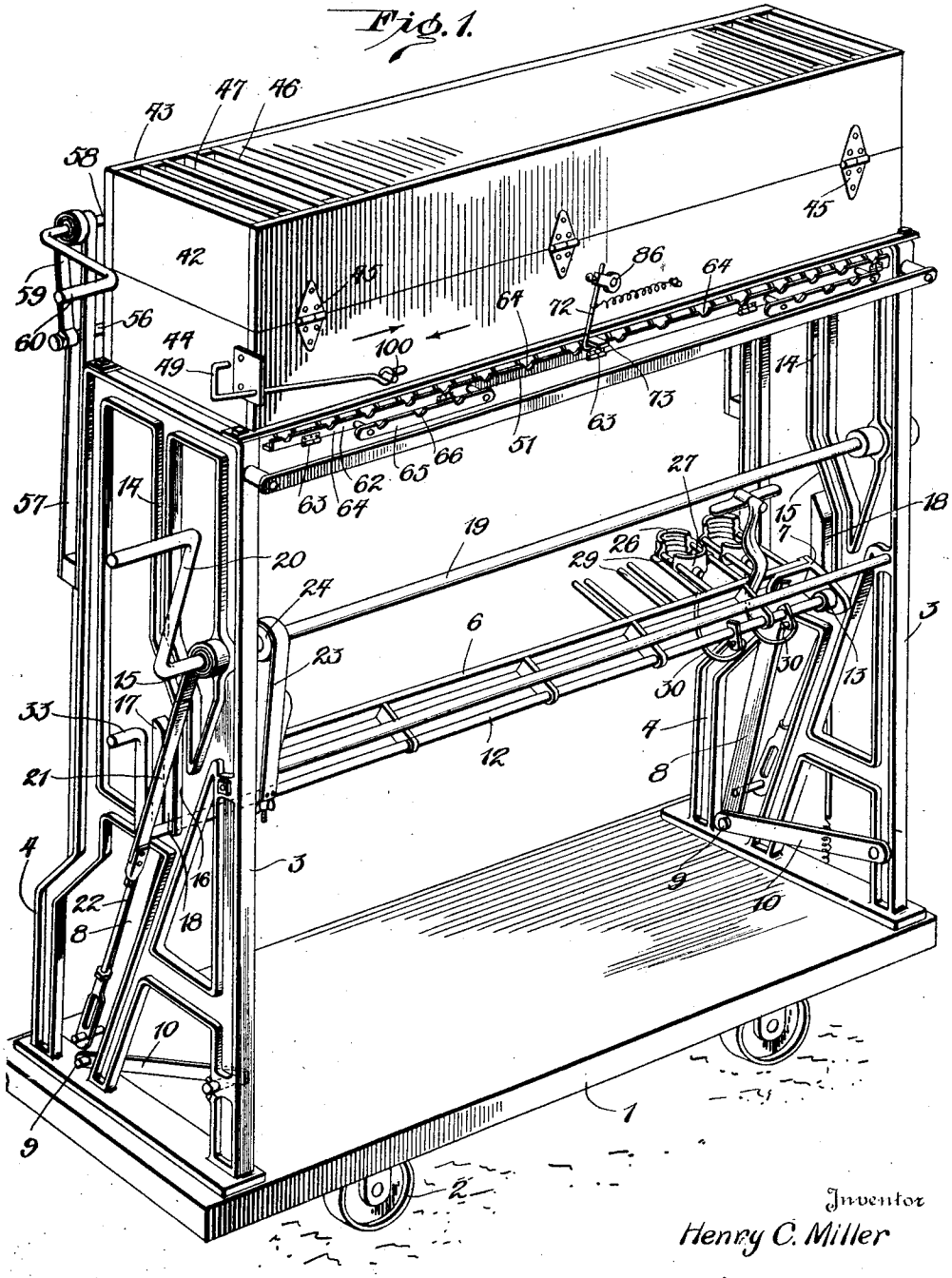
May 15, 1928. 1,669,769

H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

Filed June 12, 1922 8 Sheets-Sheet 1

Fig. 1.



Inventor
Henry C. Miller

By

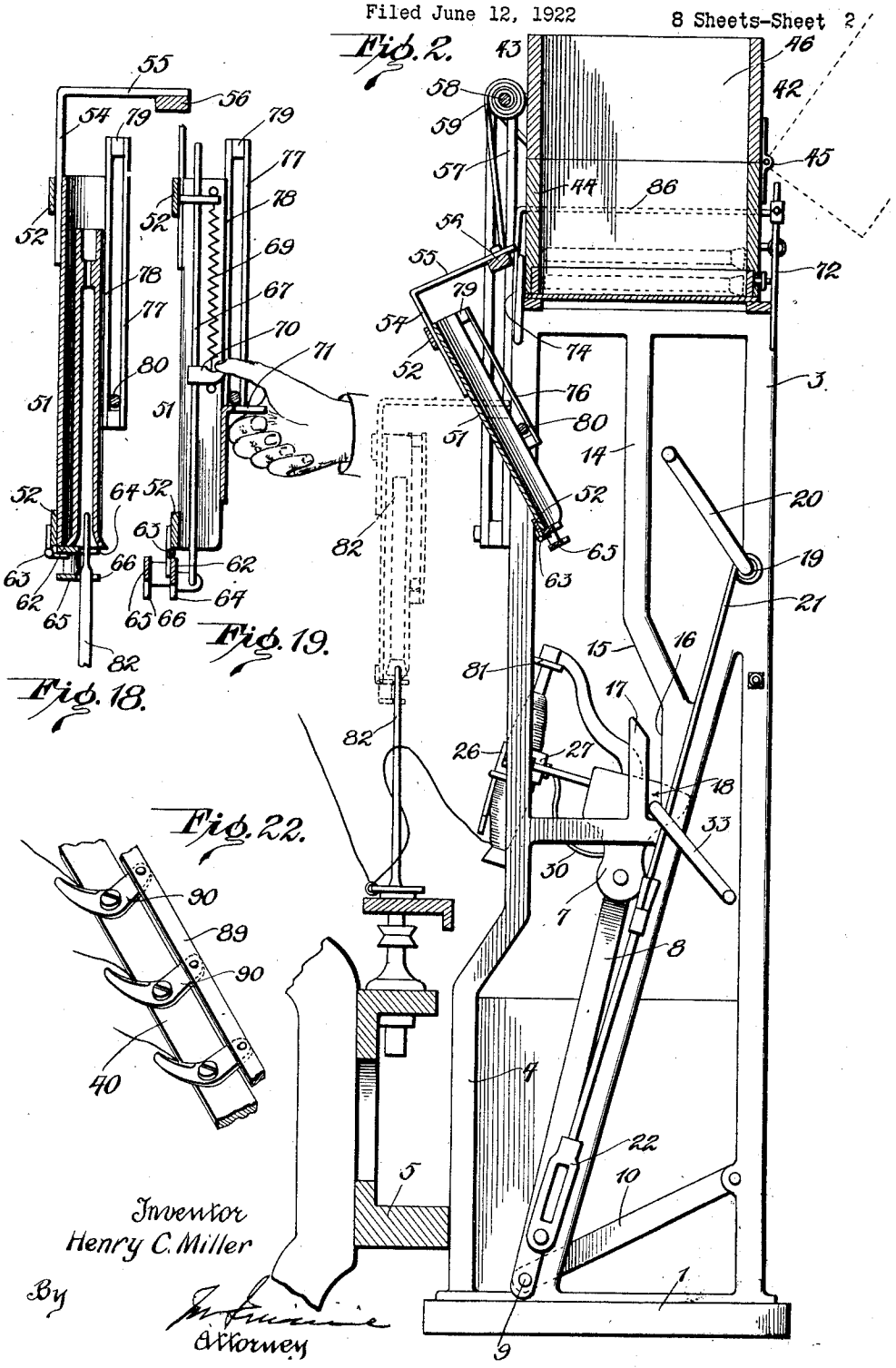
Attorney

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H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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Fig. 9.

