Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 1

Fig. 2.

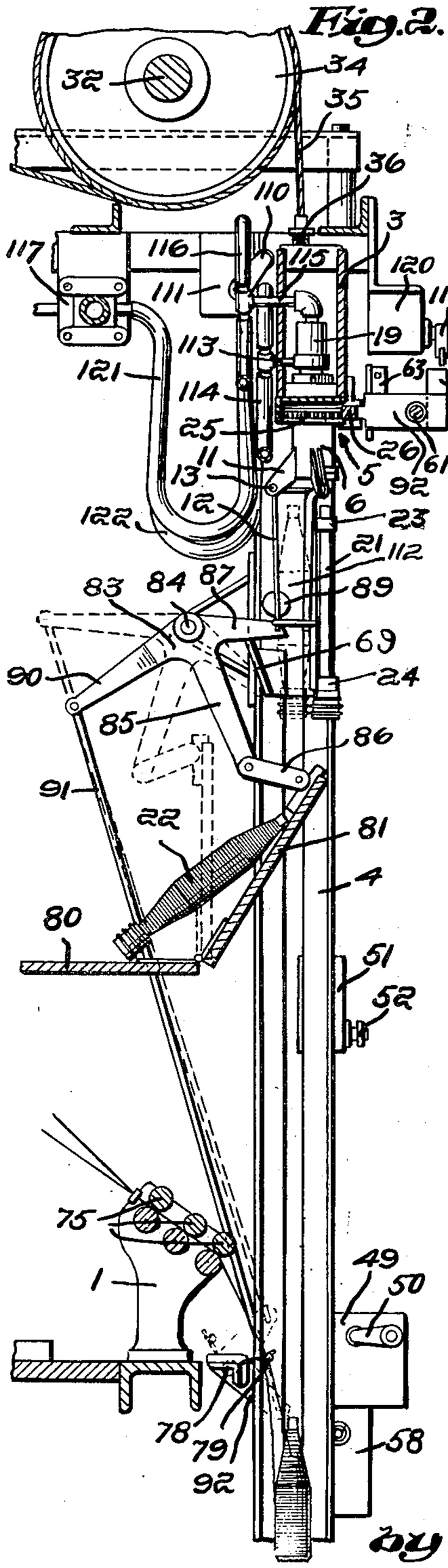
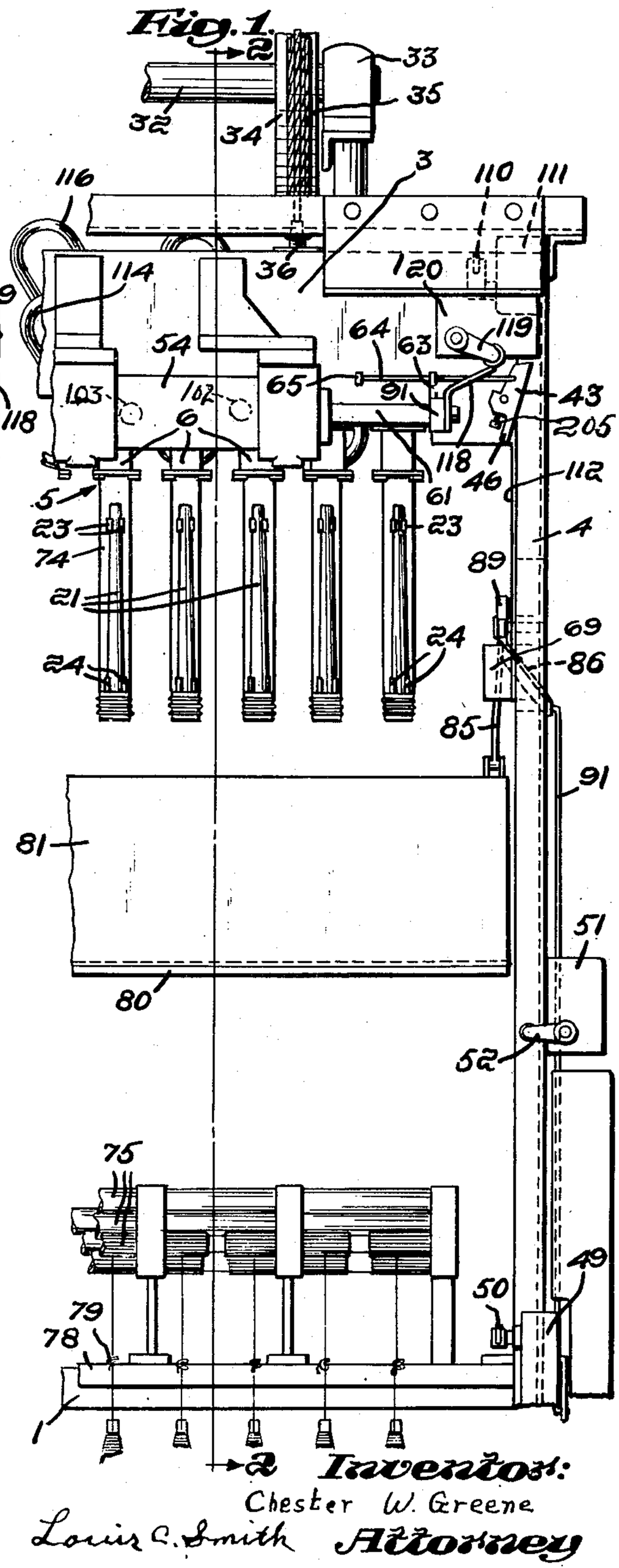


Fig. 1.



2 Inventors:
Chester W. Greene
By Louis C. Smith Attorney

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 2

Fig. 4.

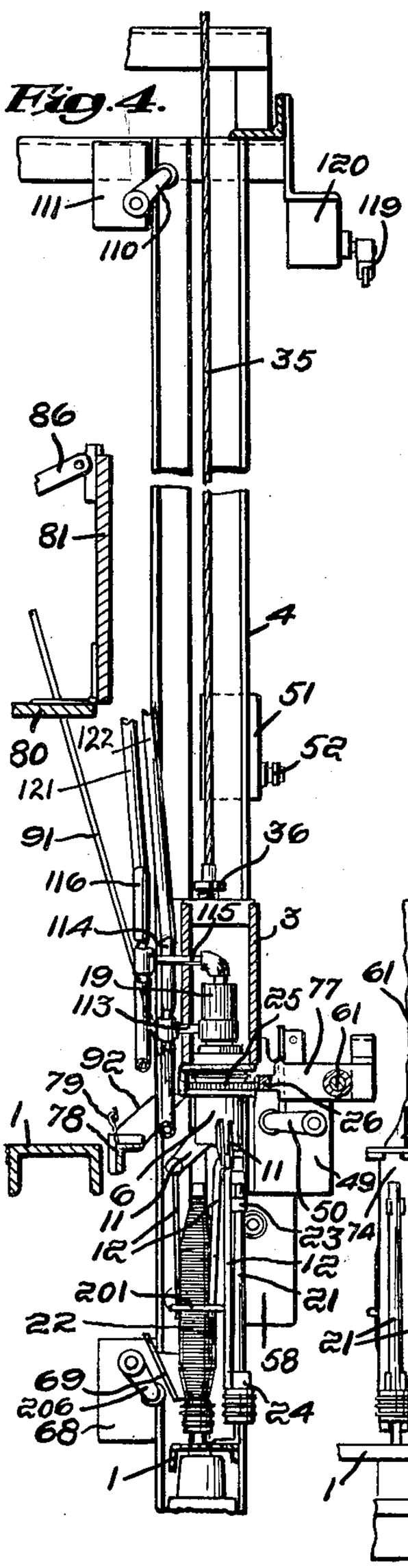


Fig. 3.

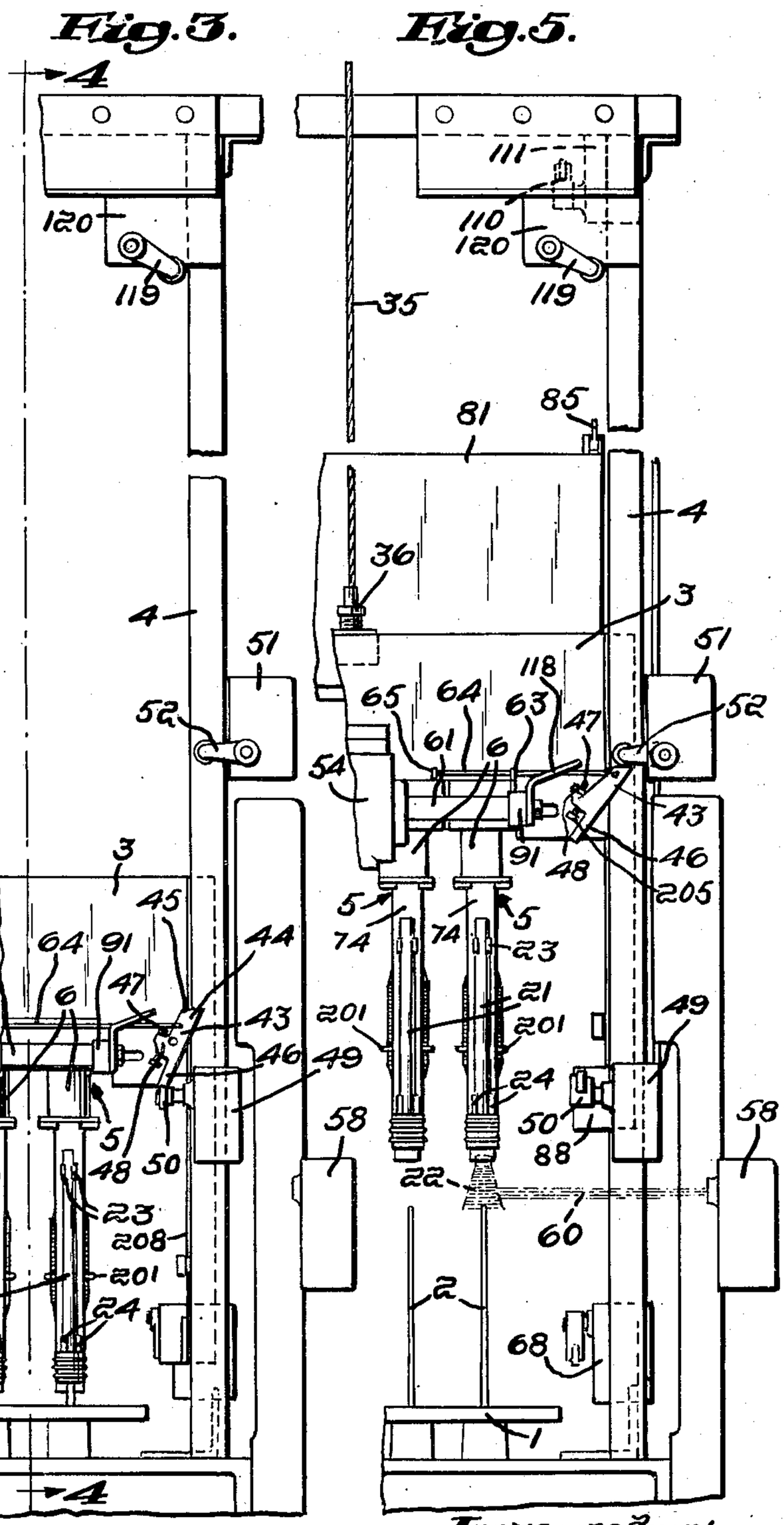


Fig. 5.

Inventor:
Chester W. Greene
Louis C. Smith
Attorney

By

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 3

Fig. 7.

