No. 624,266. Patented May 2, 1899.

# R. TODD & J. A. STOTT.

## APPARATUS FOR SPINNING TEXTILE FIBERS.

(Application filed Nov. 10, 1896.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.

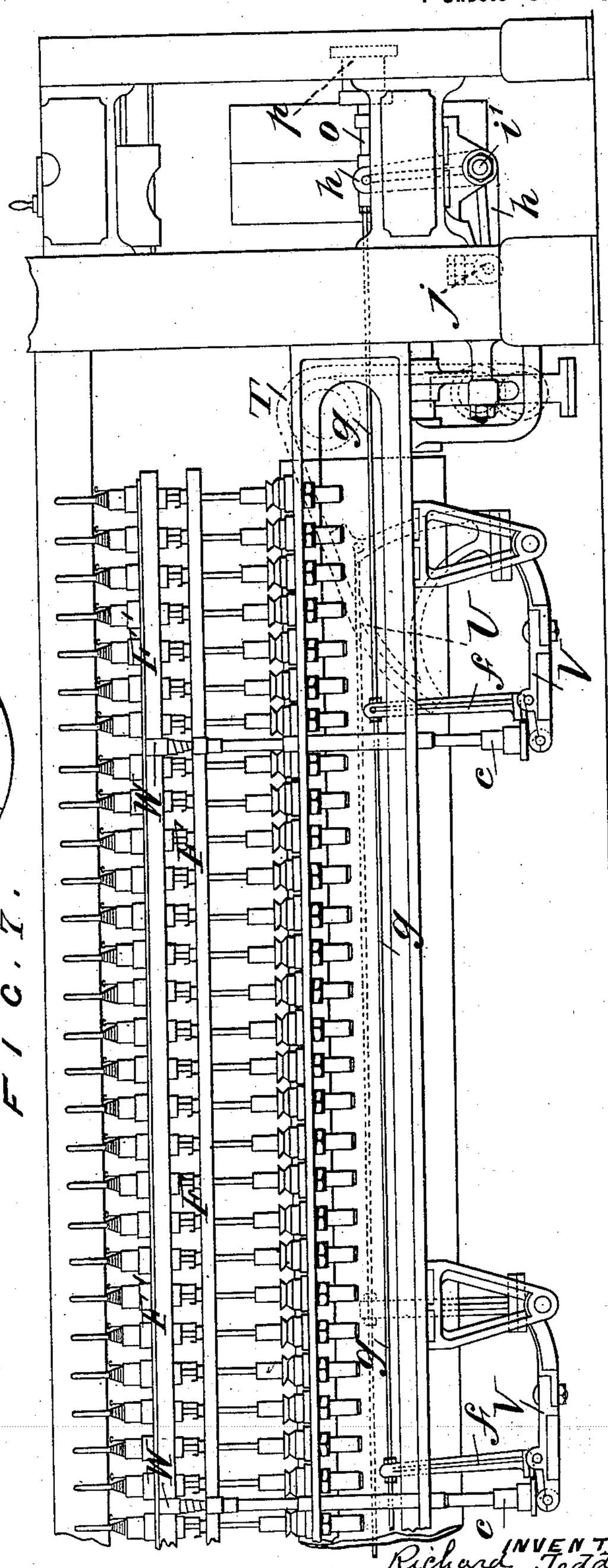



FIG. 5.

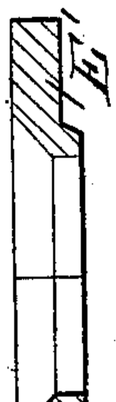



FIG. 6.


FIG. 2a.

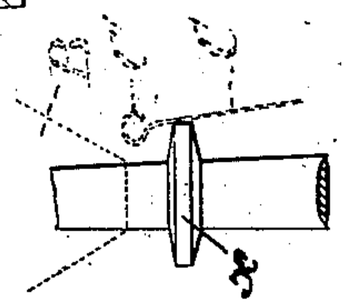



FIG. 3.


