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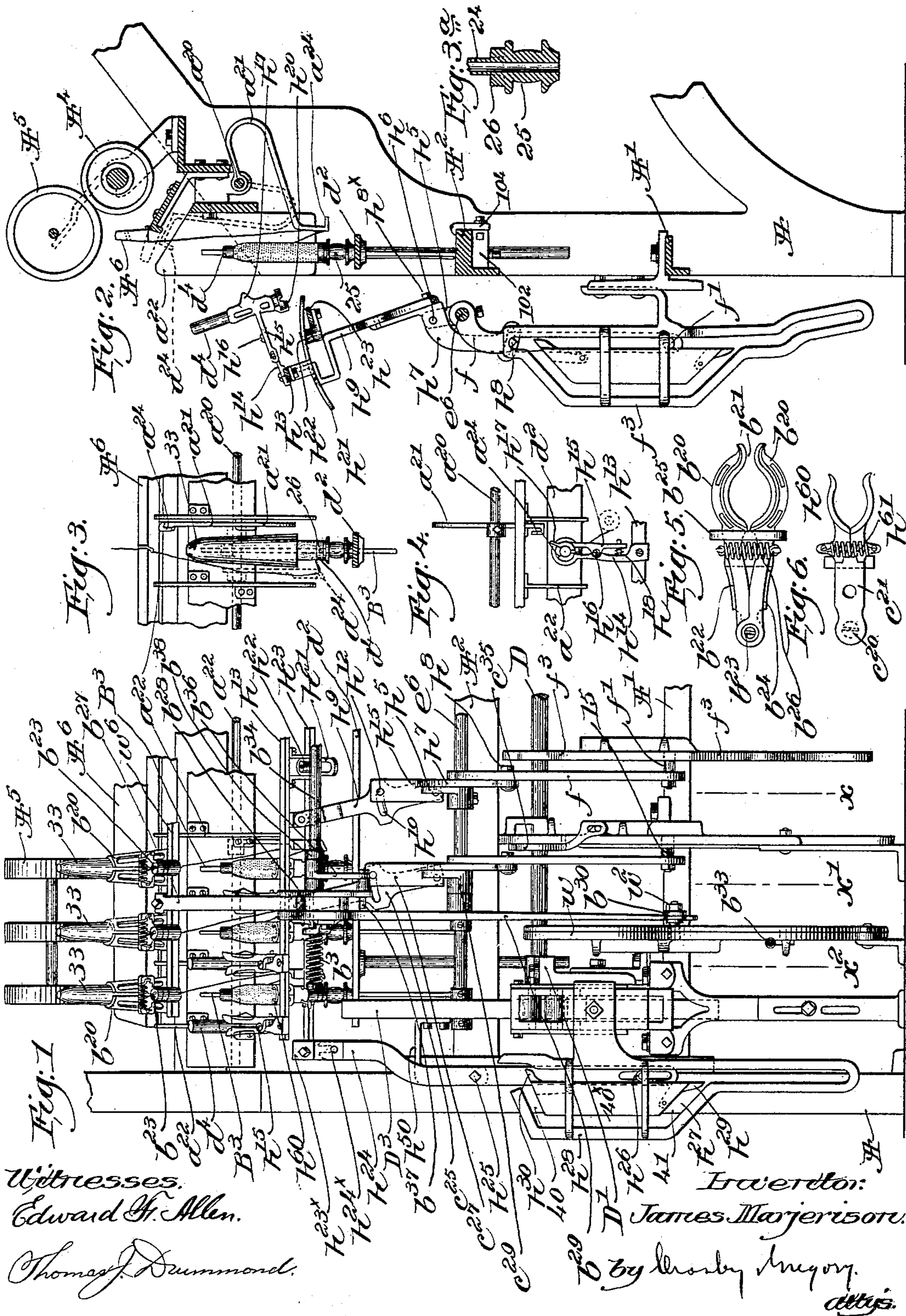
Patented Jan. 24, 1899.

J. MARJERISON.
SPINNING MACHINE.

(Application filed Feb. 21, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.

