

C. WHITAKER.

SEPARATOR MECHANISM FOR RING SPINNING FRAMES.

No. 505,500.

Patented Sept. 26, 1893.

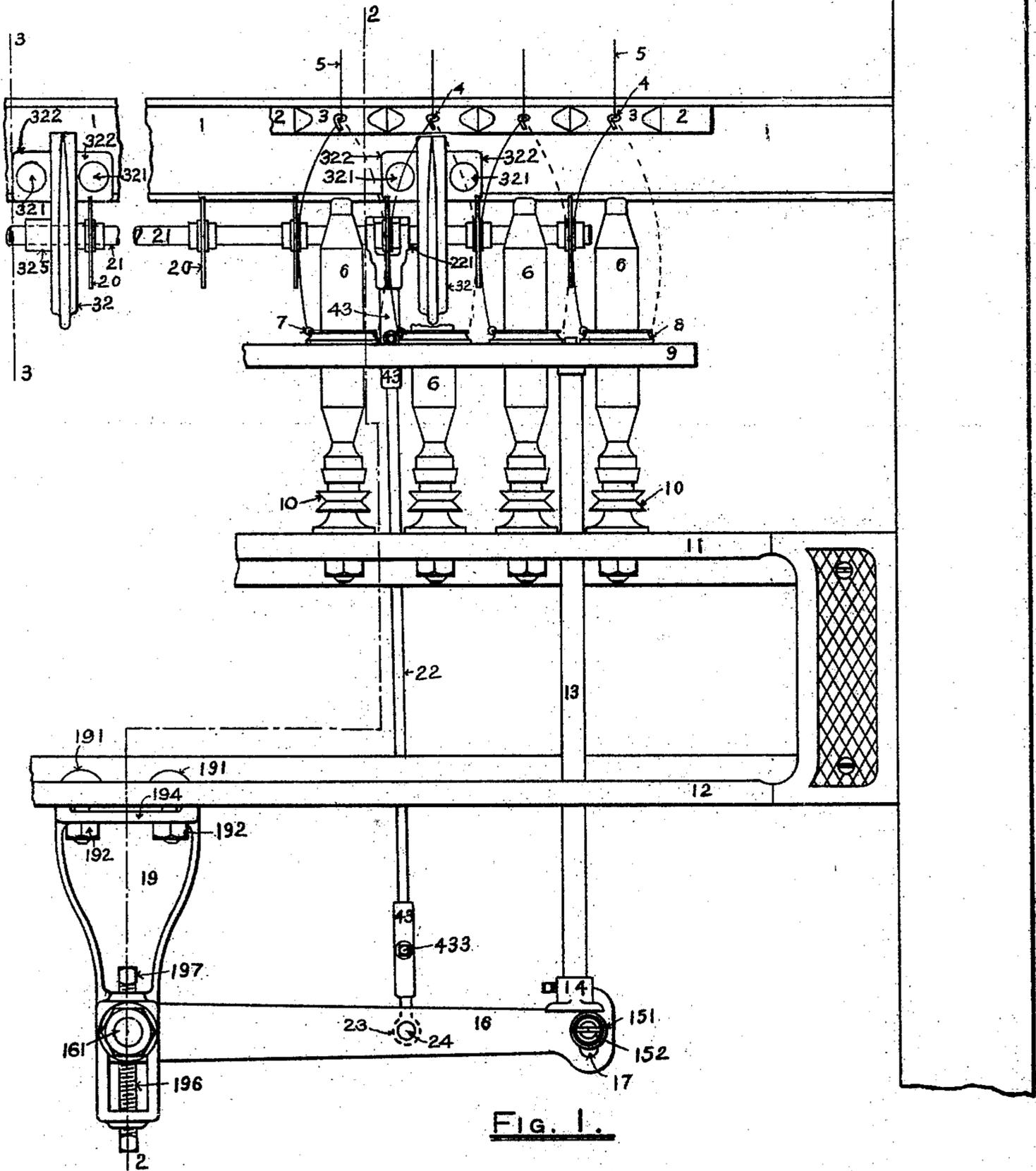


Fig. 1.

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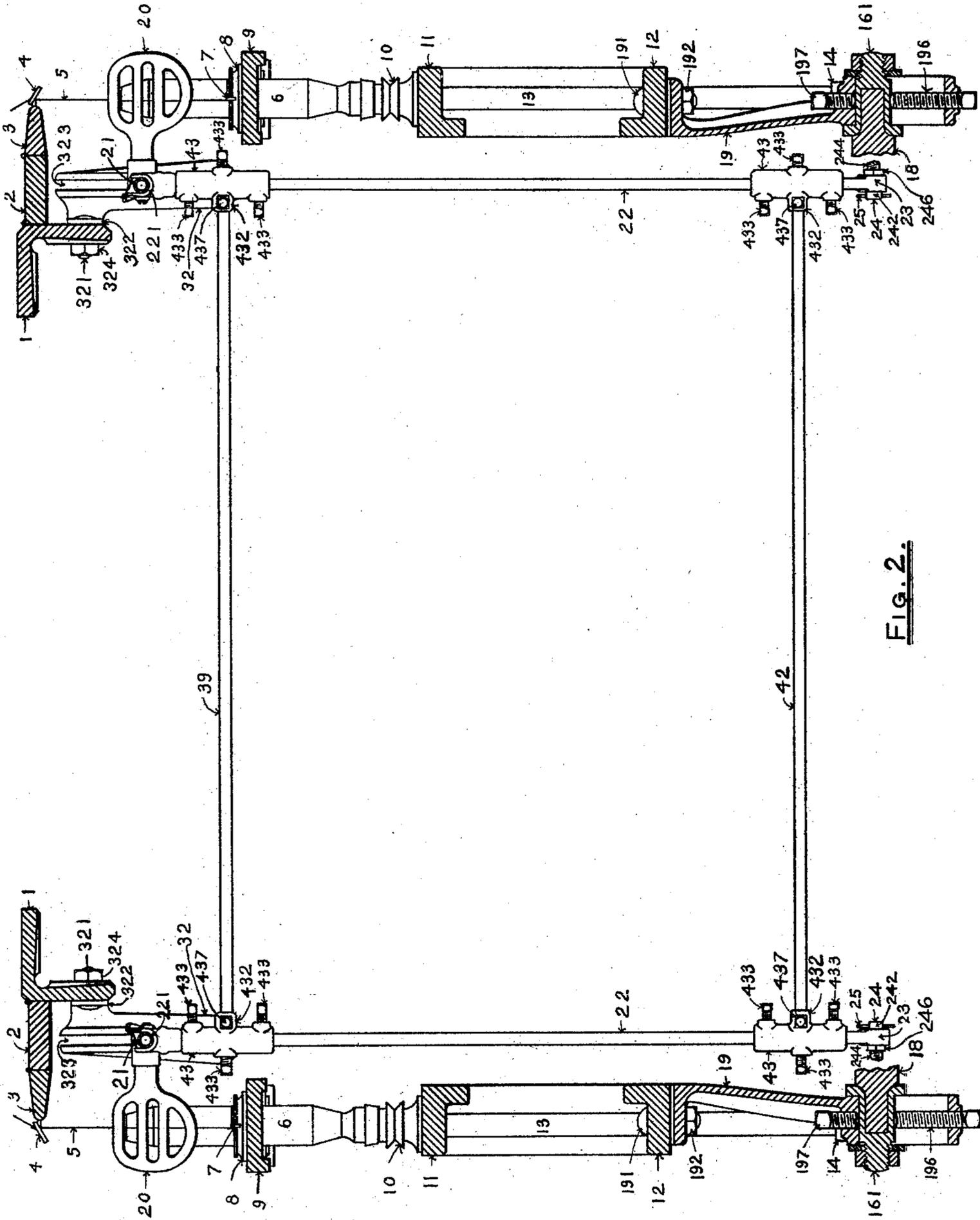


FIG. 2.

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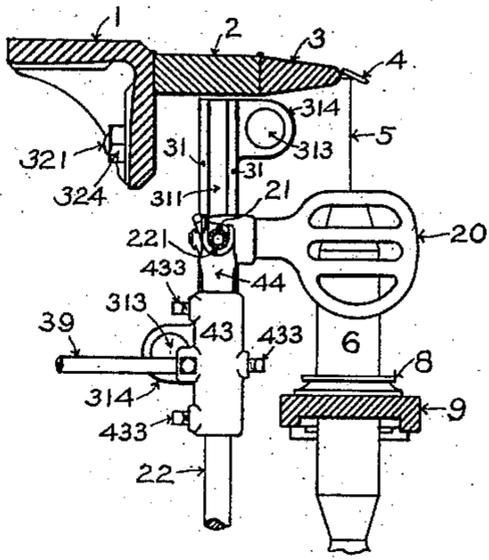


FIG. 3.

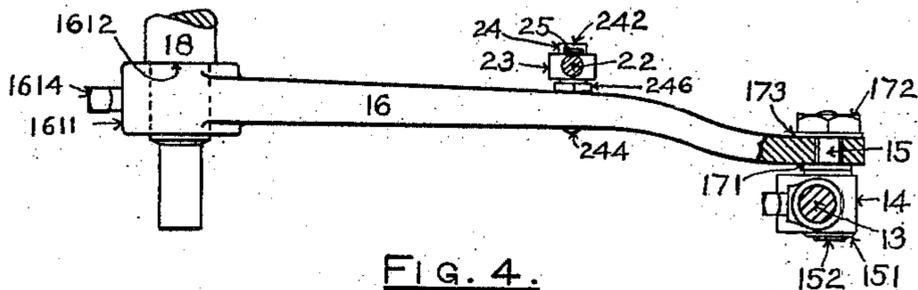


FIG. 4.

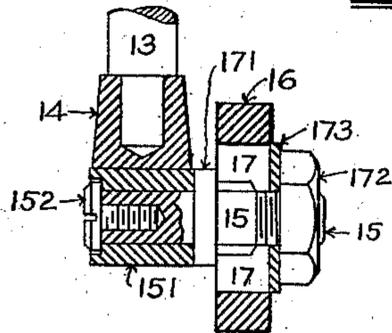


FIG. 5.

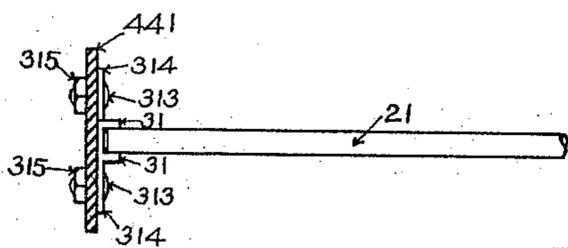


FIG. 6.