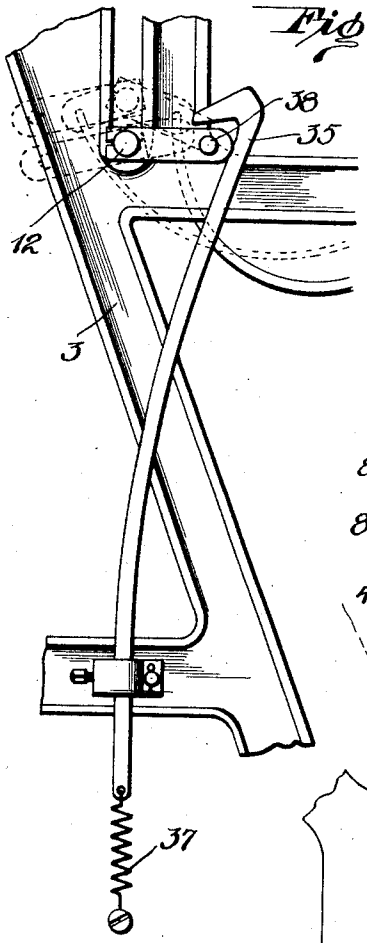
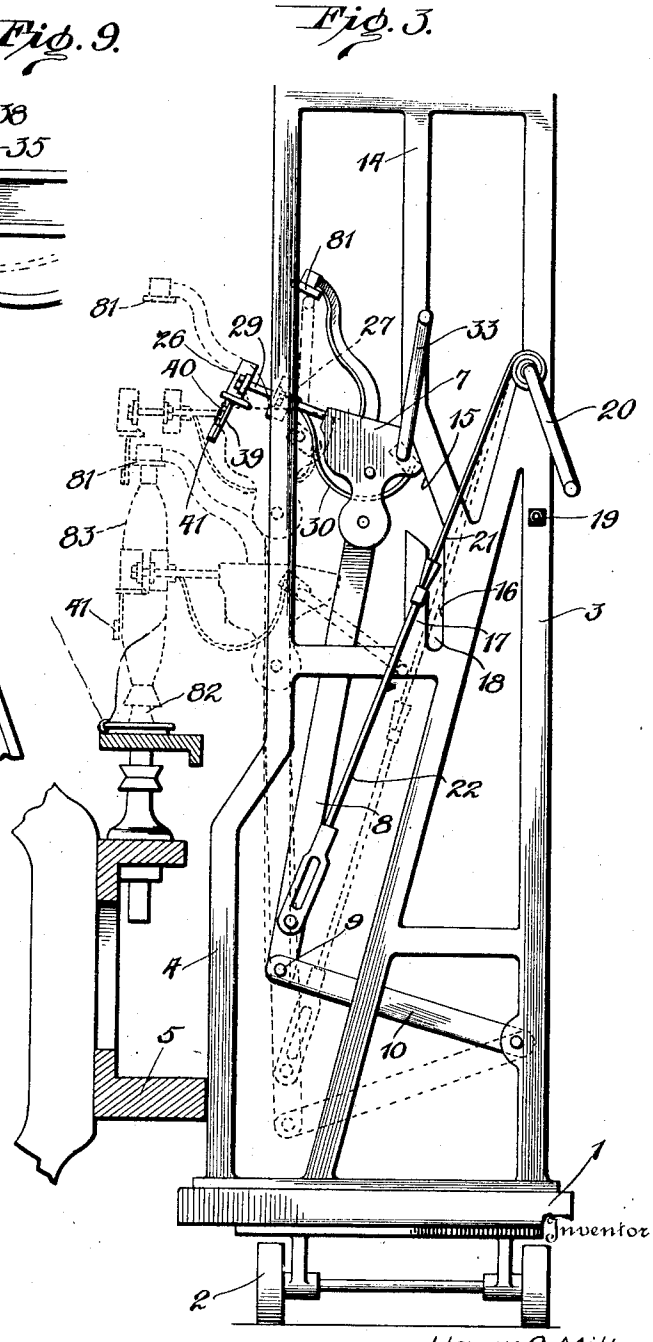


Fig. 3.



Inventor

Henry C. Miller

By

Attorney

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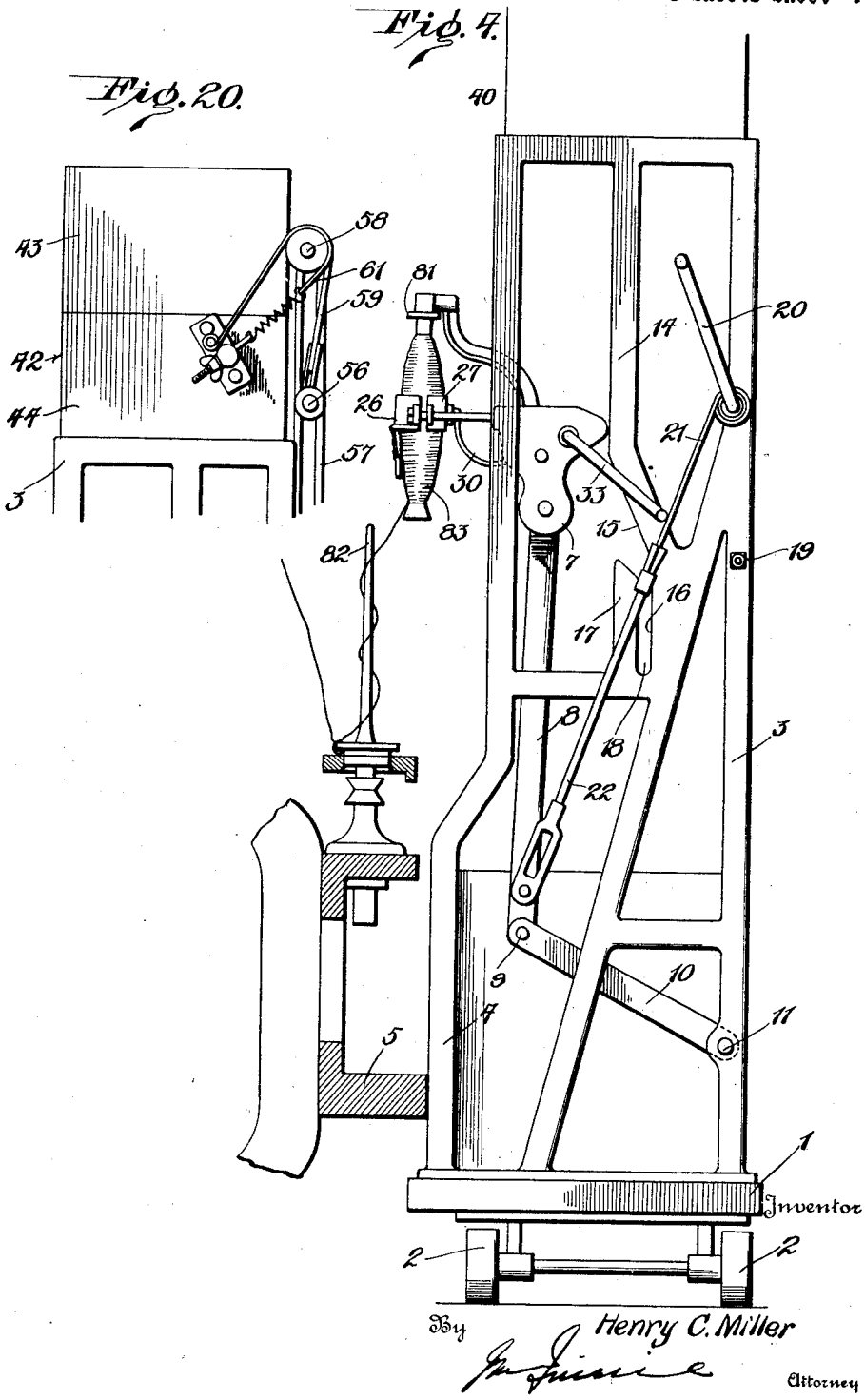
H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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Fig. 20.

Fig. 4.



Inventor

By Henry C. Miller

Attorney

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H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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Fig. 5.

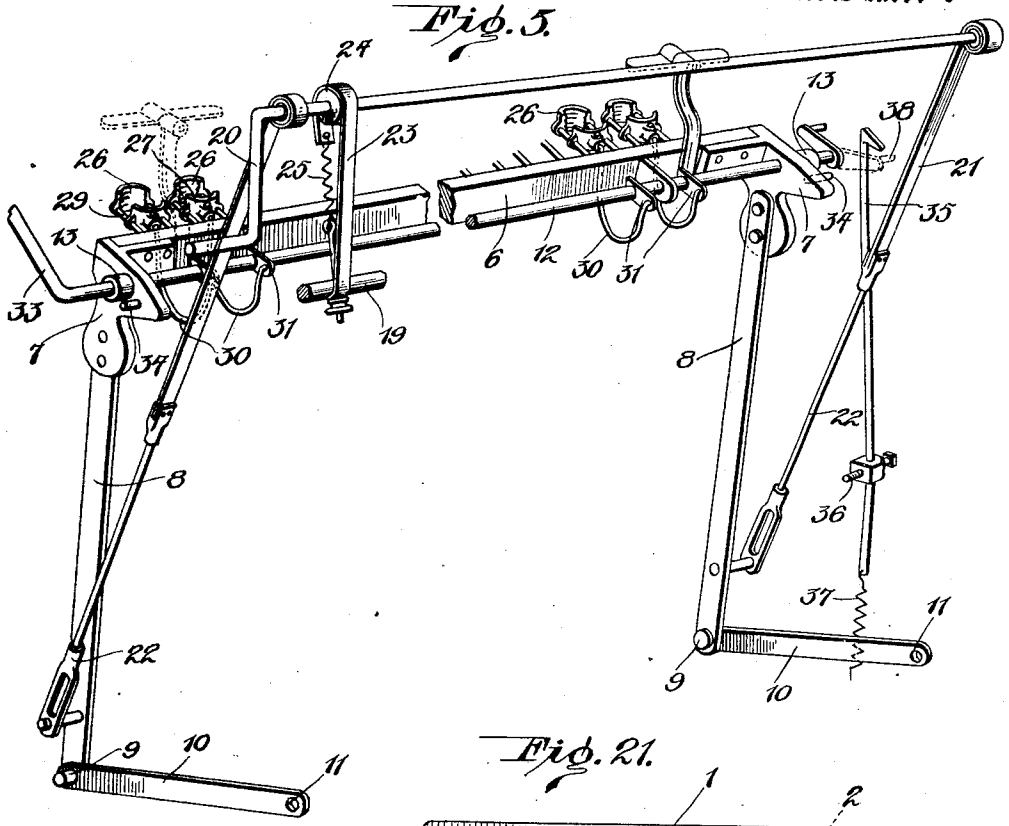
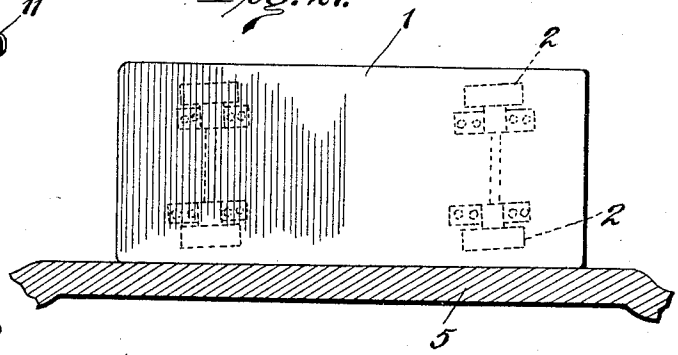


Fig. 21.