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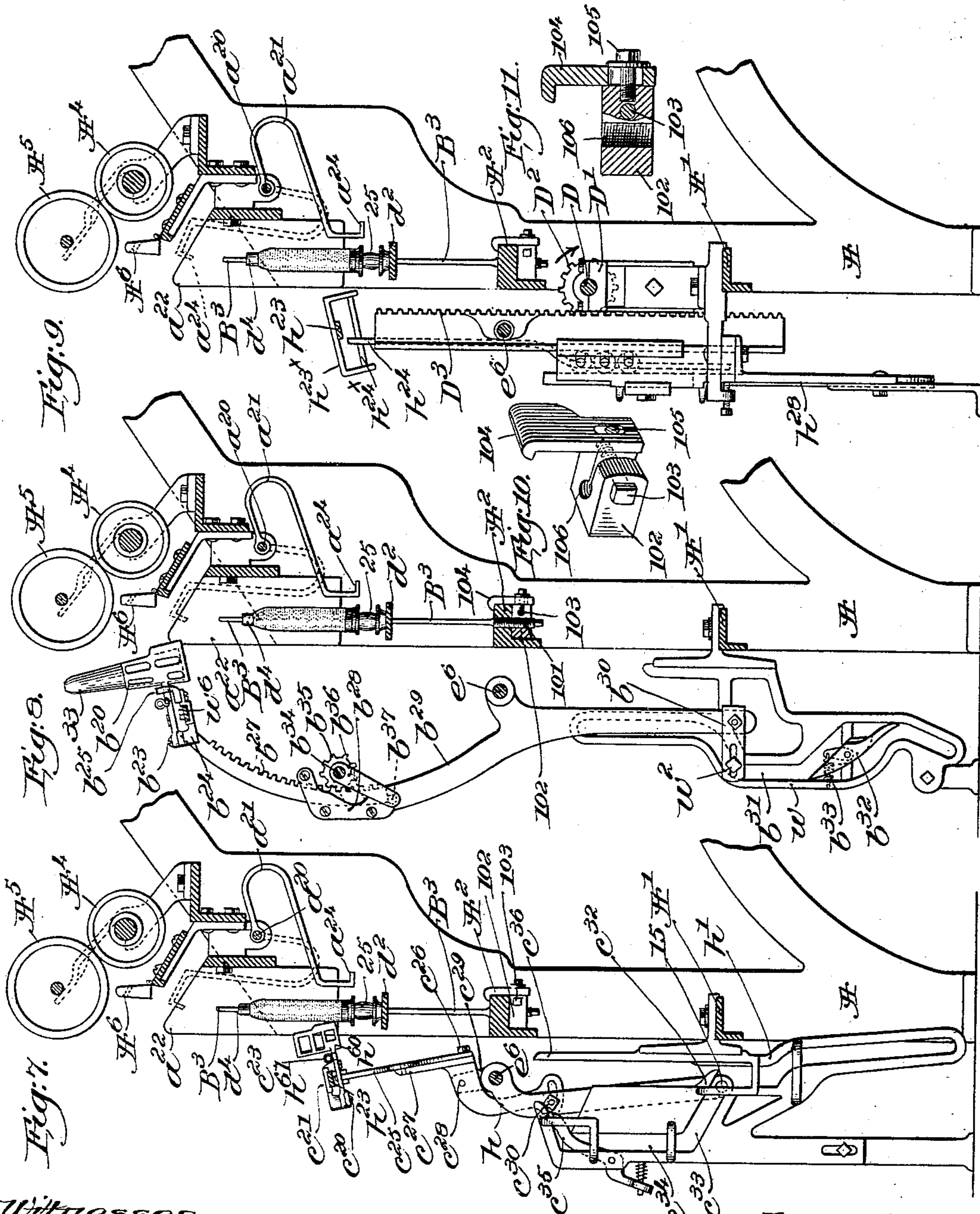
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UNITED STATES PATENT OFFICE.

JAMES MARJERISON, OF LAWRENCE, MASSACHUSETTS.

SPINNING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 618,229, dated January 24, 1899.

Application filed February 21, 1898. Serial No. 670,997. (No model.)

To all whom it may concern:

Be it known that I, JAMES MARJERISON, of Lawrence, county of Essex, State of Massachusetts, have invented an Improvement in Spinning-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 The invention to be herein described is intended as an improvement on the class of machines shown in United States Patent No. 381,567, dated April 24, 1888. The patent referred to shows and describes a spinning-
15 frame employing caps which are set on dead-spindles; and the invention therein contained comprehends means for simultaneously removing the caps and the wound bobbins in order that the latter may be doffed, and there-
20 after the tubes on said spindles have applied to them empty bobbins, and then the caps are returned upon the tops of the spindles. In this present invention I have devised novel
25 clamps or devices to handle the caps and also the full or wound bobbins and the empty bobbins. The clamps shown in said patent consisted of levers connected between their ends by a pivot, so that each carried a pair of pliers; but in practice it was found that such
30 clamps made as levers of the first order could not be opened sufficiently wide to adapt the clamps to all diameters of caps and of wound bobbins, and consequently said clamps have been improved.