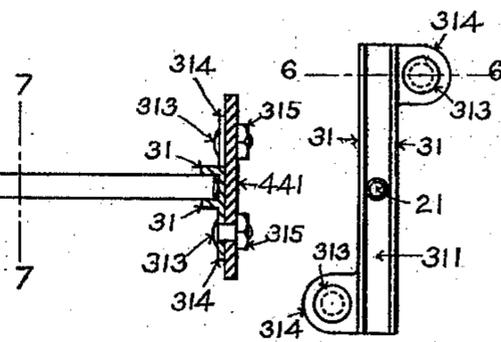


FIG. 7.

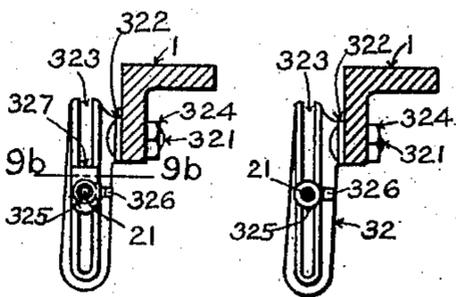


FIG. 9a. FIG. 9.

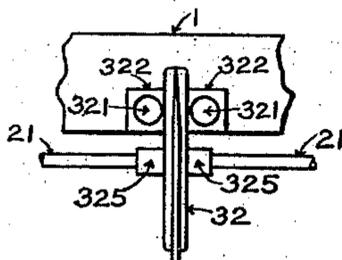


FIG. 8.

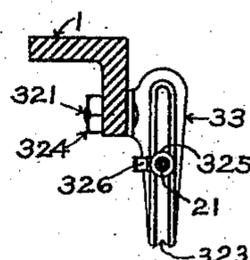


FIG. 10.

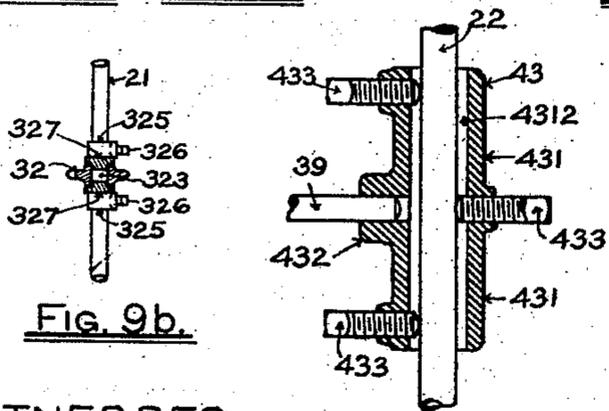


FIG. 9b.

FIG. 11.

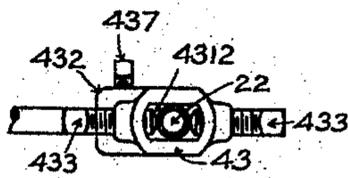


FIG. 12.

WITNESSES.  
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(No Model.)

7 Sheets—Sheet 4.

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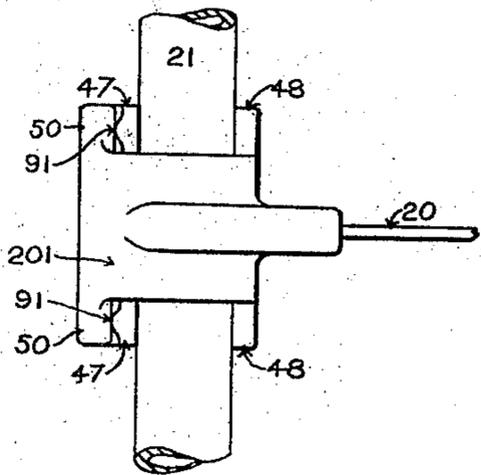


FIG. 14.

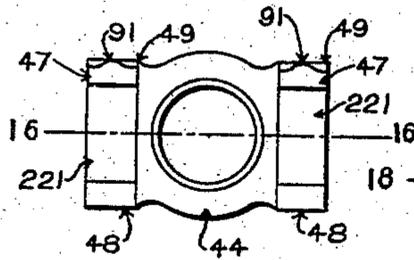


FIG. 15.

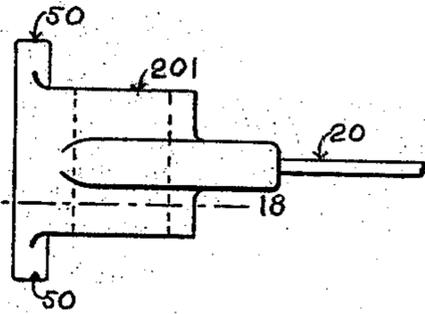


FIG. 17.

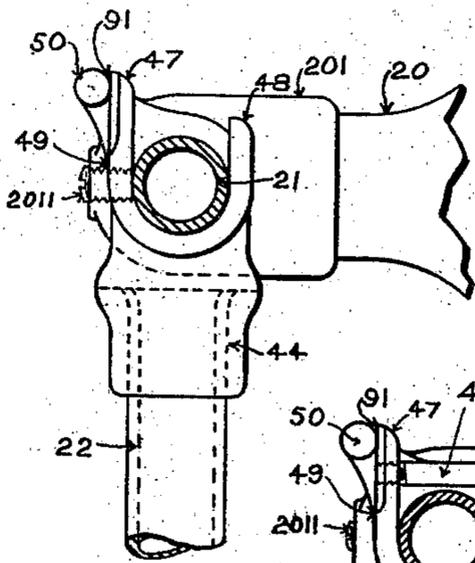


FIG. 13.

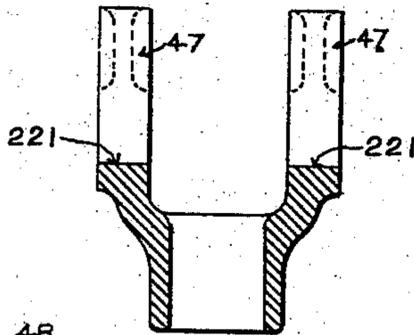


FIG. 16.

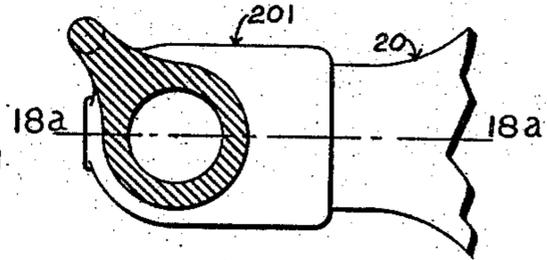


FIG. 18.

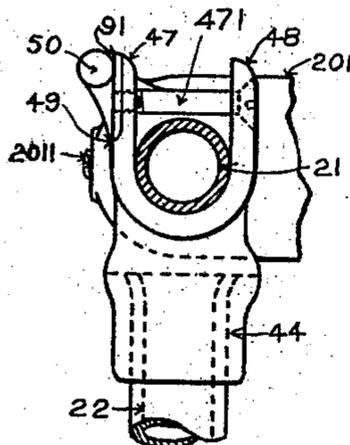


FIG. 18 b.

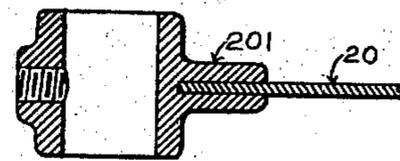


FIG. 18a.

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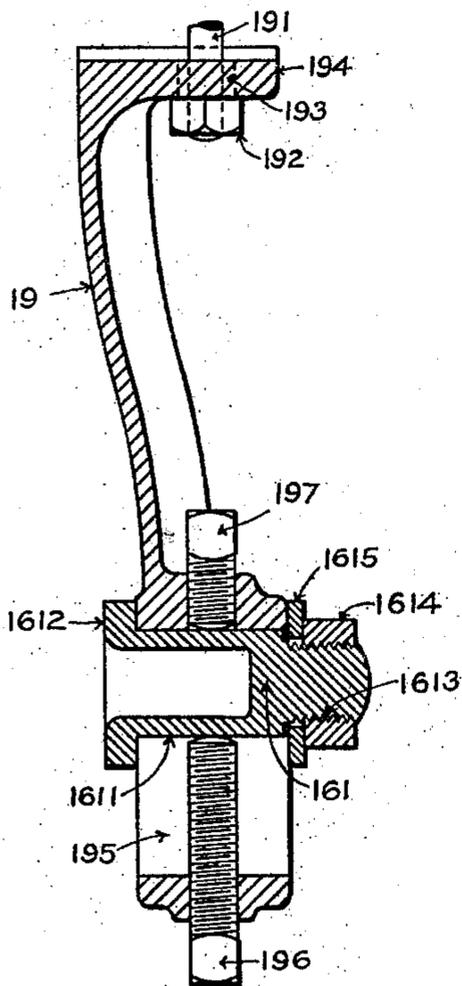


Fig. 20.

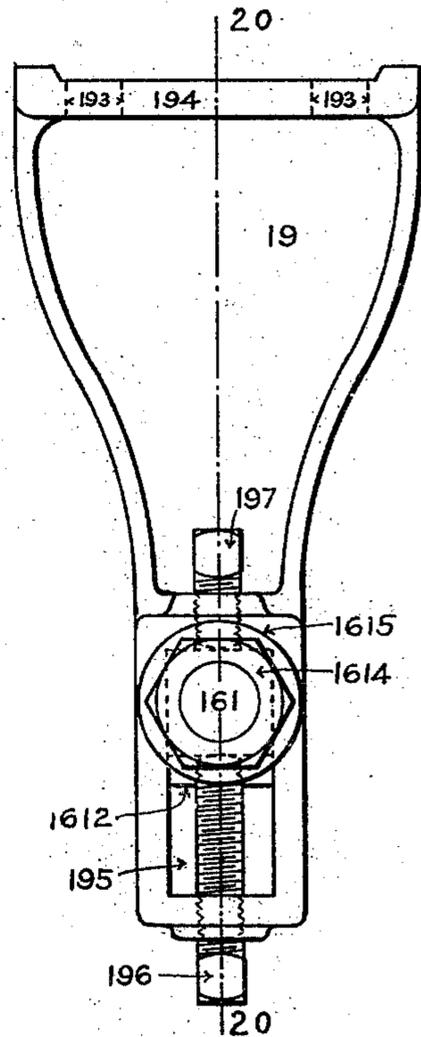


Fig. 19.