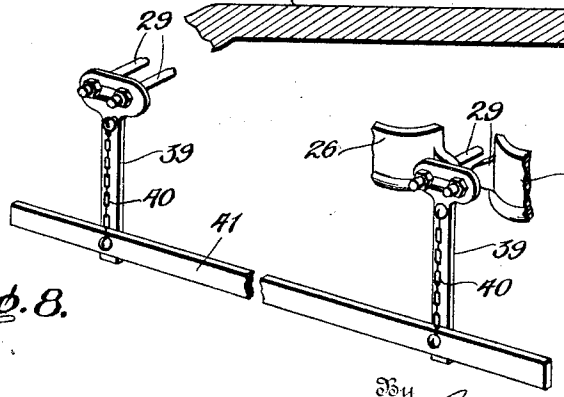


Fig. 8.

Inventor
Henry C. Miller

By

Attorney

May 15, 1928.

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H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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Fig. 14.

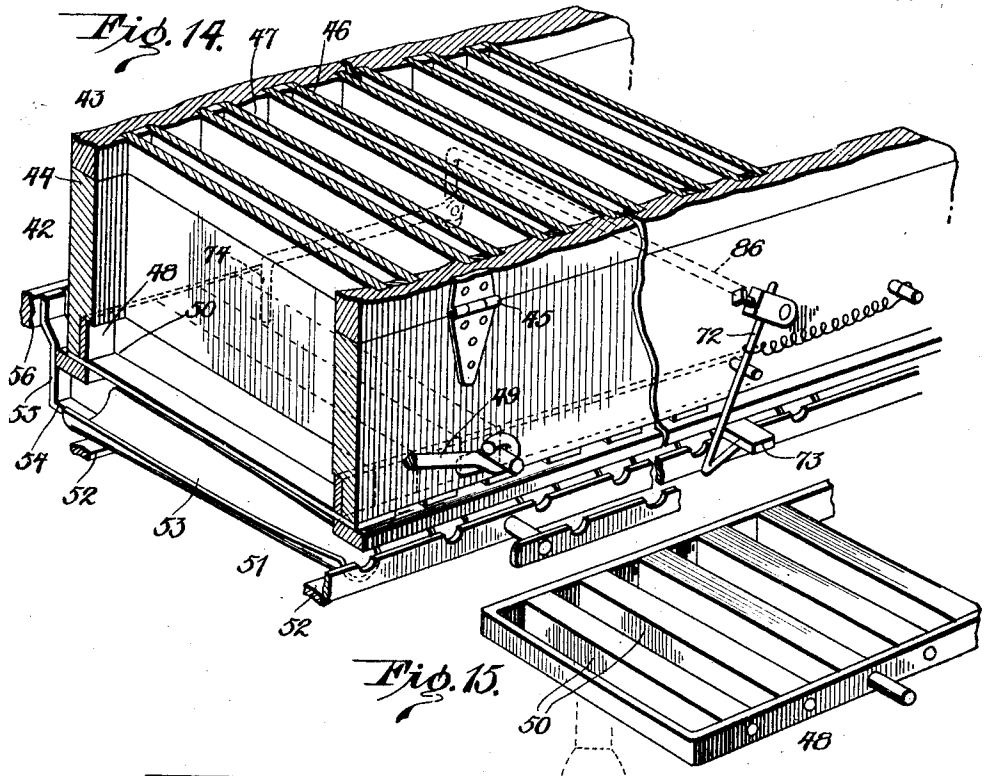


Fig. 15.

Fig. 6.

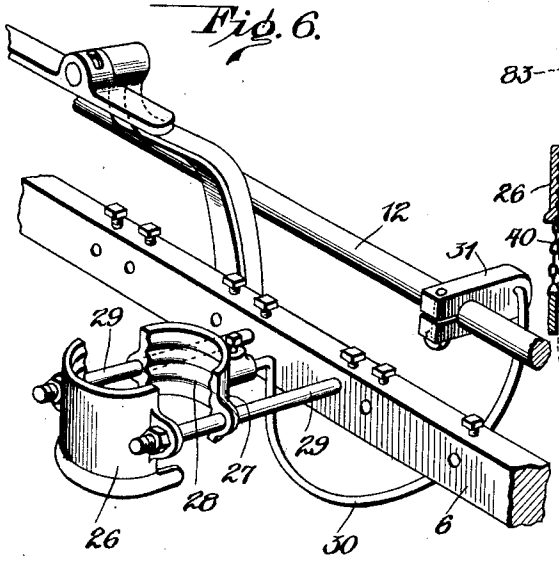
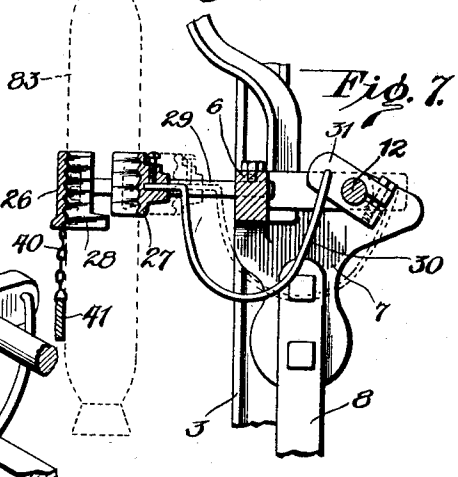


Fig. 7.



Inventor

Henry C. Miller

By

Attorney

May 15, 1928. 1,669,769

H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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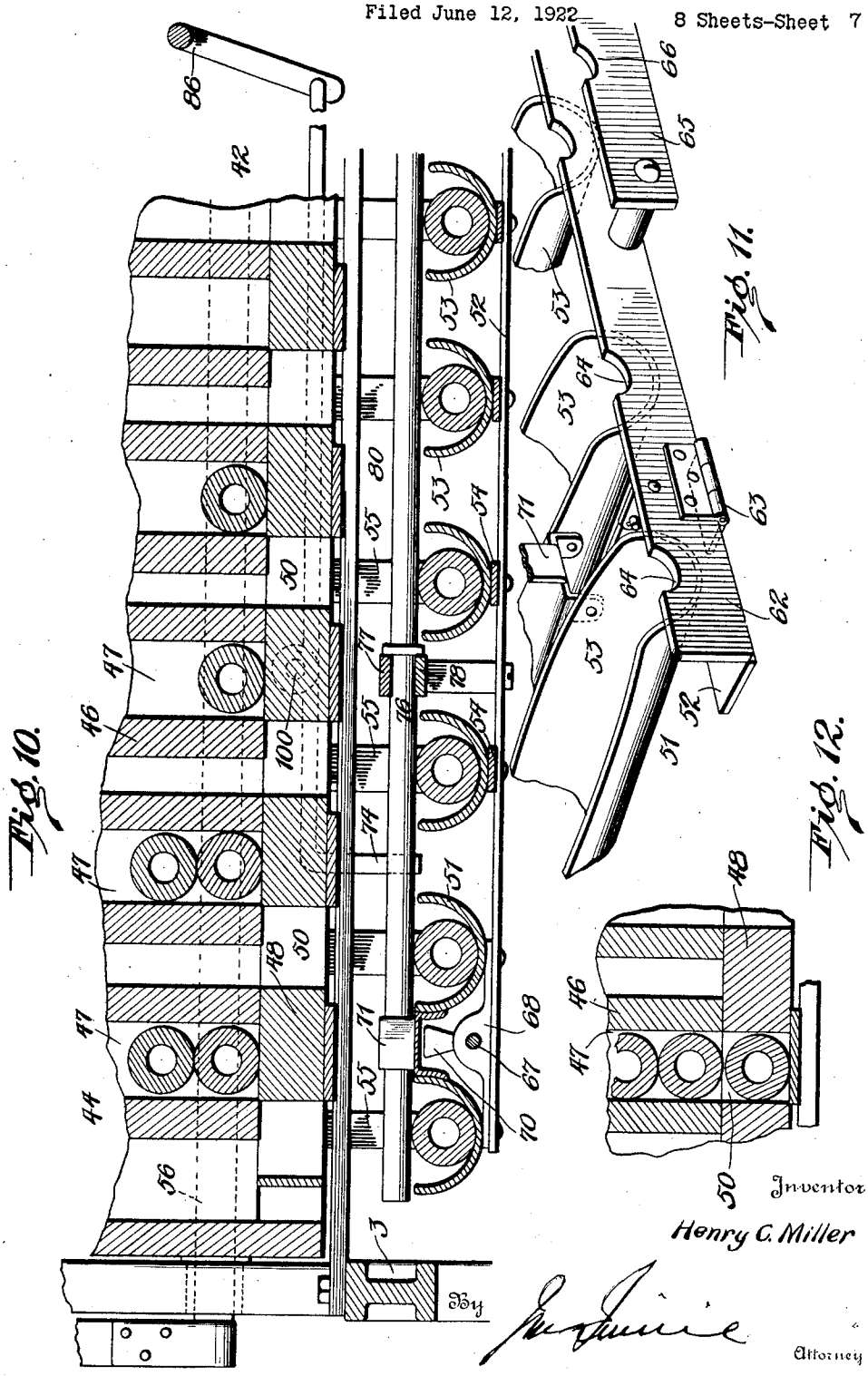


Fig. 10.

Fig. 11.

Fig. 12.

Inventor
Henry C. Miller

Attorney

May 15, 1928.

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H. C. MILLER

COMBINED DOFFER AND DONNING MECHANISM

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Fig. 15.

