# UNITED STATES PATENT OFFICE.

JAMES C. KILLAM, OF EVERETT, MASSACHUSETTS.

## METHOD OF SAWING LUMBER.

SPECIFICATION forming part of Letters Patent No. 723,469, dated March 24, 1903.

Application filed November 9, 1901. Serial No. 81,692. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES C. KILLAM, a subject of the King of Great Britain, residing at Everett, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Methods of Sawing Lumber, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to a novel method of sawing a log into lumber, and it has particular reference to the sawing of what are known as "rift-sawn clapboards," by which is meant clapboards which are sawed from the log by making a series of radial cuts extending longitudinally of the log, so that the width of the clapboard as it is taken from the log is radial of the log.

The common method now employed in sawing rift-sawn clapboards is to make a series of cuts longitudinally of the log, the said cuts being of a depth approximately equal to the width of the clapboard into which the log is to be sawed. The cuts thus made show parallel lines on the circumferential surface of the log, while at the end of the log they extend in radial directions, so that all of the clapboards into which the log is sawn have their thick edges at the circumference of the log.

When a large log is being cut into clapboards according to the existing method, a series of cuts, such as described, are made completely around the exterior surface of the log, after which the log is removed from the sawmill and the clapboards thus cut are stripped from the core.

Usually clapboards are about six inches in width, and when a log of a diameter of, say, thirty inches is being sawed into clapboards the first set of clapboards which are sawed from the exterior thereof would reduce the diameter of the log twice the width of the clapboard, which would be twelve inches. Thereafter the core of the log thus left is usually put in a lathe and its exterior surface trued up, when the said core can again be placed in the sawmill and another series of clapboards cut therefrom, this operation being repeated until the core left is too small for further use.

Since in the above-described method, which is that commonly employed, all of the cuts are made on radial lines whether the log is of a large or of a small diameter, it will be seen that when a log of large diameter is being sawed the radial cuts are much more nearly parallel than they are when a log of comparatively small diameter is being sawed, for when a log of the minimum diameter is being thus sawed the angular distance between the various cuts must be sufficient so that the space between the inner limit of each cut shall be as great as the thinnest edge of the finished clapboard is to be, while in a log of large diameter the distance between the cuts on the exterior of the log will be substantially equal to the thickness of the clapboard at its thickest edge. In both of these extreme sizes of logs the resultant clapboard requires considerable trimming in order to bring it to the right taper, and this trimming occasions a consequent loss or waste of material.

It is the object of my invention to provide a novel method of sawing rift-sawn clapboards, wherein a minimum amount of waste will be occasioned and whereby the clapboards as they come from the sawmill are of substantially the required taper, so that very little planing of the clapboard is required in the finishing thereof. In order to accomplish this, instead of making the cuts all radial, as heretofore, so that the thick edges of all the clapboards are at the exterior of the log and the thin edges thereof toward the center, I saw the logs in such a way that a portion of the clapboards in each row of clapboards will have their thick edges toward the center, the number of such clapboards depending upon the size of the log which is being sawed. By thus sawing the log so that certain of the clapboards have their thick edges toward the center and their thin edges on the periphery of the log all of the clapboards sawed from the exterior of any-sized log may be cut to approximately the required taper. In thus cutting logs according to my method the log or block of the required length is first trimmed up or turned around in a suitable lathe and is then placed in a suitable sawmill. Two cuts or kerfs are then made longitudinally of the log by any suitable sawing device, the said cuts being of a depth equal to the width of the clapboard and diverging toward the

No. 723,470. PATENTED MAR. 24, 1903.

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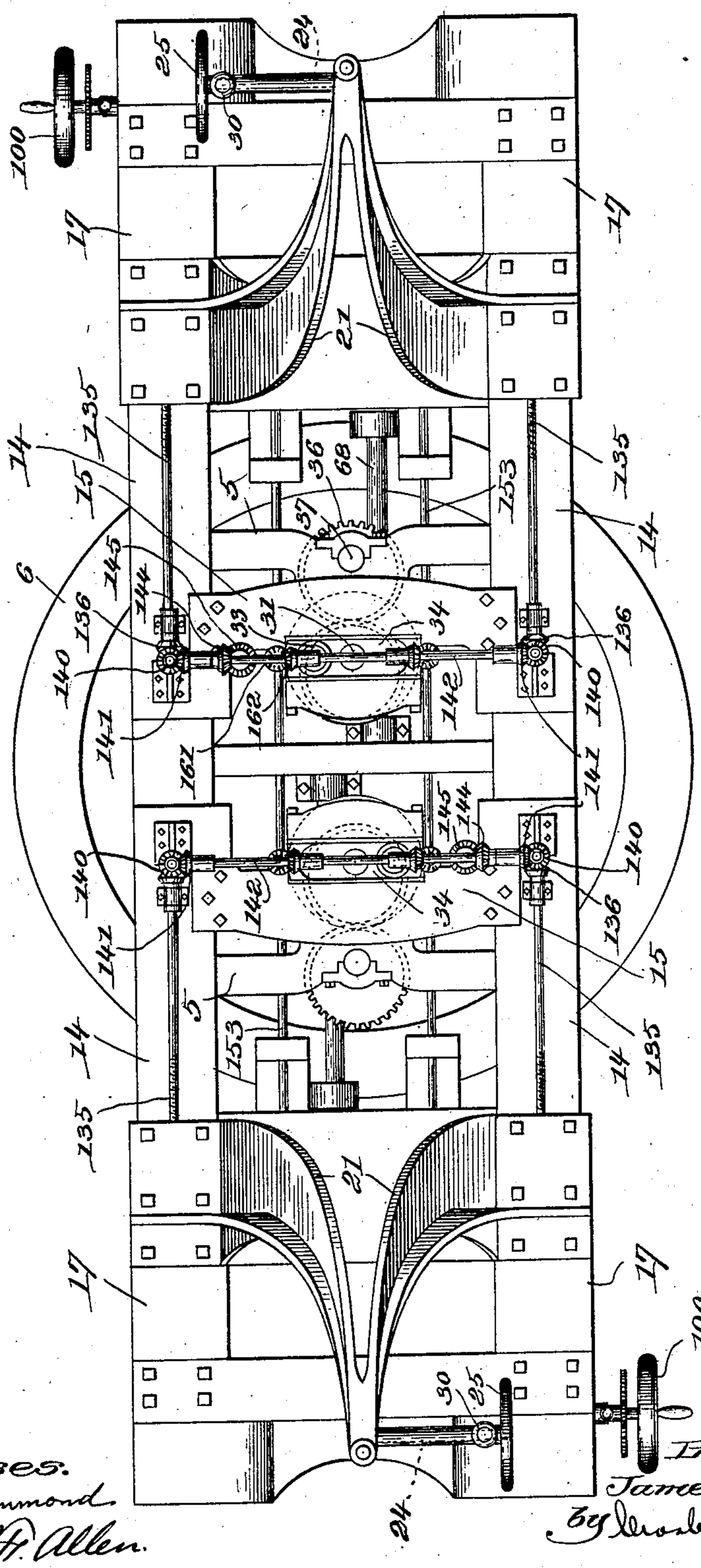
CLAPBOARD MACHINE.

APPLICATION FILED FEB. 6, 1902.

NO MODEL. 14 SHEETS—SHEET 2.

Fig. 2.




Witnesses.
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NO MODEL. 14 SHEETS—SHEET 3.

Fig. 3.

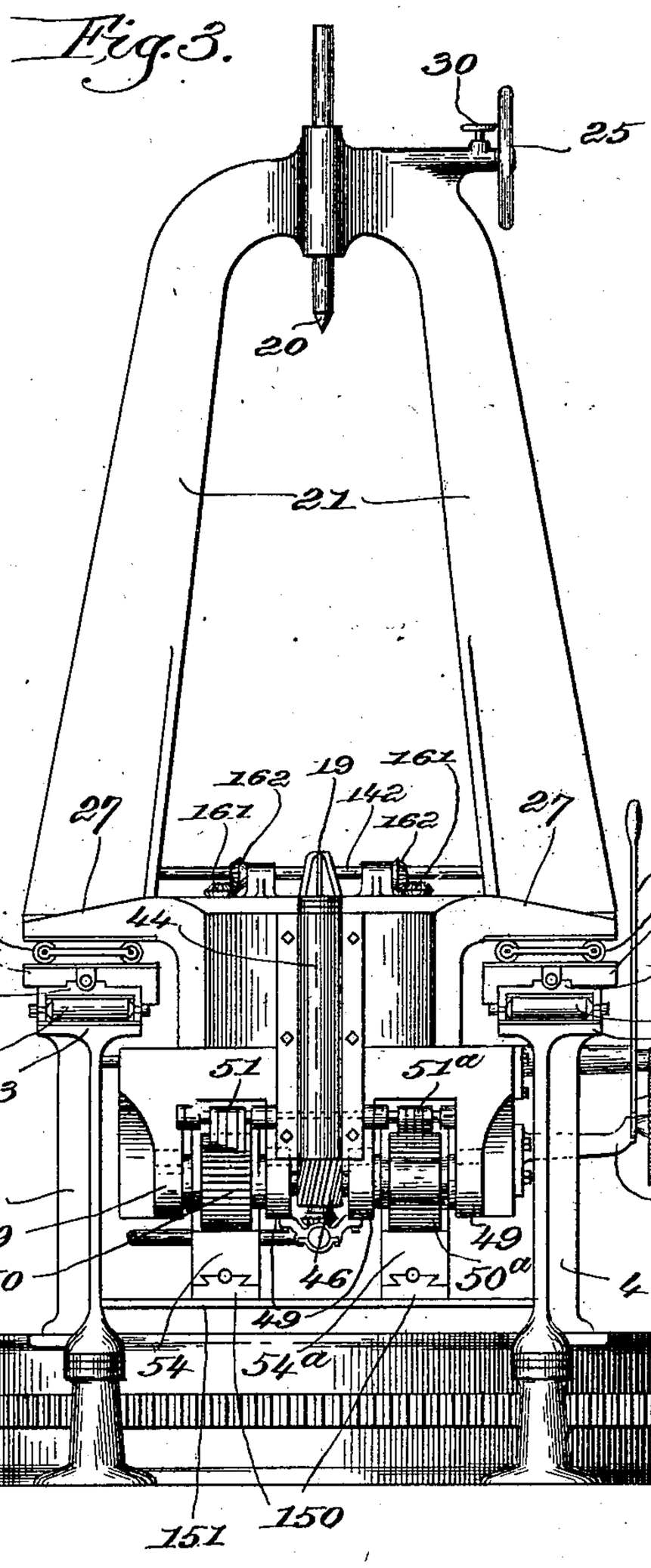
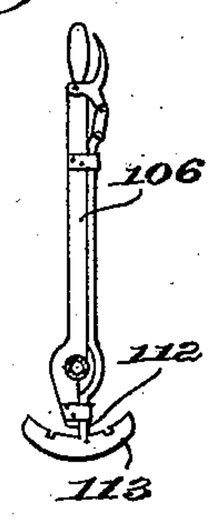



Fig. 3a.




Witnesses.
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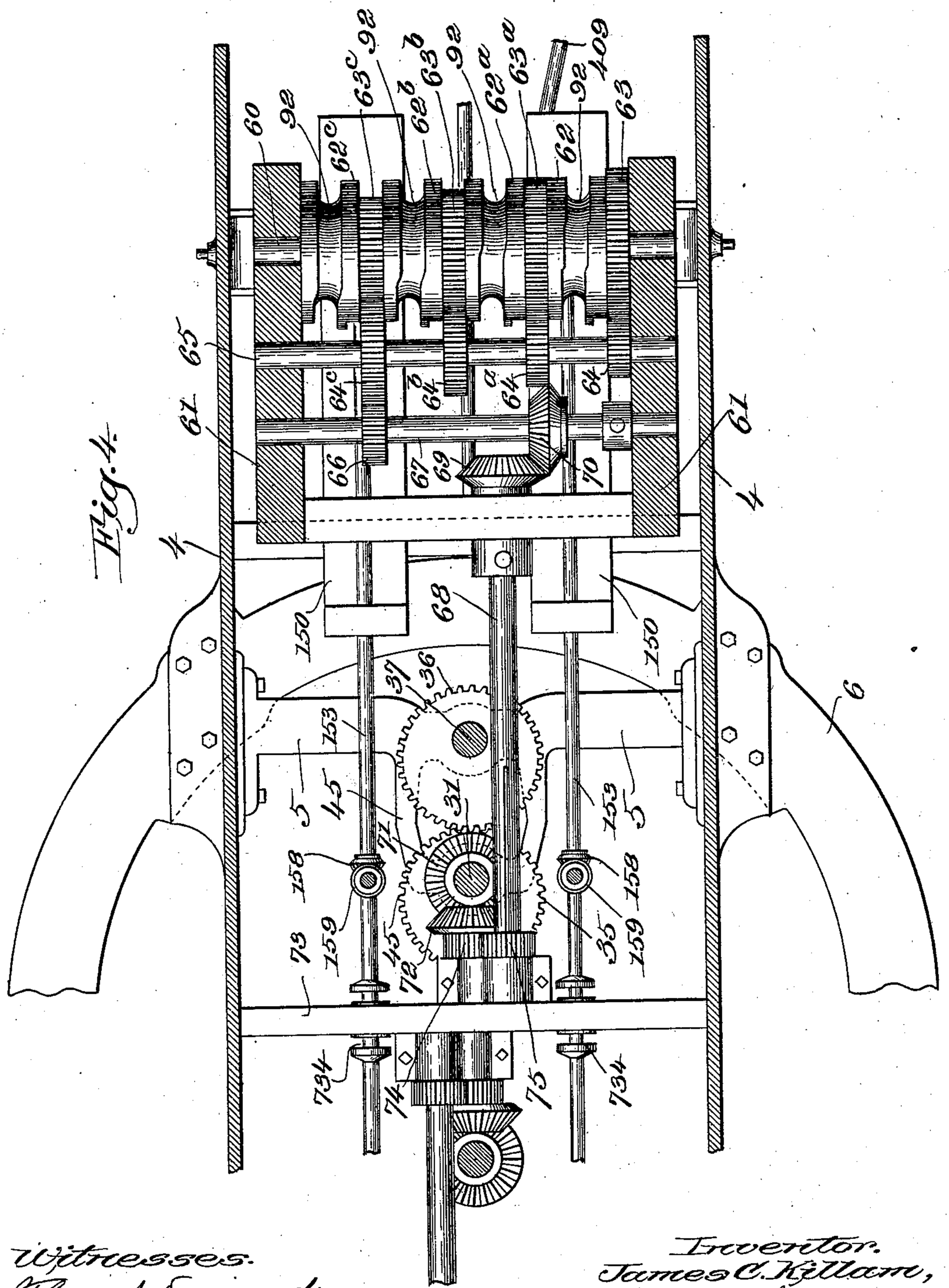
NO MODEL. 14 SHEETS—SHEET 4.

Fig. 4.




Witnesses.
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NO MODEL. 14 SHEETS—SHEET 5.

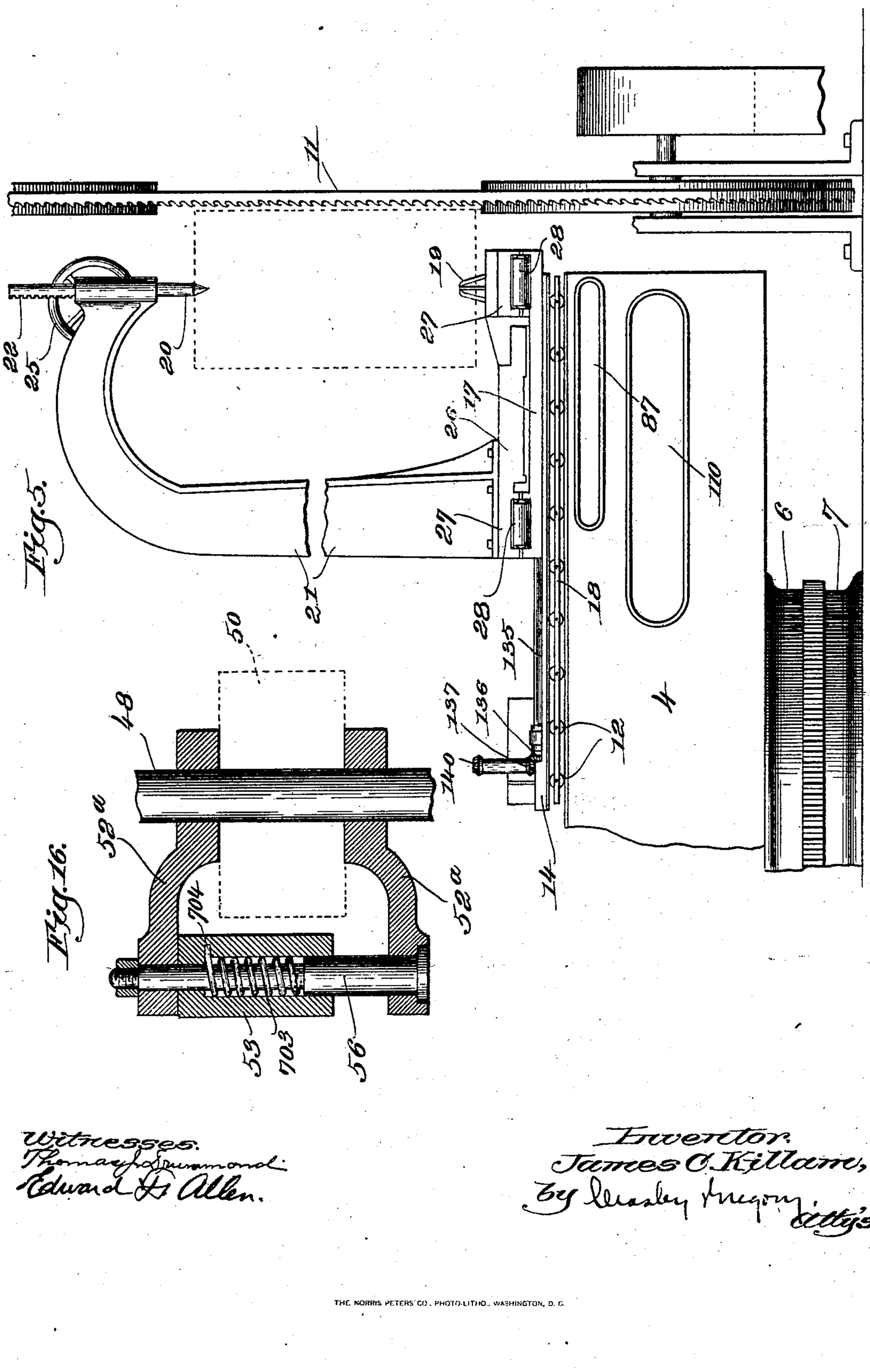


Fig. 5.

Fig. 16.

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NO MODEL. 14 SHEETS—SHEET 6.

Fig. 6.

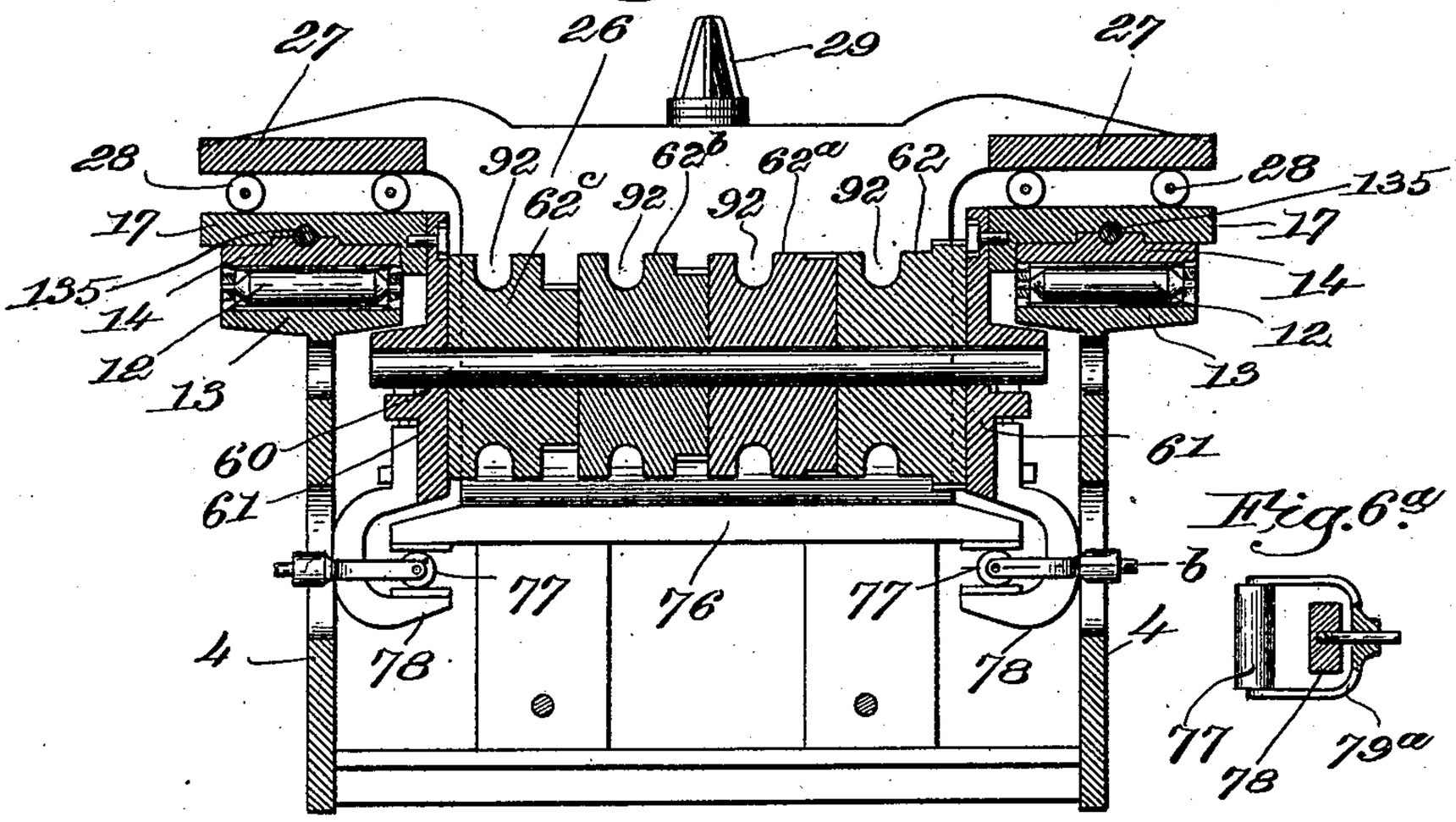
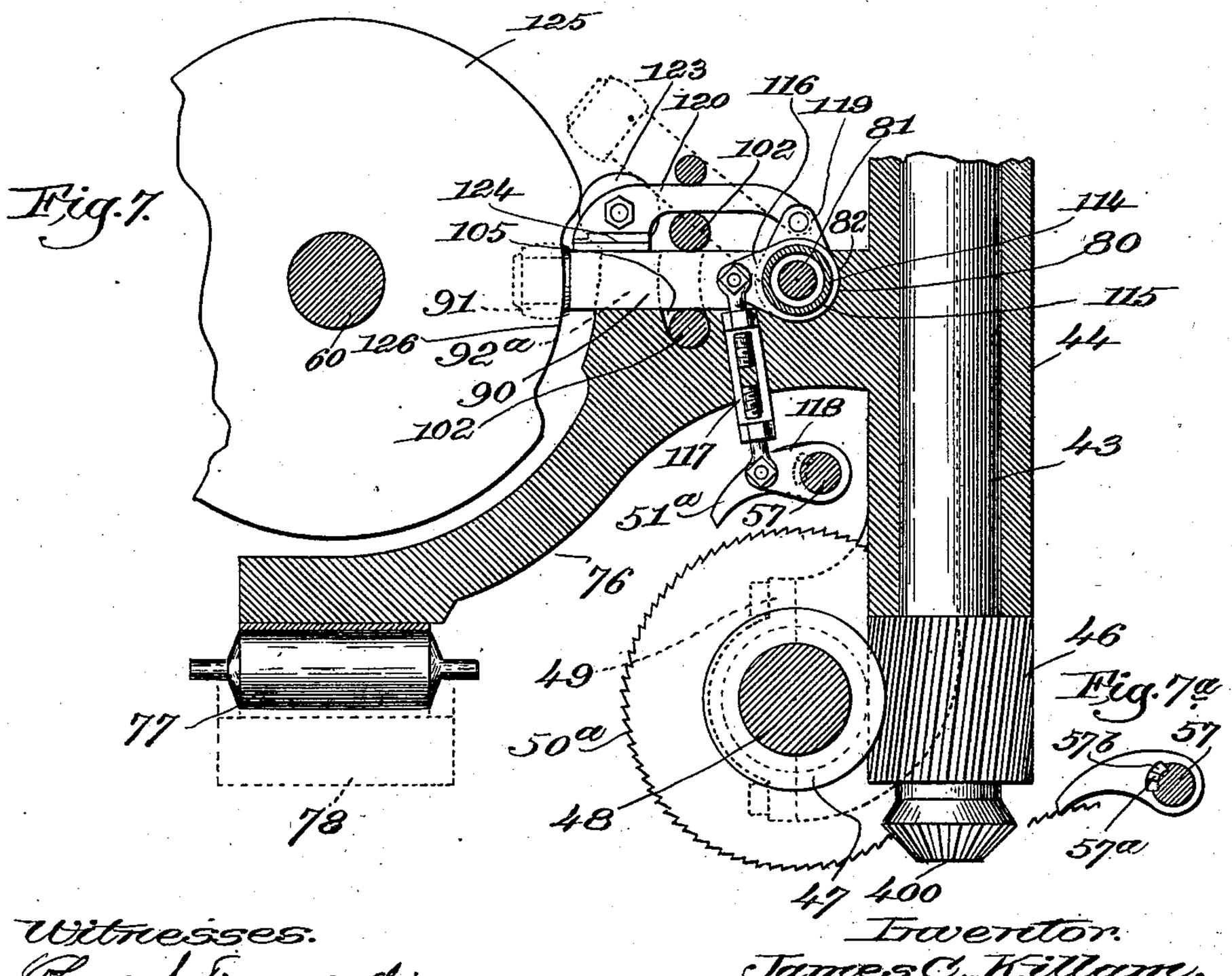