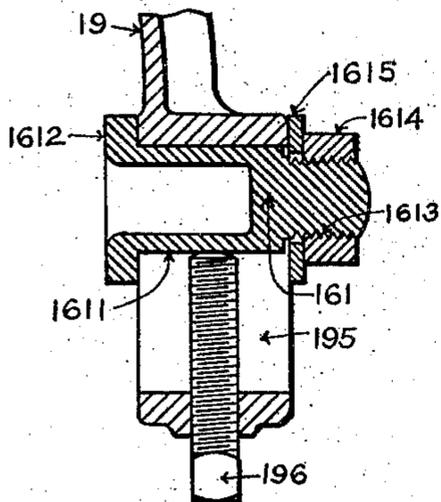


Fig. 20a.

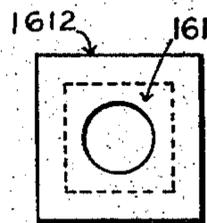


Fig. 21.

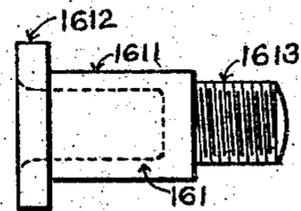


Fig. 22.

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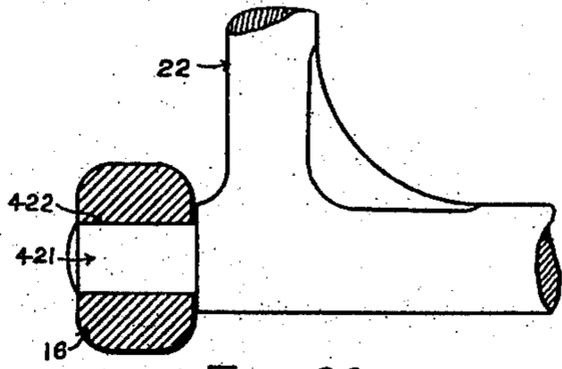


FIG. 23.

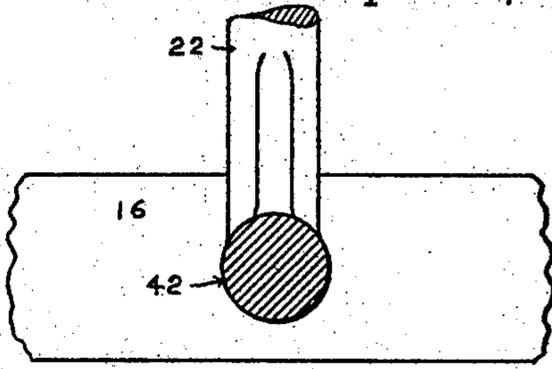


FIG. 24.

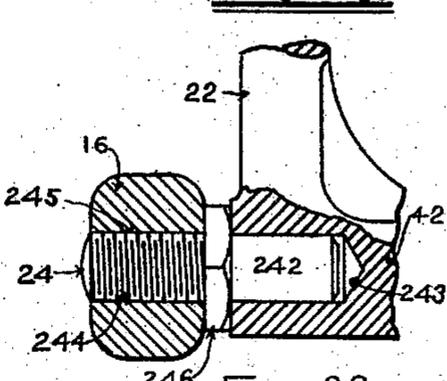


FIG. 33.

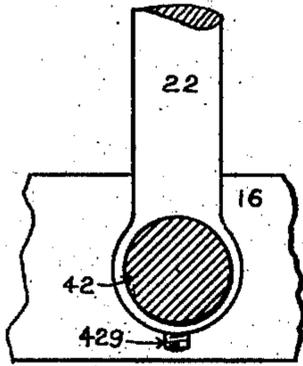


FIG. 25.

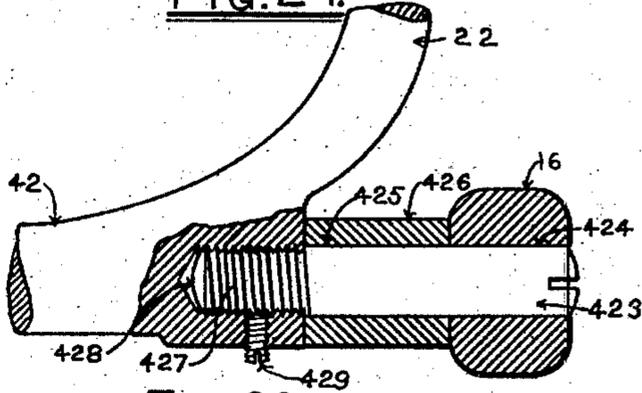


FIG. 26.

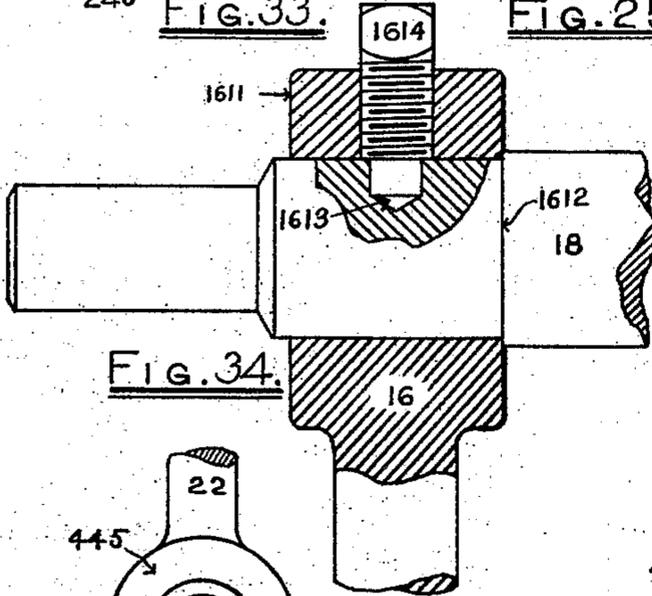


FIG. 34.

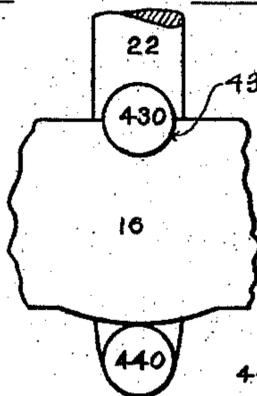


FIG. 27.

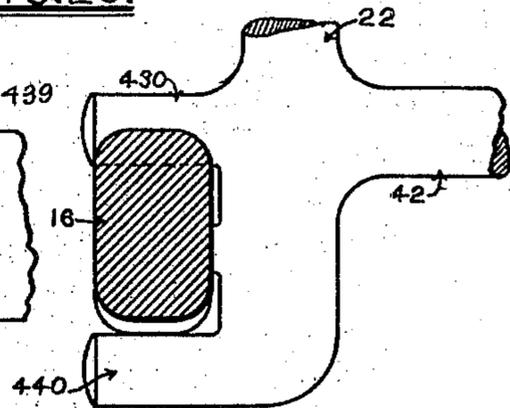


FIG. 28.

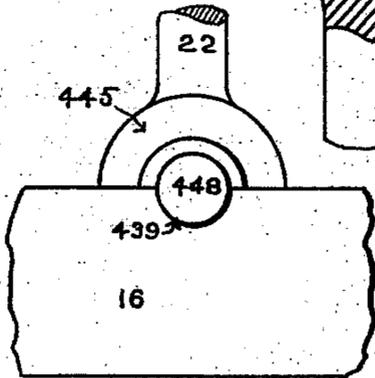


FIG. 29.

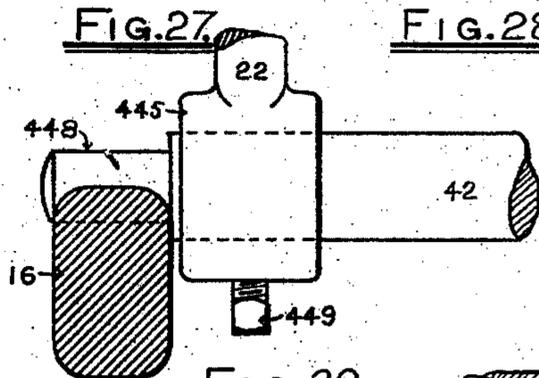


FIG. 30.

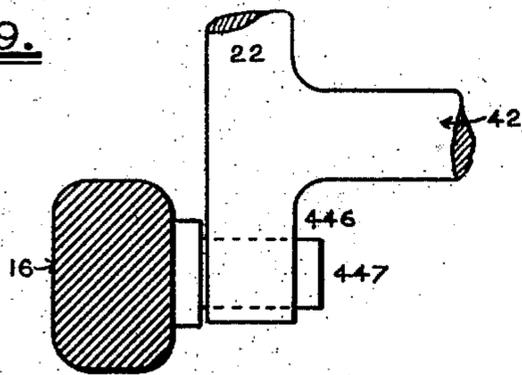


FIG. 31.

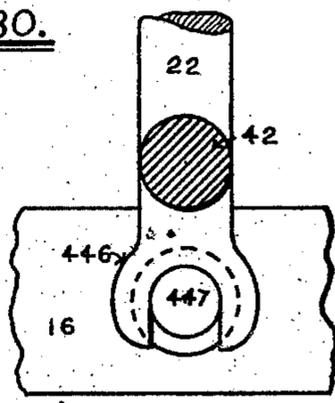


FIG. 32. INVENTOR.

WITNESSES.

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7 Sheets—Sheet 7.