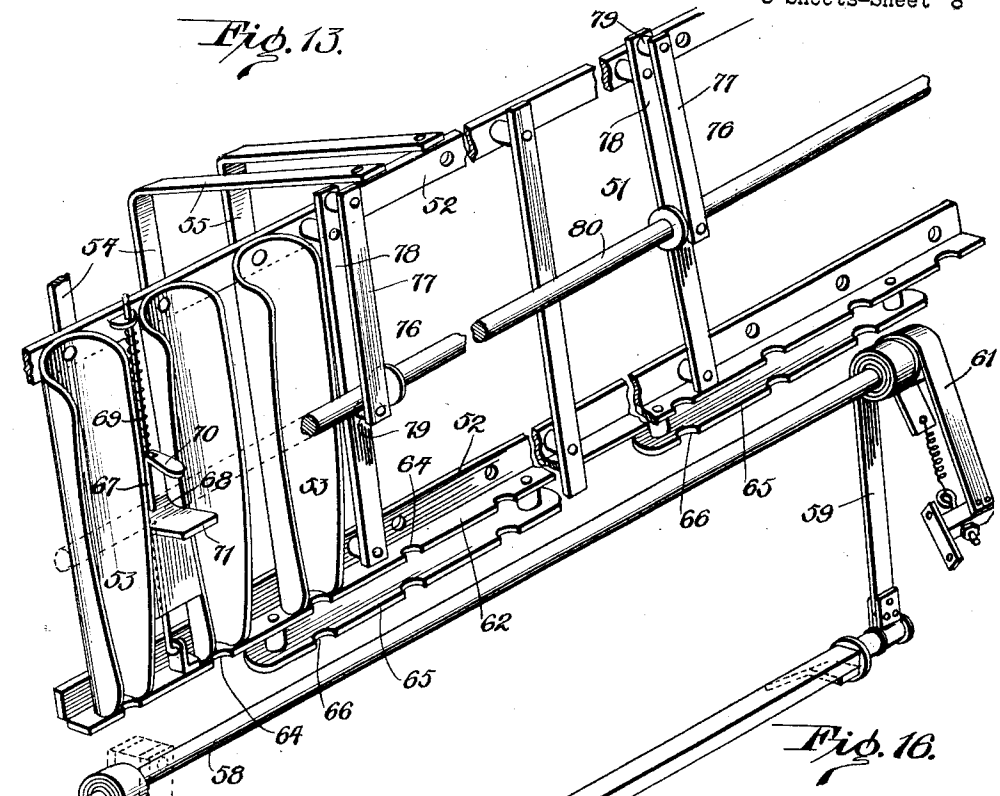


Fig. 16.

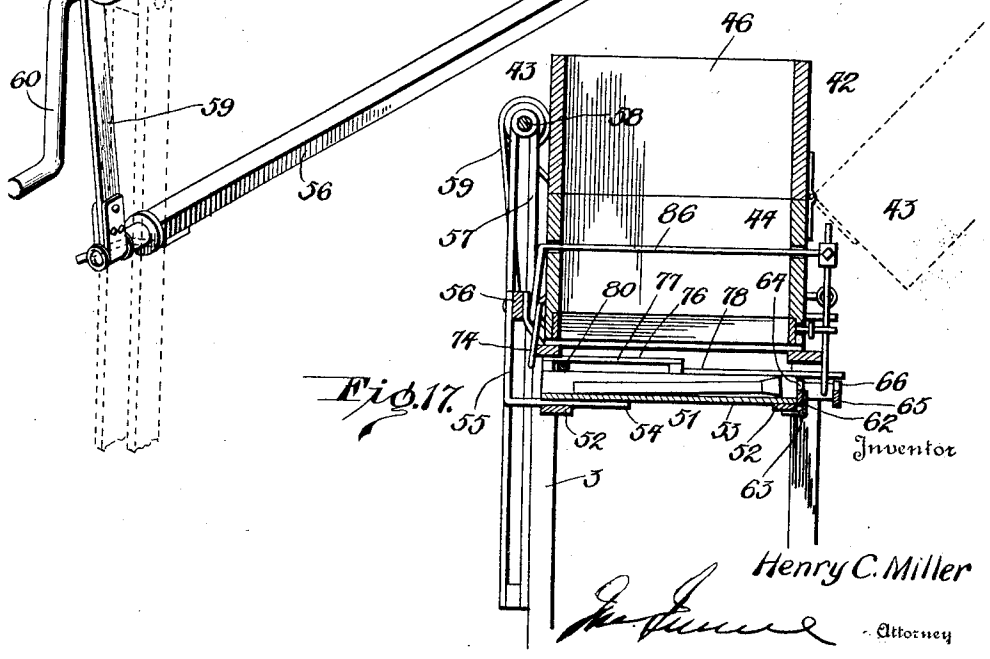


Fig. 17.

Inventor

Henry C. Miller

Attorney

Patented May 15, 1928. 1,669,769

UNITED STATES PATENT OFFICE.

HENRY C. MILLER, OF WATERFORD, NEW YORK.

COMBINED DOFFER AND DONNING MECHANISM.

Application filed June 12, 1922. Serial No. 567,586.

This invention relates to a portable apparatus, wherein there is combined a doffer mechanism and a donning mechanism for the removal of filled bobbins from and the replacement of empty bobbins on the spindles of a spinning machine.

Mechanical doffers and donners have been heretofore proposed for use in connection with spinning machines, but such have usually proven of little commercial value, primarily, in some instances, because they were adapted to be attached directly to the spinning frame and hence not only costly but necessarily added parts to the spinning frame which were difficult to keep free from lint or dirt with consequent slubs and oily spots in the spun thread; or such devices were semi-portable in that they were mounted for independent movement on parts connected to the spinning frame, with the additional expense of installation; or such other devices which are adapted to take off one filled bobbin and put on one empty bobbin at each cycle of a crank which together with the necessity of carrying same from one spinning frame to another and adjustments required after each, rendered the doffing and donning too slow to be of commercial value.

It is therefore the primary object of the present invention to provide an apparatus combining in a unitary structure a doffer mechanism and a donning mechanism, which apparatus is entirely and completely portable, in that it is without any connection with the frame of the spinning machine, with the doffer mechanism and donning mechanism each adapted to simultaneously remove and apply a number of bobbins, to thereby avoid, through the complete portable independence of the apparatus, the addition of any part or parts whatsoever to the spinning machine frame, and to provide, through the simultaneous handling of a plurality of bobbins, a speed of operation not possible through any heretofore known type of apparatus.

The improved apparatus further involves such a combinative and relative action and position of the doffer mechanism and donning mechanism that the doffer mechanism in the doffing operation avoids undue strain on the threads and also avoids interference with the usual several windings of the threads about the spindles below the filled bobbins, and then supports the doffed bobbins so that the empty bobbins when supplied to the spindles from the donning mechanism will act to confine the supply thread on the spindles and thus permit such thread between the spindle and doffed bobbins to be broken or cut as the apparatus is moved to the next set of spindles with which it is to cooperate

The apparatus as a whole is conveniently mounted on wheels to permit its movement lengthwise the spinning frame for successive cooperation with the spindles, and when in operative relation to the spinning frame, is designed to be positioned against the guide bar common to spinning machines, and which is arranged below the spindles. In order that the apparatus may in its successive movements be constantly held against this guide bar, the wheels on which the apparatus is mounted, are set at such an angle as to continually guide the apparatus toward the guide bar, so that the operator need not be concerned with the mechanical guiding of the apparatus, as after initially placing the apparatus in contact with the guide bar, the further movement of the apparatus for cooperation with successive spindles will, through the wheel inclination, maintain continual contact between said apparatus and the guide bar.

The doffing mechanism of the present apparatus is designed to simultaneously remove a plurality of filled bobbins, and includes a series of bobbin grippers, which are mechanically raised to a position above and brought into accurate registry with the respective bobbins to be removed, the grippers being thereupon actuated, each under its own automatically compensating tension, to effectively grip the filled bobbins. The doffing mechanism is then reversed to raise the filled bobbins free of the spindles, and such mechanism then automatically moves the removed bobbins to a position wholly beyond the spindles, maintaining them in this position without having severed the supply threads.

The drawing shows the doffer in opera-

tion on a ring spinning frame; it is understood that the last operation when the bobbins are filled is to cause three or more turns to be made around the cone shaped part on the bottom of the bobbin by a well known operation of the spinning frame, so that when bobbins are taken off of the spindles, the thread is drawn from the cone shaped part and the turns of thread are transferred to the spindles, the said operation also gives slack to the threads so that they are not broken when the bobbins leave the spindles and the grippers are at their lowest position, as the different bobbin threads will not be all in the back part and away from the doffer, provision must be made to push them out of the way of the gripper's reach no matter where the threads may be; I provide a thread guard to push the threads down and to the rear of the spindles.

I show a modification of the thread guard; in the preferred one, the thread is simply guarded and threads are broken between the gripped bobbins and the spindles after the donning of the empty spindles when the doffer is moved to the next position; in the modification I provide a series of shears, one for each thread simultaneously operated which are fastened to the thread guard before the doffer is moved to the next position.

The donning mechanism includes a magagine for receiving empty bobbins in sufficient number to take care of a number of successive operations of the apparatus as a whole, and a receiver frame operative beneath the magazine and having a number of receivers corresponding to the number of empty bobbins to be simultaneously applied to the spindles in a single operation of the apparatus. A separator is arranged to control the delivery of a single bobbin from each compartment of the magazine to the underlying cradle, and the cradle frame as a whole is then released for swinging to a substantially vertical position, a temporary bobbin holding means preventing accidental displacement of the bobbins from the receivers during this movement. The cradle frame is then positioned to align with the empty spindles, through appropriate guides, and lowered for a short distance to place the bobbins upon the upper ends of the spindles. The bobbins are then simultaneously released from the cradles and gravitate to proper positions on the spindles.