35 My improved clamps present longer grasping portions, and said grasping portions are carried at the ends of two levers mounted at their opposite ends on a stud located at a considerable distance from the line of the spin-
40 dles, and said levers work in a guide which controls and steadies them in their movement, said guide coöperating with said levers near their grasping portions, a spiral spring connected at its opposite ends with both of
45 said levers normally acting to keep the grasping portions pressed one toward the other, but in a yielding manner, so that each concaved grasping portion may move independently of the other as it meets a cap, bobbin,
50 or whatever is to be clamped.

The patent referred to was without means for holding the yarn between a full bobbin

and the usual front rolls when the said bobbins were to be doffed and empty bobbins were to be applied to the spindles, so that a
55 second set of bobbins could be quickly started. Herein, however, I have provided for the first time, as I believe, automatic means whereby when the clamps have grasped a wound bobbin and removed it from its tube
60 on the spindle the yarn will be caught between the front rolls and the wound bobbins and will be put in such position that it may be clamped and held by the empty bobbins as they are put upon the tubes and spindles,
65 said clamped yarn being readily wound on the bobbins just applied to the tubes and spindles when the machine is again started, the tubes being rotated on the spindles by usual banding, common to said patent.

70 The means provided for catching the yarn and putting it in position to be clamped will be hereinafter more fully described.

In the patent referred to the clamps for engaging the caps to remove them from the spin-
75 dles were carried by arms pivotally mounted on the ends of clamp-actuating levers, said arms normally occupying a position turned back, down, and away from the spindles, and they had to be turned up into operative posi-
80 tion to enable the clamps to engage the caps and remove them from the spindles preparatory to other clamps engaging the wound bobbins and removing them from the tubes and
85 spindles. These cap-holding clamps having engaged the caps and having lifted them from the spindles were again turned back, down, and away from the tubes and spindles, they
90 continuing to hold the caps while the wound bobbins were removed by other clamps and empty bobbins were put back upon the tubes and spindles by yet other clamps, after which
95 the arms having the clamps engaging the caps were again put back into elevated position, as described, to enable the clamps holding the caps to apply them to the tubes and spin-
100 dles preparatory to spinning and winding the yarn on the bobbins just applied, and thereafter the levers carrying said clamps were again turned back, down, and away from the spindles. This operation was carried on by hand and required much time, and, further, the tipping over backwardly and downwardly of these clamp-carrying arms into the usual

alley-way between the frames seriously obstructed the alley-way, which was very objectionable, because the alley-way space in all mills is limited and should be always kept open and clear. To obviate this trouble, I mounted the cap-clamps on bars carried at the upper ends of segmental toothed racks, said racks being fitted in guideways on levers to be described, and to put said bar carrying said clamps, it normally occupying its inoperative position, into its operative position I provide a shaft having gears to engage the teeth of said toothed racks, said shaft having attached to it at one end of the frame a hand-wheel, by which it may be operated. By this plan the alley-way is not at all obstructed. I have also provided novel means for supporting the clamps holding the empty bobbins. The clamps which hold the empty bobbins to put them onto the usual tubes carried by the spindles are peculiarly constructed—*i. e.*, they have each a projection or finger which as the clamps are being turned off laterally from the bobbins just put upon the tubes acts to partially rotate each bobbin, the extent of each rotation being just enough to enable the usual slots at the lower ends of the bobbins to engage and slip down on the usual bobbin-driving studs or lugs carried by the tubes, so that said bobbins are always properly seated on their driving-tubes, and in coming to their seats the heads of the bobbins clamp the threads then placed in position for said purpose by means of a thread-catcher and hold the yarn firmly with relation to said tubes as the latter are started to wind the yarn on a new set of bobbins. The yarn on the new bobbins is broken off automatically after a few turns of the bobbin and tubes, and thereafter the full bobbins are by hand taken out of the clamps holding them.

The thread-catcher is herein shown as composed of a rocking and sliding shaft having a series of hooked arms which are adapted to engage the yarns between the usual guide-board and the wound bobbins, and by a lateral movement of the thread-catcher they bear the yarns held by them laterally against the tubes, so that when the empty bobbins come into position on the tubes the said yarns are each clamped by the bobbin. Herein I employ for moving the various clamps cam-plates and levers which differ but slightly from the cams and levers employed in the patent referred to, the cams herein shown having longer slots and slightly differently shaped chiefly to provide for longer bobbins.