Fig. 6a.




Fig. 7.

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NO MODEL. 14 SHEETS—SHEET 7.

Fig. 8.

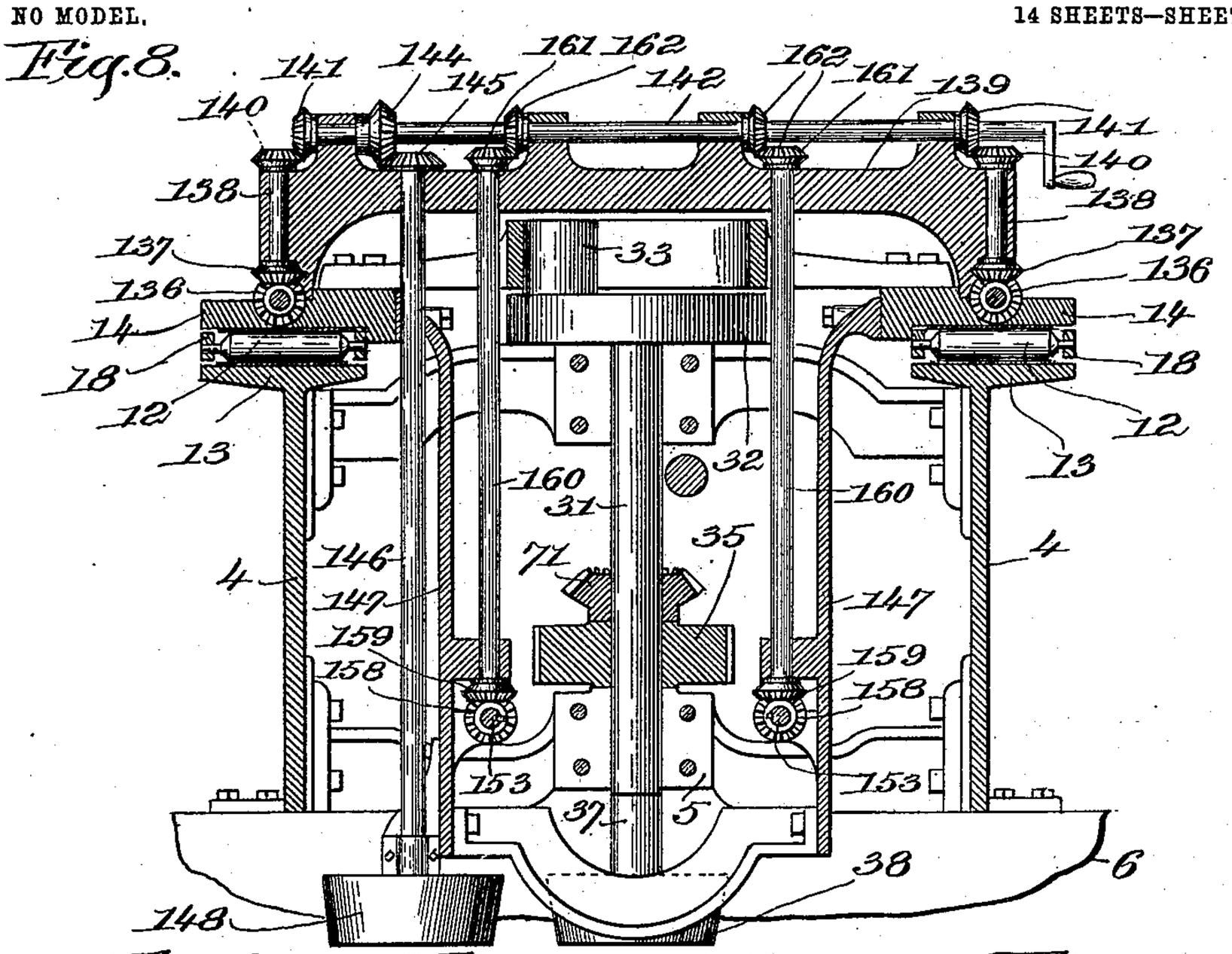



Fig. 9.

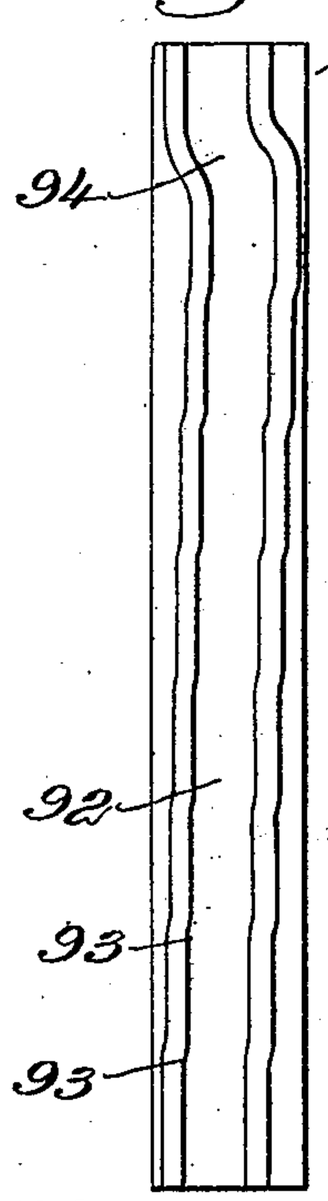



Fig. 10.

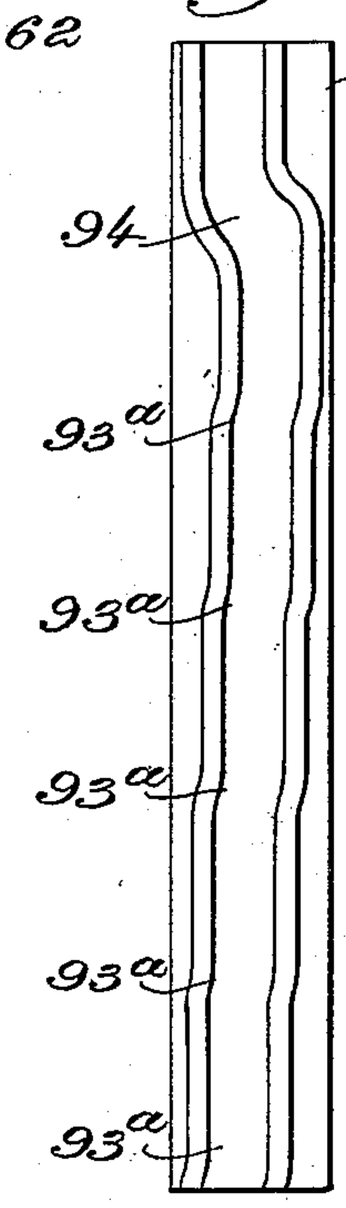



Fig. 11.

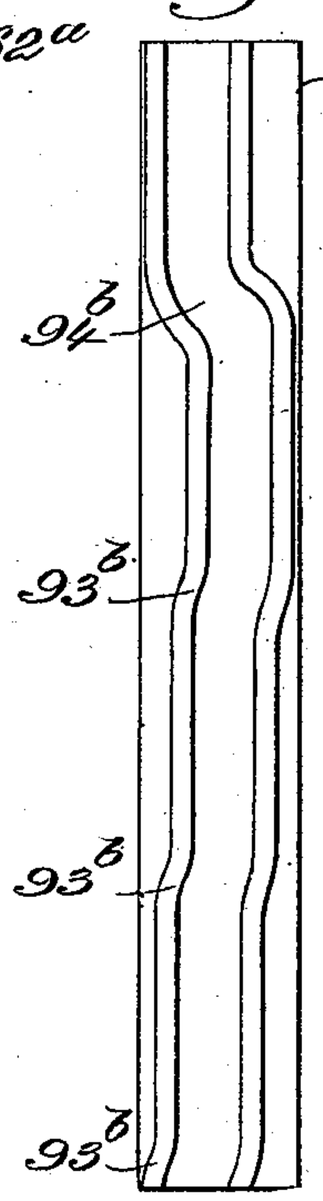
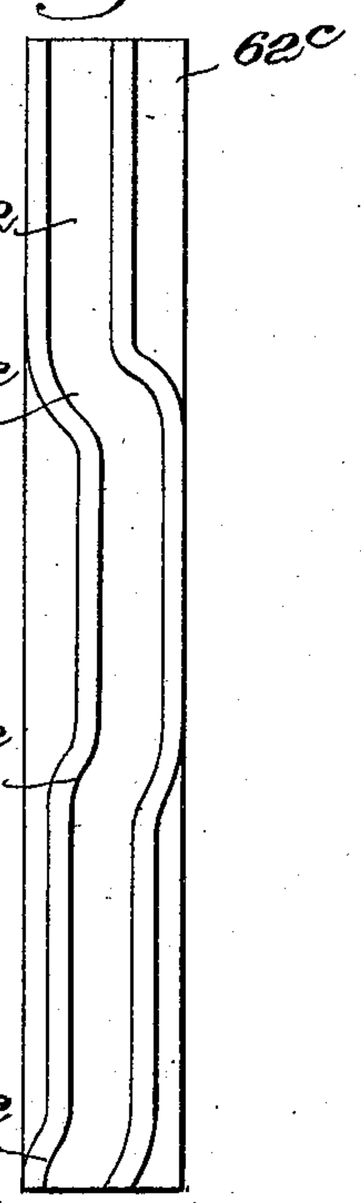



Fig. 12.

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NO MODEL. 14 SHEETS—SHEET 8.

Fig. 13.

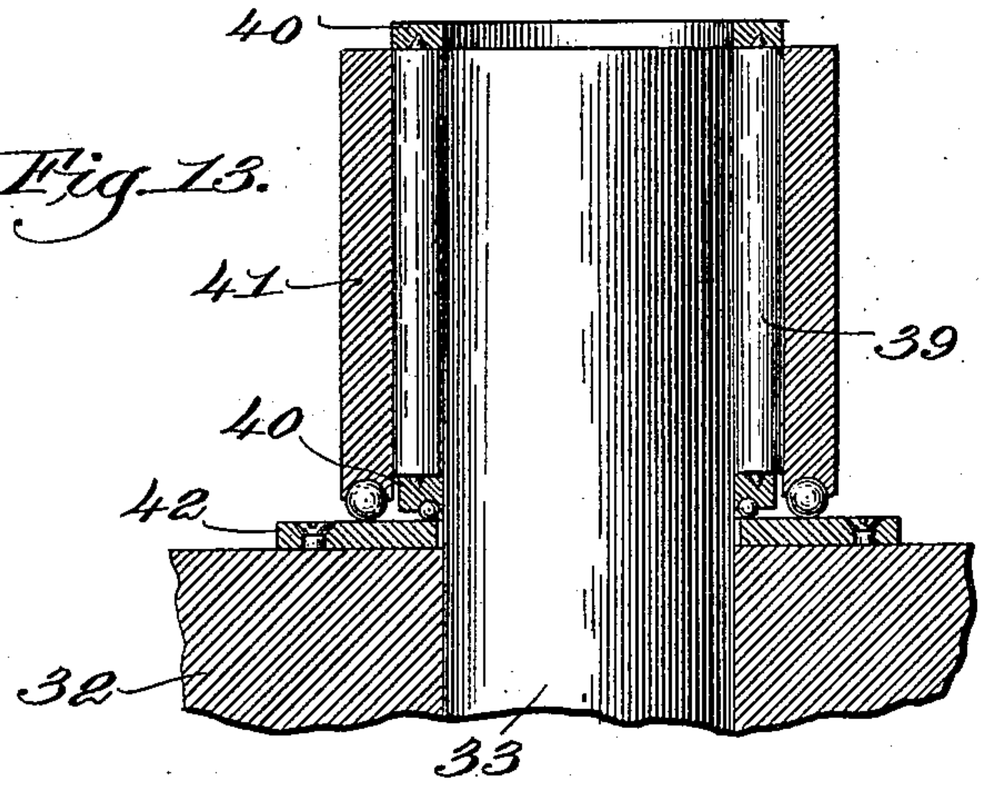



Fig. 14.

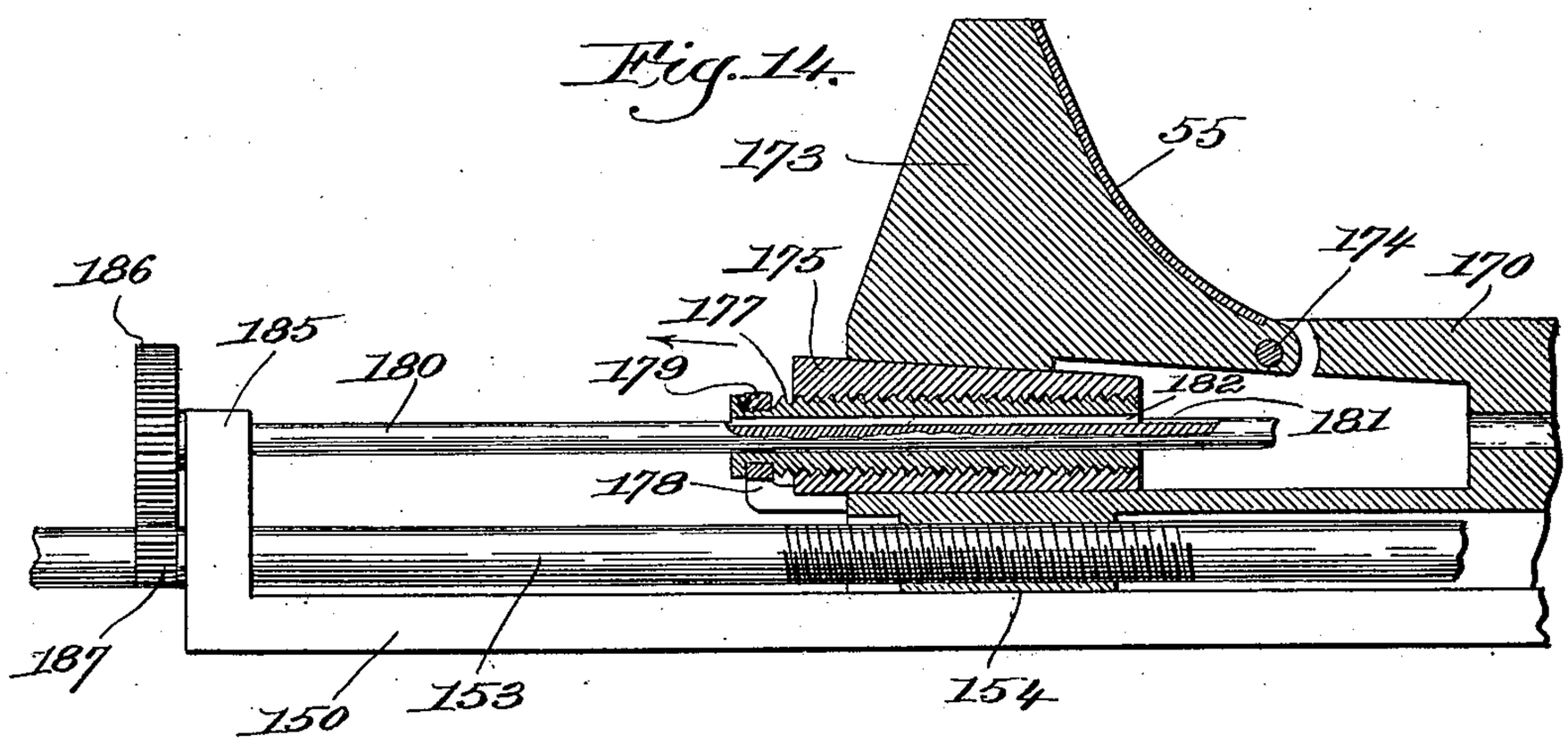
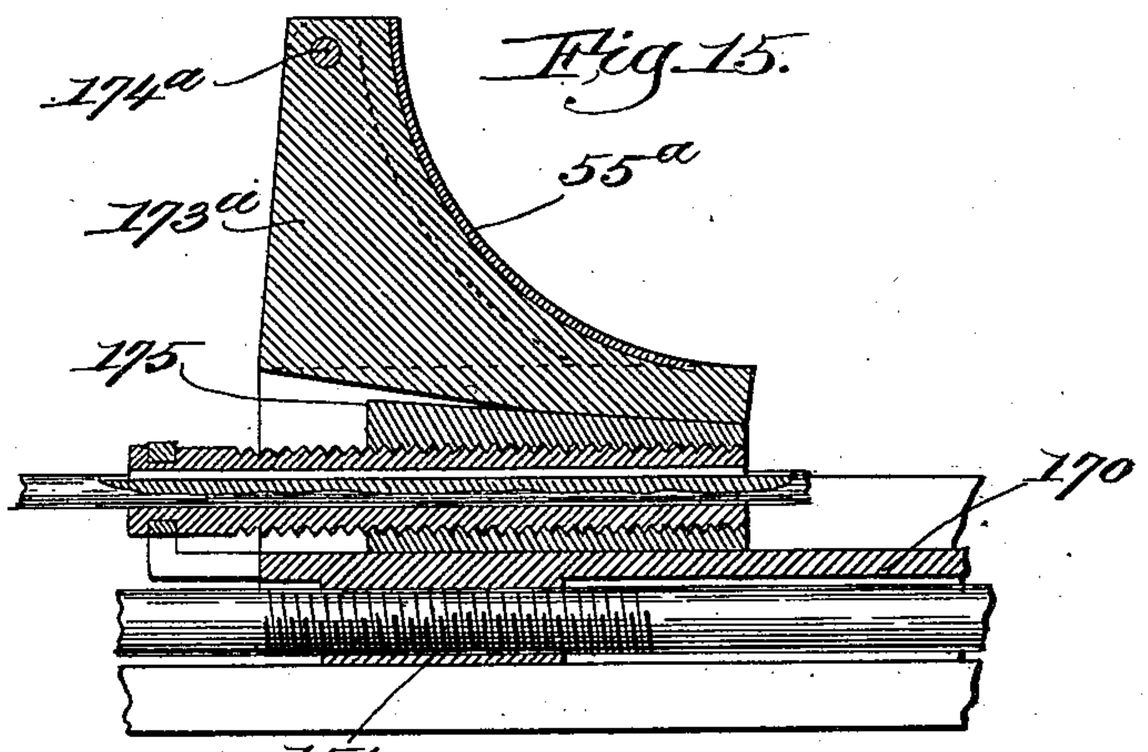



Fig. 15.