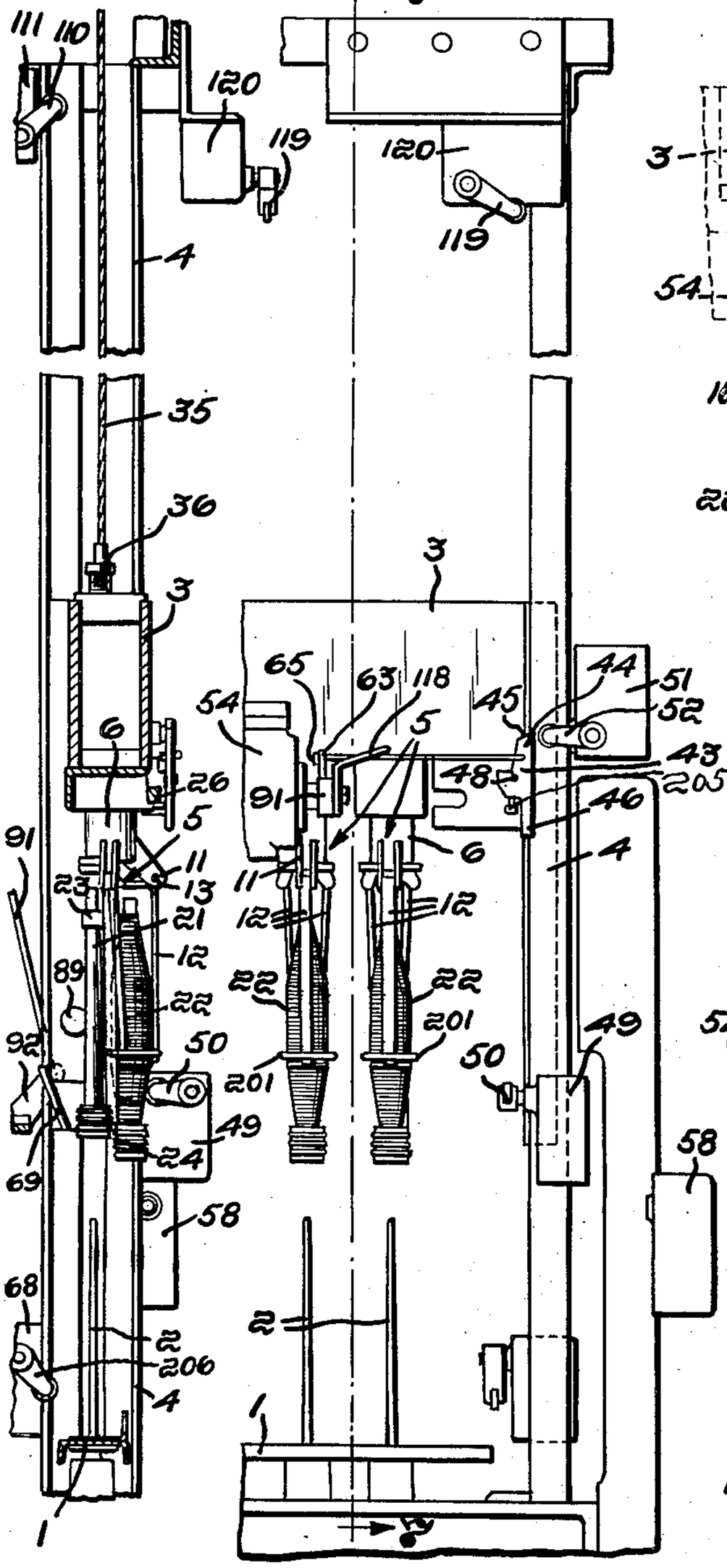
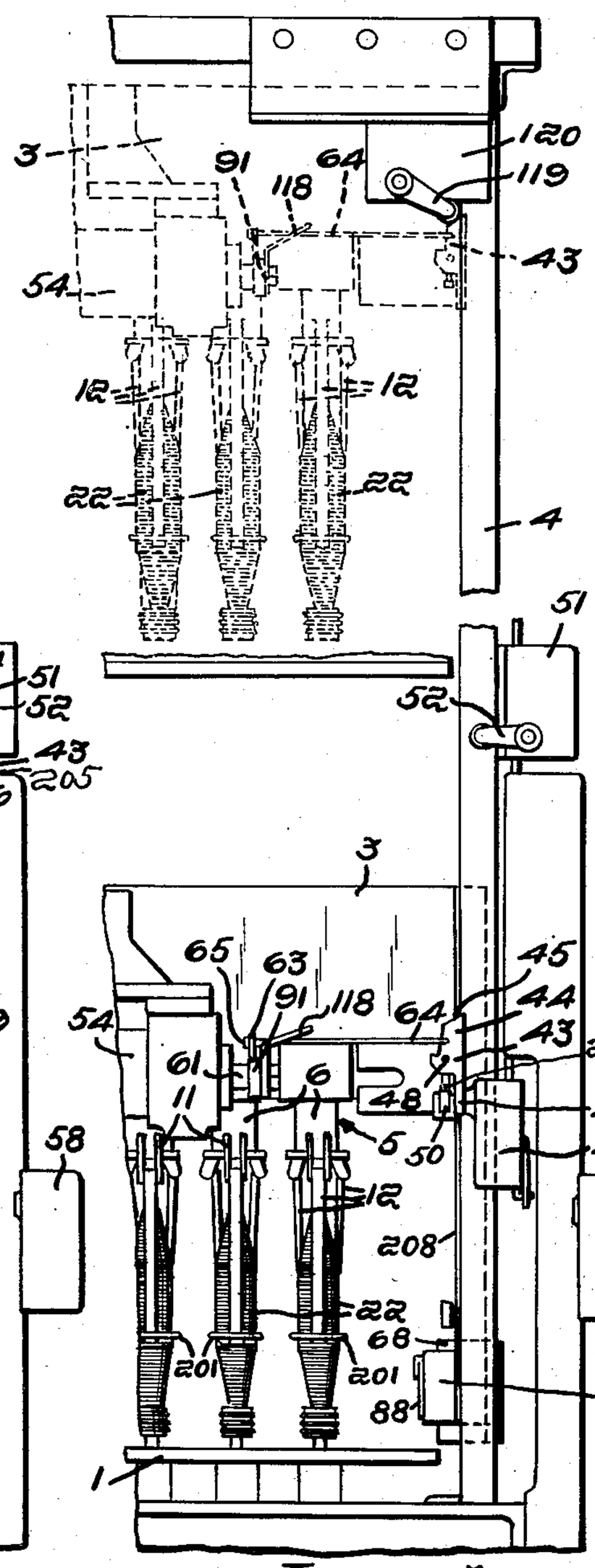


Fig. 6.

Fig. 8.



Inventor:
Chester W. Greene
Louis C. Smith
by Attorney

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 4

Fig. 9.

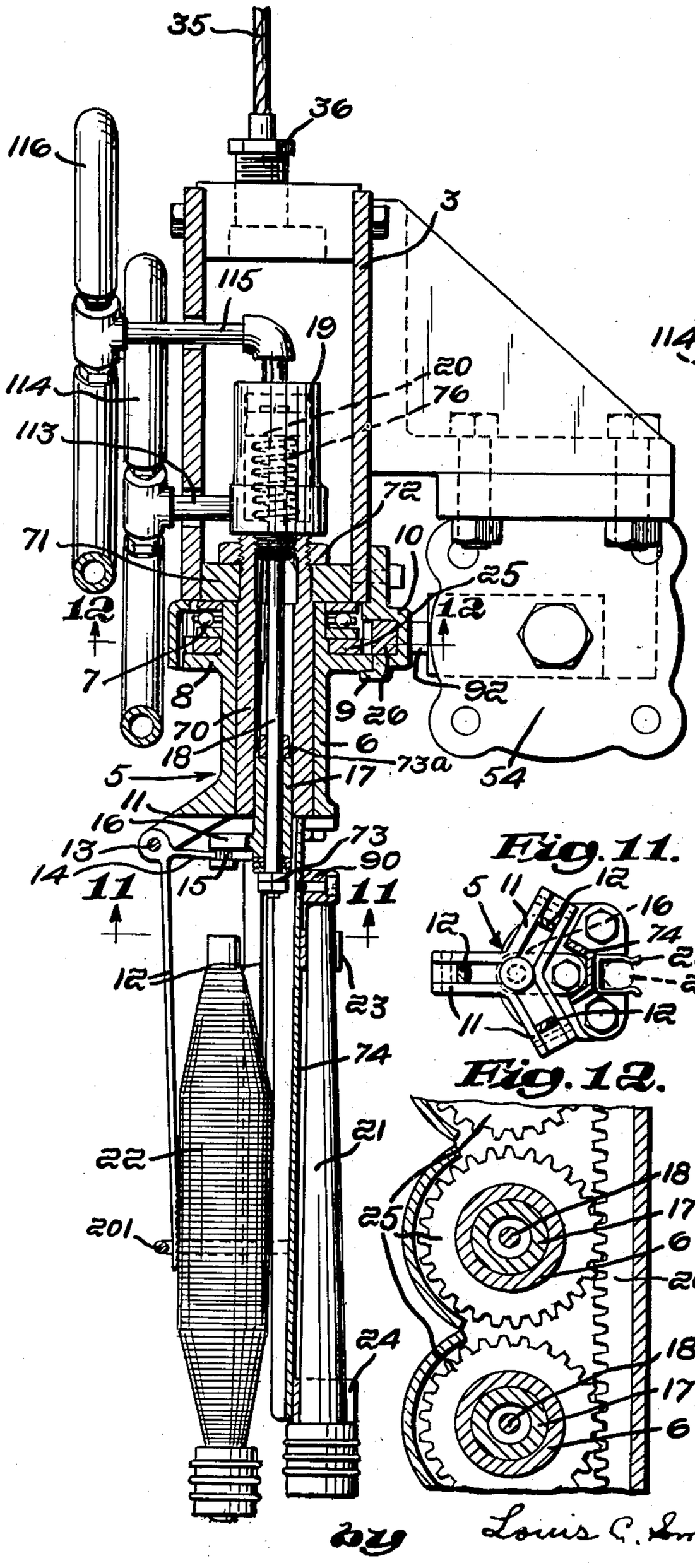


Fig. 10.

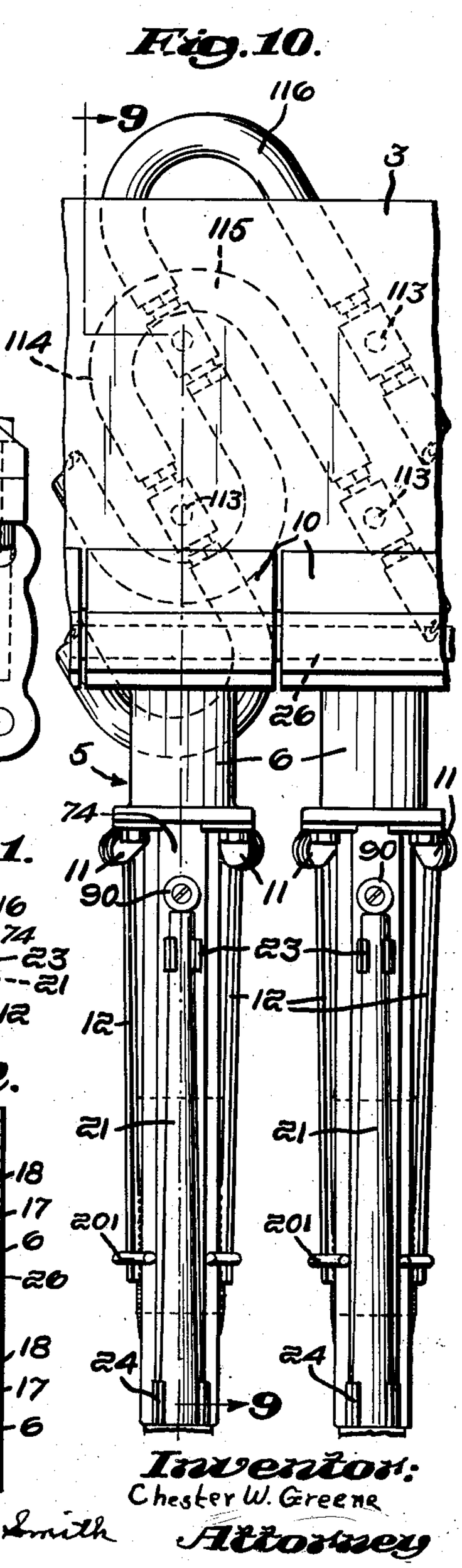


Fig. 11.

Fig. 12.