Figure 1 is a partial front elevation of one end of a spinning-frame, showing some of my present improvements. Fig. 2 is an elevation looking at the machine shown in Fig. 1 from the right. Fig. 3 is a detail in front elevation showing part of a spindle, a cap, a bobbin, part of the bobbin-rail, and part of the thread-catcher in position. Fig. 3^a is a section of the sleeve removed from the dead-spindle. Fig. 4 is a detail showing the empty

bobbin-clamp as having put a bobbin onto the sleeve, the said figure showing the yarn stretched as it will be about the tube when the empty bobbin is applied thereto in order that the empty bobbin may clamp the yarn preparatory to spinning a new set. Fig. 5 is a detail in plan view of the cap-clamp. Fig. 6 is a detail in plan view of the clamp for engaging and removing the full bobbins. Fig. 7 is a detail looking at Fig. 1 from the right of the line x . Fig. 8 is a detail looking at said figure from the right of the dotted line x' , and Fig. 9 is a detail looking at Fig. 1 from the right of the dotted line x'' ; Figs. 10 and 11, a perspective view and section of the clamp holding the dead-spindle to the builder-rail.

The frame A, the bottom rail A', extended from one to the other end of the frame, the spindle-rail A², carrying the dead-spindles B³, the builder-rail d^2 , supporting the band-receiving portions of the tube 24, having suitable lugs 26 to enter the usual grooves in the lower ends of the bobbins d^4 , the cam-plate f^3 for actuating the clamps for carrying the empty bobbins, the lever f , having a pin f' , entering the slot of said cam-plate and fixed to the rock-shaft e^6 , the cam-plate h' , having cam-grooves and receiving the pin 15 of a lever h , loose on said rock-shaft e^6 , said lever and cam being employed to actuate the clamps for taking off the full bobbins, are and may be all substantially as shown in said Patent No. 381,567, with the exception that the grooves in the cam-plates referred to are somewhat differently shaped and made somewhat longer to thereby adapt the machine to longer bobbins. These cam-plates and other cam-plates to be described are suitably erected on the bottom rail. The builder or coping rail d^2 will in practice be raised and lowered to suitably wind the yarn in bobbin form by mechanism substantially such as shown in said patent, or it may be by any usual builder mechanism commonly employed in spinning-frames. The bottom roll A⁴ and the leather-covered top roll A⁵, between which the yarn passes on its way toward and through the usual eye in the guide-board A⁶ to the bobbin to be wound thereon, are and may be all as common in spinning-machines. In Figs. 2, 7, 8, and 9 this guide-board is shown as turned up in its inoperative position; but it is shown by dotted and full lines in Figs. 2 and 3 as turned down into its operative position.

Referring now to the devices for handling the empty bobbins, the rock-shaft e^6 has fast on it a hub having a projecting arm h^5 , which receives a pivot h^6 , on which is mounted a lever h^7 , having at its lower end an elongated slot which receives a bolt h^8 , so that by loosening said bolt and turning said lever h^7 on said pivot h^6 its upper end will be placed near to or farther from the spindle, as may be desired. The lever h^7 has a stud h^{8x} , upon which is mounted the lower end of an arm h^9 , slotted as at h^{10} , said slot being entered by a guiding-

stud h^{12} , so that said arm can turn on said pivot and move longitudinally or in the direction of the length of the spinning-frame. A bar h^{13} has attached to it a series of empty-bobbin clamps composed of two members h^{14} and h^{15} , the member h^{15} being pivoted to the member h^{14} at h^{16} . Each of these members has a concaved portion to embrace properly the barrel of the empty bobbin d^4 , and the part h^{15} has a projecting lug or finger h^{17} , (see Fig. 4,) and the free end of said part h^{15} is kept pressed toward the bobbin grasped by it by a suitable spring h^{18} .

The portion h^{14} of the empty-bobbin clamp has a horizontally-extended lug h^{20} , against which the lower end or head of the bobbin d^4 stands when the said bobbins are applied in said bobbin-clamp, said lug enabling the heads of all the bobbins to be placed at the same level and also prevent any liability of the bobbins from being dropped down out of the position in said clamps, so that they might strike the spindle when the arms and levers carrying said bobbin-clamps were being put into position to apply empty bobbins to the spindles.