The magazine for empty bobbins is preferably made in two or more parts, adapted to be hinged or otherwise held together when filled; in filling a magazine of a height that would contain the proper amount of bobbins, it would be next to impossible to observe if all the bobbins are laying in proper position to be separated while in the act of donning; so I have provided a separable hopper so that operator will observe at once if the bobbins are properly placed, so when the lower sections are filled, it is only necessary to put on the next section and fill that in turn.

The invention in the preferred form of details is shown in the accompanying drawings, in which:

Fig. 1 is a perspective view, illustrating the combined unit showing the doffer mechanism and donning mechanism.

Fig. 2 is an end view of the same, partly in section, the unit being shown positioned with respect to the spinning frame and the donning mechanism in initial operative position in full lines and in completely operative position in dotted lines.

Fig. 3 is a similar view, the donning mechanism being omitted, and the doffer mechanism being shown in initially operative position in full lines and in completely operative positions in dotted lines.

Fig. 4 is a view similar to Fig. 3 with the doffer mechanism in position immediately following the doffing operation.

Fig. 5 is a perspective view of the doffer mechanism detached.

Fig. 6 is a broken perspective of a portion of the doffer mechanism, showing particularly the gripper and spindle gage.

Fig. 7 is a transverse sectional view of the same illustrating particularly the means for actuating the grippers.

Fig. 8 is a perspective view showing the thread stripper of the doffing mechanism.

Fig. 9 is a detail view in elevation showing particularly the means for automatically opening the grippers in the initial operative movement of the doffer mechanism.

Fig. 10 is a broken longitudinal sectional view through the magazine and cradle of the donning mechanism.

Fig. 11 is a broken perspective view of the cradle.

Fig. 12 is a broken longitudinal sectional view of the magazine showing the operation of the gate.

Fig. 13 is a perspective view of the cradle with parts omitted, showing the cradle in initially operative position.

Fig. 14 is a broken perspective of the magazine and cradle, the latter being shown in bobbin receiving relation to the magazine.

Fig. 15 is a broken perspective of the gate for controlling the delivery of empty bobbins from the magazine to the cradle.

Fig. 16 is a perspective view showing the manually operable means for moving the cradle vertically with respect to the magazine.

Fig. 17 is a transverse sectional view through the donning mechanism, the upper portion of the magazine being shown turned back in dotted outline.

Fig. 18 is a vertical sectional view showing

the cradle positioned to deliver an empty bobbin onto the spindle.

Fig. 19 is a similar view illustrating the means for operating the end gate of the bobbin receivers to release the bobbins for endwise movement onto the spindles.

Fig. 20 is a broken end elevation illustrating particularly the means for elevating the cradle with respect to the magazine and the frictional means for retarding the movement of such elevated means.

Fig. 21 is a plan showing the arrangement of the truck wheels, whereby the doffing and donning unit is maintained in contact with the guide bar of the spinning frame in the movement of the unit longitudinally of said frame.

Fig. 22, shows a modified form of thread guard on which are a series of shears of cutters to cause the severing of threads simultaneously.

The combined doffing and donning mechanism of this invention is here shown as comprising a completely portable and wholly independent unit in truck form, made up to include a base 1, supported on truck wheels 2, from which base rise skeleton end frames 3. The end frames on the side next the spinning machine when the apparatus is in operative position, hereinafter termed the front of the apparatus, are forwardly offset at the lower ends to provide guide bars 4, which are adapted in the use of the apparatus to contact with the longitudinal guide bar 5, which is a fixed usual part of the spinning machine.

It is to be understood that the apparatus here described is intended to simultaneously doff a number of filled bobbins, for example, sixteen, and then to don a similar number of empty bobbins on the spindles from which the filled bobbins have been removed. Thus, in the use of the apparatus, it will be moved lengthwise the front of the spinning machine for cooperation with successive sets of bobbins, and in order to insure that the apparatus will maintain its relation with the guide bar 5 of the spinning machine, without particular guiding attention on the part of the operator, the truck wheels 2 are set at a slight angle, so that in the forward movement of the apparatus, it is continually guided toward the bar 5. Thus without attention on the part of the operator, the apparatus will be properly held in relation to the spinning machine.

The doffing mechanism is arranged between the end frames 3 and includes a doffing frame, comprising a main frame bar 6 having castings 7, secured to the respective ends thereof. Bars 8 depend from the castings and are pivotally connected at their lower ends at 9, to one end of links 10, the opposite ends of which links are pivotally connected at 11 to the rear uprights of the end frames 3. A gripper operating shaft 12 is rotatively supported in the castings 7 in rear of the main frame bar, this shaft immediately beyond the castings having bearing sleeves 13 arranged to cooperate with positioning guides on the end frames 3. These guides are formed by integral sections of the skeleton end frames and include uprights 14, which depend from the upper ends of the frames and at an appropriate point have rearwardly inclined guiding portions 15, below which the uprights present vertical guiding edges 16. Short uprights 17 rising from the cross bar in each end frame, extend in spaced parallel relation to the vertical guiding edges 16, thereby providing longitudinally extending guiding recesses 18, in which the bearing sleeves 13 are normally positioned. Obviously, as the frame of the doffing mechanism is moved upwardly, the main frame bar 6 will rise vertically for a distance corresponding to the length of the guiding recesses 18, and will then be moved forwardly toward the spinning machine through cooperation with the inclined guiding portions 15. The doffing mechanism as a whole, is elevated and lowered through a shaft 19, mounted in the rear uprights of the end frames and operated through a crank handle 20 on one end thereof. Straps 21 are secured to and adapted to be wound around the shaft 19, these straps being terminally connected through adjustable connectors 22 with the bars 8 of the doffer mechanism above the connection of said bars with the links 10. The weight of the doffing mechanism is counteracted through a frictional retarding means cooperating with the shaft 19 and involving a strap 23 secured at one terminal to a projection of one end frame 3, said strap passing over a pulley 24 on the shaft 19, the terminal of the strap being connected to the end frame by a spring 25. The tension of the spring, which of course is to be adjustable, causes the strap to frictionally hold the shaft 19 against turning, and hence the doffer mechanism will remain in elevated position without specific holding means therefor.

The grippers for directly engaging the filled bobbins are carried by the frame bar 6, and are of course of a number corresponding to the number of bobbins to be simultaneously handled. The grippers each comprise a fixed section 26 and a movable section 27, each of arcuate form and each formed on their relatively inner surfaces with what may be termed corrugations 28, to effectively grip the material on the bobbin. These corrugations are peculiarly arranged in that they are at such an angle to the horizontal to avoid the possibility of coincidence with the lines of thread on the bobbin, for if the corrugations were in line with the turns

of the thread on the bobbin, there would probably result an interlocking of the different thread layers on the bobbin, so that the thread would not pull off without breaking. The fixed section of each gripper is removably secured upon the ends of rods 29 projecting forwardly from the frame bar 6, the movable gripper section 27 being slidably mounted on these rods.

It is particularly important in a doffing machine simultaneously handling a plurality of filled bobbins that each and every gripper be adapted to as readily cooperate with a "thin" bobbin as with a normally filled bobbin, and for this reason, the means for closing the grippers must be capable for automatically compensating for any variation in the usual fullness of the bobbins. This consideration has been provided for in the gripper operating means here illustrated, which means consists in a spring rod 30 secured at one end to the movable section 27 of the gripper and downwardly curved therefrom beneath and in rear of the frame bar 6 to afford the desired resiliency. The rear end of each operating rod is connected to an actuator 31 in the form of a block removably secured upon the gripper operating shaft 12 rotatively mounted in the castings 7 of the doffer frame, and having a crank handle 33 for operating such shaft. As the shaft is turned in one direction, the movable sections 27 of the grippers are forced toward the fixed sections 26 to grip the interposed filled bobbins, the movement of the shaft being continued to a limit position indicated by stops 34, in which position the actuators 31 have passed their centers of movement in line between the shaft 12 and grippers, thereby closing the grippers with a variable spring tension necessary to compensate for differently filled bobbins, and at the same time utilizing this spring pressure to hold the cam actuators in position to maintain the grippers closed until the shaft 12 is actuated in the reversed direction by means of the handle 33.

It may be here stated that the filled bobbins after doffing are to be held in the grippers in a predetermined relation to the spindles from which they are removed until the donning mechanism has been actuated, and after empty bobbins have been placed on said spindles, the apparatus as a whole is moved lengthwise the spinning machine to a new position, and the doffing mechanism then actuated for initial movement to effect a doffing. It is desired that the bobbins in the doffing mechanism be retained in the grippers until the doffing mechanism is initially actuated for a succeeding doffing movement, the gripper held bobbins being automatically released in this initial movement of the doffing mechanism. This automatic release is affected through a trip dog 35 connected with the main frame at 36, and normally held in operative position by a spring 37. The end of the gripper shaft 12 is provided with a crank pin 38, which as the doffer frame rises, is engaged by the hook end of the trip dog, and the shaft 12 turned sufficiently to move the actuators 31 below center, whereupon the spring rods 30 complete the movement of the actuators and thereby open the grippers through operation of the movable section 27. The released bobbins fall into a receptacle which may be positioned on the base 1.

It is important that during the movement of the doffing mechanism to place the grippers into cooperation with the filled spindles, the supply thread be drawn upon to provide the necessary slack for the doffing movement of the bobbins, and that at the same time this supply thread be moved to position which will absolutely prevent it from being engaged by the grippers. For the purpose of controlling the supply thread in this particular, there is secured between each, or certain pairs of grippers, depending guide strips 39 to which are secured flexible connecters as chains 40, supporting at their lower ends a stripper rod 41. This rod moves lengthwise the filled bobbins in advance of the grippers and guards the supply thread, and at the same time moves the supply thread to a position below the possible reach of the grippers. The chains permit a certain flexibility of positioning in the stripper guard, while the strips 39 steadies the guard.