Inventor:
Chester W. Greene
By Louis C. Smith Attorney

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 5

Fig. 13.

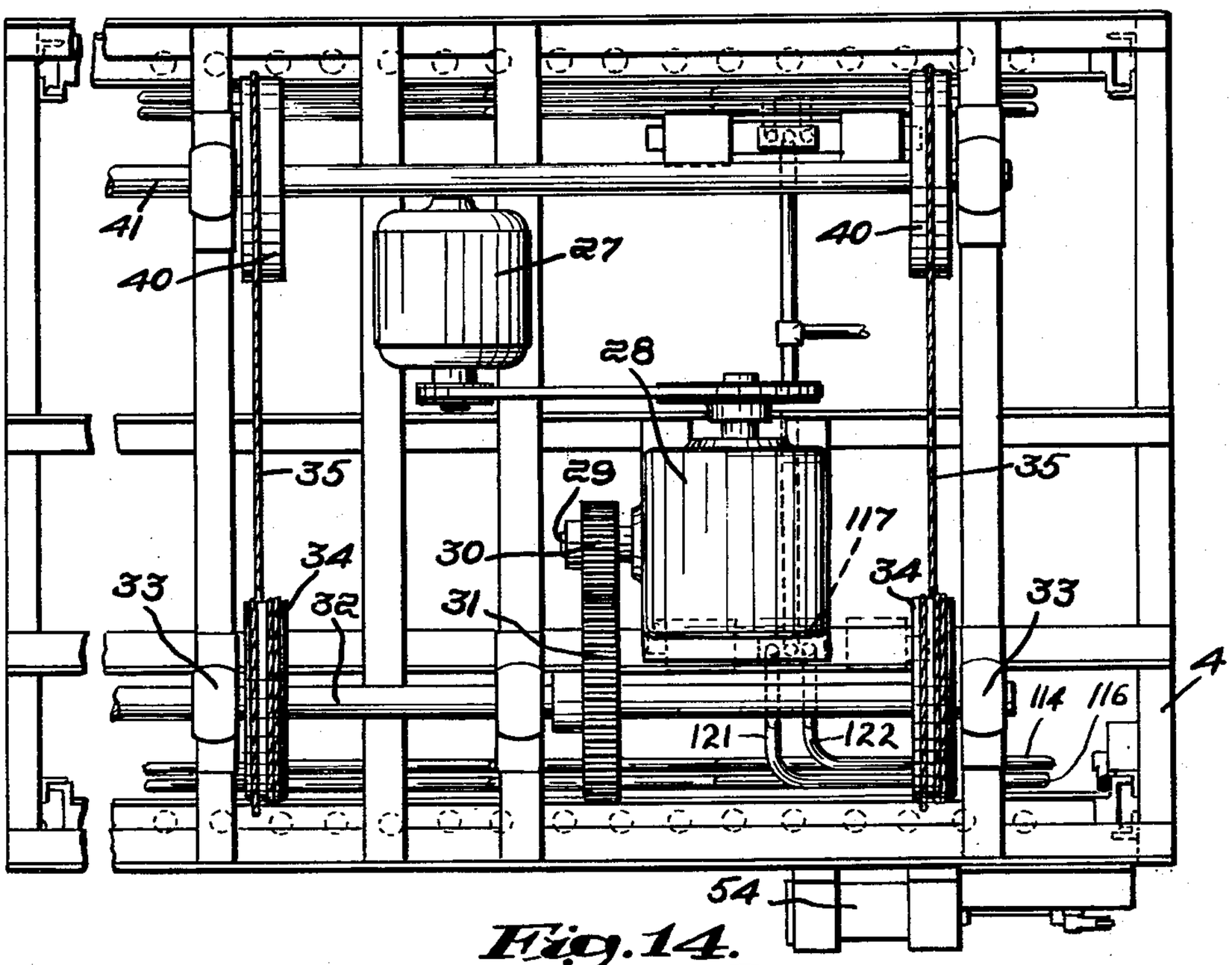
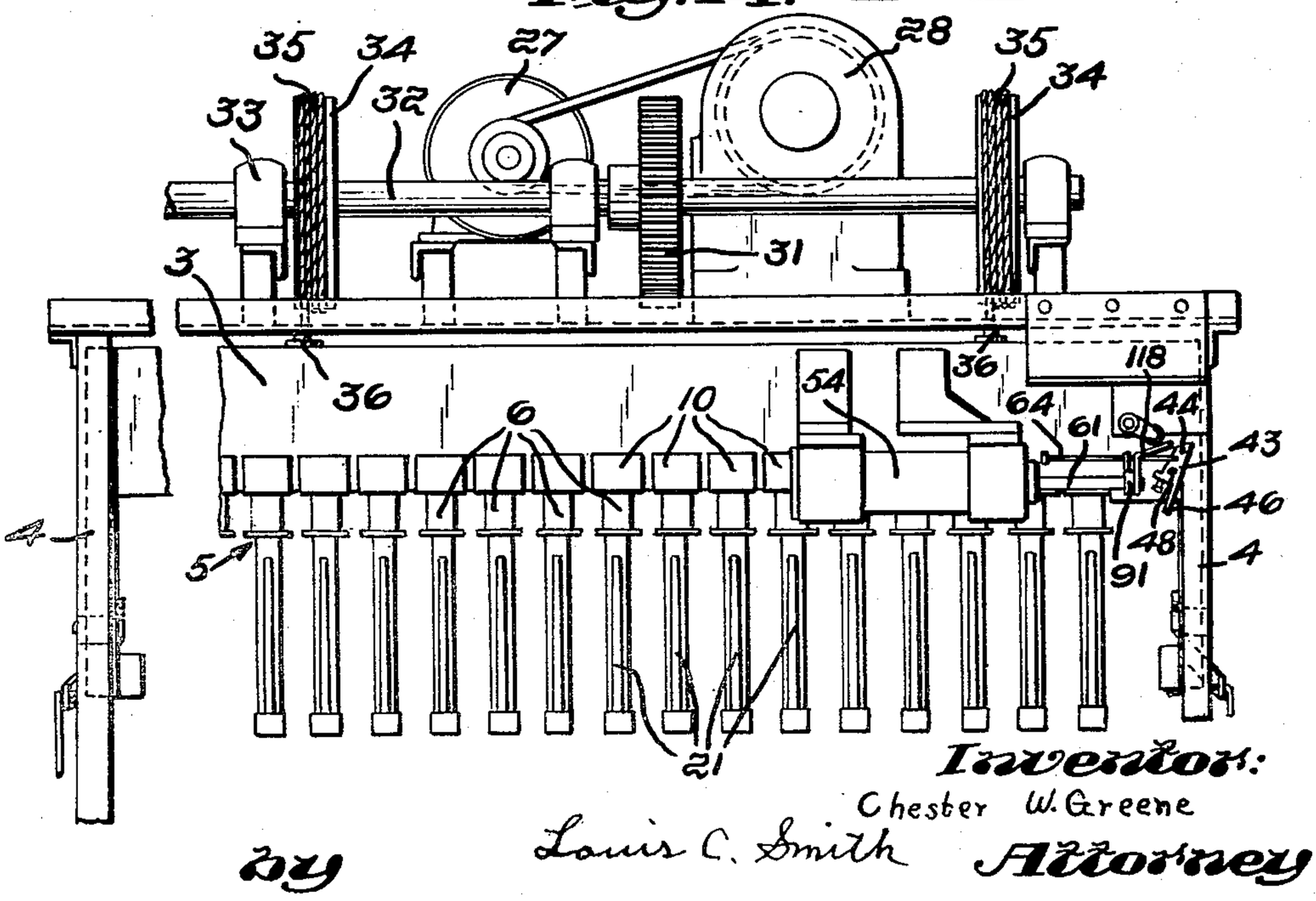


Fig. 14.



Inventor:
Chester W. Greene

By Louis C. Smith Attorney

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 6

Fig. 15.

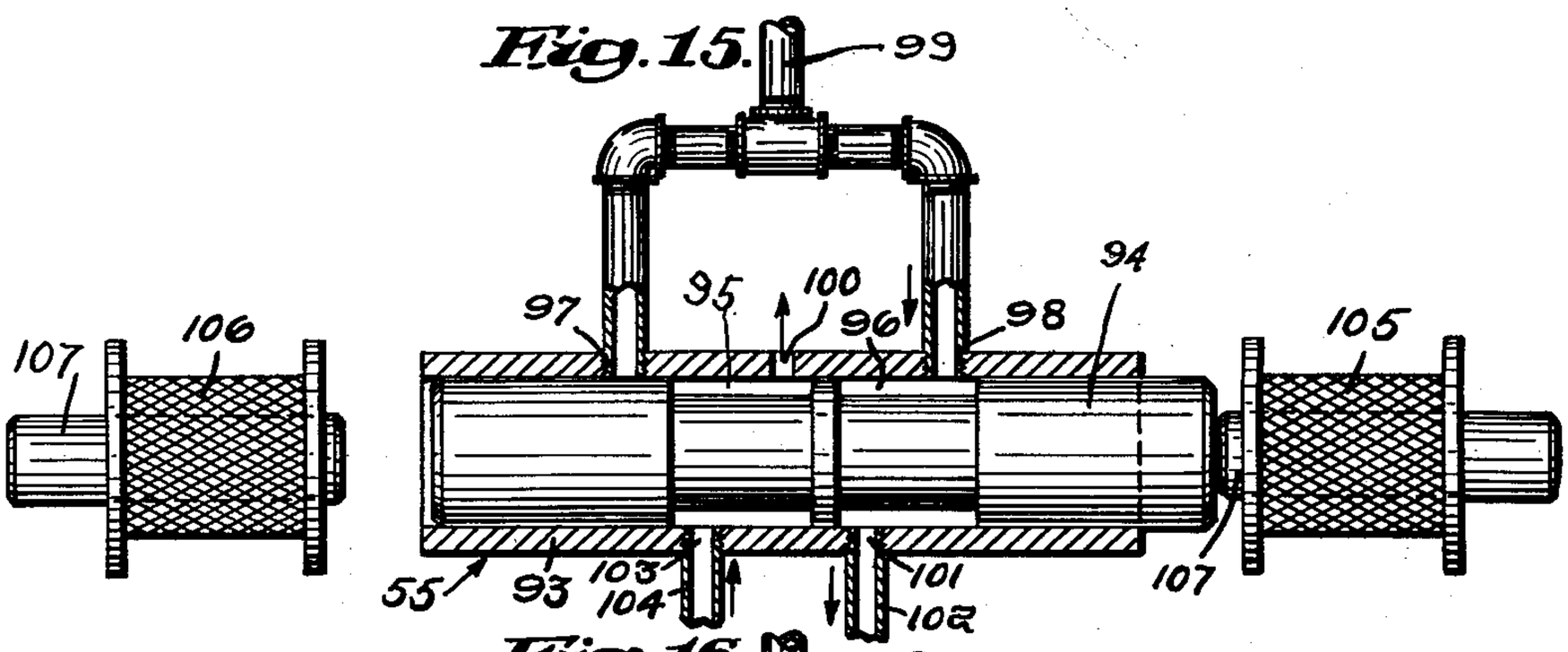


Fig. 16.