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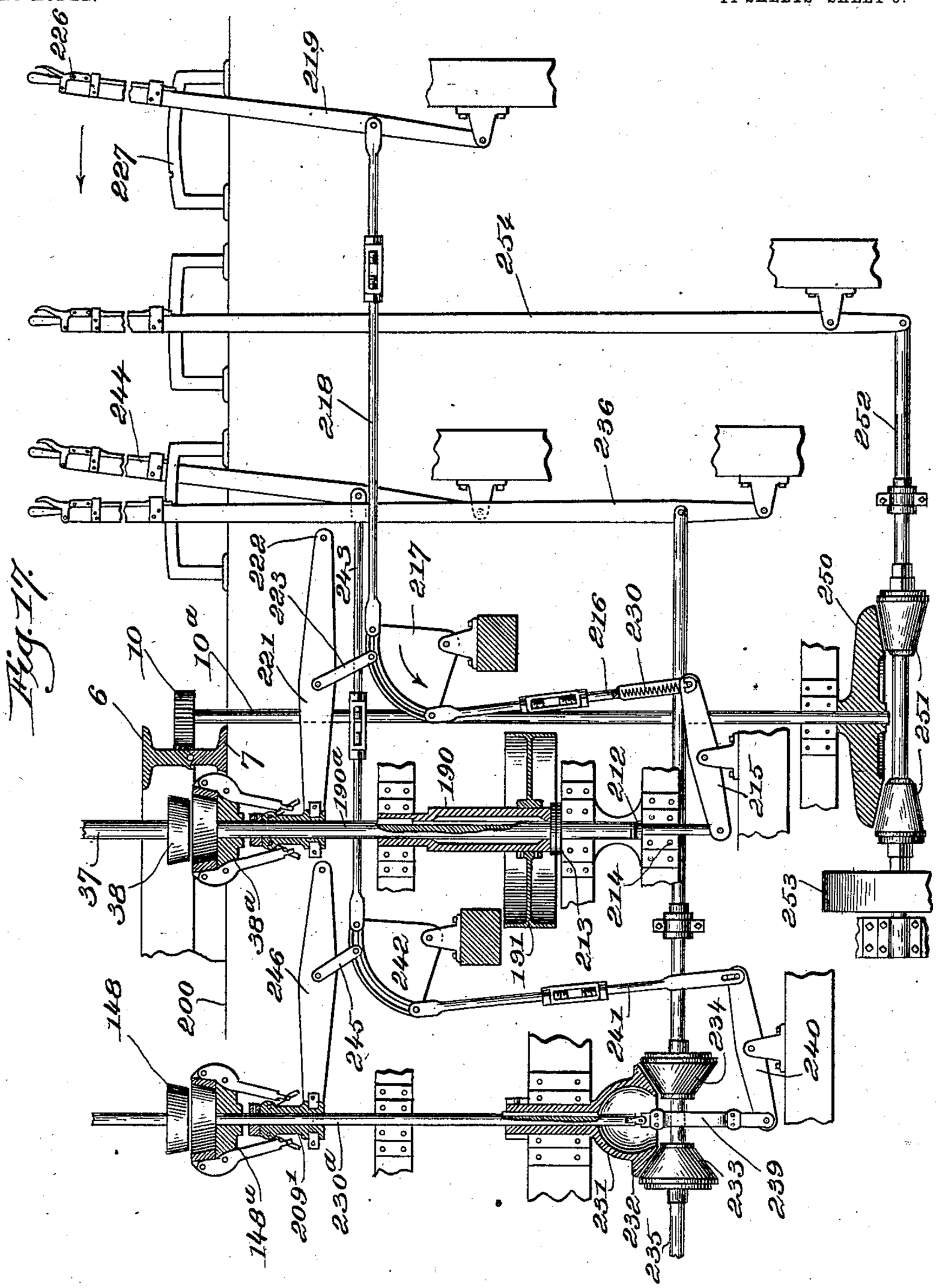
NO MODEL. 14 SHEETS—SHEET 9.

Fig. 17.

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NO MODEL. 14 SHEETS—SHEET 10.

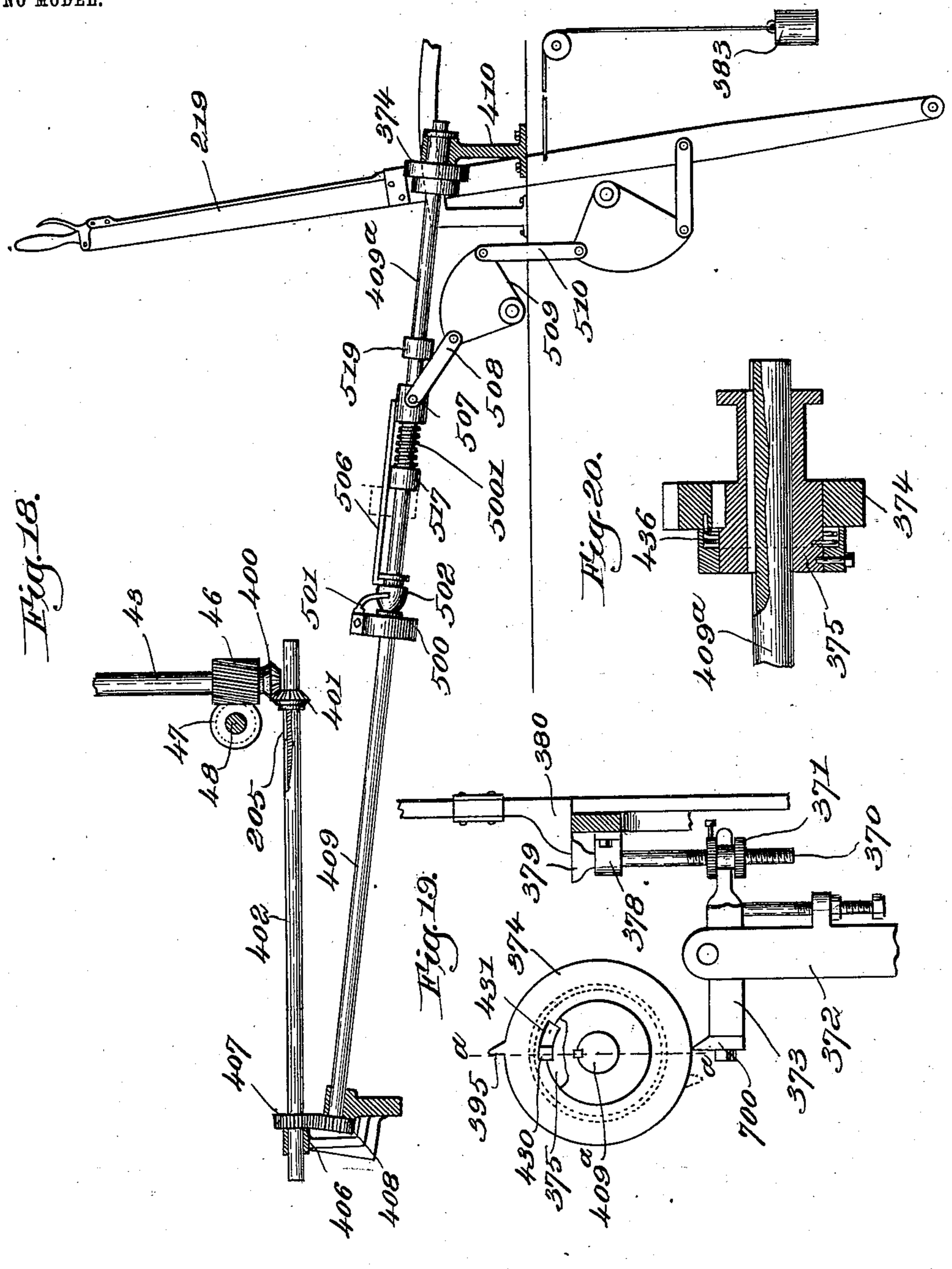


Fig. 18.

Fig. 19.

Fig. 20.

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NO MODEL. 14 SHEETS—SHEET 11.

Fig. 21.

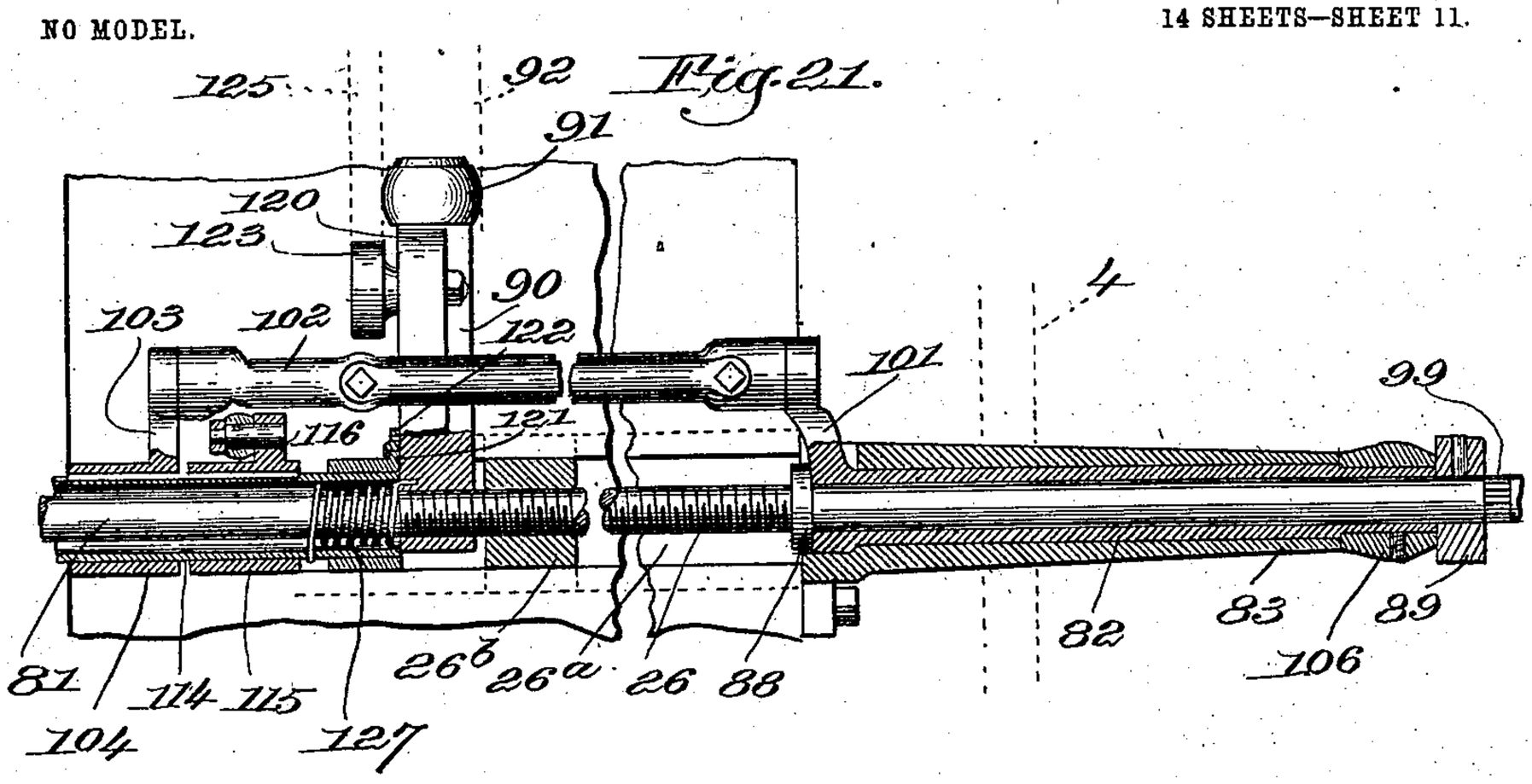



Fig. 26.

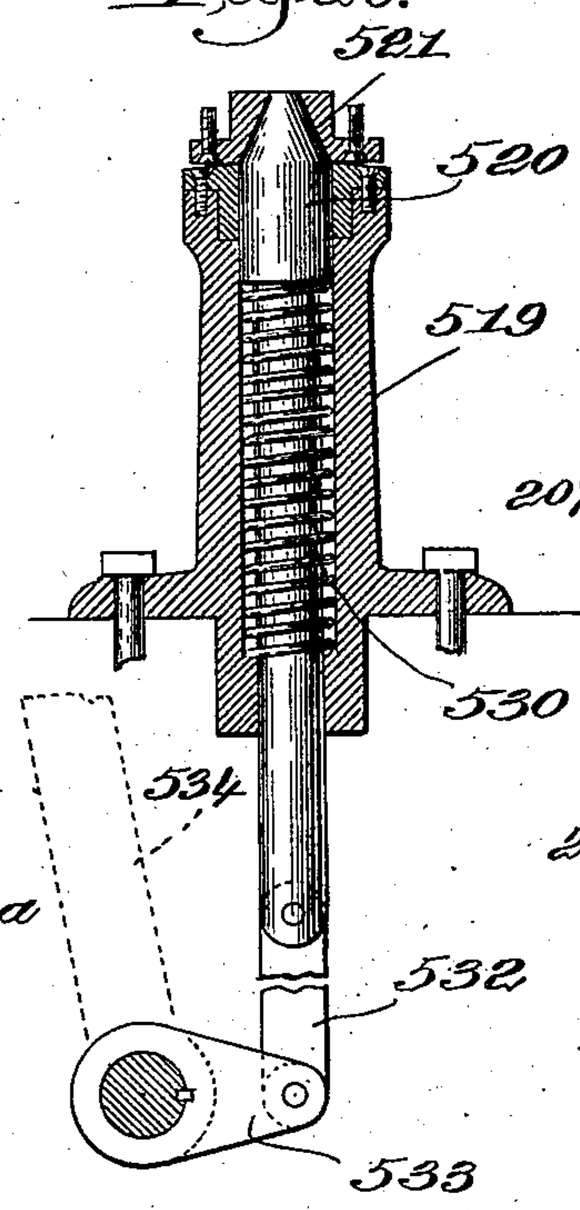



Fig. 22.

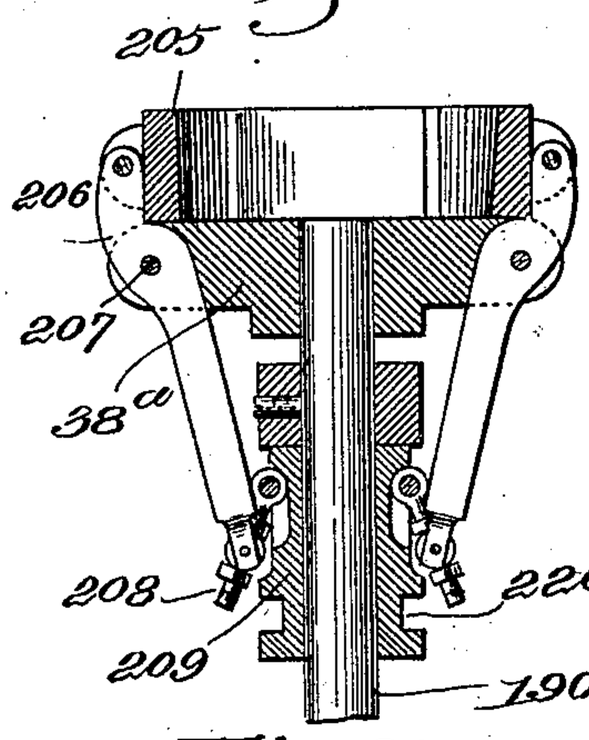
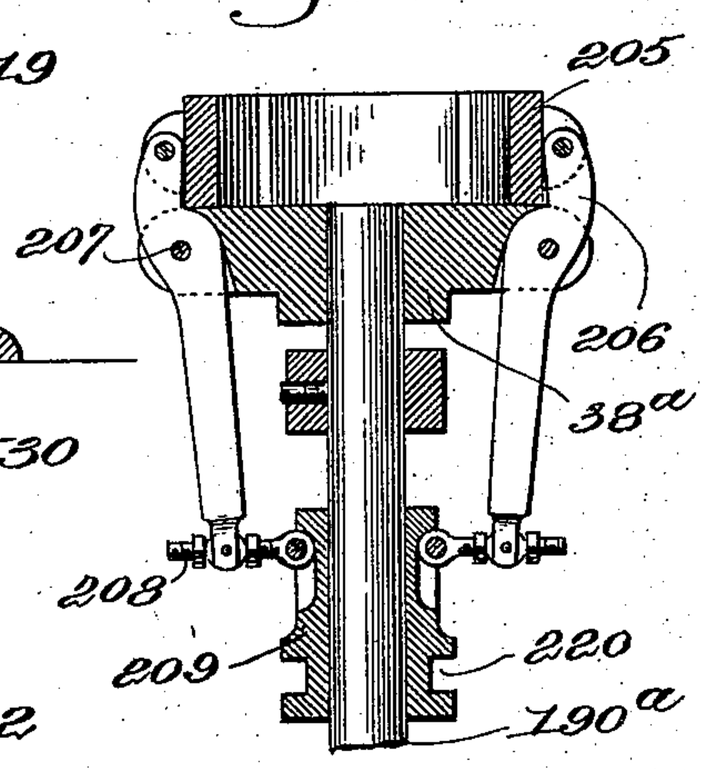



Fig. 23.

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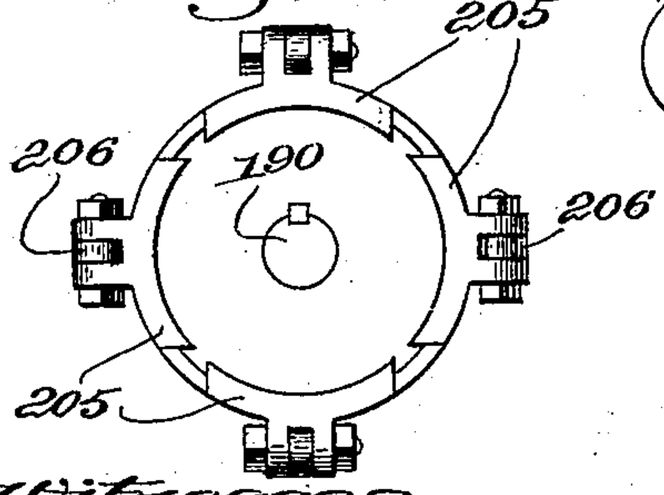


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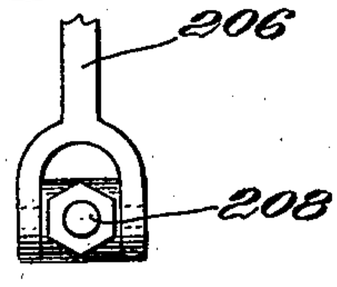


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NO MODEL. 14 SHEETS—SHEET 12.

Fig. 27.

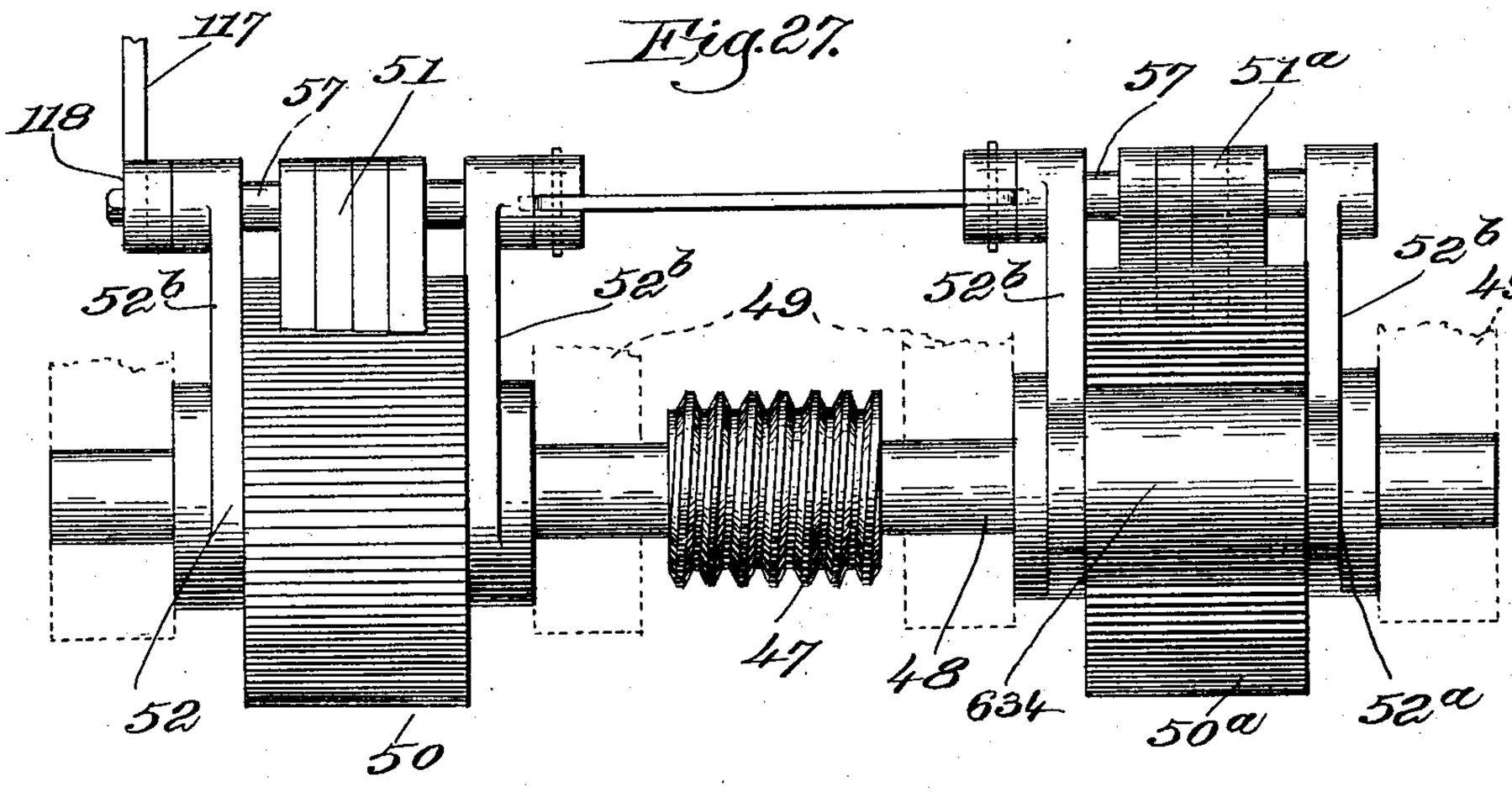



Fig. 28.

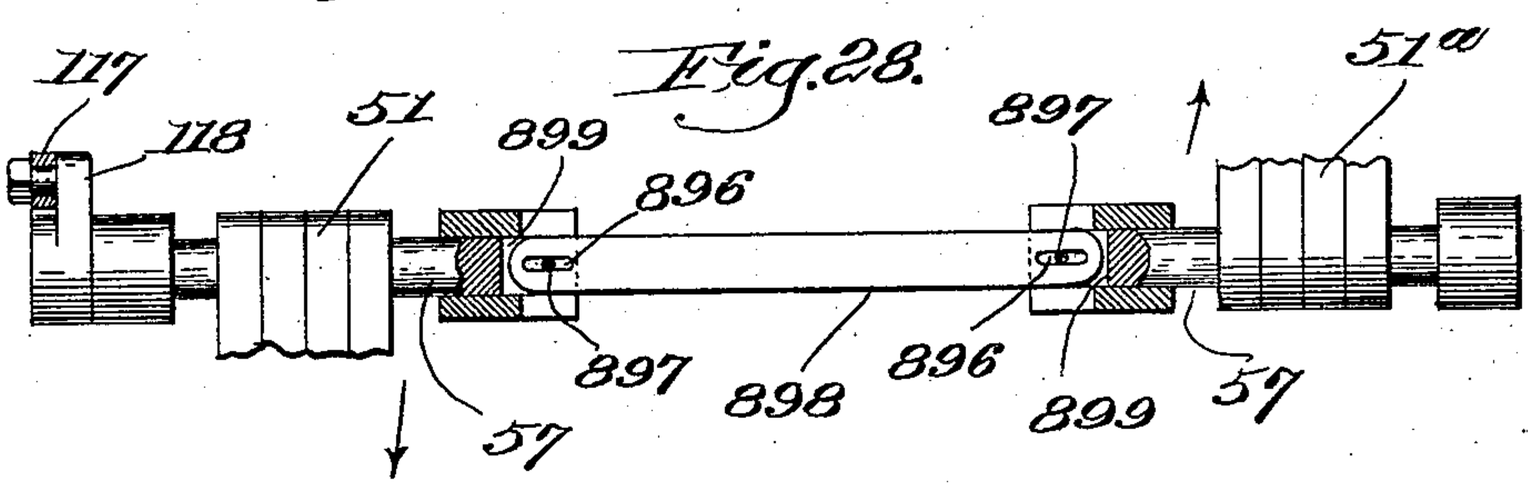



Fig. 29.

