together by transverse connectors 10. The spindles having the whirls 11 by which they are driven and carrying the yarn receivers 12 are mounted upon the spindle rails and thus there is a unit consisting of the two spindle rails, the spindles and yarn receivers and the driving element which moves vertically upon the vertical guide rods 8. The spinning frame is usually a large piece of apparatus with a spindle rail at each side extending the entire length and carrying a large number of spindles. Consequently the unit which is thus moved vertically, especially when the yarn receivers or bobbins are filled with yarn, is very heavy and must be kept under control during its vertical movements. If it is allowed to drop at any stage of the operation, it not only throws the spinning frame out of adjustment but may break or injure some of the parts.

During the spinning operation the spindle rail and its load is under the control of a builder motion such as disclosed in the aforesaid patents and particularly in Patent No. 1,842,565. At the beginning of the operation the spindle rail is in its uppermost position and this mechanism acts in the usual manner to effect the required traverse of the yarn on the yarn receiver and also to effect the required gain by which the spindle rail is gradually lowered as the operation proceeds. For this purpose a builder cam 13 journalled on the end frame 1 is rotated from a suitable driven element of the spinning frame. Cooperating with the builder cam is the builder arm 14 shown as having an adjustable fulcrum connection 15 with the end frame of the type shown in the aforesaid Patent No. 1,842,565. The builder arm carries a follower, in this case a roll 16, engaging the face of the builder cam 13. The builder arm is provided at its end with a winding drum for a builder chain 17 connected to the spindle rail and this drum is rotated in the direction to unwind or let off the builder chain by a worm 18 journalled in the end of the builder arm and driven by a suitable pick motion.

By the term "builder chain" is to be understood any flexible connecting means which extends from the builder arm to the spindle rail for effecting the raising and lowering of the spindle rail. The construction illustrated is similar to that shown in the aforesaid patents and in this case the chain section 17 extends upward from the builder arm passes around and is secured to a pulley 19 on the transverse shaft 20. Near opposite ends of the shaft 20 are secured pulleys 21 and 22. Chain sections 23 pass around the pulleys 21 and 22 and are secured at their ends thereto and extend upwardly around idlers 24 mounted on the supports 25. These chain sections 23 in turn are extended by suitable flexible connections 26 over idlers 27 to the spindle rails. It will thus be seen that as the builder cam 13 rotates, the spindle rail will alternately be forced upward by the cam and be lowered by gravity under the guidance of the cam to effect the traverse and that as the pick motion acts to let out the builder chain from the builder arm, the spindle rail will correspondingly be lowered to effect the required gain.

The mechanisms for raising the spindle rail and its load or the entire spindle rail unit to raised or doffing position at the conclusion of the spinning operation, for holding it in this raised position, and for releasing it from raised position are preferably similar to those shown in the aforesaid patents and therefore require but a brief description. In this construction it will be understood that the shaft 28 is positively driven when the spinning frame is in operation. Upon this shaft 28 is secured a bevelled gear 29 meshing with a bevelled gear 30 upon the end of a vertical shaft mounted in the swinging bracket 31 journalled on the shaft 28. Adjacent its lower end the shaft in the bracket 31 has secured thereto a worm 32 adapted, as the bracket is swung, to be engaged with or disengaged from a worm wheel 33 secured to the shaft 20. A toggle mechanism, as also disclosed in the aforesaid patents, is provided for swinging the bracket 31 to bring the worm 32 into and out of engagement with the worm wheel 33. For this purpose a shaft 34 mounted alongside the end frame 1 has secured thereto a toggle arm 35 pivotally connected to a toggle arm 36 in turn pivotally connected to the lower end of the swinging bracket 31. A handle 37 is provided at one end of the shaft 34. The shaft 34 has also secured thereto an arm 38 in the path of an arm, the hub of which 39 is adjustably secured as by the set screw 40 to the shaft 20. This arm may thus be positioned on the shaft 20 so as to cause it to engage the arm 38 and rock the shaft, break the toggle and disconnect the worm 32 from the worm wheel 33 when the spindle rail has reached any desired or predetermined point of elevation.