FIG. 4.

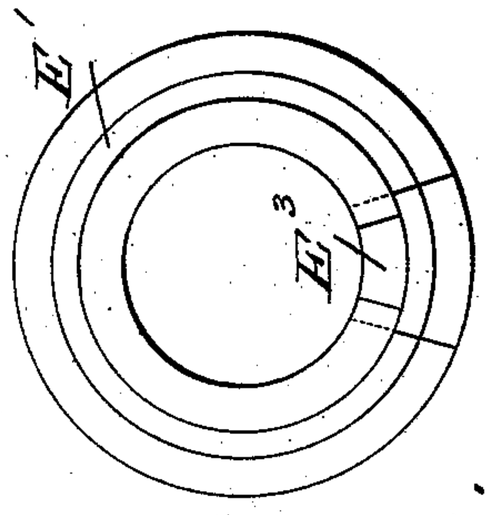



FIG. 2.

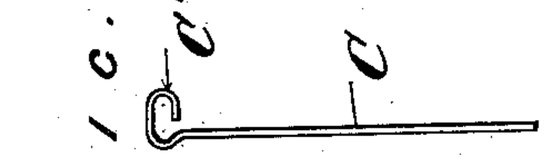
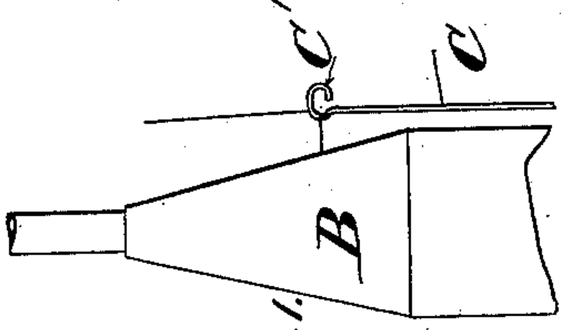



FIG. 1.




WITNESSES.

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## APPARATUS FOR SPINNING TEXTILE FIBERS.

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(No Model.) 4 Sheets—Sheet 2.

FIG. 10.