The bar h^{13} has attached to its under side a slotted curved plate h^{21} , said plate receiving a roller or other stud h^{22} , suitably connected with a bar h^{23} , carrying the full-bobbin clamps, to be described. The bar h^{23} has connected to its end a metallic yoke-shaped piece h^{23x} , (see Fig. 9,) said yoke having a rounded pin h^{24x} , which is embraced loosely by the slotted upper end of a lever h^{24} , (see the right of Fig. 1,) mounted on a pivot h^{25} , carried by a bracket h^{50} , carried by the rack D^3 , said lever being provided at its lower end with a slot in which is adjustably confined a roller or other stud h^{26} , said stud being adapted to work in the irregular cam-groove h^{27} , made in a cam-plate h^{28} , said plate having suitable switches h^{29} and h^{30} to control the movement of said stud h^{26} and at the proper time to vibrate the lever h^{24} , so that when the rock-shaft e^6 rises, as provided for in said patent, the roller-stud will travel vertically in said slot, and when it descends it will strike the switch h^{30} and move into the inclined or irregular part 40 of said slot, passing finally into the part 41 of the slot, and thence under the switch h^{29} into the lower straight part of said slot. During this movement of the lever h^{24} about its pivot h^{25} the said bar h^{23} is slid longitudinally, carrying with it, through the roller h^{22} , the bar h^{13} , on which is mounted the empty-bobbin-carrying clamps. It will be noticed that the movement of this bar while the roller h^{26} is passing from the switch h^{30} beyond the switch h^{29} is first to the right, viewing Fig. 1, and then back to the left again.

Fig. 1 shows the stud h^{26} standing in the truly-vertical part of the slot in the cam-plate h^{28} , the empty-bobbin clamps at such time standing with their bobbins at the left-hand side of the spindles B^3 , containing the full or wound bobbins. As the rock-shaft e^6 rises,

however, taking with it the bar h^{13} , carrying said clamps, to put the heads of the bobbins about the tops of the spindles, the roller 26 passes the switch h^{30} , and as the shaft e^6 starts to descend said roller meets said switch again and the bar h^{24} is turned, causing the connected bars h^{23} and h^{13} to be moved quickly to the right, thus putting the empty-bobbin clamps, with their empty bobbins, directly opposite the spindles containing the full bobbins, it being assumed, as will be described hereinafter, that the full-bobbin clamps engaged the full bobbins and removed them from the spindles while the stud h^{26} was rising in the vertical part of the slot, and while the empty-bobbin clamps are opposite the spindle the lever f will be moved by the shape of the cam-slot in the cam-plate f^3 , and the clamps and bobbins will be carried toward the spindles, and said empty bobbins will be put over the tops of the spindle and onto the tubes carried thereby by the descent of the rock-shaft e^6 , the roller h^{26} then traveling in the part 40 \times of the cam-plate h^{28} , and during such movement the rock-shaft e^6 is also turned by the cam-plate f^3 in a direction to move the said empty-bobbin clamps away from the spindles, the resulting two movements causing the finger h^{17} , connected with the portion h^{15} of the empty-bobbin clamp, to be drawn off from the empty bobbin in a diagonal path, so that the said finger h^{17} operates against the side of the empty bobbin and rotates it about the tube until the slotted lower end of the bobbin correctly engages the driving-lugs 26 of the band-receiving portion of the tube 24, so that said bobbin may be immediately thereafter taken up and rotated in unison with the said tube. At this point I will describe the manner of confining the yarn correctly with relation to the empty bobbin and tube, so that the yarn may be wound properly on the empty bobbin. To do this, I mount in the machine a rod a^{20} , one end of which is exposed at one end of the machine, where it is provided with a suitable hand-wheel (not shown) by which to turn it. This rod has fixed on it in suitable manner a series of thread-catchers a^{21} . These thread-catchers normally occupy when the frame is running regularly the position shown by dotted lines in Fig. 2 and full lines in Fig. 3, a thread-catcher lying near one side of each of the separators a^{22} , as represented in the full-line position Fig. 3.

When the operator is ready to doff a lot of full bobbins, the frame then standing still, he will engage the rod or rock-shaft a^{20} and will move it toward the left-hand end of the machine from the position Fig. 3 into the position at the opposite side of the full bobbin, so that the little notch a^{24} in the end of said thread-catcher will engage the thread between the usual thread-eyes of the guide-board A^6 and the fully-wound bobbin and will carry it to the opposite side of the bobbin, and then the rock-shaft a^{20} will be turned to move the