The means for locking the spindle rail unit in its raised position and for manually releasing it therefrom are shown as of the construction disclosed in the aforesaid Patent No. 2,019,794.

The wide toothed ratchet wheel 41 is secured to the shaft 20. The pivot stud 42 having the eccentric section 43 and the handle 44 and rotatably mounted on the bracket 45 with its axis parallel to the shaft 20 and the pawl 46 composed of two sections with weighted tails and journalled on the eccentric section 43 of the pivot pin are all as described in said patent.

With the parts thus briefly described and as previousy disclosed in the aforesaid patents, it will be seen that when the operator desires to raise the spindle rail with the full yarn receivers or bobbins to elevated or doffing position, the handle 37 is swung to straighten the toggle 35, 36 and effect the engagement of the worm 32 with the worm wheel 33. When this is done, the worm wheel 33, being thus driven by power, acts to rotate the shaft 20 and through the connections 23 and 26 to raise the spindle rail unit. When the predetermined raised position has been reached, determined by the adjustment of the arm 38 on the shaft 20, this arm 38 acts to break the toggle and disconnect the power and the spindle rail is left locked in its elevated position by the pawl 46 engaging the ratchet wheel 41. But as the spindle rail has been rising, the builder chain 17 has been slackening and the builder arm has dropped downward away from the builder cam. Consequently before the spindle rail can be released from its raised position, this slack must be taken out of the builder chain and the follower of the builder arm brought into proper relation to the builder cam. If this is not done, the whole spindle rail unit will drop to a greater or less distance with injury to the spinning frame and its adjustment. Heretofore in order to prevent this occurrence it has been necessary for the operator, before releasing the spindle rail from its raised position, manually to wind up the lower end of the builder chain on the builder arm and take out the slack and bring the builder arm into raised position with its follower in engagement with the builder cam. If then an operator fails thus manually to take up the slack in the builder chain, or fails to take it up to the proper extent, or if the spindle rail is accidentally released without this being done, the spindle rail will drop and the injury to the frame occurs.

With the present invention the slack in the builder chain is automatically taken up as the spindle rail rises under the control of the power driven mechanism so that there is no opportunity for the spindle rail to drop whenever it may be released from elevated position and the operator is not required to pay any attention to the condition of the builder chain. Furthermore, when the doffing operation has been concluded and a new set of yarn receivers placed in position on the spindle rail, all that the operator has to do is to start the frame into operation,

release the spindle rail and the parts are in proper position for proceeding with the succeeding spinning operation.

In the preferred construction illustrated for embodying the invention, the builder arm 14 is recessed at its end to provide the bifurcations 47. In these bifurcations is journalled transversely the shaft 48. A collar 49 is adjustably secured by the set screw 50 to one end of this shaft and a drum 51 is secured to the opposite end. Between the bifurcations 47 a drum 52 is keyed to the shaft 48 at 53 and is provided on one face with the ratchet wheel 54. A pick wheel 55 in the form of a worm wheel is journalled on the shaft 48 adjacent the ratchet wheel 54 and engages the worm 13. This pick wheel 55 has pivotally mounted thereon at 56 a pawl 57 cooperating with the ratchet wheel 54 and held yieldingly in engagement therewith by a spring 58. The builder chain 17 extends down around and is secured at its end to the drum 52. A strap 59, by which term is to be included any suitable flexible connector, is secured to and extends around the drum 51 in a direction opposite to the builder chain 17 and carries at its lower end a weight 60.

The collar 49 is extended to form a stop 61 adapted to cooperate with a fixed stop 62 on the builder arm.