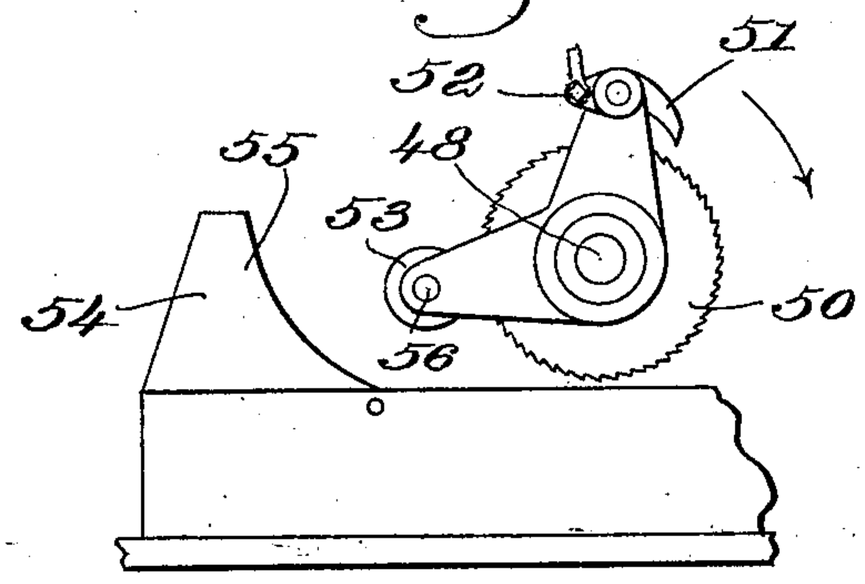
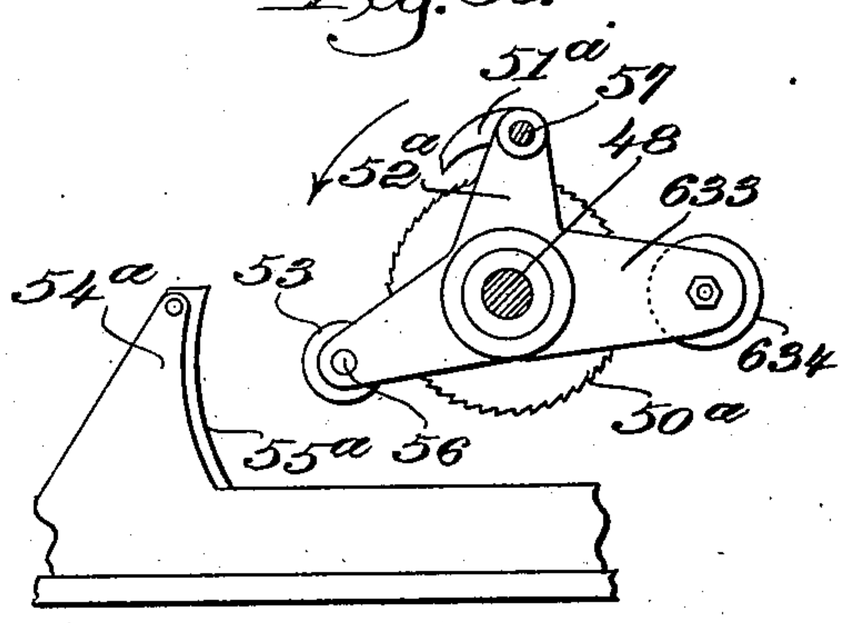



Fig. 30.

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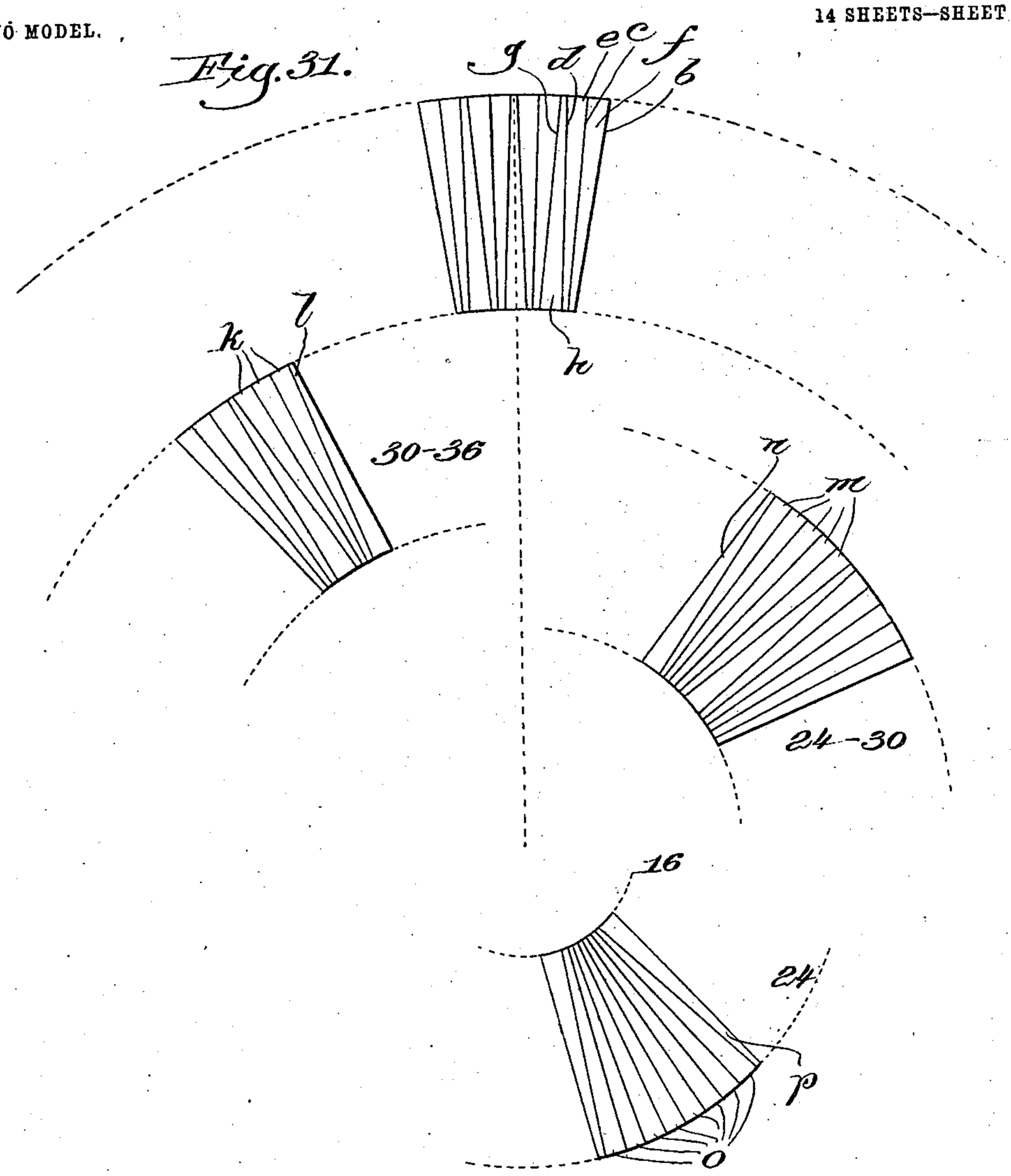
NO MODEL. 14 SHEETS—SHEET 13.

Fig. 31.

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NO MODEL. 14 SHEETS—SHEET 14.

Fig. 32.

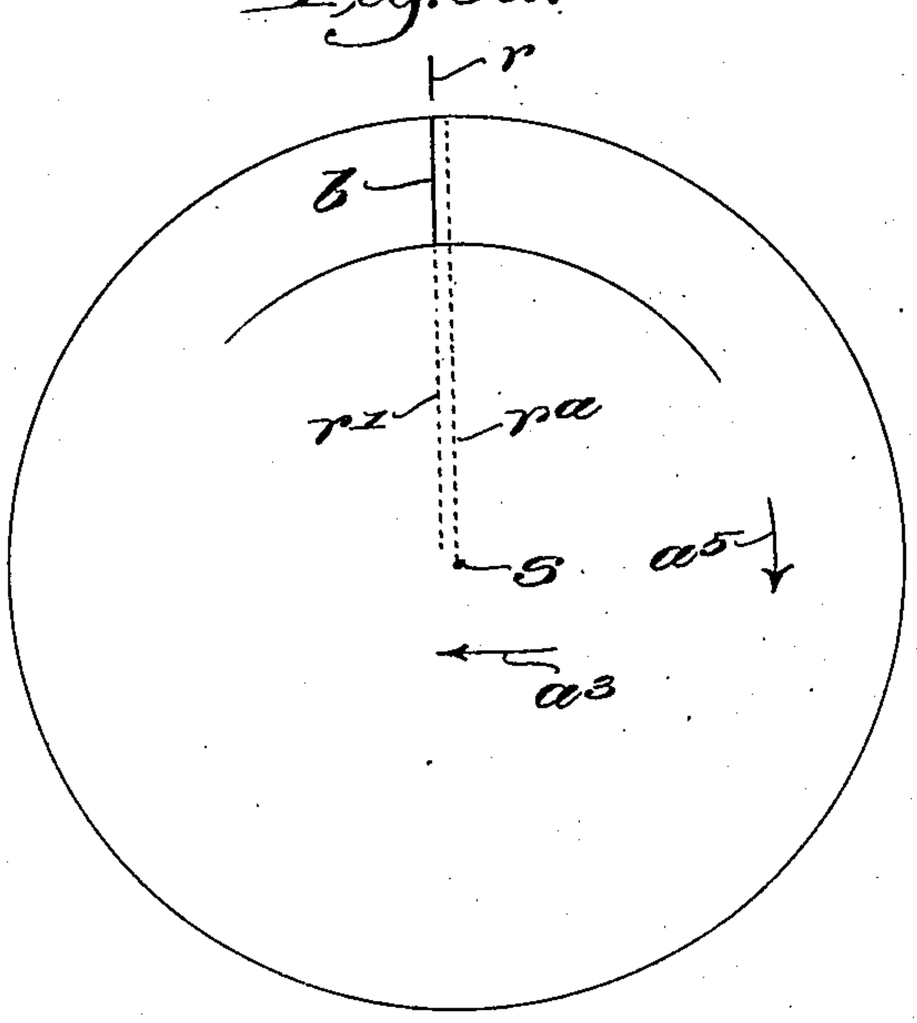



Fig. 33.

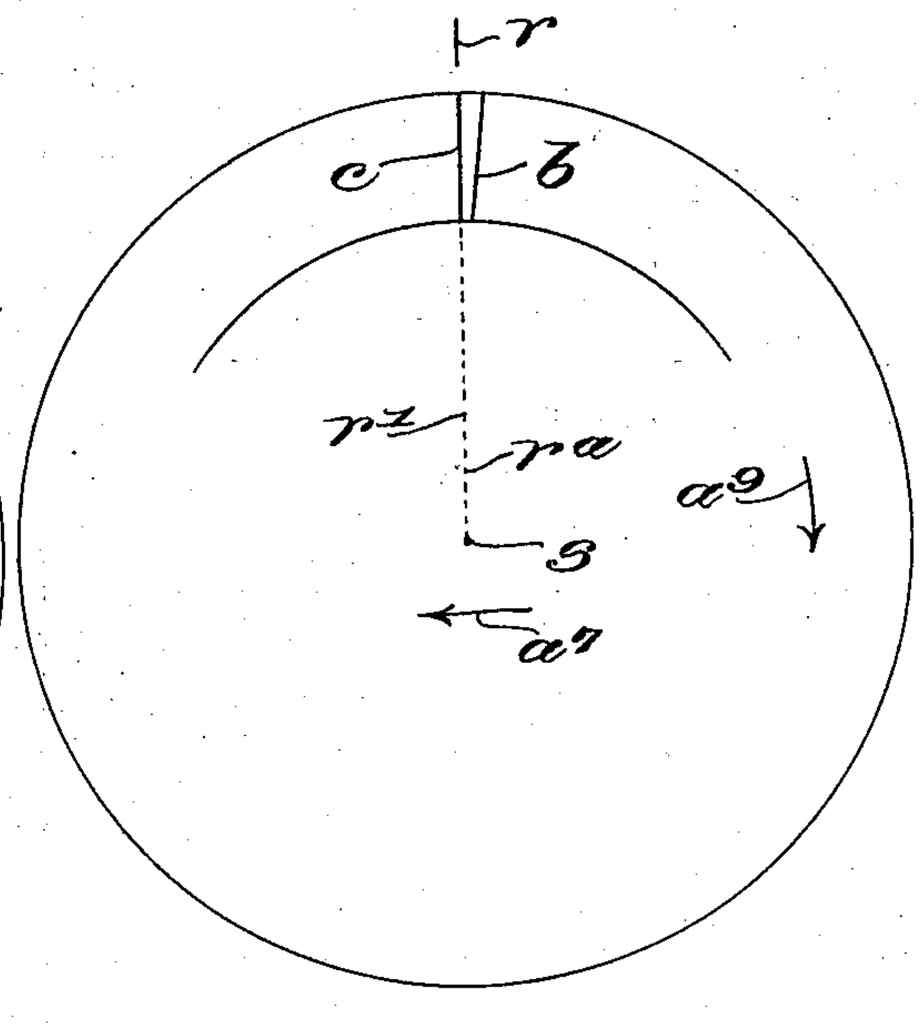



Fig. 34.

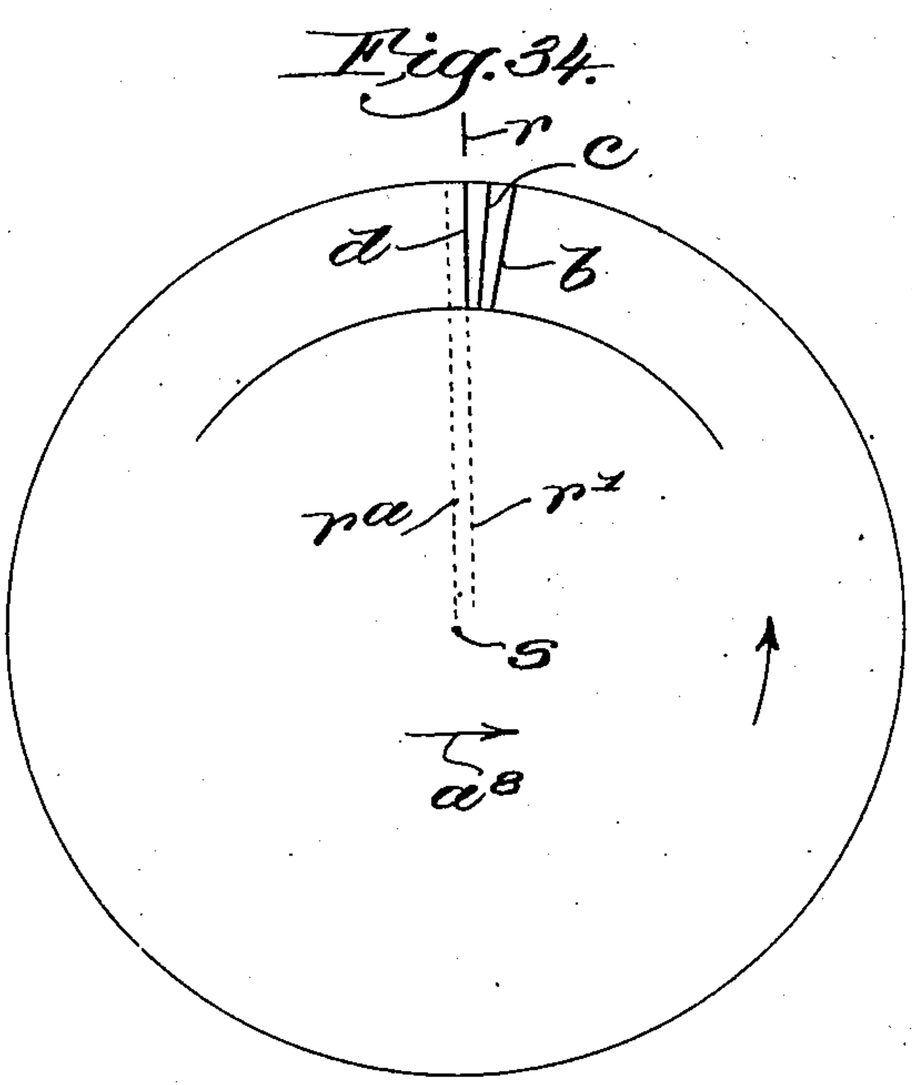
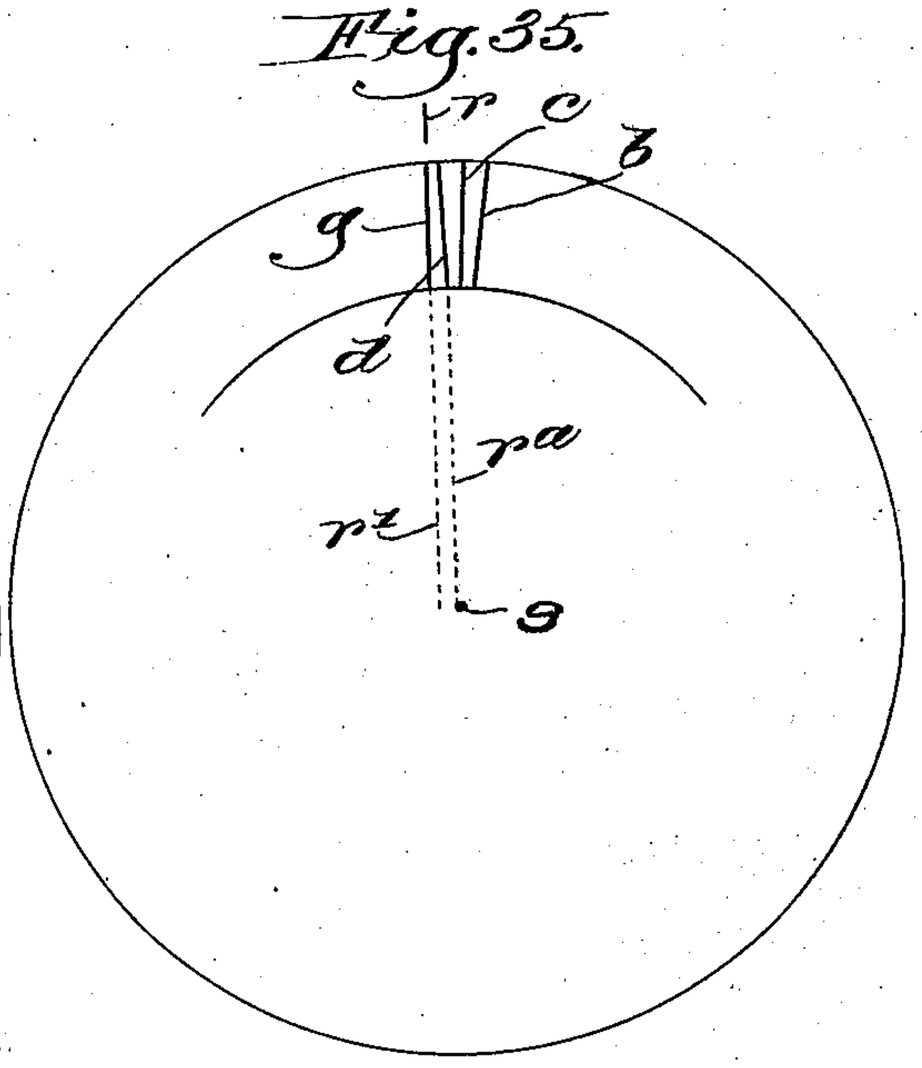



Fig. 35.

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# UNITED STATES PATENT OFFICE.

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## CLAPBOARD-MACHINE.

SPECIFICATION forming part of Letters Patent No. 723,470, dated March 24, 1903.

Application filed February 6, 1902. Serial No. 92,823. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES C. KILLAM, a subject of the King of Great Britain, residing at Everett, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Clapboard-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

In my copending application, Serial No. 81,692, filed November 9, 1901, I have described a novel method of sawing logs into clapboards, and in this invention I have illustrated and described a novel sawmill which is adapted to saw logs in the manner illustrated in said copending application.

According to the method disclosed in the above-mentioned application the log to be sawed is supported in such relation to the saw that the saw makes a plurality of series of cuts or kerfs longitudinally of the log, said cuts each having a more or less radial direction. The cuts or kerfs of each series comprise a plurality of cuts, two of which diverge from the circumference of the log toward the center thereof, while the remainder of the cuts of each series converge toward the center, the result of this system of cuts being that in making one round of cuts a plurality of series of rift-sawn clapboards are cut from the log and one clapboard of each series is cut with its thick edge toward the center of the log and its thin edge toward the circumference of the log, the remaining clapboards of the series being cut with their thin edges toward the center of the log.

In cutting a log as above described I preferably employ a band-saw and support the log while being cut in such relation to the saw that its length is parallel to the saw.

The machine which I have herein illustrated is entirely automatic in its action, so that after a log has been properly carriaged and the machine is set in operation the series of cuts or kerfs above described will be made in the log without the necessity of any hand manipulation, and when one round of cuts has been completed the mechanism is automatically stopped. In order that these operations may be automatically performed, the machine containing the preferred embodiment of my invention comprises; as stated, a suitable band-saw and a log-carriage having means to support a log with its length parallel to the saw and carriage-reciprocating mechanism adapted to move the log bodily toward and from the band-saw, the saw during the movement of the log toward the same operating to make a kerf in the log longitudinally thereof and in a substantially radial direction. As the carriage is withdrawn from the saw, mechanism is thrown into operation for automatically turning the log slightly upon its axis, and at the same time the log is automatically shifted transversely to its line of movement toward and from the saw. The carriage is then moved toward the saw to make another kerf or cut, the two kerfs made converging toward the center of the log. As the carriage is again withdrawn from the saw the previously-named steps are repeated, when another kerf is made. After a certain predetermined number of such kerfs, which converge toward the center of the log, are made and the carriage has been withdrawn from the saw the log is again turned about its axis, but in an opposite direction, and is given a transverse movement in the opposite direction to that previously given to restore the log to its initial position. As the carriage is now moved toward the saw a kerf is made longitudinally of the log, as before, but in a radial direction, which diverges from that of the last-made kerf as the kerf approaches the center of the log, this kerf being that which cuts the clapboard having its thick edge toward the center of the log.