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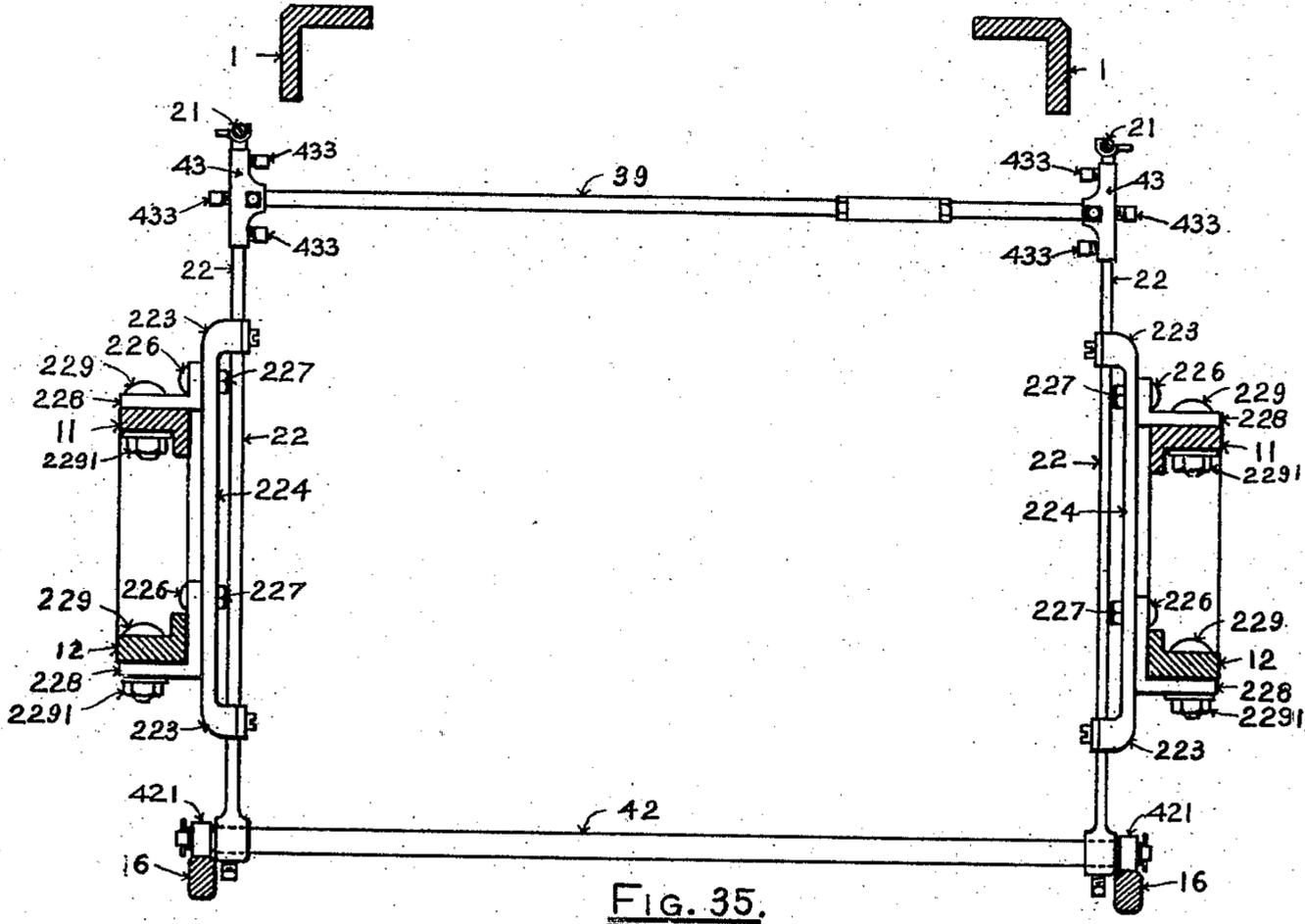


FIG. 35.

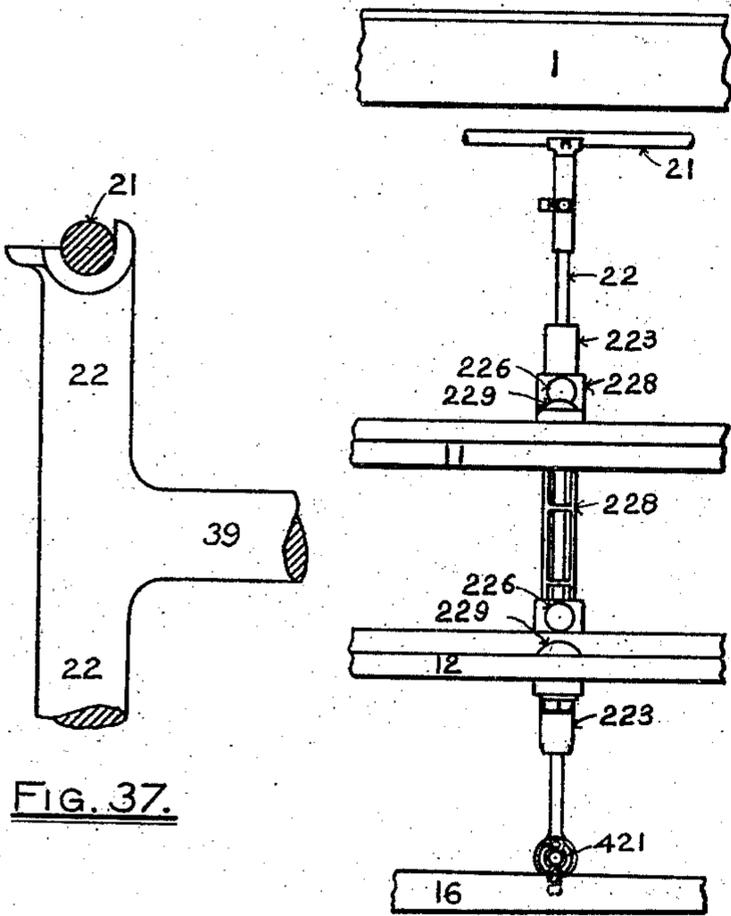


FIG. 37.

FIG. 36.

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Saml. S. Stephens.

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Channing Whitaker.

# UNITED STATES PATENT OFFICE.

CHANNING WHITAKER, OF TYNGSBOROUGH, ASSIGNOR TO THE LOWELL  
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## SEPARATOR MECHANISM FOR RING-SPINNING FRAMES.

SPECIFICATION forming part of Letters Patent No. 505,500, dated September 26, 1893.

Application filed April 24, 1893. Serial No. 471,697. (No model.)

*To all whom it may concern:*

Be it known that I, CHANNING WHITAKER, a citizen of the United States, residing at Tyngsborough, in the county of Middlesex and  
5 Commonwealth of Massachusetts, have invented certain new and useful Improvements in Separator Mechanisms for Ring-Spinning Frames, of which the following is a specification, reference being had therein to the ac-  
10 companying drawings.

The best, according to my opinion, among the known forms of separator-mechanisms for ring-spinning frames, are those of the class in which the horizontal shafts, rods, or rails carrying the separators are supported at the upper ends of vertical rods, commonly known as separator-rods, and have vertical movements transmitted to them from the cross-shaft arms which actuate the lifting-rods for the ring-  
20 rails in such ring-spinning frames, the separator-rails and ring-rails being thereby caused to move in unison, but the vertical traverse of the separator-rails being of less extent than that of the ring-rails.

My present invention is designed as an improvement upon separator-mechanisms of this class, and has for its main object to provide a separator-mechanism which shall be durable and respond to all the requirements of practical use, shall be of simple character and construction, shall consume the least possible amount of power in its working, and shall exert the least possible stress upon those parts in the ring-frame from which the necessary  
30 motion is derived.

Other objects of my invention will be made apparent in the course of the following description.

The invention relates mainly to the devices  
40 by which the separator-rails are supported and through which they are actuated, to the directive means whereby the paths of the separator-rails and the separators mounted thereon are determined, to the means by which the  
45 separator-rails are mounted on their supports, and to the bearings for the cross-shafts, and the means for supporting such bearings.

The invention consists in certain novel, useful, and improved combinations of parts, and  
50 features of construction and arrangement, all as will be clearly indicated hereinafter, and

it first will be described fully with reference to the accompanying drawings, and then will be particularly pointed out and clearly defined in the claims which are appended at the close  
55 of this specification, and which form a part hereof.

In the drawings, Figure 1, Sheet 1, is a view in front elevation of part of a ring-spinning frame having the features of my present in-  
60 vention applied thereto. Fig. 2, Sheet 2, is a view in vertical section on the line 2—2 of Fig. 1. Fig. 3, Sheet 3, is a view in vertical section on the line 3—3 of Fig. 1. Figs. 4 and  
5, Sheet 3, are views showing in plan and in  
65 vertical section, respectively, one of the cross-shaft arms and the lower end of a lifting-rod, with its shoe. Figs. 6 to 10, Sheet 3, are views, in detail, of guides or directive devices for determining the path of movement of the sepa-  
70 rator-rails and separators, as hereinafter will be described. Figs. 11 and 12, Sheet 3, are views of an adjusting device which is described hereinafter. Figs. 13 to 18<sup>b</sup>, Sheet 4, are views, in detail, showing the means for  
75 mounting the separator-rails upon their supports. Figs. 19 to 22, Sheet 5, are views, in detail, of one of the bearings for a cross-shaft, and the means of supporting such bearing. Figs. 23 to 34, Sheet 6, are views, in detail,  
80 showing certain modifications which are referred to hereinafter. Figs. 35 and 36, Sheet 7, are views showing a further modification which is described hereinafter. Fig. 37 is a detail view of still another modification which  
85 is described hereinafter.

In Figs. 1, 2, and 3, 1, 1, are the roller-beams of a ring-spinning frame, 2, 2, the thread-boards hinged thereto, as usual, 3, 3, the finger-boards hinged as usual to the thread-  
90 boards, 4, 4, the yarn-guides secured to the finger-boards, 5, 5, the yarns passing from the yarn-guides 4, 4, to the bobbins 6, 6, through the travelers 7, 7, on the rings 8, 8, supported by the ring-rails 9, 9. 10, 10, are the spindles  
95 on which the bobbins are mounted, 11, 11, are the spindle-rails, 12, 12, the lower or guide-rails, 13, 13, the lifting-rods for the ring-rails, and 14, 14, the shoes at the lower ends of the said rods. 15, see Figs. 4 and 5, is a stud upon  
100 which, or upon the roller 151 carried thereby, the under surface of each of the said shoes

rests, and 152 is the flat headed screw which holds the roller in place upon the stud, 15, when the said roller is employed, the threaded part of the said screw being caused to enter  
 5 a threaded hole in the end of the stud. 16 is the cross-shaft arm by which the stud, 15, or stud 15 and roller 151, are carried, and 17 is the transverse slot in the free end of the said arm in which the stud is mounted adjustably.  
 10 171 is a collar on the stud which takes bearing against one side of the cross-shaft arm, 16, to which the same is applied. 172 is a nut on the threaded end of the stud on the side of the arm opposite to that on which the collar, 171,  
 15 is located, and 173 is a washer which is placed between the said nut and the adjacent side of the arm. 18 is a cross-shaft provided with one of the said arms, 16, at each end thereof, as usual, and 19, 19, are the hangers or brackets  
 20 containing the bearings for the cross-shaft, the cross-shaft being caused to rock by well-known means for the purpose of moving the ring-rails up and down. In Fig. 2, all but the extreme end-portions of the cross-shaft  
 25 which is crossed by the line of section is broken away. At 20 are shown the separators. All of the foregoing parts may be of any usual or preferred construction.