The pick motion for imparting gain to the traverse may be of any suitable construction. As herein shown, the shaft 63, to which the worm 13 is secured, has secured to its outer end the ratchet wheel 64. A rocker arm 65 is journalled midway its length on the shaft 63. This arm is weighted at one end at 66 and near its other end has pivoted thereto at 67 a pawl carrier 68 having a pawl 69 cooperating with the ratchet wheel 64. A rod 70 is pivoted at its lower end to the arm 65 adjacent the pawl carrier and extends upward through the flange 71 of a bracket 72 on the end frame 1 and this rod is provided above and below the flange 71 with collars 73 and 74 adjustably secured thereto. The arrangement is such that each time the builder arm rises in effecting the traverse, the collar 74 engages the flange 71, rocking the arm 65 against the action of the weight 66 and thus causing the pawl 69 to ride back over the teeth of the ratchet wheel 64. Then as the builder arm is depressed in effecting the traverse, the collar 73 engages the flange 71, causing the pawl to advance the ratchet wheel 64 and thus rotate the worm 13 and therethrough effect the required gain.

In the preferred construction embodying the invention, an auxilary cam 75 concentric with and spaced from the builder cam a distance slightly greater than the diameter of the cam follower 16 on the builder arm is provided. The builder cam 13 and this auxiliary cam 75 are desirably face cams formed by a groove in a single cam element. This auxiliary cam 75 acts, as hereinafter explained, to insure the complete taking up of the slack in the builder chain and is desirably employed. A stop 76, shown as a stud adjustably mounted in a vertical slot 77 in the end frame may be employed to limit the extreme downward movement of the builder arm when the builder chain is slack and should be employed if the auxiliary cam 75 is not utilized.

From the foregoing description of a simple and preferred form of construction embodying the invention, it will be seen that the pick wheel 55 journalled on the shaft 48 has its rotation with respect to the builder arm controlled entirely by the pick motion so that its only rotation is that required to effect the required gain in the traverse. The drum 52 to which the builder chain 17 is secured and the auxiliary drum 51 to which the strap 59 carrying the weight 60 is secured are both, it will be noted, secured to the shaft 48 and as the builder chain and the strap extend in opposite directions around the respective drums it will be seen that the weight is constantly tending to rotate the shaft 48 in a direction to wind the builder chain on its drum. Further, it will be noted that the pawl 57 and the cooperating ratchet wheel 54 carried the one by the pick wheel 55 and the other by the drum 52 constitute a clutch connection between the pick wheel and the drum so arranged as to act to permit the drum 52 to rotate with respect to the pick wheel in a direction to wind up the builder chain and to act to prevent this drum from rotating with respect to the pick wheel so as to unwind the builder chain therefrom.

It will thus be seen that if in the operation of the spinning frame the builder chain becomes slack that slackness is at once taken up by the action of the weight 60 rotating the drum 52 with respect to the pick wheel in the builder chain winding direction.

When the builder chain tends to slacken rapidly as in the case when the spindle rail is raised by power up to doffing position the weight 60, which is necessarily of a limited character because always carried by and moving with the builder arm may not have sufficient force to take up the builder chain completely or take up the final increment of slackness. In order to secure the complete taking up of the slackness in the builder chain, the auxiliary cam 75 is provided. Immediately the spindle rail begins to rise, the builder arm is removed from the control of the cam 13 and the follower 16 rests upon this auxiliary cam. This gives a vibrating movement to the builder arm and enables the weight 66 to take up completely the slack in the builder chain.

Since with the present invention the object is to maintain the builder chain tight, and since when the spindle rail is to be raised to doffing or other raised position it is being moved by power, preferably obtained from the operation of the spinning frame, and since the builder cam is also being driven by the operation of the spinning frame, it follows that a point would be reached where the builder cam would come into action to depress the builder arm with the builder chain tight and thus a smash would result. In order to prevent this, means are provided for limiting the action of the slack taking up means for the builder chain to an extent which will prevent a tight builder chain if the builder cam engages the cam follower and acts to depress the builder arm with the spindle rail locked or held in fixed position. It is for this purpose that the cooperating stops, 61 adjustable on the shaft 48 and 62 fixed on the builder arm, are provided. These cooperating stops are carefully adjusted so that the weight 66 cannot act to take up slack in the builder chain to such an extent as to produce a smash. This adjustment may be made by bringing the spindle rail to its uppermost position, then bringing the follower 16 into contact with the high point of the builder cam, then adjusting the stops so that they engage with the builder chain tight.