The operations thus far described cut one series of clapboards from the log, and thereafter these operations are repeated until one round of cuts or kerfs has been made. The log is then removed from the carriage and the cut clapboards are stripped therefrom by suitable mechanism, while a new log may be placed upon the carriage and treated as above described.

In the preferred embodiment of my invention I will construct my machine with a suitable supporting-frame having a log-carriage at each end thereof, and means will be provided to move the frame to bring either log-carriage into its operative position with relation to the saw. With this construction while

a log supported on one carriage is being sawed the other carriage is free to have a second log carriaged thereon, this operation taking place during the time that the first log is being sawed. When the first log has been sawed, the supporting-frame may be moved to bring the second log into position to be sawed, and while this second log is being sawed the first log may be removed from the carriage and a fresh log placed thereon.

In the drawings, Figure 1 shows my invention, with the exception of the saw, partly in side elevation and partly in vertical section. Fig. 2 is a top plan view of Fig. 1. Fig. 3 is an end elevation. Fig. 3ª is a detail hereinafter referred to. Fig. 4 is a section substantially on the line *x*, Fig. 1. Fig. 5 shows one end of my device and illustrates the relative position between the saw and the carriage. Fig. 6 is a section on the line *y*, Fig. 1. Fig. 6ª is a detail of a part of Fig. 6. Fig. 7 is a detail hereinafter referred to. Fig. 7ª is a detail of the reversing-pawl. Fig. 8 is a section substantially on the line *z*, Fig. 1. Figs. 9 to 12, inclusive, show the development of the cams employed for giving to the log its transverse movement. Fig. 13 is a detail of the crank mechanism employed to reciprocate the carriage. Figs. 14 and 15 are details of the set bumpers used in turning the log about its axis. Fig. 16 is a detail of the mechanism cooperating with the set bumpers. Fig. 17 shows the various driving connections for performing the operations above described. Fig. 18 illustrates the stop mechanism employed to stop the operation of the device when one round of cuts has been made. Fig. 19 is an enlarged detail of a portion of the stop mechanism. Fig. 20 is a section on the line *a a*, Fig. 19. Fig. 21 is a detail of the devices for giving the log its transverse movement. Figs. 22, 23, 24, and 25 are details of the clutch mechanism for connecting the operating devices to the driving-shaft. Fig. 26 is a detail of the lock for holding the supporting-frame in its operative position. Fig. 27 is a detail of the reversing-pawls for giving to the log its turning movement. Fig. 28 is a plan view of a part of Fig. 27. Figs. 29 and 30 are further details of the reversing-pawls. Fig. 31 illustrates diagrammatically the manner in which different-sized logs are cut by the mechanism herein illustrated, and Figs. 32 to 35 are diagrammatic views illustrating the various steps in the forming of the cuts shown in Fig. 31.

The object in cutting a portion of the clapboards in each round of clapboards with their thick edges toward the center is to reduce to a minimum the waste which has heretofore been a necessary incident in the sawing of "rift-sawn" clapboards, by which I mean clapboards formed by making a series of substantially radial kerfs or cuts longitudinally of the log. Heretofore it has been common practice to make all of the cuts converge toward the center of the log, the result of which is that in a log of large diameter the cuts will be more nearly parallel than in a log of small diameter. Consequently while in making the first round of cuts in a large log the clapboards made according to the old method will not have enough taper, yet in sawing clapboards from a comparatively small log the clapboards will have too much taper. In either case to finish the clapboards to the right taper requires the removing of considerable material by planing or a similar process which entails considerable waste. By my method—*i. e.*, by sawing certain of the clapboards with their thick edges toward the center of the log—each clapboard may be cut to almost precisely the required taper, thus reducing to the minimum the amount removed in the final smoothing-up process. The number of clapboards in each round of clapboards which are thus cut with their thick edges toward the center of the log depends upon the size of the log, a greater number being thus cut on the larger logs, while a smaller number is cut on the smaller logs.

Referring to Fig. 31, it will be seen that I have illustrated diagrammatically the manner of cutting different-sized logs, and at the upper portion of said figure is illustrated the way in which my machine operates to cut logs of from thirty-six inches in diameter upward. From this it will be seen that a series of kerfs *b*, *c*, and *d* are made, which kerfs converge toward each other as they approach the center of the log. It will be understood, of course, that these cuts will be made of a depth equal to the width of the clapboard, which is usually about six inches. In logs of a size greater than thirty-six inches in diameter I will preferably make three such converging cuts to thereby cut two clapboards *e* and *f* from the log, these clapboards having their thin edges toward the center of the log. The next succeeding cut *g* will be diverging from the cut *d* to cut a clapboard *h* having its thick edge toward the center of the log. These cuts form one series of cuts and cut from the log one series of clapboards. The cut *g* corresponds to the cut *b*, and the next succeeding cuts after *g* correspond, respectively, to the cuts *c*, *d*, and *g*, this second series of cuts cutting from the log a second series of clapboards, one of which has a thick edge toward the center.

At the left of Fig. 31 is shown the manner in which logs varying in size from thirty to thirty-six inches in diameter will preferably be cut, and in this case it will be observed that each series of clapboards comprises three clapboards *k* with their thin edge to the center and one clapboard *l* with the thick edge to the center. In sawing logs ranging in diameter from twenty-four to thirty inches I will preferably make the cuts substantially as shown at the right in Fig. 31, the cuts being so made that each series of clapboards will have five clapboards *m* with the thin edge to the center and one clapboard *n* with the

thick edge to the center. In cutting logs of a less diameter than twenty-four inches the cuts will be so made that each series of clapboards will have eight clapboards *o* with the thin edge to the center and one clapboard *p* with its thick edge to the center.

In Figs. 32 to 35 I have illustrated diagrammatically the various movements which are given to a log in order to make the cuts in the manner described above, these views representing the various steps in making the cuts at the top of Fig. 31. In this embodiment of my invention I have illustrated a band-saw and a suitable carriage constructed to support a log with its length parallel to the cutting edge of the saw, and suitable mechanism is employed to reciprocate the carriage toward and from the saw, whereby upon each movement of the log toward the saw a kerf is made longitudinally of the log. The line *r* in Figs. 32 to 35 designates the position of the saw. The dotted line *r'* indicates the line on which the kerf is made as the log is moved toward the saw. The line $r^a$ is a line through the center of the log parallel to the line of the cut. When the first cut or kerf is made, which cut corresponds to kerf *b* at the upper portion, Fig. 31, the log-center *s* is situated at the right of the line *r'* of the cut, and consequently as the log approaches the saw the kerf will be made at *b*, as indicated in full lines *b* in Fig. 32. After the log is retracted it is shifted bodily toward the left, as indicated by arrow $a^3$, Fig. 32, and at the same time it is turned on its axis in the direction of the arrow $a^5$. The distance which the log is shifted laterally and the amount which it is turned depend on the number of kerfs which each series is to have, and where each series is to have three kerfs the log will be shifted laterally such a distance as to bring the log-center approximately in the line *r'* of the saw and will be turned on its axis to bring the kerf first made into the position shown by *b*, Fig. 33. The log is now again reciprocated toward the saw to make a radial cut *c* corresponding to kerf *c*, Fig. 31, and after it is withdrawn from the saw the log is again shifted laterally to the left in direction of arrow $a^7$, Fig. 33, and at the same time it is turned again on its axis in the direction of the arrow $a^9$ to bring kerfs *b* and *c* to the position shown in Fig. 34. The log-center is now at the left of the line *r'* of the saw and the third kerf *d* will be made, as shown in Fig. 34. After this kerf is made the log is shifted to the right in direction of arrow $a^8$, Fig. 34, a distance to bring its center to the initial position, as seen in Fig. 35, and at the same time it is given a reverse turning movement about its axis in the direction of arrow $a^6$, Fig. 34, to bring the kerfs already made into the position shown in Fig. 35, the log now being in a position to have kerf *g* made, whereby a clapboard having its thick edge to the center is cut. These operations are repeated until one round of kerfs have been made, when the log is removed from the carriage. It will be understood, of course, that when a log is being cut in such a way each series has four, six, or nine kerfs. The amount which the log is shifted laterally after each kerf is made is less than that illustrated above with reference to a log in which each series comprises only three kerfs; but the principle of the operation is the same as that set forth whatever may be the number of kerfs in any one series.

I would add that in all cases when the log is in its initial position, or that shown in Fig. 32, its center is just as far to the right of the line *r'* of cut as it is to the left when in the position shown in Fig. 34, which is the position when the last kerf of any one series is made, the result of this being that each of the two diverging kerfs have an equal divergence from a radial line drawn midway between them, as seen in Fig. 31.

Having now referred briefly to the way in which the clapboards are cut, I will describe the mechanism by means of which this operation is performed.

In the preferred embodiment of my invention I will mount or support the operating mechanism upon a supporting-frame work 3, which is constructed to have a log-carriage mounted at each end thereof, whereby while the log supported on one carriage is being sawed a second log may be carriaged upon the other carriage. The supporting-frame 3 is shown as comprising two longitudinal girders 4, which are suitably tied together by bridge-pieces 5 and which are connected rigidly to and supported by a ring 6, which in turn is rotatably mounted upon a stationary coöperating ring 7, bolted or otherwise secured to the floor or other fixed support. I have illustrated antifriction rolls or balls 8 between the engaging surfaces of the rings 6 and 7, and the ring 6 is provided on its periphery with gear-teeth 9, which engage with a suitable driving-gear 10, (see Fig. 17,) by means of which the ring 6, and consequently the supporting-frame 3, may be rotated. The saw that I preferably employ is a band-saw of any suitable or desired construction, such saw being designated by 11 in Fig. 5, and the log is supported with its length parallel to the saw, as shown in dotted lines, Fig. 5. Each end of the supporting-frame 3 has mounted thereon a reciprocating carriage adapted to support a log, as above described, and from the above description it will be seen that by rotating the support 3 either carriage may be brought into operative position with relation to the saw. The carriage which I preferably employ comprises two superposed slides mounted upon rolls 12, carried by a suitable cage 18 and running upon a bearing-flange 13 at the upper side of the girders 4. Each slide is illustrated as comprising two side members situated directly over the girders 4 and properly tied together to form a sort of rectangular frame. The two side mem-

bers of the lower slide are designated by 14, and they are tied together at their inner ends by the bridge-pieces 15. These side members 14 of the lower slide rest directly upon the antifriction-rolls 12, and they may conveniently be provided with wearing-plates. I will also preferably provide the upper portion of the flange 13 with a similar wearing-plate, and the rolls 12 will be mounted in a suitable cage 18. The upper slide comprises also two side members 17, which are suitably tied together and which are adjustable longitudinally of the lower slide members 14, as will be presently described. The upper slide, comprising the member 17, supports the head-block 26, which carries the centers 19 and 20, between which the log is supported, the said head-block being of the form shown in Figs. 6 and 7 and having the side wings 27, which extend over and rest upon cross-rolls 28 on the top of the upper slide members 17, said cross-rolls 28 being supported in a suitable cage. The main depending portion of the head-block 26 is received between the side members of the carriage and between the girders 4, for a purpose presently to be described. As stated, the head-block supports the centers 19 and 20, 19 designating the lower center, which may be positively rotated by mechanism presently to be described and which has spurs or wings 29 to engage the log, whereby the turning of the center will turn the log with it. The upper center 20 is supported in any suitable overhanging arm or arms 21, made fast to the head-block, and is vertically adjustable, said center being illustrated as having a rack 22 thereon, with which engages a pinion 23 upon a shaft 24, to the end of which shaft is secured the hand-wheel 25. By rotating the shaft 24 the center 20 may be raised into operative or lowered into operative position. I will preferably provide a clamping-screw 30, which is adapted to engage the shaft 24 and which operates to lock the center 20 in its adjusted position.

As stated above, my invention comprises a log-carriage supported on each end of the supporting-frame 3, and I have provided an operating mechanism for each carriage, whereby said log-carriages are independent in their action.

Since the mechanisms for operating each log-carriage and for performing the various operations above described are the same, I will refer in the description immediately following to the mechanism for operating one carriage only, it being understood, of course, that the same mechanism will be duplicated and used for operating the other carriages.

To reciprocate each log-carriage and its supporting head-block, I preferably employ for each carriage a crank mechanism so constructed as to give the carriage a slow movement toward the saw, but a quick return movement. For this purpose I have illustrated a crank-shaft 31, supported in suitable bearings 45, carried by the bridge-pieces 5, connecting the girders 4, as above described, upon the upper end of which crank-shaft is a crank-disk 32, having a crank-pin 33 projecting therefrom, which crank-pin is received by and works in a suitable slot 34 in the bridge-piece 15, connecting the side members of the lower slide. The crank-shaft 31 has fast thereon an elliptical gear 35, which meshes with a coöperating elliptical gear 36, fast upon a driving-shaft 37, journaled in the bridge-pieces 5, said driving-shaft having at its lower end one clutch member 38, which when the supporting-frame is in the proper position is adapted to be clutched with a co-operating clutch member on the power-shaft, as will be presently described. The form of elliptical gears I have herein illustrated comprises two gears mounted eccentrically upon their shafts, from which construction it will be apparent that while the shaft 37 has a uniform rotation the crank-shaft 31 will have a variable speed of rotation, the parts being so arranged that the crank-pin will move the carriage toward the saw with a comparatively slow movement, but will retract the carriage with an accelerated movement. To decrease friction between the crank-pin and the walls of the slot 34, I preferably provide the form of roller-bearing illustrated in Fig. 13. In this figure the crank-pin 33 is surrounded by antifriction-rolls 39, supported in a suitable cage 40, the said rolls and cage being in turn surrounded by a sleeve 41, which plays back and forth in the slot 34. The sleeve 41 and the cage 40 are supported upon suitable ball-bearings, which in turn rest upon the wearing-plates 42, fast with the disk 32. Any other form of antifriction-bearing for the crank-pin may be employed, however, if desired.

I have above described the mechanism employed to reciprocate the carriage, and with it the log supported thereon, toward and from the band-saw, and where clapboards are being sawed the stroke of the carriage must be sufficient to make the required depth of cut in the log and also to withdraw the log from the saw sufficiently far to allow of a turning movement of the log. In practice I find that a stroke of about nine inches is sufficient for this purpose.

I will here remark that in all the views of the drawings the crank-pin is so positioned as to place the carriage at half-stroke.

In making the cuts in the manner shown in Fig. 31 after the log has been moved bodily toward and from the saw to make the cut *b* the said log will be turned slightly on its axis and at the same time the center of the log will be given a transverse movement, after which the log will be reciprocated to make the cut *c*. After the cut *c* has been made the same operations are repeated—*i. e.*, the log is turned on its axis and at the same time given a slight transverse movement and the cut will then be made. The cuts *b*, *c*, and *d* are all converging toward the center, and to make the cut *g*, which diverges from the cut

*d*, the log is moved bodily in a transverse direction opposite to that above described, and at the same time is turned backward on its axis to bring the log into proper position to have its cut or kerf *g* made, as shown in Fig. 35.

It will be observed from Fig. 31 that the number of converging cuts varies with the size of the log, so that where a large log is being sawed mechanism must be employed to turn the log forward on its axis and at the same time give the same a slight transverse or lateral movement after each of the first two cuts have been made and to turn the log backward on its axis and give it a reverse, transverse, or lateral movement after the third cut, and so on, while for the next size smaller logs the mechanism must give the log the forward turn and the slight transverse movement after each of the first three cuts have been made and the reverse movement after the fourth cut. With the still smaller size logs the reverse movement will not take place until after six forward movements have been given to the log, while on the smallest size logs a reverse movement will be given after nine forward movements have been given.

The mechanism for automatically turning the log about its axis as it is withdrawn from the saw will now be described. The center 19, which, as above described, has the spurs 29 thereon, is carried upon the end of a center-shaft 43, which shaft in turn is supported in a suitable groove in the head-block and is held in place by a cap-piece 44. The lower end of the shaft 43 has a worm-gear 46 thereon which meshes with a worm 47 upon a cross-shaft 48, carried by suitable bearings 49 upon the depending portion of the head-block 26, as shown in Fig. 3 and in dotted lines, Fig. 7. It is necessary, of course, that the shaft 48 be given a slight turning movement at the time that the carriage is in its retracted position or when the log is withdrawn from the saw, and to give the worm-shaft the necessary forward-and-backward rotation I have in this embodiment of my invention illustrated the said shaft 48 as having two oppositely-disposed ratchets 50 $50^a$ fast thereon, with which engage pawls 51 $51^a$, carried by rock-arms 52 $52^a$, which are loosely mounted upon the shaft 48, said rock-arms carrying at their ends rollers 53, which are adapted to engage set bumpers 54 $54^a$ as the carriage reaches the inner limit of its stroke. The set bumpers 54 $54^a$ have cam-surfaces 55 $55^a$, with which the corresponding roll 53 engages, and as the carriage reaches the inward limit of its stroke and the rolls 53 engage the said cam-surfaces 55 $55^a$ the rock-arms 52 $52^a$ are turned. Fig. 29 is a side view of the left-hand set bumper and ratchet 50, Fig. 3, and Fig. 30 is a similar view of the right-hand set bumper and ratchet-wheel $50^a$, as will be obvious. On referring to these figures it will be seen that the cam 55 is so shaped and the roll 53 coöperating therewith is so disposed that as said roll engages the cam it runs up the cam to thereby throw the pawls 51 toward the right, as shown by the arrow, Fig. 29, while the cam $55^a$ on the other set bumper is so shaped and the coöperating roll is so disposed that as the roll engages said cam the roll runs down the cam and the pawls $51^a$ are thereby moved to the left, as shown by the arrow, Fig. 30. Suitable mechanism, hereinafter to be described, is employed to determine which set of pawls 51 $51^a$ shall be placed in operative relation with the ratchet-wheels, it being obvious that if the pawls 51 were in engagement with the ratchet 50 the center shaft 43 would be turned in one direction, while if the pawls $51^a$ were in engagement with the ratchet $50^a$ the said shaft would be turned in the opposite direction. After the carriage begins its forward movement toward the saw and the rolls 53 are carried out of engagement with the set bumpers it is necessary that the rock-arms 52 and $52^a$ should be restored to their initial position. On referring to Fig. 29 it will be seen that the weight of the roll 53 will be sufficient to restore the rock-arm 52 to the position shown in said figure after the roll has left the set bumper, and consequently no special mechanism is needed for the purpose; but the rock-arm $52^a$ is so disposed that the roll 53 thereon rolls down the cam $55^a$, and to restore said rock-arm to its initial position the latter is provided with a rearwardly-extending arm 633, carrying a weight 634, which is sufficient to overbalance the weight of the roll 53 and which serves to restore the rock-arm $52^a$ to its initial position, as will be obvious. During the time that the converging cuts are being made the pawls 51 will be in engagement with the ratchet 50, while the pawls $51^a$ will be held out of engagement with the ratchet $50^a$. When the diverging cut corresponding to *g* is to be made, however, the pawls 51 are thrown out of engagement and the pawls $51^a$ dropped into engagement, the result of which is that when the carriage is retracted for the purpose of making a diverging cut the log-center is given a reverse or backward turn. In order that there may not be any lost play or backlash between the pawls and the ratchet, I preferably make each of said rock-arms 52 $52^a$ with two members $52^b$, one situated each side of the ratchet, the said members carrying between them at one end the roll 53, which is mounted on a pin 56, connecting said members, and being connected at the other end by a pin 57, on which is supported a plurality of pawls having different lengths. (See Fig. 27.) The difference between the length of the shortest and the longest pawl is slightly less than the distance between the teeth of the ratchet, by virtue of which construction one of the series of pawls will always be in position to immediately engage a ratchet-tooth without any lost play, as will be obvious.

The mechanism for reversing the pawls 51 $51^a$ will be presently described, it being un-

derstood, of course, that the reverse takes place in order to position the log for making the cut corresponding to the cut *g*. As I have stated above, it is essential to give the log a slight transverse movement between each of the two converging cuts, while between the diverging cuts the log is given a larger transverse movement in the opposite direction to restore the log-center to its initial position. I have therefore embodied in my present invention mechanism which operates to give to the log when the latter has been retracted from the saw and simultaneously with the forward turning movement thereof a slight forward transverse movement, this transverse movement being continued so long as the converging cuts are being made which saw the clapboards, having their thin edges toward the center. This forward transverse movement of the log corresponds to that illustrated diagramatically in Figs. 32 to 34. When, however, the time has come to make a divergent cut, such as the cut *g* in Fig. 31, the mechanism for giving the carriage its forward transverse movement is reversed and the carriage is moved transversely back to its initial position and at the same time the log is turned backwardly about its axis, as illustrated diagrammatically in Fig. 34. This combined movement results in bringing the log-center or axis into such a position that as the carriage is reciprocated toward the saw a cut corresponding to the cut *g* is made. After the cut corresponding to *g* has been made and the log is retracted from the saw it is again turned forwardly about its axis by the mechanism above described and is given a slight forward transverse movement sufficient to bring the center of the log into position to have the cut corresponding to cut *c* made.

My invention as embodied in the structure illustrated allows me to make two converging cuts *c* and *d* and then one diverging cut *g*, or to make three converging cuts and then one diverging cut, or five converging cuts and then one diverging cut, or eight converging cuts and one diverging, according to the size of the log. In other words, my mechanism is adapted to give the log two successive transverse movements in one direction and then reverse transverse movement to bring the log-center to its initial position, or three successive transverse movements in one direction and then a reverse transverse movement, or five successive transverse movements and then one reverse movement, or eight successive transverse movements and then one reverse movement. I will now describe the mechanism by means of which these operations may be carried out.