The donning mechanism, by means of which empty bobbins are placed upon the spindles from which the filled bobbins have been removed by the doffing mechanism, includes a magazine in which the empty bobbins are loaded, and means for delivering a predetermined number of such empty bobbins to the spindles. The magazine comprises a receptacle 42 secured upon the upper end of the end frames 3 and divided into upper and lower sections 43 and 44 hingedly connected together at 45. The receptacle as a whole, that is, both upper and lower sections, are divided by partitions 46, to provide a series of bobbin receiving compartments 47. As at present contemplated, the magazine is of a size to receive a sufficient number of empty bobbins to take care of a number of successsive operations of the apparatus, as for example, the magazine will contain sixteen compartments, each holding eight bobbins, thereby providing one hundred and twenty-eight empty bobbins, which are sufficient for one side of the spinning machine. If in placing these empty bobbins, one should be dropped in angle position, which would prevent its proper delivery, such angle bobbin could be easily reached by swinging back the upper half of the re-

ceptacle, thus saving time and labor of removing all superimposed bobbins in a particular compartment or compartments in the lower section.

The filler as well as the warp bobbins may be doffed, all that is necessary is to substitute a magazine having its compartments a little different shape, or a removable magazine may be used for the use of small mills so that when it is necessary to doff the different style of bobbins, all that is necessary is to change the magazine as the magazines are only held on by clamping screws, not shown.

Although the doffer is shown in use with the ring spinning frame, a fly spinning frame can be also handled by very little change and by the addition of a fly lifting device which is adapted to lift the fliers off of the spools so that the grippers can remove the filled spools and don the empties, and then replace the fliers. For this purpose I provide the combination thread cutter and thread guard.

A separator 48 is slidably mounted at the bottom of the magazine and operated through a handle 49, the gate having apertures 50 therein, which when arranged in line with the compartments of the magazine permits the discharge through the gate of a bobbin from each compartment.

The empty bobbins are carried from the magazine to a donning relation with the spindles by a cradle 51, including longitudinal frame bars 52, on which are mounted a series of trough-like bobbin receivers 53. Transverse cradle frame bars 54 have their forward ends turned upwardly to provide sections 55 which are fixedly connected to a supporting bar 56, which is slidably mounted in guideways 57, secured to the front of the machine. The angular relation of the sections 55 and their length is such that when permitted to move, the cradle as a whole will swing downwardly and forwardly, disposing the receivers at an angle to the vertical, as illustrated in full lines in Fig. 2.

In the donning operation, it is necessary that the receivers as a whole with the contained bobbins be elevated and lowered for the doffing operation, and this movement is accomplished through a shaft 58 rotatively mounted on the forward wall of the magazine and connected by straps 59, adapted to be wound about the shaft 58, with the ends of the supporting bar 56. The shaft 58 is manually operated through a handle 60, and is frictionally restrained against free movement by a frictional retarder 61, similar to that described in connection with the control of the doffer mechanism shaft 19.

As the cradle swings to a lowered position, means must be provided for preventing endwise movement of the empty bobbins until the receivers are accurately positioned with relation to the empty spindles. This means comprises an end gate for all of the receivers in the form of a flat strip 62 hinged at 63 to a cradle frame bar 52. The gate overlies the discharge ends of the receivers 53 and is formed in its free edge with a notch 64 of a size and shape to cooperate with the upper end of the empty spindle and thus accurately align the particular receiver therewith. Additional gage bars 65 with spindle engaging notches 66 are secured to the end gate and arranged beyond the same to afford additional and initial gaging means. The end gate and gage bars 65 are operated at will to remove them from normal relation to the receivers and thus permit discharge of the bobbins contained in the receivers by a rod 67 connected to an ear projecting from the end gate and arranged between two receivers near one end of the cradle. The rod is slidably mounted upon a guide 68 secured upon the cradle frame bars 52 and is normally held in position to maintain the gate closed by a spring 69. The rod 67 has a handle 70 through which the rod may be operated to swing the gate to a discharge position, a thumb piece 71 being secured in position to facilitate operation of the rod by the fingers of the operator.

The cradle is normally held in close relation to the bottom of the magazine by a spring pressed latch bar 72 having its hook end engaged beneath a projection 73 on the cradle, the latch bar being preferably arranged on the rear side of the magazine and operated through a handle 74 and intervening connection 75 on the front of the magazine.

As the cradle following its release by proper movement of the latch bar swings to a lowered position, means must be provided for preventing accidental displacement of the empty bobbins from the receivers, and this means must be arranged to be out of the way of the bobbins in their delivery from the magazine to the receivers. To secure this result, there is mounted upon the cradle frame a guide structure 76 involving upper and lower bars 77 and 78, the upper bars terminating at about mid-length the receivers, the guide thus provided having end walls or stops 79 at the ends of the upper bars 77. The guide structures are arranged with the lower bars 78 in line with the upper edges of the receivers, and a bar 80 is freely slidable in these guide structures, which bar is of a length to overlie all of the receivers. As the cradle drops to lowered position, the bar 80 gravitates in the guide structures and thus provides an obstruction to the escape of the bobbins in the receivers. As the cradle is returned to a normal receiving position with respect to the magazine, the pivotally supported end thereof is on a plane slightly lower than the free or

latch engaging end. Hence the bar 80 will, in this position of the cradle, gravitate to the opposite end of the guide structures, thus entirely clearing each receiver to freely admit the empty bobbin.

In operation, the improved unit, which as previously stated, is completely portable and wholly independent at all times and in all conditions of operation from the spinning machine, is moved along side of the spinning frame, so that the guide bars 4 of the unit frame engage the guide bar 5 of the spinning machine frame. The handle 20 is then operated to turn shaft 19 which moves the doffer mechanism upwardly and forwardly through the guides 14 and 15, in which position the grippers are on a plane above the filled bobbins. The doffing frame is then swung forwardly by hand until the grippers are in line with the bobbins, whereupon by reverse operation of the handle 20, the grippers are lowered over the bobbins until gages 81 bear upon the upper ends of the spindles 82. The shaft 12 is then operated to close the grippers upon the filled bobbins 83, it being understood that the guard 41 has acted upon the supply thread as previously described. The doffer frame is then elevated by suitable operation of a handle 20, and when the filled bobbins have been removed from and are clear of the spindles, the doffer frame owing to its pivotal connection will drop back against the guide portion 14 of the end frame. This return of the doffer frame to normal position with the filled bobbins in the grippers is substantially automatic, in that it requires no attention on the part of the operator, and the movement is retarded downwardly by the frictional retarder 23, so that the speed is sufficient to draw the supply thread from the spindle as the bobbins are moved therefrom without breaking such thread, or without interfering with the turns of the thread about the spindle below the filled bobbin. This automatic return of the doffer frame permits the operator during such movement to proceed with the donning operation, thus saving an appreciable amount of time in the complete operation of the unit. In the donning operation, the separator 48 is first operated to deliver an empty bobbin to each of the receivers 55, whereupon the handle 74 is operated to release the latch and the cradle as a whole swings to a position below the magazine. The handle 60 is then operated to turn shaft 58 and through straps 59 draw the bar 56 and therefore the cradle into a position to dispose the lower ends of the receivers above the plane of the spindles 82. The cradle as a whole is then swung outwardly and lowered through operation of shaft 58 until the notches 64 in the end gate and the notches 66 in the gage bars engage the spindle and thus center the receiver. The end gate 62 is then operated through movement of the rod 67, and the contained empty bobbins are delivered onto the spindle. The cradle is then elevated from the spindles and manually moved to closed position, the latch 72 automatically engaging with the projection 73 to hold the cradle in this closed or receiving position. The filled bobbins which have been removed are still connected through the supply thread with the spindles, and as the empty bobbins are delivered onto the spindles, the supply thread is thus held, through the engagement of the bobbin with the coils of such thread about the spindles, and as the unit is moved forwardly for cooperation with the next set of bobbins to be doffed, the threads between the doffed bobbins and spindles are broken. In the movement of the doffer mechanism to cooperate with the next set of filled bobbins, the grippers are automatically open through the mechanism described, including the trip dog 35, and the bobbins previously held in the grippers are released and permitted to fall into a convenient receiving receptacle.

In the advance movement of the unit, the mounting of the truck wheels, 2 previously described, insures that the desired contacting cooperation of the guide bars 4 and 5 will be maintained, so that the operator has only to move the unit forward to the new position, without the necessity of guiding the same during such movement.

The unit as a whole is independent of the spinning machine and absolutely without any fixed or removable connection therewith at any time. This avoids any additional parts on the spinning machine, which are objectionable as not only adding to the expense of installation but in providing unnecessary parts which tend to imperfect thread, through accumulation of dirt and lint, and further, the unit being wholly independent may be used with a plurality of spinning frames, may be wholly removed when not in use, and is operatively complete in itself.

The doffer mechanism and donning mechanism conveniently handle a plurality of bobbins, filled and empty, at each operation of such mechanism, so that the operator may doff and don a considerable number of spindles at each operation of the unit. This of course tends to a more speedy operation than is possible by the most expert hand work, and the operative parts of the doffer mechanism and the donning mechanism are such and are so related that there is even less liability to imperfect results than in hand operation.