It will thus be seen that after the required adjustments have been made, all that the operator has to do at the conclusion of a spin-

ning operation when the yarn receivers or bobbins are full is to operate the handle 37, thus effecting the connection of the power drive to the shaft 20. The spindle rails, spindles and yarn receivers then move by power to the required doffing or raised position and the slack in the builder chain is automatically taken up. When the spindle rail reaches a predetermined raised position, the arm 38 acts to disconnect the power and the spindle rail is locked in raised position by the pawl 46 with the builder chain tight or without slack. At the conclusion of the doffing operation and after the new set of yarn receivers has been placed in position and after a bunch has been formed thereon if required, the operator moves the handle 44, withdrawing the pawl 46, and the spindle rail passes at once under the control of the builder cam and the succeeding spinning operation proceeds, all without any danger of the spindle rail dropping and without any attention being required from the operator to the position of the builder arm with respect to the builder cam.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. The combination in a spinning frame having a pick motion of a pivotally mounted builder arm, a shaft journalled in the bulider arm, a pick wheel journalled on the shaft and having its rotation with respect to the builder arm controlled by the pick motion, a drum for the builder chain secured to the shaft, means constantly tending to rotate the shaft in the direction to wind the builder chain on its drum, and a clutch connection between the pick wheel and the drum acting to permit chain winding and to prevent chain unwinding rotation of the drum with respect to the pickwheel.

2. The combination in a spinning frame having the construction defined in claim 1, together with cooperating stops on the shaft and on the builder arm acting to limit the rotation of the shaft in the builder chain winding direction.

3. The combination in a spinning frame having a pick motion of a pivotally mounted builder arm, a cam follower on the builder arm, a rotatable builder cam engaging the cam follower and acting to depress the builder arm in effecting the traverse, a shaft journalled in the builder arm, a pick wheel journalled on the shaft and having its rotation with respect to the builder arm controlled by the pick motion, a drum for the builder chain secured to the shaft, means constantly tending to rotate the shaft in the direction to wind the builder chain on its drum, a clutch connection between the pick wheel and the drum acting to permit chain winding and to prevent chain unwinding rotation of the drum with respect to the pick wheel, and an auxiliary cam eccentric with and spaced from the builder cam a distance slightly greater than the diameter of the cam follower acting to support the builder arm when the builder chain is slackened to disengage the cam follower from the builder cam and by vibrating the builder arm to assist the action of the means tending to rotate the shaft.

4. The combination of a spinning frame having the construction defined in claim 3, together with cooperating stops on the shaft and on the builder arm acting to limit the rotation of the shaft in the builder chain winding direction to an extent which will prevent the builder cam acting to depress the builder arm with the builder chain tight.

5. The combination in a spinning frame having a pick motion of a pivotally mounted builder arm, a shaft journalled in the builder arm, a pick wheel journalled on the shaft and having its rotation with respect to the builder arm controlled by the pick motion, a drum for the builder chain secured to the shaft, means constantly tending to rotate the shaft in the direction to wind the builder chain on its drum, and a pawl and cooperating ratchet wheel carried the one by the pick wheel and the other by the drum and acting to permit chain winding and to prevent chain unwinding rotation of the drum with respect to the pick wheel.

6. The combination in a spinning frame having the construction defined in claim 5, together with cooperating stops on the shaft and on the builder arm acting to limit the rotation of the shaft in the builder chain winding direction.