A shaft 60 is supported in suitable hangers 61, made fast to the members 17 of the upper slide (see Fig. 6) and has loose thereon a series of cams 62, $62^a$, $62^b$, and $62^c$, these cams being shown developed in Figs. 9 to 12, respectively. Each cam has fast therewith a gear, said gears being designated by 63 $63^a$ $63^b$ $63^c$, respectively, and each of said gears meshes with a coöperating gear fast on the shaft 65, carried by the hangers 61, said cooperating gears being designated 64 $64^a$ $64^b$ $64^c$, respectively. The gear $64^c$ is illustrated as meshing again with a driving-gear 66 upon a shaft 67, which is also supported in the hangers 61, the said shaft 67 being driven from a shaft 68 by means of bevel-gears 69 70 on the shafts 68 and 69, respectively. The shaft 68 in turn is driven from the crank-shaft 31, and for this purpose the said crank-shaft has fast thereto a bevel-gear 71, meshing with a bevel-gear 72, carried by a short stud, which is journaled in a suitable bearing secured to a central cross member or bridge 73. The bevel 72 has fast therewith a spur-gear 74, which meshes with a pinion 75, splined to the shaft 68, so as to rotate therewith, the construction allowing the shaft 68 to have a longitudinal movement through the spur-gear and through a suitable aperture in the cross member 73 as the carriage reciprocates. The head-block 26 is provided with a depending arm 76, extending substantially across the machine, as shown in Fig. 6, the lower end of said arm having at its ends bearings which rest upon antifriction-rolls 77, resting on the yoke-shaped hanger 78, which in turn is secured to the hangers 61 in any suitable way. The supports 78 operate to assist in supporting the head-block 26 and serve to take the strain incident to the reversing of the transverse movement of said head-block, as will be presently described. The rolls 77 are mounted in a yoke member $79^a$, which embraces the depending portion of the hanger 78, as seen in Fig. $6^a$, which is a section on the line *b b*, Fig. 6, the yoke member having a boss $79^c$, through which slidingly passes a guiding-pin $79^d$, fast to the hanger 78, this construction providing for the proper support of the yoke and at the same time allowing it to have the requisite movement in the direction of travel of the roll. The upper end of the arm 76 is hollowed or grooved out, as at 80, and in said grooved-out portion is supported a transversely-extended screw-threaded shaft 81, one end of said shaft extending through a sleeve 82, which in turn is received by a cored arm or projection 83, Fig. 21, integral with the head-block 26 and projecting through a suitable slot 87 in the side girders 4. The shaft 81 has fast thereon a collar 88, which engages the inner end of the sleeve 82, and at its outer end a collar 89, which engages the outer end of the sleeve 82, and since the sleeve is held against longitudinal movement in the projection 83 it follows that the shaft 81 is thus restrained against movement longitudinally. The screw-threaded portion of the shaft 81 passes through and has screw-threaded engagement with an eye in one end of an arm or latch-pin 90, to the other end of which is fastened a roll 91, adapted to engage the groove 92 in any one of the cams 62, $62^a$, $62^b$, or $62^c$. Fig. 7 shows the arm 90 when in operative position, and when

in this position it rests between two projections integral with the arm 76, as shown in dotted lines $92^a$. The arm 90 and shaft 81 are therefore locked together, so far as movement longitudinally of the shaft 81 or transversely of the carriage is concerned, and any movement given to the arm 90 by means of the cams 62 $62^a$, &c., is communicated therefrom to the head-block 26. Referring to Figs. 9 to 12, inclusive, which shows these various cams developed, it will be seen that in Fig. 12 the groove 92 has two transverse inclines $93^c$ in one direction and a single incline $94^c$ in the opposite direction, the extent of the incline $94^c$ being equal to the sum of the inclines $93^c$. Upon referring to Figs. 1 and 4 and to the description of the cams above it will be remembered that the cams are driven by the crank-shaft, so that the said cams rotate synchronously with the crank-shaft. The gearing between the shaft 67 and the cam $62^c$ is such that the cam will make one-third of a revolution every time the crank-shaft 31 makes a complete revolution.

If it be assumed that the roll 91 is operating in the cam-groove of the cam $62^c$ and that the pawls 51 are in operative relation with the ratchet 50, the operation of the parts thus far described will be as follows: The complete rotation of the crank-shaft 31 will carry the log toward the saw to make the cut represented by *b* in Fig. 31 and retract the log from the saw. As the log-carriage reaches the limit of its backward movement the first rise or incline $93^c$ will engage the roll 91, thereby giving to the head-block 26 and log-center a slight forward transverse movement, and at the same time the roll 53 in the rock-arm 52 will engage the set bumper 54 and turn the log about its axis to bring the log into the position shown diagrammatically in Fig. 33. The second rotation of the crank-shaft 31 will carry the log-carriage toward the saw to make the cut *c*, Fig. 31, and will then retract or withdraw the said log, during which time the roll 91 will be traveling in the straight portion of the cam-groove 92. When the log-carriage has made its second complete reciprocation and has reached the inward limit of its stroke, the second rise $93^c$ will operate to give the log a still further transverse movement, and at the same time the log will be turned about its axis by means of the set bumpers 54 to bring the log into the position shown in Fig. 34. The third rotation of the crank-shaft will make the cut *d* in Fig. 31, and after this cut has been completed and the log withdrawn from the saw the inclined portion $94^c$ of the cam will give to the log a transverse movement in the opposite direction to bring the log-center to its initial position, and at the same time the log will be turned backwardly about its axis. (See Figs. 34 and 35.) The log is now in the position so that during the fourth revolution of the crank-shaft the cut *g* will be made to thereby cut the clapboard *h*, having its thick edge toward the center, from the log, and after this cut *g* has been made the first rise $93^c$ again operates to give the head-block a forward transverse movement, the cam $62^c$ having made a complete revolution. The operation of my mechanism is therefore entirely automatic in its action, as will be readily understood.

The cam $62^c$ will be employed when comparatively large logs are being sawed—*i. e.*, logs having a diameter greater than thirty-six inches; but when smaller logs of diameters ranging between thirty and thirty-six inches are being sawed the latch or arm 90 will be caused to engage the cam $62^b$, which is similar to $62^c$, except that it has three short inclines or rises $93^b$ and the single opposite incline or rise $94^b$.

It will be remembered that all the cams 62 $62^a$ $62^b$ $62^c$ are loose on the shaft 60, so as to be capable of having independent rotary motion, and on referring to Fig. 4 it will be seen that the gear $64^b$ is smaller than the gear $64^c$, whereby the cam $62^b$ will have a slower rotary movement than cam $62^c$.

The gearing driving the cam $62^b$ is so designed that the said cam will rotate once during every four rotations of the crank-shaft, and hence every fourth cut will be a diverging cut corresponding to cut *g*. When the cam $62^b$ is being employed, the clapboards are cut as shown at the left in Fig. 31.

For logs varying in size from twenty-four to thirty inches the latch or arm 90 will be positioned to coöperate with the cam $62^a$, which, it will be noted, has five short inclines $93^a$ and one oppositely-disposed incline 94, corresponding to that of the other cams.

The gearing which drives the cam $62^a$ is so timed that said cam will make one-sixth of a revolution while the crank-shaft 31 is making a complete revolution, this resulting in the form of cuts shown at the right in Fig. 31, wherein each series of clapboards comprise five with the thin edge to the center and one with the thick edge to the center.

The cam 62 is constructed to give the head-block eight transverse impulses or movements in one direction and one in the opposite direction, and the gearing for driving said cam will operate to rotate said cam one-ninth of a revolution during each rotation of the crank-shaft. It will be apparent from what has been said that when this cam is employed the log will be sawed in the manner shown at the bottom of Fig. 31, this being the cam used on smallest-sized logs.

The mechanism employed for shifting the latch or pin 90 from one cam to another will now be described. The end of the shaft 81 has fast thereon a hand-wheel 100, by means of which said shaft may be turned, and by reason of the screw-threaded connection between the said shaft and the latch pin or arm 90 the turning of the shaft will give to the arm a lateral movement, as will be obvious. Before the said latch-pin can be shifted laterally, however, it must be lifted out of the groove

92 to the dotted-line position, Fig. 7. Accordingly I have illustrated the sleeve 82 as having an arm 101 integral therewith, to the end of which is rigidly connected two parallel rods 102, between which the latch or arm 90 plays. The rods 102 extend substantially across the width of the machine and are supported at their other end in an arm 103, carried by a suitable sleeve 104, resting in a semicircular recess in the upper side of the arm 76, so as to be capable of a rocking movement. The supporting-arm 76 will be grooved out, as at 105, to receive the lower rod 102. (See Fig. 7.) The end of the sleeve 83 has fast thereon an operating-lever 106, the hub of which is shown in section in Fig. 21. It will be obvious, therefore, that when the lever 106 is turned the sleeve 82 will be rotated and through the rigid arm 101 will operate to raise or lift the pin 90 out from the groove in the cam. When the pin has thus been raised out of the groove, or into the dotted-line position, Fig. 7, the hand-wheel 100 may be turned to give the pin a sufficient lateral movement to bring the roll 91 into alinement with the groove in any desired cam. To stiffen the shaft 81 and prevent the same from bending under the strain to which it is subjected, I preferably make the head-block 26 with the slideway 26ª, and in said slideway is a suitable nut 26ᵇ, which has screw-threaded engagement with the shaft 81. This nut of course travels longitudinally of the shaft in unison with the latch-pin 90 as the shaft is turned. As an aid to determining the exact distance necessary to shift the latch-pin to carry it from one cam to another I provide a suitable indicator, which in this embodiment of my invention comprises an indicator-wheel 108, carried by a suitable arm 109, secured to the head-block 26 and projecting laterally through a slot 110 in the slide-rails 4. This indicator-wheel 108 meshes with gear-teeth 99 upon the end of the shaft 81, and by employing a suitable pointer in connection with the indicator-wheel the number of revolutions which it is necessary to give the shaft 81 in order to bring the latch-pin into line with any one cam may be readily determined. The operating-lever 106 projects below the shaft 81, as shown at 112, Figs. 3 and 3ª, and the projecting end carries a latch which cooperates with a segment or fixed ratchet 113, carried by the arm 109. By means of this construction the lever 106 may be operated to raise the latch-pin 90 out from the groove and then may be locked in such position while the latch-pin is being shifted laterally. It will be understood, of course, that the arm 76 will have two lugs 92ª, corresponding to and disposed in opposition to each cam 62, so that whenever the latch-pin is dropped into the groove in the cam the said pin will be received between two of the lugs 92ª.

The mechanism for automatically reversing the pawls 51 51ª will now be referred to. The pawls of each set are mounted on the corresponding shaft 57, so as to have a limited oscillating movement thereabout, and for this purpose I have shown the pawls of each set as having a keyway 57ª, (see Fig. 7ª and dotted lines, Fig. 7,) in which plays a key 57ᵇ, fast to the shaft 57. The keyway is wider than the key, so that when the parts are in the position shown in Fig. 7ª, which is the position of the shaft when the pawls are in operative engagement with the ratchet, the pawls are allowed sufficient loose play to permit them to operate properly, while when the shaft is turned clockwise, Fig. 7ª, or into the position shown in Fig. 7, the key engages the end of the keyway and lifts the pawls out of operative engagement with the ratchet. It will be understood that the key on one shaft 57 is on the opposite side from what it is on the other shaft, and I have provided means for connecting the two shafts 57, so as to cause them to rotate in unison. It will be remembered, however, that when the two rolls 53 strike the set bumpers the rock-arms 52 52ª are simultaneously turned in opposite directions, as indicated by the arrows in Figs. 28, 29, and 30, and consequently the connections between the said shafts 57 must be such as to allow of this opposite vibratory motion of said shafts and yet connect them together for rotary motion. As one convenient way of accomplishing this I provide the inner end of each shaft 57 with a horizontal slot 899, into which is fitted a flat-ended connecting-bar 898, said bar and shafts being connected by pins 897, passing through the shafts and slots 896 in the ends of the bar. With this construction any rotary motion which is given to one shaft is communicated to the other; but at the same time the two rock-arms 52 52ª may have an opposite vibratory motion, the slots 896 allowing for the necessary change of length of the connection between the said shafts. With this explanation it will be apparent that by turning one of the shafts 57 about its axis in one direction or the other either the pawls 51 or the pawls 51ª may be thrown into operative engagement with their ratchets and that when one set of pawls is in such operative relation the other set of pawls is lifted out of operative relation. Secured to the end of one shaft 57 is an arm 118, to which is connected one end of an extensible link 117, the other end of which is connected to an arm 116, fast on hub 115, which is sleeved over a sleeve or tubular member 114, which surrounds the shaft 81, (see Fig. 21,) said hub being splined to the sleeve, so as to lock said members together for rotary movement, but to allow of the sleeve partaking of a longitudinal movement independent from the hub. I would here remark that the hub 115 is seated in a half-round recess or groove in the upper side of the arm 76 (see Fig. 7) and is adapted to have an oscillatory movement therein. By rotating the sleeve 114, therefore, the shafts 57 will be rocked to bring either the pawls

51 or 51ª into engagement with the corresponding ratchet, according to the direction of rotation or oscillation of the sleeve. One end of the sleeve 114 has fast thereto an arm 119, to which is pivoted a controller 120, situated directly above the latch-pin 90. The sleeve 114 is so connected to the latch-pin as to move longitudinally therewith, but is adapted to have a rotary movement independent thereof. This connection can conveniently be made by means of a suitable flange 121 on the sleeve, which engages a parti-annular keeper 122, fast to the latch-pin. The end of the controller 120 rests upon the latch-pin 90, as at 124, and carries a roll 123, and each cam 62 62ª 62ᵇ 62ᶜ has an annular cam-flange 125, with which the roll 123 is adapted to coöperate. The shape of this flange may be seen from Figs. 1 and 7, from which it will be seen that the flange has a concentric portion for the greater circumferential distance of the cam, but that at a point 126 it is cut away, this point coinciding with the peripheral portion of the cam at which the reverse incline 94 of the cam-groove 92 is situated. The roll 123 is normally held in engagement with the flange 125 by means of a spring 127, which is shown as surrounding the shaft 81 and as having one end fast to the latch-pin 90, while the other end has engagement with the sleeve 114, the said spring tending to rotate the sleeve in a direction to throw the arm 119 toward the cam, and thus maintain the roll 123 in engagement with the flange 125. The construction of the parts above described is such that while the roll 123 is in engagement with the concentric portion of the cam 125 the controller is thrown to the right, Fig. 7, and through the arm 119 rocking the sleeve 114, so as to bring the pawls 51 in operative engagement with the corresponding ratchet, and consequently the center 19 is given a forward movement or partial rotation each time that the carriage is retracted, this operation continuing during the time that the log-center is being moved transversely in one direction by means of the inclines or rises 93 of the cam. These are the operations which result in making the converging cuts. When the appropriate number of converging cuts has been made, depending upon whichever cam 62 is being used, the cam will have reached such a position that when the same is retracted the reverse incline or rise 94 will operate to give the carriage a reverse lateral movement, and at the same time the roll 123 will drop into or be forced into the cut-away portion 126 of the cam 125, thereby disengaging the pawls 51 from their ratchet and throwing the pawls 51ª into engagement.

I would here remark that the reversing of the pawls occurs just previous to the time when the rolls 53 are brought into engagement with the set bumpers, so that as the carriage reaches the backward limit of its stroke after the reversing of the pawls has taken place the center is turned in the reverse or backward direction for a distance, this occurring, as stated, substantially simultaneously with the shifting of the log-center laterally by the inclined portion 94 of the cams. The log is now in position to have a cut corresponding to *g* made as it is moved toward the saw. During the time that the cut *g* is being made the operative cam 62 is rotated sufficiently to bring the flange 125 again in engagement with the roll 123, thereby forcing the controller 120 backward and rocking the sleeve 114 to bring the pawl 51 again into operative position.

It will be observed from the description above given that the lower slide of the carriage has a fixed reciprocating movement. It is necessary, therefore, where logs of different sizes are being sawed that the center of the log be so adjusted with relation to the longitudinal movement of the carriage as to bring the log into proper position to have the proper depth of cut made therein by the stroke of the carriage. It is to accomplish this that the carriage has been made, as above described, with the superposed slides, and mechanism is provided for adjusting the upper slide relative to the lower slide, so that when a small log is being sawed the upper slide, the head-block 26, and log-center may be adjusted toward the saw, so that the fixed definite reciprocation of the carriage will move the log sufficiently to make the required depth of cut. The members 14 of the lower slide each have journaled thereon in fixed bearings an adjusting-shaft, which runs lengthwise of the members 14 and which is screw-threaded and engages a suitable nut integral with the members 17 of the upper slide. By rotating the shafts 135 in unison the members 17 of the upper slide may be adjusted longitudinally of the carriage. The following mechanism is employed to thus rotate the shafts 135 in unison: The inner end of each shaft has thereon a bevel-gear 136, which meshes with a corresponding bevel-gear 137, fast upon the end of a short vertical shaft 138, mounted in suitable bearings in a bridge-piece 139, extending across the machine and tying the members 14 together. The upper end of each shaft 138 is connected by bevel-gears 140 141 with a cross-shaft 142, also journaled in said bridge-piece 139, and the cross-shaft has fast thereon a bevel-gear 144, meshing with a bevel-gear 145 upon a vertical driving-shaft 146, the lower end of which is carried by bearings supported by a depending hanger 147, made fast at its upper end to the upper slide. The lower end of the shaft 146 has one member 148 of a friction-clutch thereon, the other member of which has a fixed position in the floor beneath the supporting-frame, as will be presently described. To adjust the log center for different-sized logs, therefore, it is simply necessary to connect the clutch member 148 with its coöperating clutch member, when through

the gearing above described the adjusting-shafts 135 will be rotated to move the upper slide and the head-block toward or from the saw with relation to the lower slide, as desired. I will preferably employ a scale 674 on the one slide, with which a pointer on the other slide coöperates, said scale assisting in the determination of the proper adjustment of the upper slide and log centers for different-sized logs. I may also provide the shaft 142 with a crank $142^m$, by means of which said shaft may be manually adjusted. It will be obvious that the position of the set bumpers 54 must be adjusted to correspond to the adjustment of the upper slide, so that the rolls on the rock-arms 52 $52^a$ may engage said set bumpers at the proper time. For this purpose I have illustrated the set bumpers as being slidingly supported upon ways 150, which in turn are supported by suitable cross-girders or tie members 151, extending between the main girders 4 of the supporting-frame. The ways 150 are illustrated as having a dovetailed projection thereon, and the set bumpers 54 have dovetailed grooves which engage said projections. Extending longitudinally of the girders and supported in suitable bearings are two adjusting-shafts 153, the ends of said shafts each being screw-threaded and having screw-threaded engagement with a suitable nut 154, fast on the set bumpers 54. By rotation of the shafts 153, therefore, the set bumpers may be moved longitudinally of the frame to correspond to the position of the upper slide and head-block. I have shown the said shafts as extending through bevel-gears 158, which are splined to the shaft, the said bevel-gears being journaled in suitable bearings carried by the hangers 147. The bevel-gears 158 mesh with bevel-gears 159 upon the vertical shafts 160, which are journaled at their lower ends in suitable bearings in the hangers 147 and at their upper ends in the cross-bridge 139. The upper ends of the shafts 160 have the bevel-gears 161 thereon, which mesh with bevel-gears 162, fast on the cross-shaft 142. By means of this construction the adjusting-shafts for the set bumpers are rotated in unison with the adjusting-shafts for the upper slide, and the gearing employed to rotate said two adjusting-shafts is such that they rotate in unison and will therefore adjust the set bumpers to the same extent that the upper slide is adjusted. The shafts 153 are carried by the main frame and have no longitudinal movement, said shafts being supported at their outer ends in bearings in the ways 150 and at their inner ends in cross-pieces 155, extending between the guides 4. I may, if desired, connect together the inner ends of the two shafts 153 on the same side of the frame by a swivel-joint which will allow one of said shafts to turn independently of the other, as seen at 734, Fig. 4. The carriage, and consequently the bevel-gears 158, however, have a longitudinal movement; but by providing the shafts with a long spline or key which engages a keyway in the bevel-gears 158 rotary movement may be communicated to the said shafts while allowing the carriage to move longitudinally on the frame, the gears 158 moving back and forth on the shafts 153.

Upon referring again to Fig. 31 it will be apparent that when a large log is being sawed the angular distance that the log must be turned between the cuts is less than where a small log is being sawed. I have therefore provided suitable adjusting mechanism for the set bumpers separate from the longitudinal adjustment thereof, whereby the distance that the said set bumpers will rock the rock-arms 52 $52^a$ will depend upon the size of log being sawed. Each set bumper comprises a base portion 170, which carries the nut 154, and pivoted to this base portion is the block carrying the cam-surface 55 or $55^a$. The set bumper shown in Fig. 14 is that shown in Fig. 29 and which coöperates with the rock-arm operating the pawls 51, while the set bumper shown in Fig. 15 is that illustrated in Fig. 16 and is the one which operates in connection with the pawls $51^a$. Referring to Fig. 14, it will be seen that the block 173, which carries the cam-surface 55, is pivoted to the base 170 at 174, and the said block is supported by and rests on an adjusting-wedge 175, which is slidably mounted in the base. The wedge has a longitudinal screw-threaded aperture in which plays a screw-threaded sleeve 177, said sleeve being held from longitudinal movement with reference to the base 170 by means of an arm 178, integral with the base, which has an eye 179 engaging the neck of the screw-threaded sleeve. Projecting longitudinally through the sleeve is a shaft 180, which has a keyway 181 running longitudinally thereof, in which plays a suitable key 182 in the sleeve 177. The shaft 180 is journaled in a suitable bearing 185, fast with the supporting-plate 150, and has at its end a gear 186, meshing with gear-teeth 187 on the shaft 153. The gears and the screw-threaded connection between the sleeve and wedge-block are such that when the shaft 153 is rotated in a direction to move the bumpers away from the saw (which is the position in which the bumpers are adjusted when a large log is being sawed) the rotation of the shaft 180, caused by the gearing 187 186, will turn the screw 177 in such a direction as to withdraw the wedge 175 or move the said wedge in the direction of the arrow, Fig. 14. The block 173 is thereby lowered slightly, the result of which operation will be that as the carriage is moved backwardly to the inward limit of its stroke the roll 53 will have a less extended engagement with the cam 55, which consequently will turn the center through a less distance. On the other hand, when the shaft 153 is rotated in a direction to set the set bumper for a small-size log the screw 177 will move the wedge in a direction opposite the arrow, Fig. 14, and will conse-

quently swing the upper end of the block 173 to the right, thereby bringing the cam-surface 55 into such position that the contact therewith against the roll 53 will cause the center to be moved through a greater angular distance. Fig. 15 illustrates the adjusting mechanism for that set bumper which coöperates with the pawls 51ª, and as in this instance the roll as it strikes the cam moves downwardly over the cam-surface 55 instead of upwardly over the same. In Fig. 14 I have pivoted the block 173ª at its upper end at 174ª between suitable arms. (Shown in dotted lines.) The lower portion of the block 173ª rests upon a wedge-shaped member 175, as in Fig. 14, and the said wedge-shaped member is adjusted longitudinally by the same mechanism illustrated in Fig. 14. In the case, however, when the set bumpers are adjusted for a large log and the wedge 175 is withdrawn the block 173ª will swing to the left, Fig. 15, and will bring the cam-surface 55ª into a more nearly vertical position, with the result that the roll 53 will have a less extended engagement therewith and will consequently turn the center shaft through a smaller angular distance. On the other hand, when the set bumpers are adjusted for a small-sized log the wedge 175 will be forced to the right, and the cam-block 173ª will be turned into such a position as to give the pawls 51ª a greater movement, as will be obvious. As I have previously stated, the shifting of the head-block laterally and the turning of the leg about its axis is done simultaneously, and consequently this lateral movement occurs while the rolls 53 are in engagement with the set bumpers. To reduce the friction between the rolls and the set bumpers to a minimum, I will preferably yieldingly mount the rolls upon the pins 56, as shown in Fig. 16, whereby the rolls may give in the direction of their axes as the lateral movement of the head-block occurs. In said Fig. 16 the rolls are shown as cored out to receive a coil-spring 703, one end of which 704 is made fast to the roll and the other end of which is made fast to the pin 56, the said pin having a reduced portion 705 to receive the spring. This construction allows the roll to yield in the direction of the lateral movement of the head-block, as will be obvious.