At 21, 21, are shown the separator-rails on  
 30 which the separators are mounted. For the sake of lightness, I preferably make the separator-rails, 21, 21, tubular or hollow.

Heretofore, in constructions of separator-mechanisms of the class on which the present invention is an improvement, the horizontal separator-rail has been attached to or mounted in bearings upon the tops of vertical rods, which commonly have been known as separator-rods, and it has been the practice to mount the separator-rods, for the purpose of defining their path of movement, and that of the separator-rail and separators, in an upright position in fixed guides, by which  
 40 latter they are compelled to move strictly in a straight line in a vertical direction, and are prevented from deviating or vibrating laterally, as otherwise they might be caused to do by the action of the swinging cross-shaft arms from which they are operated, inasmuch as the said arms swing through arcs of movement having horizontal components. Frequently, in consequence of the fact that the arcs of movement of the said cross-shaft arms have each a horizontal component as  
 45 just mentioned, it has been deemed necessary or expedient, particularly in some constructions wherein the actuating connections between the cross-shaft arms and the separator-rods are offset laterally with respect to  
 50 the axes of the separator-rods, to employ special provisions for preventing the separator-rods from being caused to twist or turn upon their vertical axes within the guides as the cross-shaft arms rise and fall through  
 55 their said arcs of movement. The said horizontal component, moreover, necessitates making the engagement or connection of the

cross-shaft arms with the guided upright separator-rods in some special manner or by some special means which will not interfere  
 70 with the horizontal movement of the actuating parts of the cross-shaft arms relatively to the separator-rods.

In my application for patent filed April 24, 1893, Serial No. 471,698, I have presented  
 75 and claimed broadly a novel and improved type of separator-mechanisms for ring-spinning frames which I originated with the aim in view of dispensing with the use of separator-rods or slide-rods that are held by fixed  
 80 guides in a definite vertical position, and prevented thereby from lateral movement or vibration. In the separator-mechanism shown and described in the said application there are embodied vibratile rods on the order of  
 85 simple connecting-rods or pitmen, each of which rods at its upper end is formed or provided with a bearing that suitably receives one journal or pivot of the corresponding separator-rail, while at its lower end each  
 90 rod is connected or engaged pivotally with the corresponding cross-shaft arm, the rod being free to swing or vibrate laterally in a vertical plane that is parallel with the vertical plane in which the cross-shaft arm moves,  
 95 as the said cross-shaft arm swings up and down through its arc of movement in actuating the ring-rail. In combination with the vibratile supporting and connecting-rods aforesaid, I use, as set forth in the said application, directive devices or guides of simple construction for determining the proper path of movement of the separator-rail and separators as they rise and fall in unison  
 100 with the ring-rail, the said directive devices or guides being of such character and so applied as not to interfere with the vibratile supporting and connecting-rods in their characteristic movements. The improvements embodied in the said application enable me  
 105 to simplify greatly the construction of the separator-mechanism; to dispense with the employment of the kinds of guides heretofore in use, and with the fitting and adjusting of such guides; to use inexpensive forms of  
 110 guides or directive devices; to make more direct and simple connections with the cross-shaft arms than heretofore; and to dispense with the provisions which heretofore have been employed to prevent the rods, by which  
 115 the separator-rails are supported, from twisting or turning on their vertical axes. Various forms and arrangements of devices embodying the generic features of my former invention are presented in the said applica-  
 120 tion. 125

The first part of my present invention falls under the type or genus of the said application, and comprises certain specific embodiments of the essential and characteristic features of  
 130 the invention presented in said application as just set forth. The vibratile supporting and connecting-rods of my application aforesaid are shown at 22, 22, in various figures of

the drawings. The bearings which are provided at the upper ends of these rods for the reception of the journals or pivots of the separator-rails, 21, 21, are shown at 221, 221.

5 The separator-rails are provided with collars thereon, which engage with the said bearings and act to prevent movement of the bearings and rails relatively to each other lengthwise of the said rails, all as hereinafter will be made to appear clearly. The manner in which  
10 the lower ends of the rods, 22, 22, are pivotally engaged or connected with the cross-shaft arms, 16, 16, is indicated in various of the figures of the drawings, and will be described, specifically, hereinafter.

In my application aforesaid, among other things, I have presented and claimed constructions embodying a cross-bar, rod, or wire whereby the upper ends of the said vibratile  
20 connecting-rod, 22, 22, on opposite sides of the ring-frame are connected in such manner that the two separator-rails, 21, 21, are prevented from separating, or, are maintained always at a uniform distance apart, and whereby the  
25 forces which tend to move the separator-rails outwardly away from each other are balanced within the cross-bar, rod, or wire, and thereby are practically neutralized. An important result secured by the use of the said cross-bar,  
30 rod, or wire, is the fact that the guides or directive devices for determining the paths of movement of the separator-rails and separators are relieved from the outwardly exerted pressure due to the weight of the separator-  
35 rails and the moving parts connected therewith, and thereby the friction, as well as the wear of the said guides or directive devices, are diminished.

In the said application I have shown and  
40 described, but without claiming the same specifically, a modification embodying a second and similar cross-bar, rod, or wire, which is connected with the vibratile supporting and  
45 connecting-rods, 22, 22, near the lower ends thereof, and whereby the two opposite vibratile supporting and connecting-rods are united and tied together at the bottom thereof and so that the said supporting and connecting-  
50 rods form, with the cross-bars, rods, or wires, a light rectangular frame which rises and falls in unison with the movement of the cross-shaft arms. This embodiment of my generic invention constitutes a main feature of the more specific invention which is covered by  
55 the present case.

At 39, see, more particularly, Figs. 2 and 3, is shown the upper cross-bar, rod, or wire, which is connected with the upper ends of the  
60 corresponding rods, 22, 22, on opposite sides of the ring-frame, and whereby the said upper ends are united as just stated, and at 42 is shown the lower cross-bar, rod, or wire, which is connected with the lower ends of the same rods, and whereby the said lower ends  
65 are united, as stated. The cross-bars, rods, or wires, 39 and 42, unite the opposite rods, 22, 22, into a light, rectangular, movable frame

of considerable stiffness and stability. There usually will be one such frame for each cross-shaft in the ring-frame, and, inasmuch as the  
70 cross-shafts are caused to rock in unison, the entire number of frames employed will rise and fall simultaneously.

To connect the cross-bars, rods, or wires, 39 and 42, to the rods, 22, 22, and also secure the  
75 proper distance apart of the rods, 22, 22, at their upper and lower ends, and the angles which the said rods make with the cross-bars, rods, or wires, 39 and 42, I provide the sockets, 43, 43, which are shown in detail in Figs.  
80 11 and 12, although, in some cases, simpler and ordinary means of connection may be employed instead. In Fig. 11 I have shown one of the sockets, 43, in vertical section, but with part of the corresponding rod, 22, and  
85 cross-bar, rod, or wire, 39, in elevation, and in Fig. 12 I have shown in plan the parts which are represented in Fig. 11. Each socket, 43, has a vertical portion, 431, having a laterally widened hole, 4312, vertically therethrough,  
90 through which hole the corresponding rod, 22, passes. The socket, also, has a laterally projecting nipple, 432, in which is secured the end of the cross-bar, rod, or wire, 39 or 42. The ends of the cross-bars, rods, or wires, 39  
95 and 42, are shown held in the nipples of the sockets, 43, 43, by means of clamping-screws, 437, 437, which pass through threaded holes in the sides of the nipples and bear by their ends upon the surfaces of the said cross-bars,  
100 rods, or wires. Adjusting-screws, 433, 433, 433, pass through the wall of the portion, 431, and take bearing against the surface of the rod, 22, thereby securing the socket, 43, and rod, 22, together. Two of the adjusting-  
105 screws, 433, 433, are situated at the opposite ends of the socket, and on one side of the latter, while the third adjusting-screw, 433, is situated at an intermediate point, and on the  
110 opposite side of the socket. By means of these oppositely acting adjusting-screws a delicate adjustment of the rods, 22, 22, laterally, and of the angles which they make with the cross-bars, rods, or wires, 39 and 42, may be secured.

When the separator-rails are supported by frames such as have just been described, various forms and arrangements of directive means whereby to hold the separator-rails in  
120 place as they rise and fall, and thereby determine the paths of movement thereof, may be employed. A number of forms and arrangements of such means are shown and described in my application hereinbefore mentioned. In particular, reference may be had to Figs.  
125 1 to 4, and 8 to 42, of the drawings of the said application, and to the accompanying description. The form and arrangement which I prefer to employ in the present connection are represented in Figs. 1, 2, and 3, in place in  
130 a ring-frame, and in separate detail in Figs. 8, 9, 9<sup>a</sup>, and 9<sup>b</sup>, a modification thereof being represented in Fig. 10. At 32, 32, are brackets, which are attached to the roller-beam, 1,

on each side of the ring-frame, at intermediate points in the length of the said roller-beam and of the corresponding separator-rail. Each of the said brackets is held to the roller-beam by bolts, 321, 321, passing through lateral ears, 322, 322, on the bracket, and also through the vertical flange of the roller-beam, the said bolts receiving nuts, 324, on the threaded ends thereof at the rear of the said vertical flange. Each of the said brackets has a vertical slot, 323, in which the separator-rail is placed, and wherein it is free to move vertically throughout the necessary extent of traverse. In Figs. 1, 2, 3, 8, and 9, the slot, 323, is open at the top to permit the separator-rail, 21, to be dropped into the slot from above. In the modification which is represented in Fig. 10 the slot is open at the lower end of the bracket so as to necessitate the introduction of the separator-rail into the said slot from below. The front and rear walls of the slot in the bracket prevent the separator-rail from moving toward the front or rear in the ring-frame. Along the front of the roller-beam a sufficient number of the brackets will be employed to guard against horizontal springing or vibration of the separator-rail, and the said brackets will be located at such points as will best serve for guiding and steadying the separator-rail, preferably near the ends and middle of the length of the separator-rail. The separator-rail is held in precise position longitudinally thereof by means of collars, 325, 325, that are mounted thereon and fixed in place by clamping-screws, 326, 326, which pass through the collars and take bearing by their ends against the surface of the separator-rail. Such collars may be applied to the separator-rail on opposite sides of a single bracket, or on opposite sides of each of two or more of the said brackets, or one collar may be at one side of one bracket and another collar may be at the opposite side of another bracket, as will be obvious. In Fig. 1, and also in Fig. 8, I have shown two collars on opposite sides of one and the same bracket. The other arrangements referred to will be obvious.