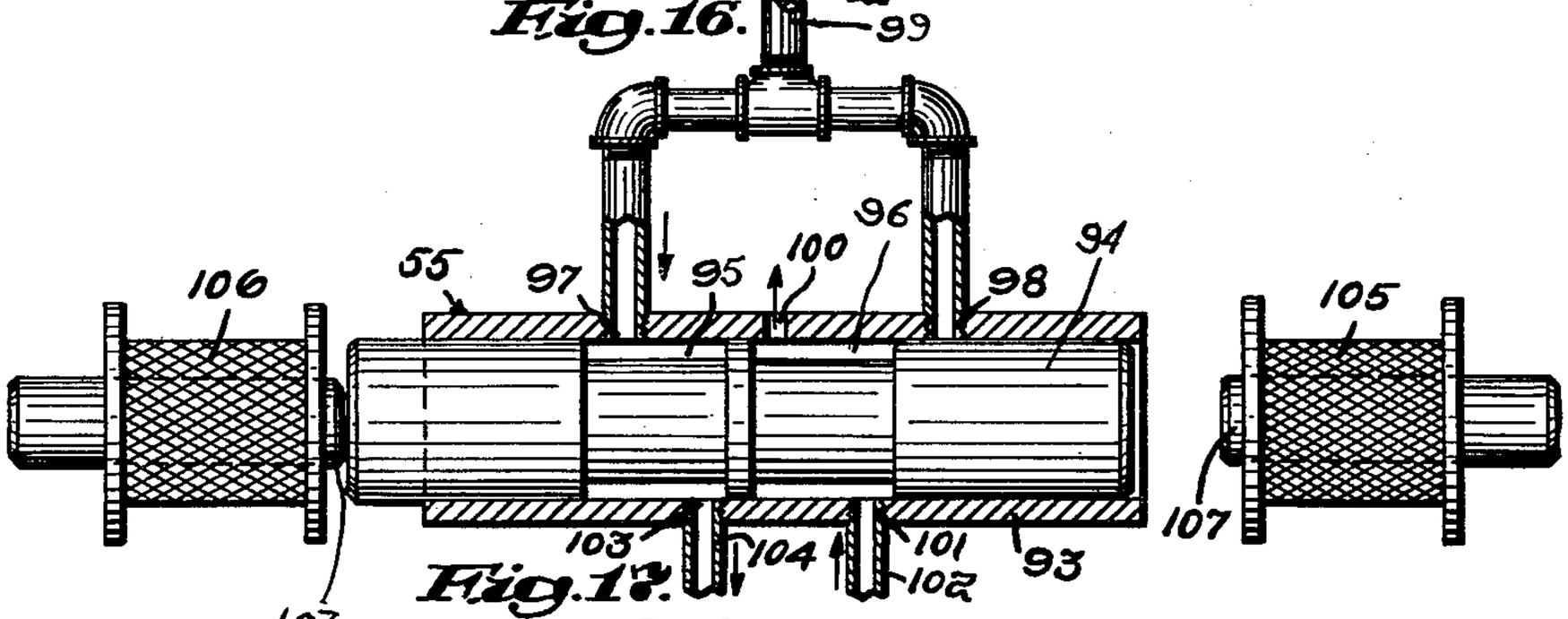
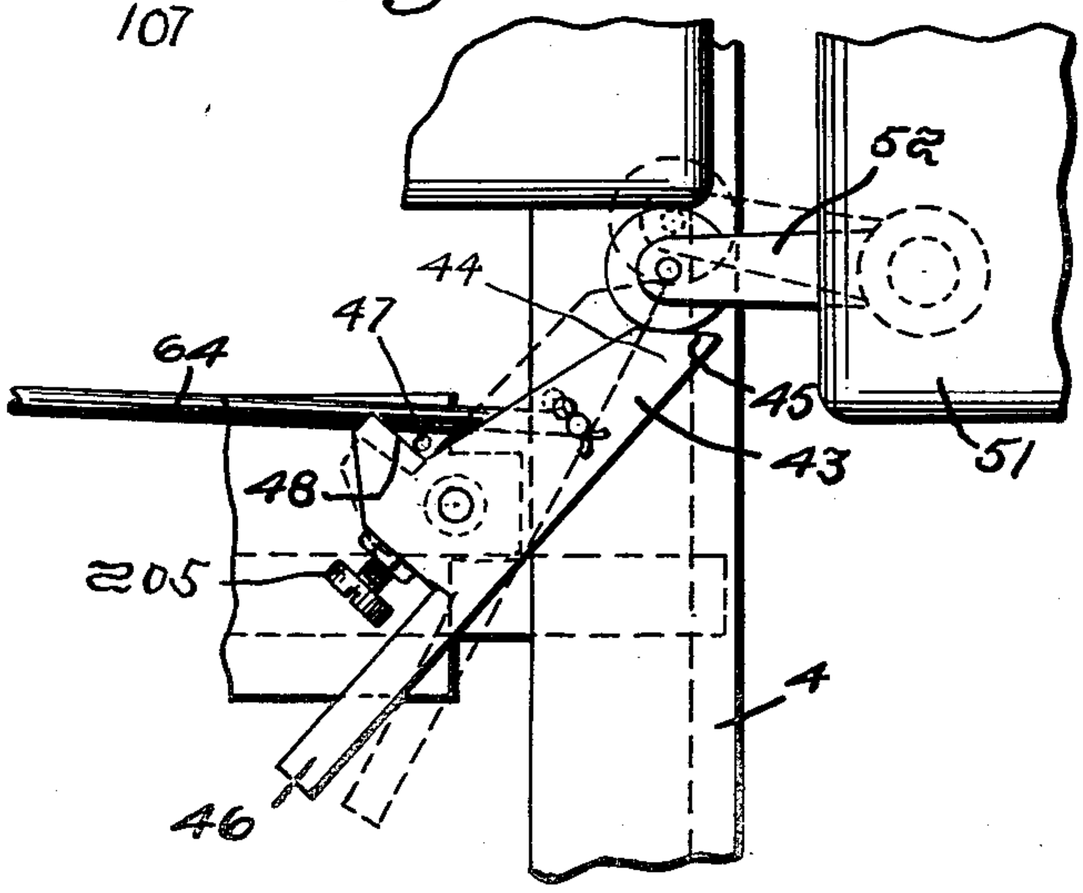


Fig. 17.



Inventor:
Chester W. Greene
By Louis C. Smith
Attorney

Feb. 17, 1953 C. W. GREENE 2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Filed Jan. 12, 1952 7 Sheets-Sheet 7

Fig. 19.

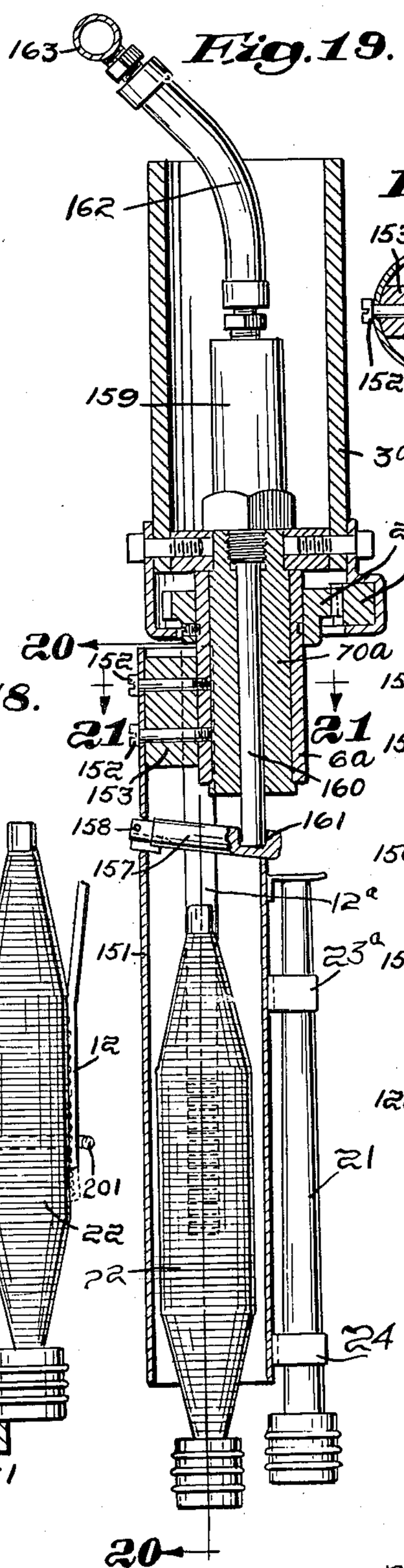


Fig. 21.

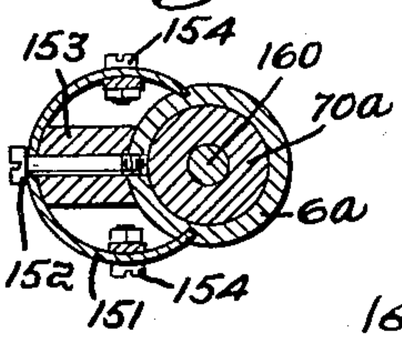


Fig. 20.

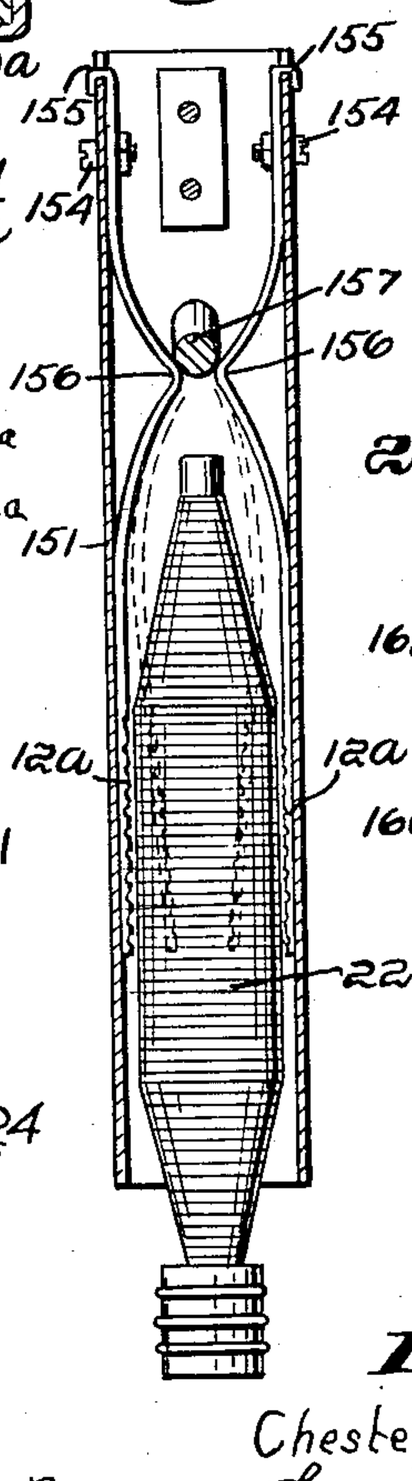


Fig. 23.

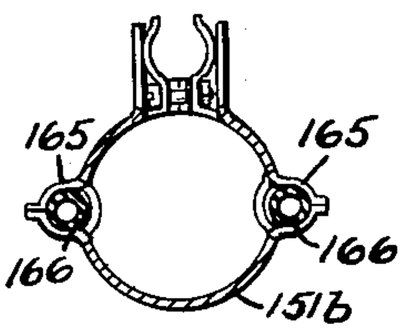


Fig. 22.