In the act of doffing, it may sometime occur that the floor supporting the doffer is uneven, so that the coacting guides 4 and 5 may not function properly so that the grippers may be thrown out of true par-

allelism with the spindles to be doffed, to prevent undue strain coming on the spindles and so that the grippers may recompense themselves, I have provided the structure shown in the drawings; by the said structure allowance is made so that if the grippers on one end should be out even three quarters of an inch out of true, the parts would spring easily so that there would be no undue strain on the spindles whatsoever; the parts 8 and 10 and the spaces between the frames allows the gripper support 7 to have this variation.

Claims:

1. A combined doffing and donning apparatus, including a completely portable unit arranged for guiding contact with the spinning machine and capable of free movement toward and from the spinning machine at any point of such guiding contact, doffer mechanism carried by said unit, and donning mechanism carried by said unit.

2. A combined doffing and donning apparatus, including a completely portable unit arranged for guiding contact with the spinning machine and capable of free movement toward and from the spinning machine at any point of such guiding contact, doffer mechanism carried by said unit, and donning mechanism carried by said unit, said unit having means adapted to contact with a fixed part of the spinning machine to thereby position the unit for the doffing and donning operation.

3. A combined doffing and donning apparatus, including a completely portable unit arranged for guiding contact with the spinning machine and capable of free movement toward and from the spinning machine at any point of such guiding contact, doffer mechanism to simultaneously doff a plurality of bobbins carried by said unit, and donning mechanism to simultaneously don a plurality of empty bobbins carried by the unit.

4. A combined doffing and donning apparatus, including a completely portable unit arranged for guiding contact with the spinning machine and capable of free movement toward and from the spinning machine at any point of such guiding contact, said unit being adapted to be positioned in contact with a fixed portion of the machine for operation, means arranged wholly on the unit for maintaining said contact in the advance of the unit from one operative position to the next, doffer mechanism carried by the unit and adapted to simultaneously doff a plurality of filled bobbins, and donning mechanism carried by the unit and adapted to simultaneously don a plurality of empty bobbins.

5. A combined doffing and donning apparatus, including a wholly portable independent unit, adapted for movement lengthwise of and in contact with the spinning machine, the unit being adapted to be freely movable toward and away from the spinning machine from any position lengthwise the latter, doffer mechanism carried by the unit, and donning mechanism carried by the unit, the movement of the unit lengthwise the spinning machine acting to break the supply thread between the spindles and the doffed bobbins.

6. A combined doffing and donning apparatus, including a completely portable unit adapted for guiding contact with the spinning machine and capable of free movement toward and from such machine at any point of such guiding contact, said unit being movable lengthwise the machine for cooperation with successive sets of spindles, doffer mechanism carried by the unit for doffing a plurality of filled bobbins, and donning mechanism carried by the unit for donning a plurality of empty bobbins, the doffer mechanism acting on the supply thread to each bobbin to permit said bobbin to be completely doffed and supported within the unit without severing said supply thread.

7. A combined doffing and donning apparatus, including a completely portable unit adapted for guiding contact with the spinning machine and capable of free movement toward and from such machine at any point of such guiding contact, said unit being movable lengthwise the machine for cooperation with successive sets of spindles, doffer mechanism carried by the unit for doffing a plurality of filled bobbins, and donning mechanism carried by the unit for donning a plurality of empty bobbins, the doffer mechanism acting on the supply thread to each bobbin to permit said bobbin to be completely doffed and supported within the unit without severing said supply thread, the donning mechanism being actuated to apply the empty bobbins to the spindles prior to the severance of the supply threads between the spindles and doffed bobbins.

8. A multiple doffer, including a doffing mechanism, a truck on which said mechanism is mounted, means on the truck to raise the doffing mechanism vertically and means to move the doffing mechanism horizontally during such vertical movement, and bobbin gripping means carried by the doffing mechanism.

9. A portable wholly independent doffing mechanism, guiding means carried thereby to cooperate with a fixed guide on the spinning machine, and means supporting said mechanism and permitting movement thereof longitudinally of the spinning machine, said means continually forcing the said doffing mechanism in a direction toward the

spinning machine in the forward movement of such mechanism.

10. In a doffer, a platform, doffing mechanism supported thereby, means on the platform to contact with a fixed part of the spinning machine in positioning the doffer for operation, truck wheels supporting the platform and normally acting at an angle to a direct line movement of the platform, to thereby force the platform toward the spinning machine in the movement of the platform longitudinally of the machine.

11. In a doffer, a wheel truck, doffing mechanism carried thereby, said truck being adapted to be moved longitudinally of the spinning machine in guiding contact with a fixed part of such machine, the wheels of the truck tending to maintain the contact between said truck and spinning machine in the movement of the truck longitudinally of the machine and serving as the sole means for maintaining cooperative relation between the doffer and spinning machine.

12. In a doffing mechanism, bobbin removers, means for raising said removers vertically, means for moving the bobbin removers horizontally during such vertical movement, and means operative in a predetermined movement of the bobbin removers to effect the cooperation of said removers with the bobbins.

13. In a doffing mechanism, a frame work formed with guideways for compelling simultaneous vertical and horizontal movement of said mechanism, bobbin gripping means forming part of said mechanism and controlled in movement by said guideways, and means to open the grippers following a predetermined movement of the doffing mechanism in said guideways.

14. In a doffing mechanism, a frame work formed with guideways for said mechanism, bobbin gripping means forming part of said mechanism and controlled in movement by said guideways, and means to open the grippers following a predetermined movement of the doffing mechanism in said guideways, said guideways being formed to compel an initial vertical and subsequent combined vertical and horizontal movements of the doffing mechanism.

15. In a doffing mechanism, bobbin removing means, including grippers, means for raising the bobbin removing means and causing the grippers to follow a predetermined path of travel, means to operate the grippers to engage the bobbins, the said raising means being then operable to lift the gripped bobbins from the spindles and also adapted to exert a lateral pull on the doffing mechanism to cause said mechanism with the doffed bobbins to move laterally and free of the spindles.

16. In a doffing mechanism, bobbin grippers, means for positioning said grippers, and means for acting upon the supply threads of the filled bobbins in advance of and during the positioning of the grippers.

17. In a doffing mechanism, bobbin grippers, means for positioning said grippers, and means for acting upon the supply threads of the filled bobbins in advance of and during the positioning of the grippers, and means for elevating the grippers and filled bobbins from the spindles.

18. In a doffing mechanism, bobbin grippers, means for positioning said grippers, supply thread engaging means movable with the grippers and acting upon the supply thread in advance of the grippers, means for operating the grippers to engage the filled bobbins, and means for elevating said grippers and supply thread engaging means to a position above the spindles.

19. In a doffing mechanism, gripping means for removing a bobbin from a spinning frame spindle, means for raising the gripping means, manually operable means for moving the grippers toward the spndle, said grippers being mounted for automatic movement from the spindles, said automatic movement of the gripping means being controlled to prevent breaking the supply thread between the doffed bobbin and the spindle.

20. In a doffing mechanism, gripping means for removing a bobbin from a spinning frame spindle, means for raising the gripping means, manually operable means for moving the grippers toward the spindle, said grippers being mounted for automatic movement from the spindles, said automatic movement of the gripping means being controlled to prevent breaking the supply thread between the doffed bobbin and the spindle, guideways for controlling the movement of the grippers under said manually operable means, and a gripping means trip for operating the gripping means, said trip being arranged in the path of movement of said grippers in said guideways.

21. In a doffing mechanism, bobbin grippers, means for manually raising said grippers, means for guiding and limiting movement in one direction of the grippers during said raising movement, said guiding means inducing a combined vertical and horizontal movement of the grippers, said manual means comprising a shaft, a handle therefor, flexible members connected to said shaft and to said grippers, said flexible members being adapted to be wound about the shaft in the raising of the grippers.

22. In a doffing mechanism, a bobbin gripper made up of relatively movable sections, each section being formed on its inner surface with corrugations at such an angle as to avoid alignment with the threads on the bobbin in the gripping thereof.

23. In a doffing mechanism, a gripper

having a bobbin engaging surface formed with corrugations biased in relation to the turns of the thread on the bobbin.

24. In a doffing mechanism, means for raising and lowering the same, said mechanism including a bar, a plurality of bobbin grippers carried by the bar, engaging means carried by the bar to limit the vertical position of the grippers on the filled bobbins without regard to the height of the doffing mechanism.

25. In a doffing mechanism, grippers, a frame supporting said grippers, an empty bobbin magazine mounted on the frame above the grippers, a cradle having means to receive and position a predetermined number of empty bobbins, means for pivotally and movably supporting said cradle, an end gate for holding the empty bobbins from endwise movement in the cradle, means for operating the end gate to release the bobbins, and independent means for holding the bobbins in the cradle during the movement of the cradle.

26. In a doffing mechanism, grippers, a frame supporting said grippers, an empty bobbin magazine mounted on the frame above the grippers, a cradle having means to receive and position a predetermined number of empty bobbins, means for pivotally and movably supporting said cradle, and an end gate for holding the empty bobbins from endwise movement in the cradle, said end gate having gage notches to cooperate with the ends of the spindles to locate the cradle relative thereto.

27. The combination with a frame, donning mechanism supported on the frame, including a magazine, a cradle pivotally supported with respect to the magazine and including a plurality of bobbin receivers, and a doffer mechanism mounted in said frame for vertical and horizontal movements, said cradle when in receiving relation to the magazine providing means within the frame for the operation of the doffer mechanism.

28. In a donning mechanism, a magazine having compartments to receive empty bobbins, a gate slidably mounted in the magazine and having bobbin receiving compartments, said gate being operable in one direction to receive bobbins from the magazine and in the other direction to discharge said bobbins below the magazine, and a cradle mounted below the magazine to receive said bobbins and maintain them in spaced relation.