7. The combination in a spinning frame having a pick motion of a pivotally mounted builder arm, a shaft journalled in the builder arm, a pick wheel journalled on the shaft and having its rotation with respect to the builder arm controlled by the pick motion, a drum for the builder chain secured to the shaft, a second drum secured to the shaft, a strap secured to and extending around the second drum in a direction opposite to the builder chain, a weight on the shaft constantly tending to rotate the shaft in the direction to wind the builder chain on the drum, and a clutch connection between the pick wheel and the builder chain drum acting to permit chain winding and to prevent chain unwinding rotation of the builder chain drum with respect to the pick wheel.

8. The combination in a spinning frame having the construction defined in claim 7, together with cooperating relatively adjustable stops on the shaft and on the builder arm acting to limit the rotation of the shaft in the builder chain winding direction.

9. A spinning frame comprising a vertically movable spindle rail, a pivotally mounted builder arm having a cam follower thereon, a rotatable builder cam engaging the cam follower and acting to depress the builder arm in effecting the traverse, a builder chain connecting the builder arm and spindle rail, a pick motion acting gradually to let out the builder chain to effect the gain, an auxiliary cam concentric with and spaced from the builder cam a distance slightly greater than the diameter of the cam follower, means for raising the spindle rail to a predetermined position and locking it in said position, means acting automatically to take up the slack in the builder chain caused by the rise of the spindle rail, and means for limiting the action of the slack taking up means to an extent which will prevent a tight builder chain if the builder cam engages the cam follower and acts to depress the builder arm with the spindle rail in locked position.

10. A spinning frame comprising a plurality of cooperating spindles and rings, a fixed ring rail for the rings, a vertically movable spindle rail for the spindles, a builder motion including a pivotally mounted builder arm, a builder cam engaging the builder arm to effect the traverse, a shaft, flexible connections supporting the spindle rail extending around the shaft in one direction and secured thereto, a builder chain extending from the builder arm around the shaft in the opposite direction and secured thereto, the said builder motion acting to lower the spindle rail

during winding of the yarn masses on to the yarn receivers down to full yarn receiver position, power driven mechanism connectible to and disconnectible from the shaft and acting when connected thereto to rotate said shaft to raise the spindle rail, means acting automatically to disconnect the power driven mechanism from the shaft when the spindle rail has reached a predetermined raised position, means for locking the spindle rail in the raised position, means acting automatically to take up the slack in the builder chain extending to the builder arm caused by the rise of the spindle rail, means for limiting the action of the slack taking up means to an extent which will prevent a tight builder chain if the builder cam acts to depress the builder arm with the spindle rail in locked position, and means for releasing the locking means to permit the restoration of the spindle rail to the control of the builder motion.

11. A spinning frame in which power driven mechanism is connected to the spindle rail upon the completion of the winding of the yarn mass on the yarn receivers and when so connected acts to raise the spindle rail, spindles and full yarn receivers to a predetermined position and in which the spindle rail is then locked in said predetermined position comprising a pivotally mounted builder arm, a builder chain connecting the builder arm and the spindle rail, means acting automatically during the raising of the spindle rail by the power driven mechanism to take up the slack in the chain extending to the builder arm caused by the rise of the spindle rail, and means to limit the downward movement of the builder arm when the spindle rail is raised by the power driven mechanism.

12. A spinning frame in which power driven mechanism is connected to the spindle rail upon the completion of the winding of the yarn mass on the yarn receivers and when so connected acts to raise the spindle rail, spindles and full yarn receivers to a predetermined position and in which the spindle rail is then locked in said predetermined position comprising a pivotally mounted builder arm, a builder chain connecting the builder arm and the spindle rail, means acting automatically during the raising of the spindle rail by the power driven mechanism to take up the slack in the chain extending to the builder arm caused by the rise of the spindle rail, and means for limiting the action of the slack taking up means to an extent which will prevent a tight builder chain if the builder arm is depressed in the operation of the frame with the spindle rail in locked position.

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