thread-catcher from its dotted-line position Fig. 2 into the dotted-line position Fig. 3, and the full bobbin is then taken hold of by the full-bobbin clamps, and the clamps are actuated to remove the bobbins from the spindles. While the full bobbins are being taken off the spindles, or just after they are off, the operator pulls the rod a^{20} again to the right, from the dotted-line position, Fig. 3, into the full-line position in Figs. 1, 2, and 4, thus leaving or putting said thread between the catcher and the full bobbin, against the tube above the lugs 26, and in this condition when the empty bobbin is put upon the tube 24 and is seated, as has been hereinbefore described, on the lugs, by a partial rotation of said bobbin on said tube the thread is clamped firmly between the lower end of the empty bobbins and the part of the tubes carrying the lugs, so that when the tubes are again started in rotation the yarn held as stated will travel with the tubes and will be applied to the bobbins, the first two or three rotations of the tubes breaking off the yarn between them and the full bobbins then held in the full-bobbin clamps, and thereafter the full bobbins may be removed by hand in any usual manner from the clamps holding them. After the tubes have been started in rotation to wind the yarn upon the empty bobbins just applied to them the operator, by hand, turns the rod a^{20} to again put the thread-catchers in their inoperative position, as represented by dotted lines in Fig. 2 and full lines in Fig. 3. The caps 33, substantially like those represented in said Patent No. 381,567, are adapted to be engaged by the cap-holding clamps b^{20} , composed of two like jaws at the ends of levers b^{22} , pivoted at their outer ends each on a stud b^{23} , each of said jaws presenting (see Fig. 5) a concaved portion with an outflaring lip b^{21} . The studs b^{23} rise from arms b^{24} , secured to a bar or rail w^6 , each of said arms presenting at its inner end a rigid guiding-loop b^{25} , in which the levers b^{22} are freely movable, said loops guiding and supporting said levers between the studs b^{23} and their concaved acting portions or ends. Each of these levers b^{22} has a suitable stud over which is caught the opposite end of a spring b^{26} , said spring controlling both parts of said clamp and enabling either lever to move, if required, in excess of the other lever, to thereby enable the jaws to properly adapt themselves to the cap.

The bar w^6 has attached to it at suitable intervals segmental rack-bars b^{27} , which fit suitable guideways b^{28} , carried by the upper ends of levers b^{29} , mounted to turn loosely on the rock-shaft e^6 , each of said levers having at its lower end, as herein shown, a projecting arm b^{30} , having a slot in which is placed the roller or other stud w^2 , which enters and slides in a groove b^{31} in the cam-groove plate w , said plate having a switch b^{32} , controlled by a spring b^{33} . The levers b^{29} have suitable bearings to receive a shaft b^{34} , provided with pinions b^{35} ,

one for each segmental rack b^{27} . The shaft b^{34} has mounted on it loosely the hub of an arm b^{36} , having a pin b^{37} , entering a hole in the part of the guide-plate b^{28} , attached to the upper end of the lever b^{29} , and said shaft, at the right-hand side of the hub of said arm, has fixed on it a collar b^{38} . A spring b^3 , surrounding said shaft b^{34} , acts normally to draw the said shaft toward the left, viewing Fig. 1, keeping the pin b^{37} in the hole in the said guide. During the time that the spinning-frame is spinning yarn and winding the same the segmental bars b^{27} stand in their lowered positions, leaving the clamps b^{20} down in position nearly opposite the bobbins being wound, and when it is desired that the clamps shall engage and remove the caps 33, or it may be a flyer, such as represented in my patent No. 381,566, then the operator engages a suitable hand-wheel on the shaft b^{34} , turns it, causing the gears b^{35} in engagement with the teeth of the rack-bars b^{27} to elevate the cap-clamps, and then the rock-shaft e^6 is raised, whereupon the roller-stud w^2 rises in the said slot and meets the switch b^{32} , which acts to quickly turn the clamps toward the caps, forcing the clamps onto and so as to embrace the caps firmly, said caps engaged by the said clamps being removed from the upper ends of the spindles as the rock-shaft e^6 continues its rising movement.

Fig. 8 shows the cap removed from the spindle and partially elevated; but the said cap will in practice be carried up above the rolls A^5 or until the roller-stud w^2 arrives in the upper end of the cam-slot b^{31} .

The clamps b^{20} hold the caps 33 firmly, and when the rock-shaft e^6 is again lowered at the proper time, the full bobbin in the meantime having been removed and an empty bobbin having been applied to the tubes on the spindles, the said caps are put upon the tops of the spindles, and after the rock-shaft e^6 has arrived in its lowermost position and the levers b^{29} have been moved to the left, viewing Fig. 8, to pull the clamps laterally from the caps the operator engages the arm b^{36} and moves it to the right, thus removing the pin b^{37} , carried by said arm, from underneath the rack-bar b^{27} , where it stood to hold up said rack-bar during the operation of doffing, the removal of said pin from underneath said rack-bar permitting the rack-bar to descend again into its normal position. During the descent of this rack-bar its teeth remain in mesh with the teeth of the gear b^{35} , the teeth of said gear being long enough to remain in mesh with said rack-bar notwithstanding the longitudinal movement of the gear with the shaft b^{34} , the spring b^3 permitting this movement of the shaft b^{34} .