I will now refer to and describe the devices for setting in operation the various mechanisms above set forth.

It will be observed that all the operative parts of the machine are carried by the rotary ring 6 and that while the carriage upon one end of the frame is in operation the carriage upon the opposite end of the frame remains idle for the purpose of carriaging a log. I have accordingly provided means whereby when the supporting-frame 3 is moved so as to bring either carriage into operative position with relation to the saw, as shown in Fig. 5, the clutch member 38 of the carriage-reciprocating mechanism for said carriage is in a position to be clutched to a coöperating clutch member having a fixed position in the floor. After the log upon this carriage has been sawed the clutch member 38 may be disengaged from its coöperating clutch member and the entire supporting-frame rotated to bring the other carriage into operative position, at which time the clutch member corresponding to the other carriage will be properly positioned to coöperate with the coöperating clutch member fixed in the floor. The coöperating clutch member fixed in the floor is capable of having an up-and-down movement, so that when the clutch member 38 is brought into register therewith the coöperating clutch member may be raised and caused to engage the clutch member 38.

Referring now to Fig. 17, the clutch member 38 for the carriage, which is in operative position, is illustrated as being in register with a coöperating clutch member 38ª, which has a fixed position in the floor. The clutch member 38ª is mounted upon a main driving-shaft 190ª, passing through and having a splined engagement with a sleeve 190, supported in suitable bearings beneath the floor, upon which sleeve 190 is fast a driving-pulley 191. The floor-line is indicated by the line 200 in said figure. The clutch member 38 is shown as a conical member, and the clutch member 38ª is provided with a correspondingly-shaped expansible socket or recess to receive the member 38, whereby the clutch member 38ª may be telescoped over the clutch member 38 and then made to engage the same with sufficient friction to transmit its rotation to the clutch member 38.

Figs. 22 and 23 show the two adjusted positions of the clutch member 38ª, and from the figures it will be seen that the walls of the said clutch member are constructed in the form of shoes 205, which are capable of having a movement toward and from the center of the clutch, the said shoes being pivotally connected to suitable levers 206, which are in turn pivoted to the body of the clutch member 38ª at 207. The lower ends of the levers are pivotally connected to arms 208, which are in turn pivoted to a sleeve 209, slidably mounted upon the shaft 190ª. With the sleeve 209 in the position shown in Fig. 22 the shoes 205 will be expanded, as will be obvious, to form an enlarged or expanded socket to receive the clutch member 38. When, however, the sleeve 209 is brought into the position shown in Fig. 23, the shoes will be contracted and will thereby grip the clutch member 38 with sufficient friction to cause the clutch members to rotate in unison. I have provided means whereby the clutch member 38ª may first be raised to telescope over the clutch member 38 and thereafter the sleeve 209 will be lowered to cause the shoes or friction members 205 to grip the clutch member 38. The weight of the sleeve 190 and the pulley 191 is supported by a step-bearing 213, carried by a suitable support beneath the floor; but the

shaft 190ª projects through said step-bearing and is supported in turn upon a step-bearing in the form of a pin 212, which is slidably supported in a suitable bearing 214. I will preferably provide antifriction-rolls between the end of the shaft and the step-bearing 212. The pin 212 is pivotally connected to one end of a lever 215, supported in any suitable way upon framing beneath the floor, and the other end of said lever is connected by an adjustable link 216 to a quadrant or rock-arm 217, also supported in any suitable way upon the framing. The rock-arm 217 is connected by a suitable link 218 with an operating-lever 219, situated in any convenient position. The sleeve 209 is provided with a suitable groove 220, with which engages the forked end of a lever 221, pivoted at 222 to any suitable fixed support. The said lever 221 is connected by a link 223 with the quadrant 217. The connection between the link 216 and lever 215 is a pin-and-slot connection, as shown, and a spring 230 is employed to normally hold the parts in the position shown in Fig. 17. The operation of these parts will be obvious from the foregoing description and is as follows: The parts are shown in Fig. 17 with the clutch members disengaged, and to bring them into engagement the lever 219, which is provided with any suitable latch mechanism 226, coöperating with a usual quadrant 227, will be moved to the left or in the direction of the arrow, and such movement will operate to turn the rock-arm 217 in the direction of the arrow and through the link 216, lever 215, and pin 212 raise the shaft 190ª to bring the clutch member 38ª over the clutch member 38. When this occurs, further movement of the operating member will, through the link 223, turn the lever 221 downwardly, thus closing the friction members 205 hard upon the clutch member 38, this added swinging movement of the quadrant being permitted without affecting the lever 215 by reason of the spring 230. The rotation of the main driving-pulley 190 is now communicated to the main shaft 37, and through the mechanism above described to the carriage and various other operative parts of the machine, this operation continuing until one round of cuts has been made, when the clutch mechanism will be automatically disengaged, as will be presently described. I have employed a similar clutch mechanism for coöperating with the clutch member 148, which, it will be remembered, operates the adjusting mechanism for the upper slide and the set bumpers. The clutch member is designated by 148ª and is similar to the clutch member 38ª. The said clutch member is supported upon a shaft 230ª, which passes through a neck or sleeve upon a driving friction 231, supported in any suitable fixed bearings, the shaft having a splined connection with the driving friction. The driving friction 231 has the conical friction driving-surface 232, which may be engaged by either of the friction-cones 233 or 234, fast upon a driving-shaft 235, which shaft may be rotated in any suitable way. The end of the shaft 235 is connected to a reversing-lever 236, by means of which either friction 233 or 234 may be brought into engagement with the conical driving members 231, whereby the shaft 230ª may be rotated in either direction as desired. The lower end of the shaft 230ª is connected to a yoke member 239, which straddles the shaft 235, the lower end of the yoke member being connected by a lever 240 with a link 241, which in turn is connected to a rock arm or quadrant 242. The quadrant 242 has a connection, by means of a link 243, with an operating-lever 244, and the said quadrant is also connected by a link 245 with a lever 246, connected with the sleeve 209′ of the clutch member 148ª, the sleeve 209′ corresponding in function and operation to the sleeve 209. (Shown in Fig. 22.) The link 240 and lever 241 will have the same elastic connection as described with reference to lever 215 and link 216, and by means of this construction it will be obvious that whenever the lever 244 is operated the clutch members 148 and 148ª may be engaged or disengaged. I will preferably adjustably connect the links 223 and 245 to the quadrants 217 and 242, respectively, and for this purpose I have provided each quadrant with a slot in which is adjustably mounted a block to which the link is connected. The purpose of thus making the connection between the links and the quadrants adjustable is to enable the clutch mechanism to be adjusted as required. The ring 6, it will be remembered, is rotated by means of the driving-gear 10, which is illustrated as being carried by a suitable shaft 10ª, carrying at its lower end a conical friction-wheel 250. Coöperating with said friction-wheel are oppositely-disposed friction-wheels 251, carried by an operating-shaft 252, which may be driven by any suitable means, such as a driving-pulley 253. The end of the shaft is connected to a reversing-lever 254, by means of which either friction-wheel 251 may be brought into operative relation with the friction-wheel 250 and the ring 6 rotated in either direction.

The stop mechanism employed to stop the operation of the machine when the log has made one complete revolution is illustrated in Fig. 18, and in said figure the center-shaft 43, having the worm 46 at its lower end, is illustrated. The lower end of the shaft 43 has a beveled gear 400, which engages with a suitable gear 401, splined to a shaft 402. The bevel-gear 401 will be carried by any suitable bearings on the head-block 26, and the shaft 402 will have a long feather or key 405, so that the bevel-gear 401 will have operative engagement therewith at any position of the carriage. The inner end of the shaft 402 is supported by suitable bearings 406, carried by the cross-girders 151, and said shaft carries a bevel-gear 407, which meshes with a

bevel-gear 408 of the same size, carried by a stop-shaft 409. The stop-shaft is supported in any suitable bearings on the cross-girders 151 and is illustrated as having a slight downward and lateral trend, the outer end of the shaft being adapted to be clutched to the end of a shaft 409ª, supported in suitable bearings 410 on the floor adjacent the controlling-lever 219 when the frame 3 is in operative position. The gearing between the shaft 43 and the shaft 409 is such that when the center shaft has made one complete revolution the stop-shaft has also made one revolution. The end of the shaft 409ª passes through a sleeve 375, which is journaled in the bearing 410 and is splined to said sleeve, whereby the shaft may have a longitudinal movement with reference to the sleeve; but the two parts must rotate together. The sleeve carries a stop-disk 374, which disk has a cam projection 395, adapted during the rotation of the disk to engage a projection on the end of a lever 373, pivoted in any suitable fixed supporting-stand 372. The opposite end of the lever 373 is forked and engages a groove upon a sleeve 371, screw-threaded to a rod 370, having a vertical sliding movement in suitable bearings 378. The upper end of the rod 378 is provided with a suitable head 379, which engages the latch 380 of the lever 219. From this description it will be observed that assuming the cam 395 to have just passed off from the projection on the lever 373 when the shaft 43 has made one complete rotation the disk 374 will have also made one complete revolution, and the cam projection 395 will engage the projection 700 on the end of the lever 373, thereby raising the pin 370 and disengaging the latch 380 from the quadrant. A suitable weight 383, connected to the lever 219, serves to throw said lever to the right, Fig. 18, when the latch is thus automatically disengaged, thus bringing the lever to the full-line position, Fig. 17, and through the operations above described disengaging the clutch members 38 and 38ª, thereby stopping the machine. If the cam projection 395 were carried rigidly by sleeve 375, it might occur that as the said cam projection wiped over the projection 700 to disengage the latch 380 the clutch would be disengaged and the mechanism stopped before the cam projection had passed entirely off from the coöperating projection 700, in which case of course the releasing-pin 370 would be maintained in its raised or operative position, thereby preventing the latch from engaging the quadrant when the lever was thrown to the left, Fig. 17. I therefore provide a yielding connection between the disk 374 and the sleeve 375. The sleeve has a key 430 therein which engages a keyway 431 in the disk, the said keyway being wider than the key, as illustrated in Fig. 19, and a suitable spring 436 is employed for maintaining the disk in the position shown in Fig. 19. When, however, the cam projection 395 engages the projection 700, the disk 374 will be held from rotation until the key 430 has engaged the opposite side of the keyway 431, at which time the disk and sleeve are firmly locked together, and continued rotation of the stop-shaft will, as above described, disengage the latch of the lever 219. The spring 436, however, is strong enough so that after the projection 395 has partially wiped over the projection 700 the said spring will carry the disk forward with relation to the sleeve, so as to carry the projection 395 into the dotted-line position, Fig. 19, and beyond the end of the lever 373. The weight of the parts will then return the releasing-pin 370 to its inoperative position, as will be obvious. Inasmuch as the stop-shaft 409 is carried by the supporting-frame, and therefore rotates with the same while the coöperating shaft 409ª is fixed to the floor, I have provided a suitable automatic clutch mechanism which connects said shafts 409 409ª when the supporting-frame is in operative position, but which is disengaged automatically by the stopping of the mechanism. The shaft 409 has a friction-clutch mechanism at its end with which coöperates an expansible clutch member 500. The expansible clutch member 500 is operated by a suitable lever 501, which engages a conical portion of an operating-cam 502, slidably mounted upon the shaft 409ª. This operating member 502 is connected by the member 506 with a sleeve 507, also slidably mounted on the shaft, and said sleeve is connected through the link and rock-arm mechanism 508 509 510, &c., with the lever 219. The construction above described is such that when the lever 219 is in its operative position or that shown in Fig. 18 the link and rock-arm mechanism maintains the sleeve 507 and the operating member 502 in its extreme position to the left, the said conical operating member 502 by its engagement with the lever 501 causing the clutch member 500 to engage its coöperating clutch member on the shaft 409. When the lever 219 is released and moved to the left, the spring 5001, which engages the sleeve 507 at one end and the fixed collar 517 at the other end, serves to move the sleeve to the right, Fig. 18, and the sleeve through the member 506 carries with it the operating member 502, thereby releasing the clutch member 500 and allowing it to expand. When the collar 507 engages the fixed collar 519, the further-continued movement of the lever 219 will carry with it through the link mechanism the shaft 409ª, thereby entirely disengaging the clutch members. The supporting-frame may now be rotated to bring the opposite end thereof into operative position, and upon again bringing the lever 219 into its operative position the link mechanism 508 509 510, &c., causes the clutch members 500 to engage the coöperating clutch member upon the shaft 409.

I have in the foregoing confined my description very largely to the mechanism at one end only of the frame 3; but it will be

understood that the mechanism described for reciprocating the carriage at one end of the frame and for performing the various operations indicated will be duplicated at the other end of the frame and that the two sets of mechanisms are independent from each other, so that while the mechanism at one end of the frame is being operated that at the other end is idle, and the log already sawed may be removed from the carriage and a new log placed thereon. It will also be understood that the mechanism at each end of the frame includes the clutch members 38 and 148, having such a relative arrangement that when the frame 3 is turned to bring either end into operative relation to the saw the clutch members at such end are alined with the coöperating fixed clutch members in the floor.

In addition to the above I have provided a device for supporting the ends of the frame 3 when in operative position and also for locking said frame against turning.

Referring to Figs. 1 and 26, 519 designates suitable struts fast to the floor beneath each end of the frame 3 and on which said frame is adapted to rest when it is in operative position. A suitable locking member 520 is supported in each strut and is provided with a conical end which is adapted to enter a suitable socket 521 on the bottom of the frame. I have illustrated a spring 530 surrounding the stem of the locking member and which operates normally to maintain the latter in its raised or operative position. The lower end of the stem of the locking member is connected by a link 532 to a rock-arm 533, to the shaft of which is connected an operating-lever 534. (Shown in dotted lines.) By turning the lever 534 the locking member may be disengaged from the socket 521, when the frame 3 may be turned, and when said frame is turned into its proper position the locking member will be automatically brought into operating position.

As I believe I am the first to use a band-saw for making substantially radial kerfs longitudinally of the log, I desire to claim the same broadly. I also believe that I am the first to provide mechanism for supporting a log and turning the same in one direction about its axis after a certain number of predetermined cuts have been made and then giving the log a reverse turning movement after the next succeeding cut has been made. I also believe myself to be the first to provide mechanism for giving the log center a transverse movement in one direction after each one of a certain predetermined number of kerfs have been made and a transverse movement in the reverse direction after the next succeeding kerf has been made. I therefore desire to claim these and various other novel features broadly. I also desire to state that while I have shown one structure in which my invention may be embodied, yet it will be obvious that the invention is not limited in matter of detail to the structure illustrated, and I therefore reserve to myself the right to make any and all changes which may come within the scope of the appended claims.

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

1. In a sawmill, a saw, a log-supporting device, means to move one of said parts relatively to the other and in such a direction as to make substantially radial cuts in the log, and automatic means to change the relative position of the saw and log both angularly with reference to the log and laterally with reference to the plane of the cut after each cut has been made.

2. In a sawmill, a saw having a straight cutting edge, means to support a log with its length substantially parallel to the saw, means to move one of said parts toward and from the other, to make cuts in the log, and automatic means to turn the log about its axis and to shift the log transversely to the line of cut after each cut has been made.

3. In a sawmill, a band-saw, means to support a log with its length parallel to the saw, means to move one of said parts toward the other whereby cuts are made longitudinally of the log, automatic means to turn the log about its axis in one direction after each one of a predetermined number of cuts have been made and to turn the log in the opposite direction after the next succeeding cut has been made.

4. In a sawmill, a saw, a log-supporting device, means to move one of said parts relatively to the other in such a direction as to make substantially radial cuts in the log, and automatic means to turn the log on its axis and to shift the latter transversely to the plane of cut after each cut has been made.

5. In a sawmill, a band-saw, means to support a log with its length substantially parallel to the saw, means to move the log toward and from the saw to make cuts longitudinally of the log, automatic means to turn the log about its axis and to give the latter a transverse movement after each cut has been made.

6. In a sawmill, a band-saw, means to support a log with its length parallel to the saw, means to move the log toward and from the saw to make cuts longitudinally of the log, means acting automatically to turn the log about its axis in one direction and to give the log a movement transverse to its movement toward and from the saw after each one of a predetermined number of cuts have been made, and to give the log a reverse turning movement after the next succeeding cut.

7. In a sawmill, a band-saw, a log-carriage constructed to support a log with its length parallel to the saw, carriage-reciprocating mechanism operating to move the carriage toward and from the saw whereby cuts are made in the log, and means acting automatic-

ally to turn the log on its axis after each cut has been made.

8. In a sawmill, a band-saw, a log-carriage constructed to support a log with its length parallel to the saw, carriage-reciprocating mechanism, automatic means to turn the log about its axis as it is withdrawn from the saw, and automatic means acting to give the log an intermittent movement transversely to the saw.

9. In a sawmill, a band-saw, a log-carriage having means to support a log with its length parallel to the saw, means to move the carriage toward and from the saw to make cuts longitudinally of the log, automatic means to turn the log in one direction about its axis and to give the log a transverse movement after each one of a predetermined number of cuts have been made, and means to give the log a reverse turning and transverse movement after the next succeeding cut.

10. In a sawmill, a band-saw, a carriage, means to reciprocate the latter toward and from the saw, a head-block mounted on said carriage for movement transverse to the line of movement of the carriage, means for supporting a log on said head-block with its length parallel to the saw, the movement of the carriage to and from the saw operating to make longitudinal cuts in the log, and means to automatically give the head-block a transverse movement after each cut has been made.

11. In a sawmill, a band-saw, a carriage, means to reciprocate the latter toward and from the saw, a head-block mounted on said carriage for movement transverse to the line of movement of the carriage, means for supporting a log on said head-block with its length parallel to the saw, and automatic means to turn the log about its axis when the carriage has been retracted from the saw.

12. In a sawmill, a saw, a pair of centers to engage the ends of a log, and support the same in position to be sawed, means to reciprocate the log toward and from the saw, and automatic mechanism to turn one center after each reciprocation whereby the saw is turned into position to make the next cut, the turning movement being in one direction and then in the other.

13. In a sawmill, log-supporting means, means to reciprocate said log in a direction perpendicular to its length, and automatic means to turn the log on its axis in one direction after each one of a predetermined number of reciprocations, and in the other direction after the next succeeding reciprocation.

14. In a sawmill, a saw, a log-supporting device, means to move one of said parts relatively to the other whereby cuts are made in the log, and automatic means to turn the log on its axis after each reciprocation, the turning movement of the log being first in one direction and then in the other.

15. In a sawmill, log-supporting means including a pair of centers to engage the ends of the log, means to reciprocate the log in a direction perpendicular to its length, and automatic means to turn said log on its axis after each reciprocation, and to shift the log transversely to the direction of its reciprocatory movement.

16. In a sawmill, a pair of centers to support a log, means to reciprocate the log in a direction perpendicular to its length, automatic means to turn one of said centers and the log in one direction after each one of a predetermined number of reciprocations, and to turn the said center and the log in the opposite direction after the next succeeding reciprocation.

17. In a sawmill, a pair of centers adapted to engage the ends of a log, one of said centers having means to interlock with the log, a gear mechanism to turn said center, and means to automatically operate said gear in one direction after each one of a predetermined number of cuts have been made, and in the opposite direction after the next succeeding cuts have been made.

18. In a sawmill, a band-saw, centers to support a log parallel to the saw, means to reciprocate the centers toward and from the saw to make cuts longitudinally of the log, and automatic means to turn one of said centers and to shift the centers transversely after each cut has been made.

19. In a sawmill, a band-saw, a pair of centers to support a log parallel to the saw, one of said centers having means to interlock with the log, means to move the centers toward and from the saw to make cuts longitudinally of the log, and automatic means to turn one of said centers in one direction after each one of a predetermined number of cuts have been made and in the opposite direction after the next succeeding cut.

20. In a sawmill, a band-saw, a pair of centers to support a log with its length parallel to the saw, means to move the centers toward and from the saw, automatically-operated gear mechanism to turn one of said centers and the log in one direction after each one of a predetermined number of cuts have been made, and in the opposite direction after the next succeeding cut has been made.

21. In a sawmill, a band-saw, means to support a log with its length parallel to the saw, means to move the log toward and from the saw to make cuts longitudinally of the log, and automatic means for giving the log after each cut has been made a combined movement about its axis and transversely to its movement toward and from the saw.

22. In a sawmill, a saw having a straight cutting edge, means to support a log with its length parallel to the saw, means to move the log toward and from the saw to make cuts longitudinally of the log, and automatic means to give the log after each cut has been made a combined turning movement about its axis and lateral movement transversely to its line of movement toward and from the

saw, such combined movement being in one direction after each one of a predetermined number of cuts have been made, and in the opposite direction after the next succeeding cut.

23. In a sawmill, a saw having a straight cutting edge, a log-carriage constructed to support a log with its length parallel to the saw, means to reciprocate the carriage toward and from the saw, and means to turn the log about its axis as it is retracted from the saw, said means including a pawl and ratchet supported by the carriage, and an adjustable set bumper to operate said pawls when the carriage is retracted, whereby different-sized logs may be accommodated.

24. In a sawmill, a saw, a log-carriage, means to reciprocate the same, and means to turn the log about its axis on the carriage after each cut has been made, said means including a reversible pawl and ratchet supported by the carriage and an adjustable set bumper supported independently from the carriage, said set bumper being adapted to operate the pawls as the carriage is reciprocated.

25. In a sawmill, a saw, a reciprocating head-block having a pair of centers adapted to support a log with its length perpendicular to the direction of reciprocation, a shaft supporting one of said centers, a worm-gear on said shaft, a worm carried by the head-block and engaging said worm-gear, and means to turn the worm when said head-block reaches one end of its stroke.

26. In a sawmill, a reciprocating head-block having a pair of centers adapted to support a log with its length perpendicular to the line of reciprocation, a shaft supporting one of said centers, a worm-gear on said shaft, a worm carried by the head-block and engaging said worm-gear, automatic mechanism to turn the worm in one direction after the head-block has made each one of a predetermined number of strokes, and means to turn the worm in the opposite direction when the head-block has completed the next succeeding stroke.

27. In a sawmill, a saw, a log-carriage, means to reciprocate the latter toward and from the saw, centers to support the log with its axis perpendicular to the line of movement of the carriage, and means to positively adjust the centers on the carriage toward and from the saw.

28. In a sawmill, a band-saw, a carriage, log-centers adjustably supported thereby and adapted to support a log with its length parallel to the saw, means to reciprocate the carriage toward and from the saw to make cuts longitudinally of the log, and automatic means operating to turn the log about its axis and shift the centers transversely of the carriage after each cut has been made.