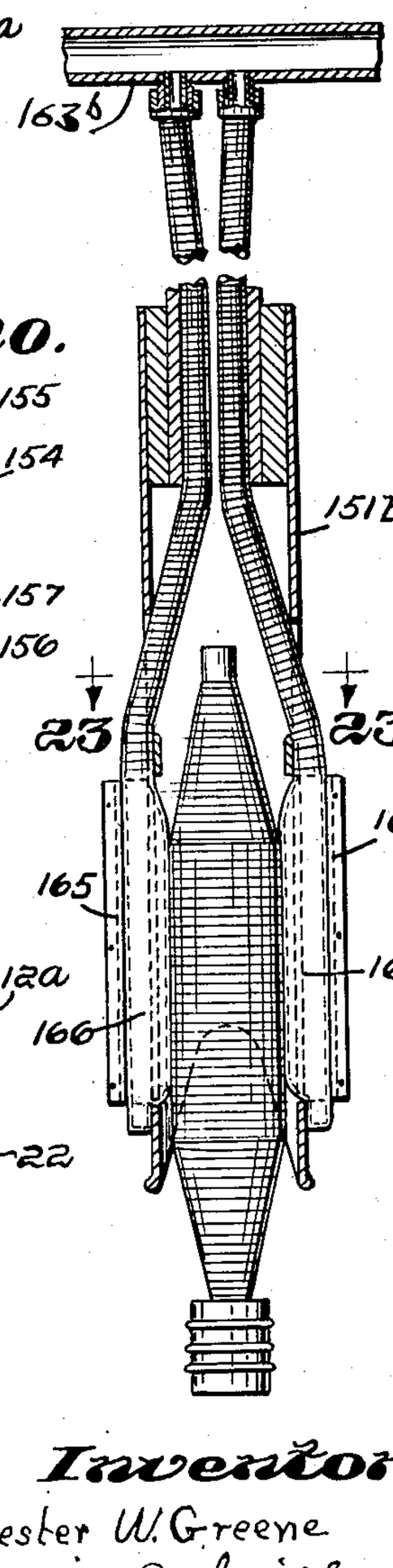
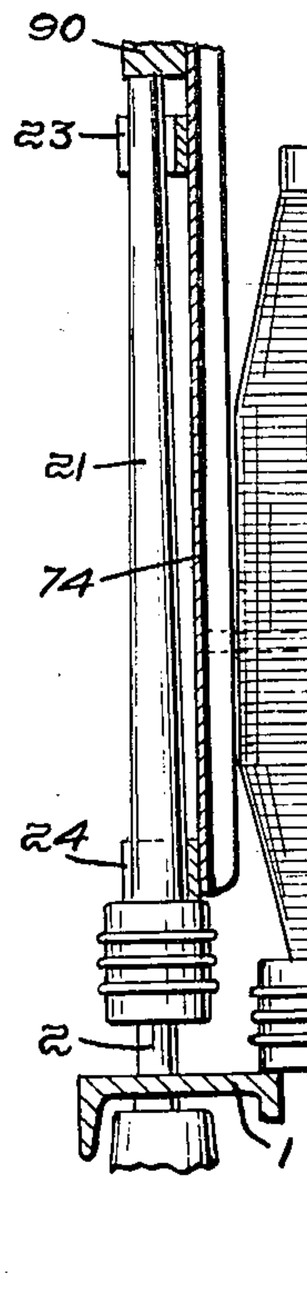


Fig. 18.



Inventors:
Chester W. Greene
Louis C. Smith
By
Attorney

Patented Feb. 17, 1953 2,628,468

UNITED STATES PATENT OFFICE

2,628,468

DOFFING MECHANISM FOR SPINNING MACHINES

Chester W. Greene, Lynn, Mass., assignor, by mense assignments, to Naumkeag Steam Cotton Company, Salem, Mass., a corporation of Massachusetts

Application January 12, 1952, Serial No. 266,135

17 Claims. (Cl. 57—52)

1

This invention relates to doffing mechanism for spinning machines and it has for one of its objects to provide a doffing mechanism by which the filled bobbins on all the spindles of a spinning machine will be doffed simultaneously and replaced by empty bobbins which are also applied to all the spindles of the spinning machine simultaneously.

A further object of the invention is to provide a doffing mechanism which includes means responsive to an incomplete doffing operation, that is, an operation which fails to remove the filled bobbins from all of the spindles, and which prevents empty bobbins from being placed on the spindles so long as a filled bobbin remains on any spindle.

Further objects of the invention are to provide various improvements in doffing machines which will be more fully hereinafter set forth.

Inasmuch as the invention relates to the doffing mechanism, I have shown in the drawings only fragmentary portions of the spinning machine, a sufficient part of the latter being illustrated to disclose the operation of the doffing mechanism.

Fig. 1 of the drawings shows a fragmentary front view of a doffing mechanism embodying the invention with the doffing heads in their normal raised position.

Fig. 2 is a section on the line 2—2, Fig. 1.

Fig. 3 is a fragmentary front view of the doffing mechanism showing the second stage of the operation in which the doffing heads are in their lowered position with the filled bobbins clamped therein.

Fig. 4 is a section on the line 4—4, Fig. 3.

Fig. 5 is a view similar to Fig. 3 showing the third stage of the operation in which the doffing heads have been raised to remove the filled bobbins from the spindles.

Fig. 6 is a view similar to Fig. 5 but showing the fourth stage of the operation in which the doffing heads have been turned about their vertical axes to place the empty bobbins carried thereby in axial alinement with the spindles.

Fig. 7 is a section on the line 7—7, Fig. 6.

Fig. 8 is a fragmentary view similar to Fig. 6 but showing the fifth stage of operation in which the empty bobbins have been placed on the spindles.

Fig. 9 is an enlarged section through one of the doffing heads on the line 9—9, Fig. 10.

Fig. 10 is a front view of the doffing head.

Fig. 11 is a section on the line 11—11, Fig. 9.

Fig. 12 is a section on the line 12—12, Fig. 9.

2

Fig. 13 is a plan view illustrating the means for operating the doffing mechanism.

Fig. 14 is a front view of Fig. 13.

Figs. 15 and 16 are views illustrating an air valve such as is used to control the indexing operation and that of the bobbin clamps.

Fig. 17 is a fragmentary view of the switch pawl and one of the switches by which certain phases of the doffing operation are controlled.

Fig. 18 is a fragmentary view illustrating the operation of seating an empty bobbin on its spindle.

Fig. 19 is a vertical sectional view showing a different form of doffing head from that shown in Figs. 1 to 10.

Fig. 20 is a section on line 20—20, Fig. 19.

Fig. 21 is a section on line 21—21, Fig. 19.

Fig. 22 is a vertical fragmentary sectional view illustrating still another form of doffing head.

Fig. 23 is a section on the line 23—23, Fig. 22.

As stated above, inasmuch as the invention relates to the doffing mechanism for a spinning machine, only such portion of a spinning machine is illustrated herein as is necessary to give a clear understanding of the operation of the doffing mechanism. In the drawings a portion of the frame of the spinning machine is indicated at 1, and 2 indicates the spindles of said spinning machine and 75 indicates the drafting rolls.

The doffer herein illustrated comprises a vertically movable support 3 in the form of a beam which extends lengthwise of the spinning frame and is located above the row of spindles 2, said beam being guided in its vertical up and down movement by suitable framework 4 located adjacent the spinning machine frame.

Mounted in the beam 3 are a plurality of doffing heads indicated generally at 5, there being one doffing head for each spindle 2 of the spinning machine.

Each doffing head is mounted in the beam 3 for turning movement about a vertical axis and is provided on one side of said axis with bobbin-clamping means for clampingly engaging a filled bobbin on one of the spindles of the spinning machine and on the other side of said axis with clips for removably holding an empty bobbin.

Each doffing head is formed with a tubular body portion 6 which is mounted for turning movement about a hollow bearing support 70 (see Fig. 9) that depends from the beam 3, the upper part of said support 70 extending through the bottom member 71 of the beam and being secured thereto by the nut 72. The tubular body

6 is provided with a flange 8 and suitable thrust ball bearings 7 are situated between the flange and the bottom of the beam 3. Said beam 3 is provided with brackets 10, one for each doffing head, each bracket having an inturned lip 9 which underlies the edge of the flange 8. Each doffing head is mounted for turning movement about the axial line of its body 6, and as stated above on one side of said vertical axis it is provided with bobbin-clamping means adapted to clampingly engage a filled bobbin on the corresponding spindle of the spinning machine, and on the other side of said vertical axis it is provided with clips to releasably hold an empty bobbin.

In the construction shown in Figs. 1 to 11, the bobbin-clamping means for each doffing head is in the form of a plurality (three being illustrated herein) of depending clamping fingers 12 which are adapted to embrace a filled bobbin on a spindle and clampingly engage said bobbin. Each clamping finger 12 is pivoted at 13 to an arm 11 which extends radially from the body 6, the pivotal mounting of the clamping fingers 12 permitting them to be moved inwardly to have a clamping engagement with a filled bobbin 22 or to be moved outwardly to relieve the clamping engagement and permit the bobbin to be discharged. For this purpose the upper end of each clamping finger 12 has the inwardly directed arm 14, the end of which occupies a groove 15 with which an arm 16 is provided, said arm 16 being rigid with a sleeve 17 which slidingly fits within the bore of the support 70.

Mounted on the upper end of the support 70 of each doffing head is an air cylinder 19 containing a piston 20, the piston rod 18 of which extends through the support 70 and through the sleeve 17, said sleeve being clamped to the piston rod between a collar 73*a* fast thereon and a clamping nut 73 screw-threaded to the lower end thereof. The piston 20 of each doffing head is normally acted on by a spring 76 which is situated between the piston 20 and the lower end wall of the cylinder 19 and which, therefore, applies an upward yielding pressure to the piston by which the clamping fingers will be yieldingly held in clamping position. Means hereinafter described are provided for admitting at the proper time compressed air to the under side of the piston 20 for the purpose of causing the clamping fingers to apply a firm clamping pressure against a filled bobbin 22 which is embraced thereby, and also to apply air pressure at the proper time to the top of the piston for forcing the piston rod downwardly thereby relieving the clamping pressure and holding the clamping fingers open. The opening movement of the clamping fingers 12 of each doffing head is limited by a ring member 201 carried by the clip-supporting member 74 secured to and depending from the tubular body 6, which ring member encircles the lower ends of the fingers 12. This mechanism for thus applying and relieving the clamping pressure of the clamping fingers on the filled bobbin will be referred to hereinafter.

The depending clip-supporting member 74 of each doffing head carries two pairs of clips 23, 24 for holding an empty bobbin 21 as best seen in Figs. 9 and 10.

It has been stated that the doffing heads are mounted in the beam 3 for turning movement about their vertical axes and the construction is such that when each doffing head is in the position shown in Fig. 9, the clamping fingers 12 thereof are in axial alinement with the corresponding spindle of the spinning machine, while when the doffing head is turned through 180°, the empty bobbin 21 carried thereby will be brought into axial alinement with said spindle.

When, therefore, the doffing heads are in the position shown in Fig. 2 and assuming that the beam 3 is in an elevated position, a downward movement of the beam will carry the clamping fingers 12 of each doffing head downwardly over a filled bobbin on the corresponding spindle of the spinning machine so that said filled bobbin 22 will be embraced by the fingers as also shown in Fig. 9.

When, however, the doffing heads have been turned 180° from the position shown in Fig. 2, the empty bobbin carried by each doffing head will be brought into a position in axial alinement with the corresponding spindle of the spinning machine.

Normally the beam 3 is in an elevated position such as shown in Figs. 1 and 2, in which position the doffing heads are located above the spindles 2, and each doffing head is positioned about its axis so that the clamping fingers 12 are on the inside thereof and are axially alined with the corresponding spindle as shown in Fig. 2.

The beam 3 remains in this elevated position while the spinning operation proceeds and until the bobbins on the spinning machine have been adequate filled. During this time the attendant places an empty bobbin 21 in the clips 23, 24 of each doffing head as indicated in Figs. 1 and 2.

When the spinning machine has been operated for a sufficient length of time to fill the bobbins and to require a doffing operation, the attendant will set the doffing mechanism in operation and the beam 3 with its doffing heads 5 will then move downwardly from its elevated position shown in Figs. 1 and 2 to a low position shown in Figs. 3 and 4. As the beam 3 approaches its low position the clamping fingers of each doffing head will move over a filled bobbin 22 on the corresponding spindle, as shown in Fig. 9.

It should be stated at this time that air under pressure is maintained in the upper end of each cylinder 19 above the piston 20 therein when the beam 3 is in its elevated position and also during its downward movement into the position shown in Figs. 3 and 4, and thereby the clamping fingers 12 of each doffing head are held in their open position against the ring 201 so that they can freely move downward into bobbin-embracing position without disturbing the yarn on the filled bobbin.

When the beam has reached a down position with the clamping fingers of each doffing head embracing a filled bobbin, the compressed air is exhausted from the upper end of each cylinder 19 and air under pressure is admitted to the lower end thereof beneath the piston therein, thereby subjecting the piston to an upward pressure which operates through the piston rod 18 and arms 14 to clamp the fingers 12 of each doffing head firmly against a filled bobbin 22.

The beam 3 then moves upwardly, and because of the clamping pressure of the clamping fingers against the filled bobbins, they will be doffed from their spindles during such upward movement.