As shown in Fig. 1, one of the collars may be the hub or collar of a separator. The collars may rest in immediate contact with the sides of the brackets, and in consequence of such contact they will operate to prevent movement of the separator-rail in the direction of its length. If desired, in order to afford better sliding surfaces than will be furnished by the collars themselves, I shall use the washers, 327, 327, shown in Figs. 9<sup>a</sup> and 9<sup>b</sup>, Fig. 9<sup>a</sup> being a view similar to Fig. 9 in its showing, and having in addition the said washers, and Fig. 9<sup>b</sup> being a view in horizontal section on the horizontal line, 9<sup>b</sup>—9<sup>b</sup>, of Fig. 9<sup>a</sup>. These washers are mounted on the separator-rail between the collars and the sides of the brackets.

Another suitable form and arrangement of directive means will be found in Figs. 6 and

7, in which figures each of the ends of the separator-rail, 21, enters between the ribs, 31, 31, on a plate, 311, which is secured to a suitable portion, 441, of the machine framing, by bolts, 313, 313, that pass through lugs, 314, 314, on the said plate, and also through the portion, 441, of the machine framing, and receive nuts, 315, 315, on their threaded ends outside of the said portion, 441, of the machine framing. The ribs, 31, 31, correspond with the front and rear portions of the slotted brackets which have just been described, and operate to keep the separator-rail, 21, from falling backward or forward in the ring-frame. The contact of the extreme ends of the separator-rail with the vertical faces of the plates, between the ribs, prevents the separator-rail from shifting endwise.

My improved means of mounting the separator-rails on their supports is shown in detail in Figs. 13 to 18<sup>b</sup>. It is designed, mainly, as an improvement upon like means forming the subject matter of claims in my patents for improvements in separator-mechanisms for ring-spinning frames, granted May 30, 1893, No. 498,338 and No. 498,342, and in the patent granted to Charles F. Randall, May 30, 1893, No. 493,305.

Fig. 13 is a view mainly in side elevation, but with the separator-rail in vertical section, showing the upper end of a rod, 22, the socket which is applied thereto, and my present improvement in the means of mounting the separator-rail. Fig. 14 is a view in plan of the parts which are shown in Fig. 13. Fig. 15 is a view in plan of the socket shown in Figs. 13 and 14. Fig. 16 is a view in vertical section on line 16—16 of Fig. 15. Fig. 17 is a view in plan of the portion of a separator which is shown in Figs. 13 and 14. Fig. 18 is a view of the said separator in vertical section on line 18—18 of Fig. 17. Fig. 18<sup>a</sup> is a view of the said separator in horizontal section on line 18<sup>a</sup>—18<sup>a</sup> of Fig. 18. Fig. 18<sup>b</sup> is a view corresponding with Fig. 13, but showing how the separator-rail may be held positively in its supporting socket, if desired.

At 44 is shown a socket that is applied to the upper end of the rod, 22, the said socket being formed or provided with open bearings, 221, 221, in which is received the journal of the separator-rail, 21, and into which the said journal may be dropped readily in assembling the parts, or from which the said journal may as readily be removed when it is desired to take the separator-rail away, the said journal turning in the said bearings as the separators are shifted from their lowered or operative position to their raised or idle position, and vice versa.

In the illustrated construction the front and rear walls, 47 and 48, of the bearings are vertical. The rear walls, 47, are prolonged to a sufficient extent from the seats in the bearings in which the journal of the separator-rail rests to enable the rear surfaces, 49, 49, of said walls, to be utilized for receiving

the impact of stops, 50, 50, moving with the separator-rail. The said open bearings, and the surfaces or rests, 49, 49, are without obstruction to interfere with either the rail or the stops as the rail is being removed, and the stops come in contact with the surfaces, 49, 49, when the separators have reached their operative position between the spindles, whereby the movement of the separators forwardly and downwardly is arrested. The stops, 50, 50, act against the surfaces, 49, 49, at points in the rear of the seats for the journal of the separator-rail, and as clearly will be apparent from inspection of Figs. 13 and 14, the said surfaces, 49, 49, serve as rests or fulcra against the rearward sides of which the stops, 50, 50, take bearing while the unbalanced weight of the parts in front of the points of contact operates to bear or impel the journal of the rail to its seats and hold it there, the parts gravitating naturally into their proper position and remaining there. In the patents aforesaid the socket is formed with but a single bearing for the journal of the separator-rail, and the latter has but a single rest which is engaged by a corresponding stop moving with the separator-rail. In the said patents there is shown one form of construction in which the stop is constituted by a laterally projecting and offset finger making part of the collar or hub of the separator which is next to the socket. In such construction the blade of the said separator is bent twice at right angles, so that its free and widest part shall stand in front of the socket bearing.

In Figs. 13 to 16, I have shown the socket formed with two bearings, 221, 221, for the journal of the separator-rail, the said bearings being on opposite sides of the socket, and being separated by a space sufficient to receive between them the hub or collar, 201, of the separator, 20, which hub or collar is clamped to the separator-rail by a screw, 2011, passing therethrough and taking bearing by its end against the surface of the separator-rail. The stops, 50, 50, are clearly shown in Figs. 13, 14, 17, and 18, as formed by fingers projecting laterally in opposite directions from the rear side of the said collar or hub, 201, and being arranged to engage as aforesaid with the rear surfaces, 49, 49, of the rear walls, 47, 47, of the bearings. Herein, as in my Patent No. 498,338, I form the rear surfaces, 49, 49, with narrow projecting parts, 91, 91, in the shape of vertical ribs which are preferably made of semi-cylindrical or angular outline where the stops, 50, 50, touch them. These narrow projecting parts co-operate with the stops, 50, 50, to cause or permit the socket-bearings to become restored to parallelism with the separator-rail in case the socket should, from any accidental cause, become slightly turned on its vertical axis, the mode of operation being substantially as set forth in my said Patent No. 498,338. My present construction renders it unnecessary to place

collars on opposite sides of the bearing for the journal of the separator-rail as heretofore deemed to be necessary in order to prevent movement of the separator-rail and socket relatively to each other lengthwise of the rail, and it also enables me to use straight separator-blades in place of crooked ones in the case of the separator which is nearest to the socket, as shown clearly in Figs. 17, 18, and 18<sup>a</sup>. The construction, shown, also, is such as to permit the separator-rail and separators to be removed directly from the support at any time, before the separators have been turned out of their operative position, and to be taken away from the machine, without it being necessary to provide for the disengagement of the rail from its supports by first turning the separators out of their operative position into an inoperative position.

In Fig. 18<sup>b</sup> I have represented the manner in which the journal or pivot of the separator-rail may be held positively to its seat or seats in a socket in order to meet the views of some users of ring-frames containing separator-mechanism, or to provide for exceptional conditions experienced in practice. This view indicates the readiness with which the construction of a socket, embodying an open bearing and unobstructed rest, may be modified so as to provide means for holding positively the separator-rail journal or pivot to its seat or seats in the bearing or bearings provided therefor in the socket. The said Fig. 18<sup>b</sup> shows a screw, 471, passing through a hole in the front wall, 48, of a bearing, and having its threaded end fitted into a threaded hole in the rear wall, 47. Obviously, some other form of cross-piece may be substituted for the screw. To provide for the reception of this screw or cross-piece it is necessary only that the front wall, 48, should rise to a slightly greater height than in Fig. 13, and that the holes for the reception of the screw or other cross-piece should be made in the front and rear walls.

When an ordinary ring-spinning frame having the separator-mechanism operated from the cross-shaft arm is altered so as to adapt it to the use of bobbins of a length different from those which have been used thereon, a compensating adjustment in the separator-mechanism is required, in consequence of the change that is made in the height of the cross-shaft. This change is incident to the adjustment, vertically, of the spindle-rail which is effected for the purpose of bringing the tips of the bobbins at the requisite distance from the thread-guides, it being customary to adjust each spindle-rail, 11, of a ring-spinning frame, at the time of each change in the length of the bobbins, to such a height in the frame that when the bobbins, 6, 6, are applied to the spindles, 10, 10, the tips of the bobbins shall be at the same fixed distance below the thread-guides, 4, 4, regardless of the length of the bobbins. It is usual to have the spindle-rail, 11, and guide-rail, 12, connected to-

gether by intermediate vertical pieces, the two rails, 11 and 12, with the intermediate connecting pieces making up what ordinarily is known as the ladder, it being usual, also, to hang the cross-shaft, 18, to the lower side of the guide-rail, 12, by means of brackets or hangers resembling those shown at 19—19, in the drawings, the whole of the ladder being moved upward when shorter bobbins are substituted for longer ones, or downward when longer bobbins are substituted for shorter ones, and the ladder carrying the cross-shaft with it in each case.

It is customary to have the mechanism which actuates the cross-shaft and its arm to raise and lower the ring-rail so arranged that the upper limit of the movement of the stud, 15, or of the stud and its roller, 151, shall be at the same fixed point, and hence that the upper limit of the traverse of the ring-rail shall be at the same fixed distance below the thread-guides for all lengths of bobbins, the change in the traverse required to suit a new length of bobbins being secured by adjustment of the copping-mechanism in such manner as to raise or lower the lower limit of the traverse of the ring-rail to the extent that may be necessary.

Inasmuch as it has been found in practice that the nearer the thread-guides are placed to the tops of the bobbins, the better are the results secured, and whereas the parts of a ring-frame are usually arranged and operated so that the separator-blades lie in the space between the top of the ring-rail and the bottom of the thread-board, when they and the ring-rail have reached, simultaneously, the upper limits of their traverses, it is customary to place the thread-guides and thread-board as near to the tops of the bobbins, and as near to the upper limit of the traverse of the ring-rail, as the width of the separator-blade will permit. When the separators and the ring-rail are at the upper limits of their traverses, and in correct adjustment, the separator-blades are in close proximity to the thread-board above them and to the ring-rail below them. Because of this close proximity, a maladjustment of the separator-mechanism, which shall alter the upper limit of the traverse of the separator-blades, will lead to the striking of the thread-board by the separator-blades, if the adjustment of the upper limit of their traverse is too high, or, to the striking of the separator-blades by the ring-rail, if the adjustment of the upper limit of the traverse of the blades is too low. It, therefore, will be seen that, when the frame is re-adjusted to correspond with a change in the length of the bobbins, the upper limit of the traverse of the separator-rail and separators will not remain as before, for, although the stud, 15, and roller, 151, may rise to exactly the same height as before, all points on the cross-shaft arm which are intermediate the said stud and the cross-shaft will have new positions at the end of the rise of the

cross-shaft arm, in consequence of the change that is made in the height of the cross-shaft. Accordingly, the separator-mechanism will be raised or lowered, but to a less extent than the cross-shaft, in proportion as the position of the cross-shaft is raised or lowered, and, in order to prevent the interference of the separator-blades with the thread-board, or with the ring-rail, when both the separator-blades and the ring-rail are at the upper limits of their traverses, it will become necessary to make a compensating adjustment of the separator-mechanism.