I will now describe the action of the clamps for engaging the full bobbin and removing the same from the tube on the spindle. These clamps I have lettered h^{60} . One of them is shown in plan and detached in Fig. 6, and it

is composed of two concaved jaws carried each by an arm mounted to turn on a stud-screw c^{20} in the under side of an arm c^{21} , attached by a suitable screw inserted in practice in the hole c^{22} in the arm c^{21} , said screw entering a suitable hole in the bar h^{23} , said arms having each a suitable stud or groove with which are connected the opposite ends of a spring h^{61} , said spring normally acting to keep said jaws closed, but permitting them to yield as the acting free ends of said jaws meet the surface of the wound bobbin as the said jaws are being moved toward the said bobbin to grasp it frictionally. The bar h^{23} , carrying said clamps, is mounted on the upper end of a suitable arm c^{25} , pivoted at c^{26} on a lever c^{27} , pivoted at c^{28} on an arm of a hub c^{29} , loose on the shaft e^6 , the lower end of said lever c^{27} having a slot which is entered by a bolt c^{30} , said bolt serving to secure said lever in any desired adjustable relation to the lever h , mounted loosely on the rock-shaft e^6 , and having the roller or other stud 15, entering the cam-slot in the cam-plate h' . The lever c^{27} is adjusted, when desired, to normally keep the front edges of the jaws or clamps substantially close to the surface of the wound mass of thread on the bobbins, so that when said clamps are moved to embrace and grasp the wound bobbins the extent of movement may be reduced to the minimum.

Assuming that the shaft e^6 is in its lowest position and the stud 15 is in the bottom of the slot in the cam-plate h' , then in this condition the clamp h^{60} will stand a little below the spindle-rail A^2 , and as the rock-shaft e^6 is raised the pin 15 soon arrives opposite the little projection c^{32} , and as said pin travels through the part of the slot marked c^{33} the clamps h^{60} will be moved from the position Fig. 7 to the right to engage the full bobbins, and as the rock-shaft e^6 continues to rise the said pin will rise through the part c^{34} of said slot, the clamps at such time in engagement with the full bobbins acting to lift them vertically off from the tubes and spindles, the caps having been previously removed, and, finally, when the full bobbins have been fully removed the pin 15 passes the free end of the switch c^{35} , and immediately thereafter the weight of the full bobbins removed from the tubes and spindles is sufficient to cause the levers c^{27} and h to turn on the rock-shaft e^6 until the pin 15 meets the straight side c^{36} of said cam-plate. Now it has been described that the empty-bobbin-carrying clamp moves to the right to bring its bobbins into position opposite the spindles from which the full bobbins have just been taken, and during this movement the bar h^{23} , carrying the full-bobbin clamps, they containing full bobbins, is also moved with it to the right, the jointing of the lever c^{25} to the lever c^{27} permitting of this movement. The main shaft D is supported in suitable bearings D' from the bot-

tom rail A' . This shaft may be driven by power in any usual manner to operate the machine so that it will rotate a certain number of times in one direction, and then it may be reversed to rotate a certain number of times in the opposite direction. This shaft has a pinion D^2 , and when said shaft is rotated to move the pinion in the direction of the arrow near it in Fig. 9 the rack D^3 , carrying the rock-shaft e^6 , is raised in order that the different levers and devices carried by it may be raised in the act of removing the caps and taking off the full bobbins, and when the shaft is lowered the empty bobbins may be put on and thereafter the caps put in position on the tops of the spindles. To do this, the shaft D has substantially two rotations in one direction and then two rotations in the opposite direction. This shaft in practice is put under such control that it may be stopped at any position no matter what its direction of rotation.

The spindles B^3 are confined to the builder-rail in novel manner. Usually each spindle been held in place by a set-screw inserted in the rail, its end acting against the spindle. Herein each spindle has its lowest end provided with a screw-thread 101, (shown in Fig. 8,) which is screwed into a threaded part of a split or clamping nut 102, provided with a clamping set-screw 103, which may be set up to hold the lower end of the spindle in adjusted position. The nut 102 has adjustably attached to it by a set-screw 105 a lipped finger 104. The spindle may have its foot set in the threaded hole 106, and the spindle may then be put up through the hole in the builder-rail until the nut meets the under side of the said rail, and the lipped finger will then be confined in position with its lip on the upper side of the rail, and the spindle when adjusted to put its top at the proper level will be held firmly by turning in the set-screw 103.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a spinning-machine, a series of dead-spindles, having bobbin-receiving tubes, and a bar having a series of clamps to hold and present empty bobbins, said clamps normally occupying a position out of line with relation to said spindles and tubes, and means to move said bar and its clamps longitudinally to put said clamps in line with said spindles, and to thereafter move said clamps toward said spindles to put the bobbins carried by them onto said spindles and tubes, substantially as described.