When the upward movement of the beam has progressed to a point in which the filled bobbins 22 have been removed from the spindles, as shown in Fig. 5, but before the said beam has returned to its initial raised position, it is brought to rest, and each doffing head is then indexed by turning it about its vertical axis through 180°, thereby

bringing the filled bobbin 22 into a position in front thereof and its empty bobbin into axial alinement with the corresponding spindle.

After the doffing heads have been thus indexed, the beam 3 has a second down movement during which the empty bobbins, which at this time are in axial alinement with their respective spindles, are placed on the spindles.

It will be noted from Figs. 3 and 4 that the clips 23, 24 which hold the empty bobbins are so located that the bobbins held thereby are positioned on the doffing heads at a slightly higher level than the filled bobbins which have been withdrawn from the spindles, and hence in order to seat the empty bobbins properly on the spindles the second down movement of the beam carries the doffing heads to a lower level than the first downward movement and brings the lower ends of the filled bobbins against the rail portion 1 of the spindle frame as shown in Fig. 18 before the second down movement is completed.

Just as the filled bobbins come into contact with the rail during the further downward movement toward the lower level, the air pressure beneath the pistons 20 is released and compressed air is again applied to the top of said pistons, thereby releasing the clamping pressure of the clamping fingers on the filled bobbins, which are at this time resting on the rail 1.

During such further downward movement to the lower level while the clamping fingers 12 are in open position and the filled bobbins are resting against the rail 1, said clamping fingers are forced further onto the filled bobbins, as shown in Fig. 18, in which the full lines show the position of the clamping fingers 12 relative to the filled bobbin at the end of the first down movement of the beam 3 and the dotted lines show the position of said fingers at the end of the second down movement to the lower level. At the end of such further downward movement the air pressure above the piston 20 by which the clamping fingers are held open is again released and compressed air is admitted to the lower ends of the cylinders 19, thereby again bringing the clamping fingers into firm clamping engagement with the filled bobbins.

The beam 3 with the doffing heads loaded with the filled bobbins is then again moved upwardly leaving the empty bobbins on the spindles, and the second upward movement carries the beam with the doffed bobbins and its now empty clips 23, 24 to its fully elevated position shown in Figs. 1 and 2 where it is brought to rest.

The doffing heads are then again indexed by turning them 180° about their vertical axes to return them to their initial positions shown in Figs. 1 and 2 with the bobbin clamping fingers, which at this time are holding the filled bobbins, on the rear side of the doffing heads and the empty clips 23, 24 on the front side thereof. The clamping fingers are then opened and the filled bobbins are discharged into a suitable receiver, as will presently be described, the empty clips 23, 24 being then in position to be filled with empty bobbins.

It will be noted that each clip-carrying member 74 is provided with a projection 90 with which the upper end of the empty bobbin has engagement, so that when each doffing head has its second downward movement to place an empty bobbin on the corresponding spindle, the projection 90 will press against the end of the bobbin and firmly seat it on its spindle. As a result, when the beam 3 begins its second upward movement each empty bobbin will be withdrawn from its clips and left on its spindle.

While any suitable means for giving the beam 3 its up and down vertical movement may be employed, there is shown for this purpose a motor 27 (see Fig. 13) mounted on the frame 4 at its upper end, which motor is belted to a speed-reducing unit 28, the latter having a power take-off shaft 29 which is connected by gears 30 and 31 with a shaft 32 that is mounted in bearings 33 carried by the top of the frame 4. The shaft 32 has a plurality of drums 34 thereon, about each of which are several turns of a cable 35, one end of which is attached to the beam 3 as shown at 36, Fig. 9. The other end of each cable is shown as passing over a pulley 40 carried by a shaft 41 and which leads to a beam similar to beam 3 which carries doffing heads for doffing the spindles on the other side of the spinning frame.

The means for indexing the doffing heads by turning them about their vertical axes as above described comprises the following mechanisms. Each doffing head has rigid therewith a gear 25 which meshes with a rack bar 26 which extends the full length of the beam, said rack bar being guided in the brackets 10, and means hereinafter described is provided for moving the rack bar in one direction when the beam 3 completes its first or partial upward movement thereby to index the doffing heads by turning them about their vertical axes from the position shown in Fig. 4 to that shown in Fig. 9, and for moving said rack bar in the other direction at the end of the second or full upward movement of the beam, thereby again indexing the doffing heads and returning them to their initial position for the discharge of the filled bobbins.

The reversal of the direction of movement of the beam and the operation of the clamp-actuating piston 20, as well as the movement of the indexing rack 26 for indexing the doffing heads is controlled by the up and down movement of the beam.

Pivotally mounted on the beam at one end thereof is a switch-actuating pawl 43. This pawl has a nose portion 44 provided with an inclined surface 45 and it also has a tail portion 46. The numeral 47 indicates a stop pin carried by the beam and adapted to engage a shoulder 48 with which the pawl is provided for the purpose of limiting the clockwise swinging movement of the pawl. Normally the pawl occupies the inclined position shown in Figs. 3 and 5.

Mounted on the frame 4 is a switch 49 controlling the circuit of the motor 27 and having an arm 50 by which the switch is actuated. This arm normally stands in the path of movement of the tail 46 of the switch-actuating pawl when the latter is in its inclined position shown in Fig. 3 so that during the first down movement of the beam from its elevated position shown in Fig. 1, said tail will engage the switch arm 50 and actuate the switch 49 as seen in Fig. 3, thereby reversing the motor 27. Said switch 49 is so positioned on the frame that its actuation by the tail of the pawl will occur just when the beam has been lowered into its first down position in which the clamping fingers are embracing the filled bobbins on the spindles of the spinning machine, as seen in full lines, Fig. 18. The actuation of the switch 49 by the tail 46 of the pawl 42 reverses the motor 27 and also actuates a valve, presently to be described, which releases the air pressure on the upper side of the piston 20 of each doffing head and admits air under

pressure to the under side of each piston, thereby urging its piston upwardly and causing the clamping fingers 12 to be firmly clamped against the corresponding bobbin 22 as above described. The reversal of the motor 27 by the switch 49, above referred to, causes the beam to rise, and because of the clamping pressure between the clamping fingers 12 and the filled bobbins, said bobbins will be lifted off from their spindles and will be retained by the clamping fingers of the doffing heads.

After the beam has risen sufficiently to clear the filled bobbins from the spindles as shown in Fig. 5, it is brought to rest and the indexing rack 26 is given a movement in the direction of its length thereby turning all of the doffing heads through 180° so that the empty bobbin 21 carried by each doffing head is placed in axial alinement with the corresponding spindle, and the filled bobbin is located in front of the axial line of said spindle as shown in Fig. 7. The stopping of the upward movement of the beam in the mid position shown in Fig. 5 is accomplished through another switch member 51 carried by the frame 4 and which is formed with an actuating arm 52 with which the nose portion of the pawl 43 engages. The upward movement of the switch arm 52 which is given to it by the pawl 43 stops the motor 27 thus bringing the beam to rest.

The indexing mechanism is then set in operation as stated above to turn each doffing head 180° about its axis thereby to place the empty bobbin carried by each doffing head in axial alinement with the corresponding spindle. For this purpose the following mechanism is employed.

Mounted on the beam 3 is an air cylinder 54 in which operates a piston, the piston rod 61 of which extends beyond the cylinder and has at its outer end a head 91 provided with a laterally extending arm 92 which is secured to the end of the rack bar 26. The movement of the piston in the cylinder 54 will therefore be communicated to the rack bar 26.

Means are provided for admitting air under pressure to the cylinder 54 on the right side of the piston therein when the beam has been raised to the mid position shown in Fig. 5 thereby to index the doffing heads as above described. For this purpose there is provided a valve 55 which is shown in Figs. 15, 16 and which includes a valve casing 93 within which operates a piston valve 94 having two circumferential ports 95 and 96. The valve casing is provided with two air supply ports 97, 98 which are connected by a pipe 99 to a suitable source of compressed air, said valve casing also having an exhaust port 100. In addition the valve casing has a port 101 connected by a pipe 102 to the right end of the cylinder 54 and another port 103 connected by a pipe 104 to the left end of said cylinder 54.

When the piston valve 94 is in the position shown in Fig. 15, the supply pipe 99 will be connected to the pipe 102 through the ports 98, 96, 101, and the pipe 104 will be connected to the exhaust port 100 through the ports 103 and 95 whereby air under pressure will be admitted to the right hand end of the cylinder 54 and the left hand of said cylinder is connected to the exhaust port 100. When the valve is moved into the position shown in Fig. 16, however, the pipe 104 will be connected to the supply pipe 99 and the pipe 102 will be connected to the exhaust port 100 so that compressed air is admitted to the left hand end of said cylinder 54 and the air exhausted from the right hand end.

The piston valve 94 is given its movement in one direction or the other through the medium of two solenoids 105, 106, each solenoid being provided with a core 107 which is given an impulse when the solenoid is energized. When for instance the solenoid 105 is energized, its core will be projected forwardly thereby engaging the end of the piston valve 94 and moving it from the position shown in Fig. 15 to that shown in Fig. 16, thereby admitting compressed air into the left hand end of cylinder 54. When the solenoid 106 is energized, its core, by its impact with the end of the piston valve 94, will move said valve to the right and back into the position shown in Fig. 15, thereby admitting compressed air to the right hand end of cylinder 54.

The valve 94 is normally in the position shown in Fig. 16, in which position air under pressure is admitted to the left hand end of the cylinder 54 so that the piston and the piston rod remain in this position during the first down movement of the beam 3, and also during the first movement up into mid position, during all of which time the piston and piston rod 61 are in their right hand position.

Just before the beam starts on its second down movement the valve 94 is shifted into the position shown in Fig. 15 thereby to admit compressed air into the right hand end of the cylinder 54 and exhaust the left hand end thereof. The piston and the indexing rack 26 are thereby given a movement toward the left which causes all the doffing heads to be turned through 180° and thus properly indexed.

Means are provided whereby the valve 94 will be operated to index the doffing heads when the beam reaches its mid position only if the doffing operation has been completed and all of the filled bobbins have been removed from their spindles. If the doffing operation was incomplete and one or more bobbins remained on their spindles after the beam has been raised to its mid position, the indexing operation will not take place and the beam will remain at rest in said mid position.

To accomplish this, the operation of the valve 94 is made dependent on an electric eye or photoelectric cell which is actuated by a beam 60 of light emanating from a light source 58 which is positioned to direct its light beam lengthwise of the spinning machine directly over the tips of the empty spindles 2 and in a position to be intercepted by a bobbin on any spindle whether the bobbin is empty or full. Hence, so long as any bobbin remains on its spindle after the beam has been raised to its mid position, such bobbin will intercept the light beam 60 from the source of light and the solenoid 106 will remain inactive. The machine will, therefore, remain at rest with the beam 3 in its mid position until the undoffed bobbin has been removed from its spindle and the path of the light beam 60 has been cleared of obstructions. As soon as this occurs the solenoid 106 will be activated and the valve 94 will be shifted into the position shown in Fig. 15, thereby admitting compressed air into the right hand end of cylinder 54 and the indexing operation will then proceed.

If when the beam 3 rises into its mid position shown in Fig. 5 all the bobbins have been doffed, the path of the light beam 60 will have been cleared of obstruction and the electric eye will become operative to close the circuit of the solenoid 106 and thereby shift the valve into posi-

tion shown in Fig. 15, with a result that compressed air will be delivered to the right hand end of the cylinder 54.

There is thus provided means which will prevent the second down movement of the beam 3 from mid position for loading empty bobbins onto the empty spindles so long as any undoffed bobbin remains on its spindle after the beam has been raised to mid position.

Means responsive to the indexing operation above described is provided whereby when such indexing operation is completed, the beam is given its second downward movement for placing the empty bobbins 21 on the empty spindles 2 as above described. For this purpose the extended portion of the piston rod 61 of the indexing piston is provided with a projection 63 through which extends a pawl actuating rod 64, the latter being connected at one end to the pawl 43 and having a head 65 at its other end. When the indexing operation above described takes place and the piston rod 61 moves to the left in Fig. 5, the projection 63 will be brought up against the head 65 during the final indexing movement of said piston rod whereby during such final movement the pawl actuating rod 64 will be moved to the left thereby swinging the pawl 43 from its inclined position shown in Fig. 5 into its vertical position shown in Figs. 6 and 8. During this swinging movement of the pawl, the inclined face 45 thereof has a camming action against the roll carried by the end of the lever 52 thereby swinging said lever upwardly as seen in Fig. 17. Such upward movement of the lever 52 actuates the switch 51 to reverse the motor 27 so that the beam will then begin its second downward movement for the purpose of placing the empty bobbins on the spindles as above described.