In accordance with one part of my invention I make provision for proper compensating adjustment, but not in the separator-mechanism itself, as follows, reference being had to Figs. 19 to 22, Sheet 5. Fig. 19 shows in elevation one of the bearings for the cross-shaft, and the hanger or bracket forming the support therefor. Fig. 20 is a view in vertical section on line 20—20 of Fig. 19. Fig. 20<sup>a</sup> is a view in vertical section on line 20—20 of Fig. 19, showing a modification. Figs. 21 and 22 are views in rear and side elevation showing the said bearing.

At 161, is shown one of the bearings for the journals of a cross-shaft, and, at 19, the hanger or bracket by which the said bearing is supported, the said hanger or bracket being fixed to the under side of guide-rail 12, see Fig. 1, by the bolts, 191, 191, which latter receive upon their threaded ends the nuts, 192, 192. The holes, 193, 193, in the flange, 194, of the hanger or bracket through which the bolts, 191, 191, pass, are enough larger than the bolts to permit of slight horizontal adjustment of the hanger or bracket upon the guide-rail, as may be required. The bearing, 161, has a plain, preferably square, body-portion, 1611, which fits in a vertical slot, 195, formed in the hanger or bracket. At one end, the bearing, 161, has a flange, 1612, which contacts with one side of the hanger or bracket, and prevents the bearing from passing entirely through the slot, 195, while at its other end the bearing has a threaded portion, 1613. On this threaded portion is applied a nut, 1614, which serves for clamping the bearing in place, a washer, 1615, being placed between the said nut and the adjacent side of the hanger or bracket, 19. The bearing, 161, is adjustable vertically in slot, 195, and thus may be varied in position as may be required for the purpose of effecting the compensating adjustment which is referred to above. To definitely fix and determine the adjustment, I provide an adjusting-screw, 196, on the upper end of which the bearing, 161, rests, the said screw passing upward through the material of the hanger or bracket at the lower end of the slot and projecting into the slot. If desired, a clamping-screw, 197, may be used, as in Figs. 19 and 20, it passing downwardly through the material of the hanger or bracket at the upper end of the slot and being turned in until its lower end bears against

the upper side of the bearing. In Fig. 20<sup>a</sup> the clamping-screw, 197, is omitted.

In Figs. 1, and 2, each rod, 22, is formed at its lower end with an eye, 23, which is entered by a stud or pin, 24, that projects from the side of the cross-shaft arm, 16, the said eye being kept on the said stud or pin by means of a split pin, 25, which is passed through the end of the stud or pin, 24, outside of the eye, 23. The stud or pin, 24, is located at a point intermediate the axis on which the cross-shaft, 18, turns and the point at which motion is transmitted to the lifting-rod, 13. Through the described pivotal connection of the vibratile rod, 22, with the cross-shaft arm, 16, motion is communicated positively from the said arm to the rod, and to the separator-rail and separators sustained thereby. In consequence of connecting the rod, 22, with the cross-shaft arm, 16, at a point between the axis on which the arm rocks and the point on the arm at which motion is communicated to the lifting-rod, 13, the movement communicated to the rod, 22, separator-rail and separators, while occasioned simultaneously with that communicated to the lifting-rod, ring-rail, and rings, is less in extent than the latter movement, and thus the extent of the traverse of the separator-rail and separators is made less than that of the ring-rail and rings. Various modifications may be made in the construction of the rectangular frame herein presented, and in the mode of operating said frame from the cross-shaft arms, 16, 16.

In Figs. 23, 24, 25, and 26, I have indicated the manner in which the rods, 22, 22, and lower cross-bar, rod, or wire, 42, may be formed integrally with one another.

Figs. 23 and 24 indicate the construction at the end of the rectangular frame which is next adjacent to one cross-shaft arm, 16, and show the mode of connecting the frame at that end with such arm, while Figs. 25 and 26 indicate the construction at the end of such frame which is next adjacent to the opposite cross-shaft arm, and show the mode of connecting the frame at that end with the latter arm.

In Figs. 23 and 24, a journal or pin, 421, projects from the frame and enters the hole, 422, formed in the arm, 16.

In Figs. 25 and 26, a screw, 423, with a long cylindrical head passes through a hole, 424, in the corresponding arm, 16, and then through a hole, 425, in a filling-in block, 426, and the threaded end, 427, thereof enters a threaded hole, 428, in the corresponding end of the rectangular frame, it being locked by a small screw, 429, which fits a threaded hole formed transversely in the frame, and takes bearing at its inner end against the thread of screw, 423. This construction, as shown in Figs. 25 and 26, is adopted for convenience in placing the parts in their proper relative positions.

In Figs. 27 and 28, a construction, in which

the side-rods, 22, 22, and cross-bar, rod, or wire, 42, are integral, is adopted, but the journal or pin, 430, at the end of the frame is received in a notch or open bearing, 439, on the upper side of the cross-shaft arm, 16. For the purpose of making the action of the cross-shaft arm in transmitting motion to the frame positive in both directions in the case of this modification, the frame is provided at its end with a finger, 440, which projects under the cross-shaft arm. Preferably, the lower side of the cross-shaft arm beneath the open bearing, 439, is formed in the shape of a segment of a horizontal cylinder having its axis concentric with the pin, 430, when the latter rests in the open bearing, 439.

In Figs. 29 and 30, the lower end of the rod, 22, is formed with an eye, 445, and is slipped upon the end of the cross-bar or rod, 42, and held thereon, with capacity for adjustment along the cross-bar or rod, 42, by a clamping-screw, 449, which latter passes through a threaded hole in the side of said eye and takes bearing at its end against the side of the cross-bar or rod, 42. The cross-bar or rod, 42, has a journal, 448, that fits a notch or open bearing, 439, in the upper side of the cross-shaft arm. Herein, the action is not positive in the downward movement of the cross-shaft arm, and the weight of the parts is depended upon to carry them down when the cross-shaft arm descends.

Figs. 31 and 32 show a construction in which the side-rods and bottom cross-bar or rod of the rectangular frame are made integral, and in which the frame is provided at its end with a downwardly projecting fork, 446, which fits upon a pin, 447, projecting from one side of the cross-shaft arm. The construction represented in Fig. 33 has a stud, 24, carried by the cross-shaft arm, 16, and provided with a rounded projecting portion, 242, which enters a hole, 243, in the corresponding end of the rectangular frame. The threaded end, 244, of the said stud enters a threaded hole, 245, in the arm, 16, and the polygonal head or flange, 246, serves for the reception of a suitable tool for turning the stud when screwing it into place on the arm. This is the construction which is represented in Figs. 1, 2, and 4. It is adapted for use at both ends of a cross-bar, 42. When I make use thereof, and of a movable rectangular supporting frame for the separator-rails, such as the frame shown in Fig. 2, or one having its parts made integral with one another, I make one of the cross-shaft arms, 16, removable from the cross-shaft, 18, as shown in Figs. 4 and 34, instead of having both of the arms of the said shaft cast integral therewith, as heretofore usual.

In Figs. 4 and 34, the arm, 16, is shown formed with a collar, 1611, which fits on a reduced portion near the end of the cross-shaft, and bears against a shoulder, 1612. The cross-shaft is "spotted" or formed with a hole, 1613, for the reception of the end of the screw, 1614,

which holds the arm, 16, to the shaft, thus providing for preventing any possible rotation of the removable cross-shaft arm with respect to the shaft.

5 The features that are represented in Figs. 4 and 34 will be useful in connection with other modifications, also.

10 In Fig. 37, Sheet 7, I have represented an upper cross-bar, 39, made integral with a rod, 22. It is obvious that the opposite end of the said cross-bar, 39, may be thus integral with the opposite rod, 22, and that the entire frame, 39, 22, 42, 22, may be cast or otherwise formed of a single piece.

15 Certain of the features of my invention hereinbefore presented are adapted for use in other connections than those in which they are shown in the figures of the drawings which have been referred to in the foregoing description. Thus, in Figs. 35 and 36, I have shown  
20 a contemplated modification, in which a rectangular frame, substantially such as has been described, is combined with fixed guides of the character of those which have been employed in earlier forms of separator-mechanisms. Fig. 35 is a view in vertical section,  
25 and Fig. 36 is a view in front elevation, showing the connection of such modification with parts of a ring-frame. Herein the rods, 22, 22, slide through the upper and lower fixed guides, 223, 223, forming parts of stands, 224, 224, that  
30 are held by bolts, 226, and nuts, 227, to brackets, 228, that in turn are affixed by bolts, 229, and nuts, 2291, to the spindle-rails, 11, and guide-rails, 12. The upper cross-bar, rod, or  
35 wire, 39, is connected with the upper ends of the rods, 22, 22, by sockets like those which are shown in Figs. 11 and 12, with their provisions for adjustment. The lower cross-bar  
40 or rod, 42, and the mode of connecting the lower ends of the rods, 22, 22, thereto, are substantially as illustrated in Figs. 29 and 30, but herein the ends of the said cross-bar or rod  
45 do not fit notches or open bearings on the upper sides of the cross-shaft arms, as in Figs. 29 and 30. Instead, they, or the rollers, 421, 421, which they carry, rest in sliding contact on the said upper sides, as shown clearly in  
50 Figs. 35 and 36.

I claim as my invention—

1. The combination with the ring-rails and the separator-rails on the opposite sides of a ring-frame, and the separators carried by the separator-rails, of a frame sustaining the said  
55 separator-rails, and means for separately moving the ring-rails and the said frame vertically, substantially as described.

2. The combination with the ring-rails and the separator-rails on the opposite sides of a  
60 ring-frame, the separators carried by the separator-rails, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame whereby the ring-rails are actuated, of a frame sustaining the said separator-rails,  
65 and separately actuated by the said cross-shaft arms, substantially as described.