29. In a donning mechanism, a magazine having compartments to receive empty bobbins, a gate slidably mounted in the magazine and having bobbin receiving compartments, said gate being operable in one direction to receive bobbins from the magazine and in the other direction to discharge said bobbins below the magazine, and a cradle mounted below the magazine to receive said bobbins and maintain them in spaced relation, and means for holding the bobbins against displacement from the cradle in the movement of the cradle relative to the magazine.

30. In a donning mechanism, a magazine having compartments to receive empty bobbins, a gate slidably mounted in the magazine and having bobbin receiving compartments, said gate being operable in one direction to receive bobbins from the magazine and in the other direction to discharge said bobbins below the magazine, and a cradle mounted below the magazine to receive said bobbins and maintain them in spaced relation, and means for holding the bobbins against displacement from the cradle in the movement of the cradle relative to the magazine, said means being wholly inoperative when the cradle is in bobbin receiving relation to the magazine.

31. In a doffer mechanism, a frame including a main bar, a plurality of bobbin grippers carried thereby, each of said grippers comprising independent sections, manually operable means for causing relative movement of the sections for a gripping action, manually operable means for elevating the frame to arrange the grippers in a plane above the spindles to be doffed, and means for automatically opening the grippers during such raising movement of the frame.

32. In a donning mechanism, a magazine formed to provide empty bobbin compartments, a cradle mounted for swinging movement below the magazine, said cradle including a plurality of bobbin receivers, an end gate closing the receivers against endwise movement of the bobbins during the swinging movement of the cradle, and means for moving the cradle vertically with respect to the magazine.

33. In a donning mechanism, a magazine formed to provide empty bobbin compartments, a cradle mounted for swinging movement below the magazine, said cradle including a plurality of bobbin receivers, an end gate closing the receivers against endwise movement of the bobbins during the swinging movement of the cradle, and means for moving the cradle vertically with respect to the magazine, and frictional retarding means for such vertical cradle movement.

34. In a donning mechanism, a magazine formed to provide empty bobbin compartments, a cradle mounted for swinging movement below the magazine, said cradle including a plurality of bobbin receivers, an end gate closing the receivers against endwise movement of the bobbins during the swinging movement of the cradle, manually

operable means for moving the end gate from receiver closing position, and means for moving the cradle vertically with respect to the magazine.

35. In a donning mechanism, a magazine formed to provide empty bobbin compartments, a cradle mounted for swinging movement below the magazine, said cradle including a plurality of bobbin receivers, an end gate closing the receivers against endwise movement of the bobbins during the swinging movement of the cradle, said end gate being formed with spindle engaging means serving to gage the position of the receivers with respect to the spindles, and manually operable means to move the end gate from receiver closing position.

36. In a donning mechanism, an empty bobbin magazine, a cradle to transfer the empty bobbins from the magazine to the spindles of the spinning machine, and a spindle holding element automatically operated in the movement of the cradle from the magazine toward the spindles.

37. In a donning mechanism, an empty bobbin magazine, a cradle to transfer the empty bobbins from the magazine to the spindles of the spinning machine, and a spindle holding element automatically operated in the movement of the cradle from the magazine toward the spindles, said spindle holding element being automatically movable to an inoperative position in the movement of the cradle into normal cooperation with the magazine.

38. In a donning mechanism, an empty bobbin magazine formed with bobbin compartments, and a cradle to carry the empty bobbins from the magazine toward the spindles of the spinning machine, said magazine being constructed in independent hingedly connected upper and lower sections dividing the compartments longitudinally.

39. In a donning mechanism, a magazine, a cradle for carrying empty bobbins from the magazine toward the spindles of the spinning machine, said cradle including a plurality of single bobbin receivers, an end gate simultaneously closing the ends of all of said receivers, and a locking bar cooperating with all of said receivers in the movement of the cradle from the magazine to hold the bobbins against displacement from the receivers.

40. In a donning mechanism, a magazine, a cradle for carrying empty bobbins from the magazine toward the spindles of the spinning machine, a series of single bobbin receivers mounted on the cradle, and means carried by the cradle to cooperate with the spindles of the spinning machine to align the respective receivers with said spindles.

41. In a donning mechanism, a magazine, a cradle for carrying empty bobbins from the magazine to the spindles of the spinning machine, a plurality of single bobbin receivers arranged on the cradle, and means cooperating with the magazine and adapted in operation to simultaneously deliver a bobbin to each receiver from the magazine.

42. In a donning mechanism, a multiple compartment magazine, a cradle arranged for swinging movement with respect to the magazine, a series of bobbin receivers carried by the cradle, and means for adjusting the cradle to arrange the receivers in bobbin delivering relation to the respective spindles of a spinning machine.

43. In a donning mechanism, a magazine, a cradle having means to receive and support a plurality of independent bobbins, means to deliver bobbins from said magazine to said cradle, and means for operating said cradle to dispose the same in bobbin discharging relation to a plurality of spinning-frame spindles.

44. In a donning mechanism, a magazine, a cradle adapted to receive empty bobbins from the magazine and having means to support a plurality of bobbins, said cradle being mounted for movement from the magazine toward the spinning-frame spindles, and means for holding the bobbins in said cradle during such movement, said holding means becoming automatically operative through movement of the cradle.

45. A doffer mechanism including bobbin grippers, means for moving said mechanism to arrange said grippers in alignment with the filled bobbins on the spindles, and means for manually operating said grippers to engage said bobbins, said means including a spring bowed member for each gripper, to permit automatic compensation of each gripper without regard to the others.

46. A doffer mechanism including grippers, each having a fixed section and a movable section, a spring rod connected to the movable section, and means for simultaneously exerting endwise pressure on all of said rods, said rods being bowed to permit individual compensating movement.

47. A doffer mechanism including spring operated grippers, a bar for supporting all of said grippers, means for moving the bar through a predetermined path of travel, and means for automatically opening the grippers during the initial movement of such bar.

48. A doffer mechanism including a frame, means for manually operating said frame, a series of grippers carried by the frame, a shaft mounted in the frame, cams carried by the shaft, and spring rods between said cams and grippers, whereby said shaft may be operated to open and close the grippers.

49. A doffer mechanism including a frame, means for manually operating said frame, a

series of grippers carried by the frame, a shaft mounted in said frame, spring means operated in the movement of said shaft to open and close said grippers, and means for automatically operating said shaft in the operation of said frame.

50. In a doffer mechanism, a truck frame, a doffer frame movable in the truck frame, grippers carried by the doffer frame, means for manually operating said doffer frame, and guides formed in the truck frame to compel a combined vertical and lateral movement of said doffer frame.

51. A donning mechanism, comprising a magazine, a cradle mounted for swinging movement with respect to the magazine, a series of bobbin receivers mounted on the cradle, and manually operable means for moving the cradle as a whole vertically with respect to the magazine.

52. A donning magazine including a cradle mounted for swinging movement, a series of trough-like bobbin receivers carried by said cradle, and a locking bar movable as a unit over said receivers during the swinging movement of the cradle said locking bar having a limit position intermediate the lengths of the receivers to thereby retain the bobbins in place.

53. In a doffer for spinning or like machine, a gripper bar having means adapted to grip more than one bobbin, means for operating both ends of the gripper bar simultaneously, either end of the bar being capable of independently flexing towards and from the spindles of the machine for the purpose set forth.

54. In a doffer, in a frame for supporting mechanism for raising and lowering two or more grippers, means for operating grippers, supports on each end to raise and lower grippers, a spinning frame, two or more spindles supporting filled bobbins, mechanism for allowing grippers to approach the filled bobbins in a slightly different line, means to cause the grippers to grip the filled bobbins, the said gripping position of the grippers causing the gripping bar to right itself without putting undue strain on the said spindles, and means for removing the filled bobbins from the spindles.

55. In a donning mechanism, a magazine, means for delivering a plurality of empty bobbins from the magazine to the spindles of a spinning machine, and means for holding the bobbins in said delivery means against displacement therefrom during the transfer, said holding means being released by contact with the bobbin spindles.

56. In a donning mechanism, a magazine, means for transferring empty bobbins from the magazine to the spindles of a spinning machine, means for releasing the transferring means for gravital movement to a position below the magazine, and manually operable means for thereafter positioning the transferring means into alignment with and above the spindles of the bobbins.

57. A doffer mechanism including grippers made up of relatively movable parts, a spring member connected to one of said parts and serving to move said part relative to the other under compensating tension, and means for moving the spring member for opening the grippers following a predetermined movement of the doffer mechanism.

58. A doffer, a frame, multiple gripper elements movably mounted on the frame, mechanism for raising and lowering the gripper elements vertically of the frame, and means acting automatically to prevent causal raising or lowering of the gripper elements following the cessation of power actuation of said mechanism, said means yielding to the power actuation of said mechanism.

59. In a donning apparatus, a magazine to receive filled bobbins for the donning operation, and means whereby the bobbins may be delivered from the magazine, said magazine being made up of a series of superimposed movably connected sections each formed with partitions to provide, when the sections are in super-imposed relation, a series of similar shaped bobbin receiving compartments, the upper section being movable relative to the lower section to permit independent access to the compartments of the lower section to directly reach the bobbins in such lower section in the event such bobbins assume an incorrect position.

60. A doffer, a frame, multiple gripper elements movably mounted on the frame, mechanism for raising and lowering the gripper elements vertically of the frame, and frictional means automatically acting on the cessation of power actuation of said mechanism to hold the gripper elements against casual raising or lowering, said frictional means yielding to the power actuation of said mechanism.

61. In a doffer, a movable frame, a plurality of gripping mechanisms carried thereby, gripper mechanism actuating means, and flexible connections between said actuating means and each gripper mechanism, said actuating means serving in the movement past the operative center to lock the gripper mechanism through the flexible connection when said gripper mechanism cooperates with the pull bobbin.

In testimony whereof I affix my signature.

HENRY C. MILLER.