During the second downward movement of the beam, the pawl 43 is held in its vertical position shown in Figs. 6 and 8 by the piston in the cylinder 54, and in this vertical position the tail of the pawl will bypass the switch operating arm 50 as the beam descends, thereby permitting the beam to move to its lower level.

The lower level position of the beam is determined by the engagement of a projection 205 on the pawl 43 with the arm 50 of the switch 49 by which the motor 27 is reversed, as shown in Fig. 8, said projection 205 being located above the tip of the tail 46 of said pawl so that said switch 49 is not actuated to reverse the motor 27 on the second downward movement of the beam until the end of the tail 46 of the pawl 43 has passed beyond the arm 50.

It will be recalled that during the final portion of the second movement of the beam 3 to its lower level, the filled bobbins 22 are resting on the rail 1, and just as said filled bobbins come into engagement with the rail 1 the air pressure in the cylinders 20 beneath the piston 19 is released and compressed air is admitted to the top of the cylinders thereby relieving the clamping pressure on the filled bobbins of the clamping fingers.

During the final portion of the second downward movement, the unclamped fingers move further down on the bobbins, as seen in dotted lines, Fig. 18, and when the beam has completed its second down movement to the lower level the engagement of the switch arm 50 by the projection 205 of the pawl 43 reverses the motor 27 and also operates a valve by which air is exhausted from the upper end of each cylinder 19 and compressed air admitted to the lower end of each cylinder, thereby causing the clamping arms to

firmly clamp the bobbins in the same manner as was done at the end of the first down movement.

The release of the air pressure on the underside of the pistons 20 and application of air pressure to the top of the cylinders 19 thereby to release the clamping engagement of the clamping fingers 12 with the bobbins 22 during the final portion of the second down movement of the beam is accomplished by means of a valve actuating switch 68 having a pivoted switch arm 206 which is engaged by a projection 69 mounted on a depending portion 208 of the beam 3, said projection 69 coming into engagement with the switch arm just as the filled bobbins come into engagement with the rail 1 and before the projection 205 engages the switch arm 50. The valve actuated by the switch 68 and the manner in which it controls the admission of compressed air to the cylinders 19 will be presently described.

The engagement of the projection 205 with the switch arm 50 when the beam has reached its lower level will render operative a valve controlling admission of compressed air to the lower ends of the cylinders 19, whereby the clamping fingers 12 for each doffing head will be a second time firmly clamped against the filled bobbins. This operation of the switch arm 50 will also again reverse the motor 27 and thereby raise the beam 3.

During the second upward movement of the beam 3, the pawl 43, which is in its vertical position, will bypass the switch 51, so that the beam will continue its upward movement into its fully raised position shown in Figs. 1, 2, and 5.

When the beam makes its second upward movement after the empty bobbins have been placed on the spindles, and as said beam approaches its elevated position shown in Figs. 1 and 2, it, or a projection thereon, engages the arm 110 of a switch member 111 thereby stopping the motor 27. The switch 111 not only opens the motor circuit and thus stops the motor but also closes the circuit of the solenoid 105. Said solenoid is thus energized and the core 107 is given a quick impulse to the left thereby moving the valve from the position shown in Fig. 15 to that shown in Fig. 16. With the valve in the position shown in Fig. 16, compressed air is admitted to the left hand end of the cylinder 54 and its piston and piston rod will be moved to the right into the position shown in Fig. 1. It will be remembered that the piston rod 61 is provided with an arm 92 which is connected to the end of the rack bar 26 so that the movement of the piston and piston rod 61 to the right moves said rack bar in the same direction and thus gives the doffing heads a reverse turning movement through 180°, thereby indexing them so as to place the filled bobbins on the rear side thereof and the empty clips 23, 24 on the front side.

The piston rod 61 has a projecting arm 118 which is brought into engagement with the pivoted switch arm 119 of a switch 120 as said piston rod comes to the end of its movement to the right while the beam is in its raised position, as shown in Fig. 1. This operation of the switch 120 actuates a valve which admits air to the upper end of the cylinders 19, thereby releasing the clamping pressure of the clamping arms 12 on the filled bobbins 22 so that said bobbins will be discharged from the doffing heads. As the bobbins are thus discharged they are received by a receiver 80, as shown in Fig. 2.

The receiver 80 is provided with a flap 81 which is pivotally connected thereto, said flap, when the

beam is in its elevated position, being positioned beneath the doffing heads and thus in a position to deflect the discharged bobbins into the receiver.

Means are provided whereby when the beam moves downwardly at the beginning of the operation, the flap will be folded into an upright position shown in dotted lines Fig. 2 and will thus be out of the way of the beam.

For this purpose there is provided a three-armed lever 83 which is pivoted to the frame at 84, one arm 85 of the lever being connected by a link 86 with the flap 81. The beam 3 is provided with a depending portion 112 which carries at its lower end a projection 69 which cooperates with the arm 87 of said three-armed lever during the final upward movement of the beam to swing said lever from the dotted to the full line position and thus to move the flap 81 into its operative position. The depending projection 112 of the beam is also provided with a stud 89 which is located above the arm 87 and which by its engagement with said arm during the initial downward movement of the beam swings the three-arm lever into the dotted line position thus moving the flap 81 into its dotted line position out of the path of travel of the beam.

Spinning machines are commonly provided with a thread board 78 carrying a plurality of thread guides 79, one for each spindle, through which the yarn being spun passes on its way from the drawing rolls to the bobbin. The thread board 78 is pivotally mounted so it can be swung from its operative position shown in Fig. 2 into an inoperative position as indicated in dotted lines, Fig. 2 and in Fig. 4, in which inoperative position the thread guides 79 are out of the path of travel of the beam.

For thus moving the thread board, the arm 90 of said three-armed lever 83 is connected by a link 91 to an arm 92 rigid with the thread board so that when the three-armed lever is moved into its dotted line position during the initial downward movement of the beam, the thread board will be swung up into its inoperative position.

Reference has been made above to the means for introducing air under pressure to the lower end of the cylinder 19 of each doffing head for the purpose of clamping the clamping fingers 12 firmly against the filled bobbins when the beam is in its first down position, and also when the beam is in its second down position at the lower level, and for introducing air into the upper end of the cylinders 19 to release the clamping pressure of the clamping fingers as the beam approaches its lower level position during the second downward movement and also when the beam is fully raised to its top position for the purpose of discharging the bobbins into the receiver 30.

For this purpose, each cylinder 19 has a pipe connection 113 by which the lower end of the cylinder is connected to a manifold member 114, and each cylinder has another pipe connection 115 leading into its upper end and which communicates with a second manifold member 116. A solenoid operated valve device 117 similar to that shown in Figs. 15 and 16 is employed to admit air under pressure to the manifold 116 and thus to the upper end of each cylinder 19, thereby holding the clamps open during the first downward movement of the beam into its first low position, and when the beam has reached its first low position said valve 117 is actuated by the switch 49 to release the air from the manifold 116 and admit compressed air to the manifold 114 whereby compressed air is admitted to the lower

end of each cylinder 19 and the clamping fingers are clamped against the bobbins.

Said valve 117 is also rendered operative by the switch 68 during the final movement of the beam 3 into its second and lower level position to again admit air to the manifold 116, thereby releasing the clamping pressure of the clamping fingers against the bobbins, and when the beam terminates its second down movement it is again actuated by the switch 49 to release the air pressure from the manifold member 116 and admit compressed air to the manifold 114, thereby again to activate the clamping fingers 12 to apply clamping pressure to the bobbins.

Inasmuch as the valve 117 has the same construction as the valve 55 shown in Figs. 15 and 16, it is not deemed necessary to show said valve in detail. It may be stated that in the valve 117 the port corresponding to port 103 of Figs. 15 and 16 may be connected to manifold 116 and the port corresponding to the port 101 may be connected to the manifold 114 so that when the valve is in the position shown in Fig. 16, compressed air will be admitted to the upper end of all the cylinders 19 and the clamping fingers of all the doffing heads will be held open, while when the valve is in the position shown in Fig. 15 the compressed air will be admitted to the lower ends of the cylinders and the clamping fingers will be clamped against the filled bobbins.

The switch 49 is constructed not only to reverse the motor 27 when it is actuated by the descending beam 3 but to actuate the solenoid of valve 117 corresponding to solenoid 106 of Figs. 15 and 16 and thereby shift the valve into a position corresponding to that shown in Fig. 15, thereby to admit compressed air to the lower ends of the cylinders 19 with the result that the clamping fingers will be clamped against the filled bobbins.

The switch 68 is constructed so that when it is actuated by the beam as it approaches its lower elevel during its second down movement, the circuit of the solenoid corresponding to solenoid 105 of Figs. 15 and 16 will be closed thereby energizing said solenoid thereby to shift the valve into the position shown in Fig. 16, with the result that the compressed air will be admitted to the upper ends of all the cylinders 19 and all the clamping fingers will be released to allow them to move further over the bobbins as described above and as shown in dotted lines, Fig. 18.

When the beam 3 reaches its lower level on its second down movement the switch 49 will again be actuated and the motor will not only be reversed but the valve 117 will be actuated again to admit compressed air to the lower ends of the cylinders thereby causing the clamping fingers to be clamped firmly against the filled bobbins, as above described.

It has been stated above that when the switch 120 is actuated by the engagement of the arm 118 with the switch arm 119, a valve is rendered operative to admit air to the upper ends of the cylinders 19 thereby releasing the clamping fingers 12 to allow the filled bobbins to be discharged into receiver 30. The valve thus referred to is the valve 117. When the switch is actuated it closes the circuit of the solenoid of valve 117 corresponding to solenoid 105 of valve 55 shown in Fig. 15 thereby to shift the valve into the position corresponding to that shown in Fig. 16 with the result that compressed air is admitted to the upper end of each cylinder 19 and air is exhausted from the lower end thereby releasing the clamp-

ing finger 12 and allowing the doffed bobbins to be discharged into the receiver 80.

In Figs. 19, 20 and 21 there is shown a doffing head of a different construction from that shown in Figs. 4 and 9.

In said Fig. 19, 3a indicates a portion of the beam by which the doffing heads are carried and which corresponds to the beam 3 in Figs. 1 to 9, and 6a is the rotary body portion of one of the doffing heads, said body portion being supported by a bearing member 70a, which is secured to the beam 3a and having fixed thereto a ring gear 25a which meshes with the indexing rack bar 26a.

The body 6a carries a tubular member 151 which is open at its lower end and is of a size to receive the filled bobbin. This tubular member 151 is secured to the body portion 6a by means of bolts 152 which extend through a spacing block 153 and screw into the body member 6a, as shown in Fig. 19.

Situated within the tubular member 151 are two clamping members 12a which are adapted to have clamping engagement with the bobbin for doffing it from its spindle. Each clamping member 12a is secured at its upper end to the tubular member 151 by bolts or screws 154 and the upper end of each clamping member is shown as bent over the edge of the tubular member, as shown at 155.

Each clamping member is bent to present the inwardly directed portion 156, and said clamping members are made of resilient metal and are so constructed that normally they would assume the dotted line position in Fig. 20.

The tubular member 151 is so positioned that during the first downward movement of the beam 3a said tubular member is axially alined with the spindle and during such downward movement the clamping members 12a are held in their spread position against the walls of the tubular member 151, as shown in full lines Fig. 20.

For this purpose there is provided a clamp spreading member 157 which is pivoted to the member 151 at 158 and extends transversely between the clamping members 12a above the inwardly bent portions 156. The beam 3a carries a series of cylinders 159, one cylinder for each doffing head, and each cylinder has a piston therein provided with the piston rod 160, which extends through the bearing member 70a and the lower end of which is received in a socket 161 with which the spreading member 157 is provided.