3. The combination with the separator-rails

on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding  
70 cross-shaft arms upon the opposite sides of the ring-frame, of a frame sustaining the said separator-rails and composed of side rods provided with supports for the separator-rails and acted upon at their lower ends by the  
75 cross-shaft arms, and upper and lower cross-bars, rods, or wires connecting the said side-rods, substantially as described.

4. The combination with the separator-rails on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding  
80 cross-shaft arms upon the opposite sides of the ring-frame, of the frame sustaining the said separator-rails composed of side-rods provided with supports for the separator-rails and connected pivotally at the lower ends  
85 thereof with the cross-shaft arms, and upper and lower cross-bars, rods, or wires connecting the said side-rods, substantially as described.

5. The combination with the separator-rails  
90 on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame, of the frame sustaining the said separator-rails composed of side-rods pro-  
95 vided with supports for the separator-rails and acted upon at their lower ends by the cross-shaft arms, upper and lower cross-bars, rods, or wires connecting the said side-rods, and means for connecting the cross-bars, rods,  
100 or wires to the side-rods and adjusting the direction of the said cross-bars, rods, or wires with respect to that of the said side-rods, substantially as described.

6. The combination with the separator-rails  
105 on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame, of the frame sustaining the said separator-rails composed of side-rods pro-  
110 vided with supports for the separator-rails and connected pivotally at their lower ends with the cross-shaft arms, upper and lower cross-bars, rods, or wires connecting the said side-rods, and means for connecting the cross-  
115 bars, rods, or wires to the side-rods and adjusting the direction of the said cross-bars, rods, or wires with respect to that of the said side-rods, substantially as described.

7. The combination with the ring-rails and  
120 separator-rails on the opposite sides of a ring-frame, and the separators carried by the separator-rails, of the frame sustaining the said separator-rails, means for separately actuating the ring-rails and the said frame, and di-  
125 rective means whereby to maintain the separators as they rise and fall in proper positions relative to the spindles, substantially as described.

8. The combination with the ring-rails and  
130 the separator-rails on the opposite sides of a ring-frame, the separators carried by the separator-rails, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame

whereby the ring-rails are actuated, of a frame sustaining the said separator-rails, and separately actuated by the said cross-shaft arms, and directive means whereby to maintain the separators as they rise and fall in proper position relative to the spindles, substantially as described.

9. The combination with the separator-rails on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame, of a frame sustaining the said separator-rails composed of side-rods provided with supports for the separator-rails and acted upon at their lower ends by the cross-shaft arms, and upper and lower cross-bars, rods, or wires connecting the said side-rods, and directive means whereby to maintain the separators as they rise and fall in proper positions relative to the spindles, substantially as described.

10. The combination with the separator-rails on the opposite sides of a ring-frame, the separators carried thereby, and the corresponding cross-shaft arms upon the opposite sides of the ring-frame, of the frame sustaining the said separator-rails composed of side-rods provided with supports for the separator-rails and connected pivotally at the lower ends thereof with the cross-shaft arms, and upper and lower cross-bars, rods, or wires connecting said side-rods, and directive means whereby to maintain the separators as they rise and fall in proper positions relative to the spindles, substantially as described.

11. The combination with the separator-rails on the opposite sides of a ring-frame, the separators carried thereby, rods sustaining the said separator-rails, and means for reciprocating the said rods vertically, of a cross-bar, rod, or wire uniting the corresponding rods on opposite sides of the ring-frame, and means for adjusting the direction of the said cross-bar, rod, or wire with respect to that of one of the said rods, substantially as described.

12. The combination with the separator-rails on the opposite sides of a ring-frame, the separators carried thereby, rods sustaining the said separator-rails, and means for reciprocating the said rods vertically, of a cross-bar, rod, or wire uniting the corresponding rods on opposite sides of the ring-frame, and means for adjusting the distance apart of the said rods, and the direction of the said cross-bar, rod, or wire with respect to that of one of the said rods, substantially as described.

13. The combination with the separator-rails on the opposite sides of the ring-frame, and the separators carried thereby, of side-rods sustaining the said separator-rails, means for reciprocating the said side-rods vertically, a cross-bar, rod, or wire uniting the corresponding side-rods on opposite sides of the ring-frame, and a socket, 43, connected with one end of the cross-bar, rod, or wire, and having an opening therethrough for the

reception of one of the side-rods, and also having the oppositely located screws, 433, 433, 433, substantially as described.

14. The combination with the separator-rail, the separators carried thereby, the vibratile supporting and connecting-rods, and the cross-shaft arms whereby the said rods are moved to actuate the separator-rail, of the guides for the separator-rail provided with vertical surfaces between which the separator-rail moves and whereby the said separator-rail is prevented from moving transversely of the ring-frame, substantially as described.

15. The combination with the separator-rails on opposite sides of a ring-frame, the separators carried thereby, the swinging frame whereby the said rails are supported, and the corresponding cross-shaft arms on opposite sides of the ring-frame by which the said swinging-frame is actuated, of guides provided with vertical surfaces whereby the said separator-rails are prevented from moving transversely of the ring-frame, substantially as described.

16. The combination with the separator-rail, the separators carried thereby, the vibratile supporting and connecting-rods, and the cross-shaft arms whereby the said rods are moved to actuate the separator-rail, of a slotted bracket in which the separator-rail is fitted and by which it is guided, substantially as described.

17. The combination with the separator-rail, the separators carried thereby, the vibratile supporting and connecting rods, and the cross-shaft arms whereby the said rods are moved to actuate the separator-rail, of a slotted bracket in which the separator-rail is fitted and by which it is guided, and collars on the separator-rail on opposite sides of said bracket, substantially as described.

18. The combination with the separator-rail, the separators carried thereby, the cross-shaft, the cross-shaft arm, and means for operating the separator-rail from the cross-shaft arm, of the guide-rail, and a vertically adjustable bearing for the cross-shaft supported on the said guide-rail, substantially as described.

19. The combination with the separator-rail, the separators carried thereby, the cross-shaft, the cross-shaft arm, and means for operating the separator-rail from the cross-shaft arm, of the guide-rail, a vertically-slotted hanger or bracket carried by the guide-rail, a bearing for the cross-shaft in the slot of said hanger or bracket, and a set-screw beneath the said bearing for fixing the position thereof, substantially as described.

20. The combination with the separator-rail, the separators carried thereby, the cross-shaft, the cross-shaft arm, and means for operating the separator-rail from the cross-shaft arm, of the guide-rail, a vertically-slotted hanger or bracket carried by the guide-rail, a bearing for the cross-shaft in the slot of

said hanger or bracket, a set-screw beneath and a clamp-screw above the said bearing for fixing the position thereof, substantially as described.

5 21. The combination with the separator-rail, the separators carried thereby, the cross-shaft, the cross-shaft arm, and means for operating the separator-rail from the cross-shaft arm, of the guide-rail, a vertically-slotted  
10 hanger or bracket carried by the guide-rail, a bearing for the cross-shaft in the slot of said hanger or bracket having a flange at one end fitting against one side of the hanger or bracket and having the other end threaded, a clamp-  
15 ing-nut on said threaded end, and a set-screw beneath said bearing for fixing the position thereof, substantially as described.

22. The combination with the separators, and the separator-rail provided with oppositely projecting stops, of a support having  
20 bearings at the opposite sides thereof, and having rests with which the said stops may engage, substantially as described.

23. The combination with the separators, the separator-rail, and a hub or collar mounted on the separator-rail provided with oppositely projecting stops, of a support having  
25 bearings at the opposite sides thereof, between which bearings the said hub or collar may enter, and also having rests with which the said stops may engage, substantially as described.

24. The combination with the separators, the separator-rail, and a hub or collar mounted on the separator-rail provided with oppositely projecting stops located at the rear of  
35 the separator-rail, of a support having bearings at the opposite sides thereof, between which bearings the said hub or collar may enter, and also having rests at the rear sides of such bearings with which the said stops may engage, substantially as described.

25. The combination with the separators, the separator-rail, and a hub or collar mounted on the separator-rail provided with oppositely projecting stops, of a support constructed to permit the separator-rail to be unobstructedly removed therefrom before the  
45 separators have been turned out of their operative position, it having open bearings at the opposite sides thereof, between which bearings the said hub or collar may enter, and also having rests without obstruction to interfere with the stops while the rail is being removed and with which rests the said  
50 stops may engage, substantially as described.

26. The combination with the separators, the separator-rail, and a hub or collar mounted on the separator-rail provided with oppositely projecting stops located at the rear of  
60 the separator-rail, of a support constructed to permit the separator-rail to be unobstructedly removed therefrom before the separators

have been turned out of their operative position, it having open bearings at the opposite  
65 sides thereof, between which bearings the said hub or collar may enter, and also having at the rear sides of such bearings the rests without obstruction thereabove to interfere with the stops while the rail is being removed, substantially as described.

27. The combination with the separator-rail, a separator, and the separator-collar mounted on the separator-rail and provided with oppositely projecting stops, of a support constructed to permit the separator-rail to be unobstructedly removed therefrom before the  
75 separators have been turned out of their operative position, it having open bearings at the opposite sides thereof, between which bearings the said collar may enter, and also having rests without obstruction to interfere with the stops while the rail is being removed and with which rests the said stops may engage, substantially as described.

28. The combination with the separator-rail, a separator, and the separator-collar mounted on the separator-rail and provided with oppositely projecting stops located at the rear of  
85 the separator-rail, of a support constructed to permit the separator-rail to be unobstructedly removed therefrom before the separators have been turned out of their operative position, it having open bearings at the opposite sides thereof, between which bearings the said collar may enter, and also having at the rear sides of such bearings the rests without obstruction thereabove to interfere with the  
90 stops while the rail is being removed, substantially as described.

29. The combination with these separator-rails on opposite sides of a ring-frame, the separators carried thereby, and the movable frame supporting the separator-rails, of the cross-shaft having arms provided with studs or  
105 pins in engagement with the said movable frame, one of the said arms being removable from the cross-shaft and having means for securing it in place on the latter, substantially as described.

30. The combination with these separator-rails on opposite sides of a ring-frame, the separators carried thereby, and the movable frame supporting the separator-rails, of the cross-shaft having arms provided with studs or  
115 pins in engagement with the said movable frame, one of the said arms being removable from the cross-shaft, and a screw for securing said movable arm in place on the latter, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

CHANNING WHITAKER.

Witnesses:

MARY CAVERLY,  
SAML. G. STEPHENS.