2. In a spinning-machine, a bar provided with a series of clamps to hold a series of empty bobbins, combined with a bar occupying a position parallel with relation to it, and united therewith by a roll-and-slot connection, combined with a lever and means to operate it to slide said two bars in unison in the same direction, and means to carry and move the

bar carrying said clamps toward and from the spindles, to operate substantially as described.

3. In a spinning-machine, a series of spindles, and a bar having a series of clamps provided each with a finger and holding empty bobbins, combined with means to actuate said bar and clamps to put said bobbins on the tubes of said spindles, the fingers of said clamps, as the clamps are being pulled off laterally from said bobbins, acting to partially rotate said bobbins on said tubes, to enable the notches of said bobbins to engage the lugs of said tubes, substantially as described.

4. In a spinning-machine, a guide board or device to guide the yarns, a series of dead-spindles, and a series of bobbin receiving and driving tubes carried thereby; a series of clamps to engage full bobbins to remove them from said tubes and spindles, and a thread-catcher to engage the thread between said full bobbins and said guide-board; combined with a series of empty-bobbin clamps, and means to carry and actuate said empty-bobbin clamps to apply said empty bobbins to the spindles and tubes after the removal of the full bobbins, and cause the head of each empty bobbin to clamp the thread while held by said thread-catchers between themselves and the said tubes, substantially as described.

5. An empty-bobbin-holding clamp and means to actuate it to apply an empty bobbin to the spindle and tube, said clamp presenting as one member thereof a lever having a projecting inclined finger to act against the surface of the empty bobbin—it having been put upon a spindle and tube—as the said clamp is being drawn laterally from said empty bobbin, to rotate it upon said tube, substantially as described.

6. A series of dead-spindles, and a series of bobbin driving and carrying tubes mounted thereon, combined with a thread-catcher means adapted to move it from its inoperative position across the vertical path of the said spindle, to thereby partially wrap or bend said thread about said tubes, and means to remove the wound bobbins therefrom, substantially as described.

7. In a spinning-machine, a clamp-carrying bar or rail, a series of arms having guiding-loops and secured to said bar or rail, a series of clamps consisting each of two levers pivoted at their extreme outer ends, on one of said arms, said jaws or levers presenting at their inner ends concaved faces, said levers

moving freely in said guiding-loops and being supported thereby near their concaved portions, substantially as described.

8. In a spinning-frame, a series of spindles, a series of levers having guides for the reception of rack-bars, a bar or rail, a series of clamps carried thereby and adapted to engage a series of caps used in connection with said spindles, a series of rack-bars depending from the bar or rail carrying said clamps, and entering said guides, and means to engage said rack-bars to raise and lower them and their clamps with relation to the levers carrying said clamps, substantially as described.

9. The bars b^{29} having the guides b^{28} , the rack-bars b^{27} mounted in said guides and carrying a bar w^6 provided with a series of clamps, combined with an arm having a sliding pin to coöperate with said rack-bars and maintain them in elevated position, substantially as described.

10. The bars b^{29} having the guides b^{28} , the rack-bars b^{27} mounted in said guides and carrying a bar w^6 provided with a series of clamps, combined with a rock-shaft b^{34} having a series of pinions for each rack-bar, whereby said rack-bars may be raised and lowered at the proper times on or with relation to said levers b^{29} , substantially as described.

11. In a spinning-machine, a series of clamps to engage full bobbins and remove them from tubes on spindles; a bar carrying said clamps, a series of levers c^{25} upon which said bar is mounted, and a series of levers c^{27} upon which the levers c^{25} are pivoted, means to move said bar longitudinally, and means to move said levers c^{27} to carry said bar and its clamps toward and from the spindles, substantially as described.

12. In a spinning-machine, a series of clamps to hold and present a series of empty bobbins, a bar carrying said clamps, a series of levers h^9 carrying said bars, a series of levers h^7 upon which the said levers h^9 are pivoted; means to move said bar longitudinally, and means to move the levers h^7 toward and from a series of spindles, as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES MARJERISON.

Witnesses:

GEO. W. GREGORY,
ALEX. C. PROUDFIT.