During the first downward movement of the beam 3a the piston in the cylinder 159 is held in its lowered position by compressed air admitted to the upper end of the cylinder through a pipe 162 connected to a manifold 163, and when the piston is thus in its lowered position the spreading member 157 has been forced downwardly against the inwardly bent portions 156 of the clamping arms, thereby forcing them apart and holding them against the interior walls of the tubular member 151, as shown in full lines in Fig. 20.

As the beam 3a approaches its first low position, the tubular member 151 will be moved over the filled bobbin and as the said beam reaches its low position a suitable valve is operated by the switch 49 which releases the compressed air from the cylinder 159. As this occurs, the resiliency of the clamping members 12a will bring them into clamping engagement with the bobbin so that when the motor 27 is

reversed by the switch 49 each bobbin will be doffed from its spindle.

It will be understood, of course, that when the beam makes its second down movement and approaches its lower level the switch 68 will be operated as above described to again admit air to the upper end of the cylinder 159, thereby again releasing the clamping pressure of the clamping members on the bobbin.

When the beam reaches its lower level position at the end of its second down movement, the switch 49 will be operated by the pawl 43, as shown in Fig. 8, and the air pressure in the cylinder 159 will again be released so that the clamping fingers 12a will again have clamping engagement with the bobbin.

A different form of doffing head is shown in Figs. 22, 23, wherein the doffing head includes a tubular member 151b within which the filled bobbin is received when the beam moves downwardly. In this embodiment, however, the tubular member 151b has formed at each side an elongated pocket 165 which opens into the interior of the tubular member and each pocket contains a rubber tube 166. These tubes extend to and communicate with a manifold 163b. The portion of the tubes 166 which are located within the pockets 165 are flexible and expansible while the portions of the tubes not included in the pockets are substantially inexpansible.

In this construction when the compressed air is admitted to the tubes from the manifold 163b the elastic portion of the tubes within the pockets will be expanded and said tubes will thus have a clamping engagement with the bobbin.

When the air pressure in the manifold is released, the tubes 166 in the pockets will collapse thus relieving the clamping pressure on the bobbins.

The admission of the air to the manifold 163b and its exhaust therefrom is controlled by suitable valve mechanism in the same way that the admission of air to or its exhaust from the cylinders 19 is controlled.

I claim:

1. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle, and then to move said support upwardly to doff the filled bobbins from their spindles, and subsequently to move said support downwardly again, and means operative between the upward and second downward movement of said support to index the doffing heads by turning each doffing head about its vertical axis to bring the empty bobbin carried thereby into axial alinement with the corresponding spindle, whereby during such second downward movement an empty bobbin is placed on each spindle.

2. A machine for doffing filled bobbins from a

spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle of the spinning machine, and then to move said support upwardly to doff the filled bobbins from their spindles, and to move the support downwardly a second time and then upwardly a second time, means operative at the end of the first upward movement to turn each doffing head about its vertical axis to bring an empty bobbin into vertical alinement with the corresponding spindle whereby during the second downward movement an empty bobbin is placed on each spindle, and means to discharge the filled bobbins from the doffing heads at the end of the second upward movement of the support.

3. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle of the spinning machine, and then to move said support upwardly to doff the filled bobbins from their spindles, and to move the support downwardly a second time and then upwardly a second time, means operative at the end of the first upward movement to turn each doffing head about its vertical axis to bring an empty bobbin into vertical alinement with the corresponding spindle whereby during the second downward movement an empty bobbin is placed on each spindle, and means operative at the end of the second upward movement of the support to turn each doffing head about its vertical axis into its initial position, and means to discharge the filled bobbins from said doffing heads.

4. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly directed bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle of the spinning machine, support-moving means to move said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means to clamp the bobbin-gripping fingers of each doffing head against the bobbin on the corresponding spindle, said support-moving means operating to raise the support thereby doffing the bobbins from the spindles and then to lower said support again, and means operative after the support has been given its upward bobbin-doffing movement to turn each doffing head about its axis to bring the empty bobbin thereon into axial alinement with the corresponding spindle, whereby during the second downward movement of said support the empty bobbins carried by said doffing heads are placed on the corresponding spindles of the spinning machine.

5. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly depending bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle, means including a reversible motor for moving said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means to clamp said fingers against the bobbins embraced thereby, means to reverse said motor thereby to raise the support and doff the bobbins from the spindles, means to arrest upward movement of the support after the bobbins have been doffed, means to turn the doffing heads about their vertical axes to position the empty bobbins in axial alinement with the various spindles, and means to again reverse the motor thereby to lower the support and thereby place an empty bobbin on each spindle.

6. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly depending bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle, means including a reversible motor for moving said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means to clamp said fingers against the bobbins embraced thereby, means to reverse said motor thereby to raise the support and doff the bobbins from the spindles, means to arrest upward movement of the support after the bobbins have been doffed, means to turn the doffing heads about their vertical axes to position the empty bobbins in axial alinement with the various spindles, means to again reverse the motor thereby to lower the support and thereby place an empty bobbin on each spindle, means to reverse the motor at the end of the second downward movement whereby said support and the filled bobbins carried thereby are raised to an elevated posi-

tion, and means to turn the doffing heads about their vertical axes to restore the bobbin-gripping fingers to their initial position in vertical alinement with the spindles of the spinning machine, and means to discharge the filled bobbins from said fingers.

7. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly directed bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle of the spinning machine, support-moving means operative to move the support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, pressure-actuated means to clamp the fingers of each doffing head firmly against the bobbin embraced thereby, said support-moving means being also operative to move said support upwardly thereby doffing the filled bobbins from their spindles, means operative while said support is in its raised position to turn the doffing heads about their vertical axes to position the empty bobbins carried thereby in axial alinement with the various spindles, said support-moving means being further operative to move the support downwardly a second time thereby to place the empty bobbins on the spindles, and then to move said support upwardly again, means operative when the support reaches a raised position after its second upward movement to turn the doffing heads about their axes into their original positions, and pressure-actuated means to release the clamping pressure of the bobbin-gripping fingers on the filled bobbins whereby they are discharged from the doffing heads.

8. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle, and then to move said support upwardly to doff the filled bobbins from their spindles, subsequently to move said support downwardly again, and means operative between said upward and second downward movement of said support to turn each doffing head about its vertical axis to bring the empty bobbin carried thereby into axial alinement with the corresponding spindle, whereby during such second downward movement an empty bobbin is placed on each spindle, and means responsive to the presence of an undoffed bobbin on any spindle to prevent said second downward movement of the support.

9. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle of the spinning machine, and then to move said support upwardly to doff the filled bobbins from their spindles, and to move the support downwardly a second time and then upwardly a second time, indexing means operative at the end of the first upward movement of the support to turn each doffing head about its vertical axis to bring an empty bobbin carried thereby into vertical alinement with the corresponding spindle, whereby during the second downward movement an empty bobbin is placed on each spindle, means to render the indexing means operative again at the end of the second upward movement of the support thereby to turn each doffing head about its axis into its initial position, and means rendered operative by the indexing means to release the bobbin-gripping means whereby the bobbins are discharged from the doffing heads.

10. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly directed bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle of the spinning machine, support-moving means to move said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, pressure-actuated means to clamp the bobbin-gripping fingers of each doffing head against the bobbin embraced thereby, said support-moving means being operative to raise the support thereby doffing the bobbins from the spindles and then to lower said support again and subsequently to give the support a second upward movement, indexing means operative at the end of the first upward movement of the support to turn each doffing head about its vertical axis to bring an empty bobbin carried thereby into vertical alinement with the corresponding spindle, whereby during the second downward movement of said support an empty bobbin is placed on each spindle, means to render the indexing means again operative at the end of the second upward movement of the support thereby to turn each doffing head about its axis into its initial position, means rendered operative by the indexing means to release the gripping pressure of the gripping fingers on the bobbins whereby they are discharged from the doffing heads by gravity, a receiver to receive the discharged bob-

bins, a deflecting flap pivoted to the receiver, and means rendered operative by the final upward movement of the support to swing the deflecting flap into position to receive the discharged bobbins and deflect them into the receiver.

11. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis bobbin-gripping means for receiving and holding a filled bobbin and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping means in axial alinement with the corresponding spindle, means to move said support downwardly to bring the bobbin-gripping means of each doffing head into gripping engagement with a filled bobbin on the corresponding spindle, and then to move said support upwardly to doff the filled bobbins from their spindles, means to bring the support to rest when the filled bobbins have been removed from their spindles, means to index the doffing heads at the end of the upward movement by turning them 180° about their vertical axes to bring the empty bobbin carried by each doffing head into axial alinement with the corresponding spindle, and means responsive to the indexing operation to render operative the support-moving means to move the support downwardly and thereby place an empty bobbin on each spindle.

12. A machine for doffing filled bobbins from a spinning machine as defined in claim 11 and which includes means to render the indexing means inoperative if any bobbin remains on its spindle after the upward movement of the movable support.

13. A machine for doffing filled bobbins from a spinning machine as defined in claim 11 and which includes means responsive only to the doffing of all the bobbins from the spindles to index the doffing heads at the end of the upward movement of the movable support by turning each doffing head 180° about its vertical axis to bring an empty bobbin into axial alinement with the corresponding spindle.

14. A machine for doffing filled bobbins from a spinning machine as defined in claim 1 and which includes means responsive only to the doffing of all the bobbins from the spindles to index the doffing heads at the end of the upward movement of the movable support by turning each doffing head 180° about its vertical axis to bring an empty bobbin into axial alinement with the corresponding spindle.

15. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly directed bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle of the spinning machine, support-moving means to move said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means actuated by said support as it reaches the end of its down movement to clamp the bobbin-gripping fingers of each doffing head against the bobbin on the corresponding spindle, said support-moving means operating to raise the support thereby doffing the bobbins from the spindles and then to lower said support again, and means operative after the support has been given its upward bobbin-doffing movement to turn each doffing head about its axis to bring the empty bobbin thereon into axial alinement with the corresponding spindle, whereby during the second downward movement of said support the empty bobbins carried by said doffing heads are placed on the corresponding spindles of the spinning machine.

16. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly depending bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle, means including a reversible motor for moving said support downwardly to bring the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means to clamp said fingers against the bobbins embraced thereby, means actuated by the support as it reaches the end of its down movement to reverse said motor thereby to raise the support and doff the bobbins from the spindles, means to arrest upward movement of the support after the bobbins have been doffed, means to index the doffing heads by turning them about their vertical axes to position the empty bobbins in axial alinement with the various spindles, and means operated by the indexing means to again reverse the motor thereby to lower the support and place an empty bobbin on each spindle.

17. A machine for doffing filled bobbins from a spinning machine comprising a vertically movable support, a plurality of doffing heads mounted thereon for turning movement about vertical axes, there being one doffing head for each spindle of the spinning machine, each doffing head having on one side of its vertical axis a plurality of downwardly directed bobbin-gripping fingers and on the opposite side of said vertical axis means for supporting an empty bobbin, each doffing head normally being positioned with its bobbin-gripping fingers in axial alinement with the corresponding spindle of the spinning machine, means normally holding the bobbin-gripping fingers in inoperative position, support-moving means to move said support downwardly to move the bobbin-gripping fingers of each doffing head into embracing relation with a filled bobbin on the corresponding spindle, means rendered operative by the support as it reaches the end of its down movement to clamp the bobbin-gripping fingers of each doffing head against the bobbin on the corresponding spindle, said support-moving means operating to raise the support thereby doffing the bobbins from the spindles and then to lower said support again, means operative after the support has been given its upward bobbin-doffing movement to turn each

doffing head about its axis to bring the empty bobbin thereon into axial alinement with the corresponding spindle, whereby during the second downward movement of said support the empty bobbins carried by said doffing heads are placed on the corresponding spindles of the spinning machine.

CHESTER W. GREENE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 15,604	Alderman	May 15, 1923
755,450	Carey	Mar. 22, 1904
869,044	Arnold-Forster	Oct. 22, 1907
946,144	Lister	Jan. 11, 1910
1,079,270	Shackleton	Nov. 18, 1913