29. In a sawmill, a band-saw, a carriage, log-centers adjustably supported thereby and adapted to support a log with its length parallel to the saw, means to reciprocate the carriage toward and from the saw to make cuts longitudinally of the log, and automatic means operating to turn the log about its axis and give the log a transverse movement in one direction after each one of a predetermined number of cuts has been made, and to give the log a reverse turning and lateral movement after the next succeeding cut has been made.

30. In a sawmill, a band-saw, means to support a log with its length parallel to the saw, means to move the log toward and from the saw to make cuts longitudinally of the log, and automatic means to move the log bodily after each cut is made whereby the cuts are made at different angles to a radial line.

31. In a sawmill, a saw having a straight cutting edge, a log-carriage having centering devices to support a log with its length parallel to the saw, means to reciprocate the carriage through a definite distance, toward and from the saw and means to adjust said centering device toward and from the saw whereby different-sized logs may be cut.

32. In a sawmill, a saw having a straight cutting edge, a log-carriage having centering devices to support a log with its length parallel to the saw, said centering devices being adjustable on the carriage toward and from the saw, carriage-reciprocating mechanism, and automatic log-turning mechanism rendered operative after each cut has been made to turn the log on its axis.

33. In a sawmill, a saw having a straight cutting edge, a log-carriage having centering devices to support a log with its length parallel to the saw, said centering devices being adjustable on the carriage toward and from the saw, carriage-reciprocating mechanism operating to give the carriage a definite movement, and automatic means operating to turn the log on its axis and to shift the centering devices transversely to the line of reciprocation of the carriage after each cut has been made.

34. In a sawmill, a saw having a straight cutting edge, a log-carriage having centering devices to support a log with its length parallel to the saw, said centering devices being adjustable on the carriage toward and from the saw, carriage-reciprocating mechanism operating to give the carriage a definite movement, and automatically-operating means to turn the log on its axis and to shift the centering devices transversely to the line of movement of the carriage in one direction after each one of a predetermined number of cuts have been made and in the opposite direction after the next succeeding cut.

35. In a sawmill, a saw having a straight sawing edge, a reciprocating carriage comprising two superimposed slides, one of said slides being adjustable on the other in the direction of the reciprocation of the carriage, log-supporting devices on said adjustable slide and adapted to support the log with its

length parallel to the saw, and means to give said carriage a definite reciprocating movement.

36. In a sawmill, a carriage, means to reciprocate the same, said carriage comprising two superimposed slides, means to adjust the upper slide relative to the lower slide in the direction of movement of the carriage, log-centering devices carried by said upper slide, and constructed to support the log with its axis perpendicular to the movement of the carriage and means to give the log-centering devices a movement transverse to the slide.

37. In a sawmill, a saw having a straight cutting edge, a carriage, means to reciprocate the latter toward and from the saw, said carriage comprising two superimposed slides, means to adjust one of said slides toward and from the saw, log-centering devices carried by the adjustable slide, and automatic mechanism operating at the end of each inward stroke of the carriage to turn the log about its center and to shift the log-centering devices transversely.

38. In a sawmill, a reciprocating carriage comprising two superimposed slides, one of said slides being adjustable in the direction of reciprocation of the carriage, a head-block supported on the adjustable slide for movement transversely of the movement of the carriage, said head-block having means to support a log with its axis perpendicular to the movement of the carriage, and cam mechanism on the carriage, and operating to move the head-block transversely at the end of each inward stroke of the carriage.

39. In a sawmill, a reciprocating carriage comprising two superimposed slides, one of said slides being adjustable relative to the other, a head-block supported on the adjustable slide for transverse movement, a centering-shaft on said head-block having means at one end to engage a log, automatic means to turn said shaft at the end of each inward stroke of the carriage, said means including a worm engaging said shaft, and pawl-and-ratchet mechanism to operate said worm.

40. In a sawmill, a carriage, means to reciprocate the same, log-supporting means carried by said carriage, and means to turn the log about its axis at the end of each inward stroke of the carriage, said means including reversible pawl-and-ratchet mechanism.

41. In a sawmill, a carriage, means to reciprocate the same, log-supporting means carried by said carriage, and means to turn the log about its axis at the end of each inward stroke of the carriage, said means including reversible pawl-and-ratchet mechanism, and automatic mechanism to control the time of reversal of said pawl-and-ratchet mechanism.

42. In a sawmill, a carriage, means to reciprocate the same, log-supporting means carried by said carriage, and means to turn the log about its axis at the end of each inward stroke of the carriage, said means including reversible pawl-and-ratchet mechanism, and automatic cam mechanism to control the time of reversal of said pawl-and-ratchet mechanism, said cam mechanism operating to reverse the pawls for a single stroke after the carriage has made a predetermined number of strokes.

43. In a sawmill, a carriage, a centering-shaft carried thereby and adapted to engage the end of a log, a shaft geared to said centering-shaft and having two oppositely-disposed ratchets thereon, pawls adapted to cooperate with said ratchets, means to oscillate said pawls, and cam mechanism operating to determine which pawl shall have operative engagement with its ratchet.

44. In a sawmill, a carriage, means to reciprocate the same, centering devices mounted on the carriage, said centering devices constructed to support a log for turning movement about its axis, means to turn the log at the end of each inward stroke of the carriage, said means including two oppositely-disposed ratchets, a rock-arm adjacent each ratchet, a pawl supported on each rock-arm and engaging the coöperating ratchet, a set bumper adapted to be engaged by each rock-arm as the carriage reaches the inward end of each stroke whereby the pawls are oscillated, and means to determine which pawl shall have operative engagement with its ratchet.

45. In a sawmill, a carriage, means to reciprocate the same, centering devices mounted on the carriage, said centering devices constructed to support a log for turning movement about its axis, means to turn the log at the end of each inward stroke of the carriage, said means including two oppositely-disposed ratchets, a rock-arm adjacent each ratchet, a pawl supported on each rock-arm and engaging the coöperating ratchet, a set bumper adapted to be engaged by each rock-arm as the carriage reaches the inward end of each stroke whereby the pawls are oscillated, and cam mechanism operating to determine which pawl shall have operative engagement with its ratchet, said cam mechanism maintaining one pawl in operative position for a predetermined number of strokes and the other pawl in operative position for the next succeeding stroke.

46. In a sawmill, a supporting-frame, a carriage slidably mounted thereon, carriage-reciprocating mechanism, log-centering devices on the carriage, means to turn the log on its center and to shift the centering devices laterally after each inward stroke of the carriage, said means being mounted on the carriage and having operative connection with the carriage-reciprocating mechanism.

47. In a sawmill, a carriage, carriage-reciprocating mechanism, a head-block mounted on the carriage and adapted to support a log, means to move the head-block laterally of the carriage, said means including a plurality of independent cams on the carriage, said cams having different shapes, a latch-pin on the head-block adapted to engage any one of said cams, and means for operatively con-

necting the cams with the carriage-reciprocating mechanism.

48. In a sawmill, a carriage, carriage-reciprocating mechanism, a head-block sustained by the carriage, said head-block having means to support a log, means to move the head-block laterally on the carriage, said means including a plurality of separate cams supported by the carriage, means to rotate said cams at different speeds from the carriage-reciprocating mechanism, and a latch-pin on the head-block adapted to engage any one of said cams, whereby the character of the lateral movement of the head-block depends upon the particular cam being employed.

49. In a sawmill, a carriage, carriage-reciprocating mechanism, a head-block mounted on the carriage and having means to support a log, a plurality of cams mounted on the carriage, a latch-pin on the head-block adapted to engage any one of said cams, and means to rotate said cams upon the carriage-reciprocating mechanism, said cams during their revolution operating to give the head-block a transverse movement in one direction after each one of a predetermined number of reciprocations of the carriage, and in the opposite direction after the next succeeding reciprocation, the predetermined number being different for different cams.

50. In a sawmill, a saw having a straight cutting edge, a movable supporting-frame, a reciprocating log-carriage supported thereby and having means to support a log with its length parallel to the edge of the saw, means to reciprocate the carriage toward and from the saw, and means to move the frame to bring the log into position to be cut or to move the log out of such position.

51. In a sawmill, a saw, a movable supporting-frame having means to support a plurality of logs in position to be sawed, means to move said frame to bring any one of the logs into operative position with relation to the saw and means to move the log when in operative position toward and from the saw.

52. In a sawmill, a saw, a rotatable supporting-frame having means at each end to support a log in position to be sawed, means to rotate the frame to bring either end thereof into operative relation with the saw, and means to reciprocate the log at the latter end of the frame to make cuts in said log whereby while the log at one end of the frame is being sawed the log may be carriaged on the other end.

53. In a sawmill, a saw, a movable supporting-frame, a plurality of reciprocating log-carriages supported thereby, means to move said frame to bring either log-carriage into operative relation with the saw, and means to reciprocate that carriage which is thus in operative position.

54. In a sawmill, a saw, a movable supporting-frame, a plurality of independently-movable log-carriages supported thereby, means to move said frame to bring either log-carriage into operative relation with the saw, and means to reciprocate the carriage independently.

55. In a sawmill, a band-saw, a rotatable supporting-frame, a plurality of independent carriages mounted thereon, each of said carriages having means to support a log with its length parallel to the saw, means to turn the supporting-frame to bring either log-carriage into operative position, and carriage-reciprocating mechanism.

56. In a sawmill, a movable frame, a log-carriage supported thereby, carriage-reciprocating mechanism movable with the frame and suitable driving mechanism, and means to clutch said carriage-reciprocating mechanism to the driving mechanism when the supporting-frame has been moved into operative position.

57. In a sawmill, a rotatable frame, a plurality of independently-movable log-carriages mounted thereon, a carriage-reciprocating mechanism for each carriage, means to rotate the frame to bring either carriage into operative relation with the saw, and driving mechanism adapted to be connected with the reciprocating mechanism of that carriage which is in operative position.

58. In a sawmill, a rotating frame, a plurality of independent log-carriages mounted thereon, a carriage-reciprocating mechanism for each carriage, said carriage-reciprocating mechanism each comprising a clutch member, a single driving mechanism having a cooperating clutch member, and means to rotate the frame to bring either of the first-named clutch members into register with the coöperating clutch member of the driving mechanism.

59. In a sawmill, log-supporting mechanism, a saw, means to move one of said parts relative to the other to make substantially radial cuts longitudinally of the log, means to turn the log about its axis after each cut has been made, and means acting automatically to stop the operation of the device when one round of cuts has been made.

60. In a sawmill, a saw having a straight cutting edge, means to support a log with its length parallel to the saw, means to move the log toward and from the saw to make substantially radial cuts longitudinally of the log, means to turn the log about its axis after each cut has been made, and automatic means to stop the operation of the mill when one round of cuts has been made.

61. In a sawmill, a saw, a log-carriage, means including a clutch device to reciprocate the same, means to turn the log on its axis after each cut has been made, and means to automatically disengage the clutch when one round of cuts has been made.

62. In a sawmill, a saw, a log-carriage, means to reciprocate said carriage, means supported on the carriage to turn the log on its axis after each cut has been made, and automatic means to stop the reciprocation of

the carriage after one round of cuts has been made.

63. In a sawmill, a reciprocating log-carriage, a centering-shaft carried thereby, and adapted to engage the end of a log, means to turn said centering-shaft about its axis after each cut has been made, said means including two oppositely-disposed pawls, and set bumpers to engage said pawls, and means to determine which pawl shall be rendered operative.

64. In a sawmill, a reciprocating log-carriage adapted to support a log, means to turn the log about its axis at the end of each inward stroke, said means including a shaft having oppositely-disposed ratchets thereon, a pawl coöperating with each ratchet; and means to determine which pawl shall have operative engagement with its ratchet.

65. In a sawmill, a movable log-carriage, means to turn the log about its center at predetermined points in the movement of the carriage, said means including a shaft having oppositely-disposed ratchets thereon, pawls coöperating with said ratchets and means to determine which of said pawls shall have operative engagement with its ratchet.

66. In a sawmill, a saw, a reciprocating log-carriage, means to turn the log on the carriage at a predetermined time in the movement of the carriage, said means comprising a shaft having oppositely-disposed ratchets thereon, rock-arms loose on said shaft, a pawl carried by each rock-arm, said pawls coöperating with the ratchets, means to turn said rock-arms, and means to determine which pawl shall be in operative engagement with its ratchet.

67. In a sawmill, a reciprocating log-carriage, means to reciprocate the same, means to intermittingly turn the log on the carriage after each reciprocation, said means including a shaft having two oppositely-disposed ratchets thereon, a pawl coöperating with each ratchet, means to simultaneously operate said pawls, and means to determine which pawl shall have operative engagement with its ratchet.

68. In a sawmill, a reciprocating log-carriage, and means to turn the log at a predetermined time in the movement of the carriage, said means comprising two oppositely-disposed ratchets mounted on a shaft, a rock-arm for each ratchet, a pawl carried by each rock-arm, and set bumpers adapted to engage the rock-arms during the movement of the carriage, said set bumpers operating to swing said rock-arms in opposite directions.

69. In a sawmill, a reciprocating log-carriage, and means to turn the log at a predetermined point in the movement of the carriage, said means including a shaft, a pawl thereon having a limited turning movement thereabout, a ratchet, and means to turn said shaft to lift the pawl out of engagement with the ratchet.

70. In a sawmill, a reciprocating log-carriage adapted to support a log, means to reciprocate said carriage, and means to turn the log on its axis after each reciprocation, said means including a shaft, two oppositely-disposed ratchets thereon, a rock-arm loose on said shaft adjacent each ratchet, a pawl carried by each rock-arm, means to determine which pawl shall have operative engagement with its ratchet, and means to simultaneously turn said rock-arms in opposite directions.

71. In a sawmill, a saw, a reciprocating log-carriage, having means to support a log, means to reciprocate said carriage, means to turn the log on its axis after each reciprocation, said means including a shaft, two oppositely-disposed ratchets thereon, a rock-arm on said shaft adjacent each ratchet, a pawl-carrying shaft carried by each rock-arm, a pawl on each pawl-carrying shaft, said pawls having a limited turning movement about the shaft, means connecting said pawl-carrying shafts to rotate in unison, and means to control the position of said shafts whereby either one of said pawls have operative engagement with its ratchet.

72. In a sawmill, a reciprocating log-carriage, means to reciprocate the same, means to turn the log on its axis at each reciprocation, said means including a shaft mounted on the carriage, two ratchets on said shaft, a rock-arm loose on said shaft adjacent each ratchet, a pawl-carrying shaft carried by each rock-arm, a pawl on each pawl-carrying shaft, said pawls each having a limited turning movement on its shaft, means to oscillate the rock-arms in opposite directions, means to connect the pawl-carrying shafts for simultaneous turning movement, means controlling the position of said shafts whereby either pawl may be thrown into operative engagement with its ratchet.

73. In a device of the class described, a log-carriage, means to reciprocate the same, means to turn the log on its axis after each reciprocation of the carriage, said means including a shaft supported by the carriage, two ratchets thereon, a rock-arm loose on said shaft adjacent each ratchet, a pawl-carrying shaft carried by each rock-arm, a pawl on each pawl-carrying shaft, said pawls having each a limited turning movement on its shaft, means to oscillate the rock-arms simultaneously in opposite directions, flexible connections between the pawl-carrying shafts, said connections allowing the rock-arms to have independent turning movement, means controlling the position of said shafts whereby either pawl may be thrown into engagement with its ratchet.

74. In a sawmill, a reciprocating log-carriage, means to intermittingly turn the log on its axis as the carriage reciprocates, said means including a shaft supported by the carriage and having oppositely-disposed ratchets thereon, rock-arms loose on the shaft, a pawl-carrying shaft on each rock-arm, a pawl mounted on each pawl-carrying shaft

and constructed to have a limited turning movement thereon, means to oscillate the rock-arms in opposite directions at a predetermined point in the movement of the carriage, connections between said pawl-carrying shafts, said connections being constructed to allow said rock-arms to have free oscillating movement but to connect the shaft together for turning movement, and means to control the position of the pawl-carrying shafts whereby either pawl may be brought into operative engagement with its ratchet.

75. In a sawmill, a pair of centers to support a log, mechanism to make cuts in the log, and automatic means to give one of the centers a positive turning movement after each cut has been made whereby the log is turned about its axis, said mechanism being adjustable whereby the amount of movement given to the center may be varied according to the size of the log.

76. In a sawmill, a pair of centers to support a log, means to make cuts in the log, automatic means to turn one of said centers after each cut has been made whereby the log is turned about its axis, and means to vary the amount that the center is turned according to the size of the log being operated upon, whereby the log is turned through the same circumferential distance regardless of its size.

77. In a sawmill, a saw having a straight cutting edge, means to support a log with its length parallel to the said cutting edge, means to move the log toward and from the saw whereby cuts are made longitudinally of the log, and automatic means to turn the log on its axis after each cut has been made, said means operating to give the log a uniform circumferential movement regardless of its size.

78. In a sawmill, a saw having a straight cutting edge, centers to support a log with its length parallel to the saw, means to move the centers toward and from the saw, and means to turn one of said centers after each cut has been made, said latter means operating to give the log a definite circumferential movement regardless of the size of the log.

79. In a sawmill, log-supporting means, means to make cuts in the log, and automatic means to shift the log transversely of the plane of cut after a cut has been made, the amount of the transverse movement depending on the size of the log.

80. In a sawmill, log-supporting means, means to make substantially radial cuts in the log, automatic means to turn the log on its axis, and to shift the same transversely to the line of cut after a cut has been made, the amount of both of said movements being dependent on the size of the log.

81. In a sawmill, a carriage having centers to support a log, and means to shift the centers transversely to the line of cut after a cut has been made, said means including a plurality of independent cams having different shapes, and means to render any one cam operative, whereby a greater or less movement may be given to the centers dependent on which cam is operative.

82. In a sawmill, a log-carriage, means to turn the log and to shift the same transversely after a cut has been made, said means including a plurality of differently-shaped cams, and means to render any one cam operative.

83. In a sawmill, a log-carriage, a pair of centers supported thereby, and adapted to hold a log between them, a pawl-and-ratchet mechanism supported on the carriage and operating to turn one of said centers after a cut has been made, a set bumper for operating said pawl-and-ratchet mechanism, and means to simultaneously adjust the set bumper and the log-centers.

84. In a sawmill, a saw, a log-carriage having a centering device for the log, carriage-reciprocating mechanism, means to turn the log on its axis after each cut has been made, and a stop mechanism to stop the operation of the mill after the log has made one complete revolution, said stop mechanism including a clutch device.

85. In a sawmill, a saw, a log-carriage, carriage-reciprocating mechanism, means to turn the log on its axis after each cut has been made, an operating-lever for the carriage-reciprocating mechanism, means to hold the lever in operative position, and connections between said means to turn the log and said lever to disengage the latter after one round of cuts has been made, whereby the carriage-reciprocating mechanism is stopped.

86. In a sawmill, a saw, a movable supporting-frame, mechanism carried thereby to move the log toward and from the saw, and turn the log about its axis after each cut has been made, an operating-lever for said mechanism, a latch to hold said lever in operative position, connections between the lever and the mechanism to turn the log, said connections operating to disengage the lever when one round of cuts has been made, and means for disconnecting said connections when the lever is disengaged whereby the support may be moved.

87. In a sawmill, a saw, a centering-shaft to support a log, means to move said shaft relatively to the saw, means to turn said shaft after each cut has been made, an operating-lever for controlling the operation of the said means, a latch for said lever, and automatic means to disengage said latch when the centering-shaft has made a complete rotation.

88. In a sawmill, a centering-shaft to support a log, means to make cuts in the log, means to turn said shaft after each cut has been made, an operating-lever for said means, means to lock said lever in operative position, connections between said shaft and the lever, said connections operating automatically to release the lever when the shaft has made a complete revolution.

89. In a sawmill, a centering-shaft to support a log, a saw, means to move the shaft toward and from the saw, means to turn said shaft after each cut has been made, a lever controlling the said means, said lever having a latch to hold it in operative position, and means operated by the shaft when the latter has made a complete revolution to disengage said latch.

90. In a sawmill, a saw, a movable supporting-frame, a log-carriage mounted thereon, carriage-reciprocating mechanism, a log-centering shaft on said carriage, means to turn the shaft after each cut has been made, an operating-lever for controlling the operation of said carriage, said lever being independent from the supporting-frame, a latch to hold said lever in operative position, connections between the shaft and the said lever, said connections operating to disengage the latch when the shaft has made one complete revolution, and means to break said connections when the lever is disengaged.

91. In a sawmill, a saw, a movable supporting-frame, having a plurality of log-carriages thereon, carriage-reciprocating mechanism for each carriage, means to move the frame to bring any carriage into operative relation to the saw, mechanism on each carriage to turn the log on its ends after each cut has been made, an operating-lever controlling the operative carriage-reciprocating mechanism, a latch for said lever, connections between the log-turning mechanism on the operative carriage and the said lever, whereby the latch is disengaged when one round of cuts has been made.

92. In a sawmill, a saw, a movable support having a plurality of independent log-carriages thereon, any one of which may be brought into operative relation with the saw, a carriage-reciprocating mechanism for each carriage, log-turning mechanism on each carriage, said mechanism operating to turn the log after each cut has been made, an operating-lever controlling the movements of the operative carriage, and having a latch to retain it in operative position, connections between the log-turning mechanism on the operative carriage and said lever, said connections operating to disengage the lever when one round of cuts has been made, and means whereby the said connections are disconnected when the lever is disengaged whereby the support may be moved.

93. In a sawmill, a saw, a movable support having a plurality of independent log-carriages thereon any one of which may be brought into operative relation to the saw, carriage-reciprocating mechanism, a log-centering shaft on each carriage, means to turn the shaft on the operative carriage after each cut has been made, a lever controlling the carriage-reciprocating mechanism, a latch for the lever, connections between the shaft on the operative carriage and the said lever, said connections operating to disengage the lever when the shaft has made one complete revolution, and means to disconnect said connections when the lever is disengaged, whereby the movable support may be turned.

94. In a sawmill, a saw, a turn-table device, a plurality of log-carriages supported thereby, carriage-reciprocating mechanism, means to turn the turn-table to bring any carriage into operative relation with the saw, a log-centering shaft on each carriage, means to turn the operative shaft after each cut has been made, an operating-lever for the operative carriage-reciprocating mechanism, means to normally hold said lever in operative position, and means to disengage the lever when one round of cuts has been made.

95. In a sawmill, a saw, a turn-table device, a plurality of log-carriages supported thereby, means to turn the turn-table to bring any carriage into operative relation with the saw, carriage-reciprocating mechanism, a log-centering shaft on each carriage, means to turn the shaft on the operative carriage after each cut has been made, an operating-lever for controlling the movements of the operative carriage, means to normally hold said lever in operative position, connections between the operative shaft and said lever, said connections operating to disengage the lever when the shaft has made one revolution, and means to disconnect said connections when the lever is disengaged.

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

JAMES C. KILLAM.

Witnesses:
LOUIS C. SMITH,
JOHN C. EDWARDS.