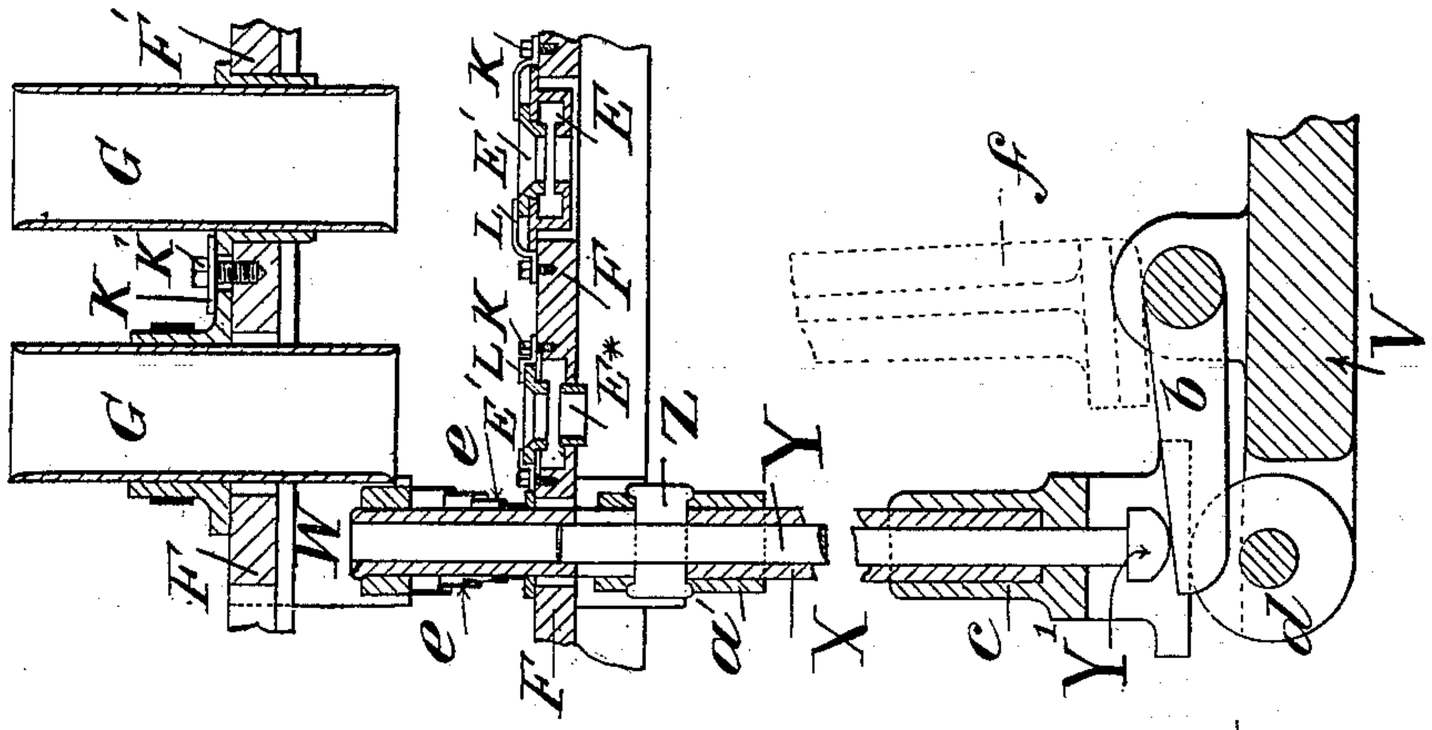



FIG. 9.

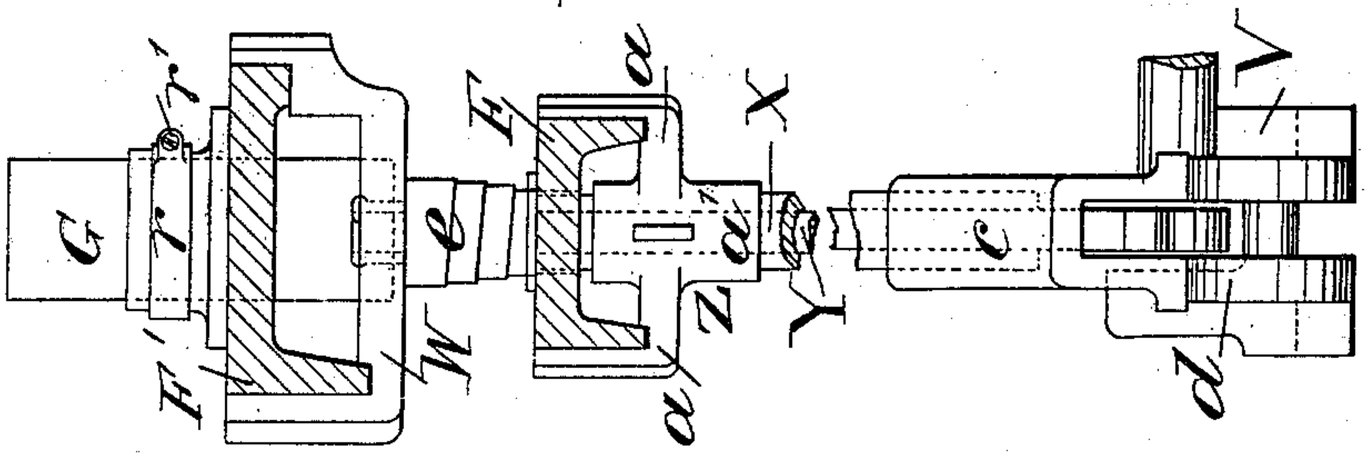
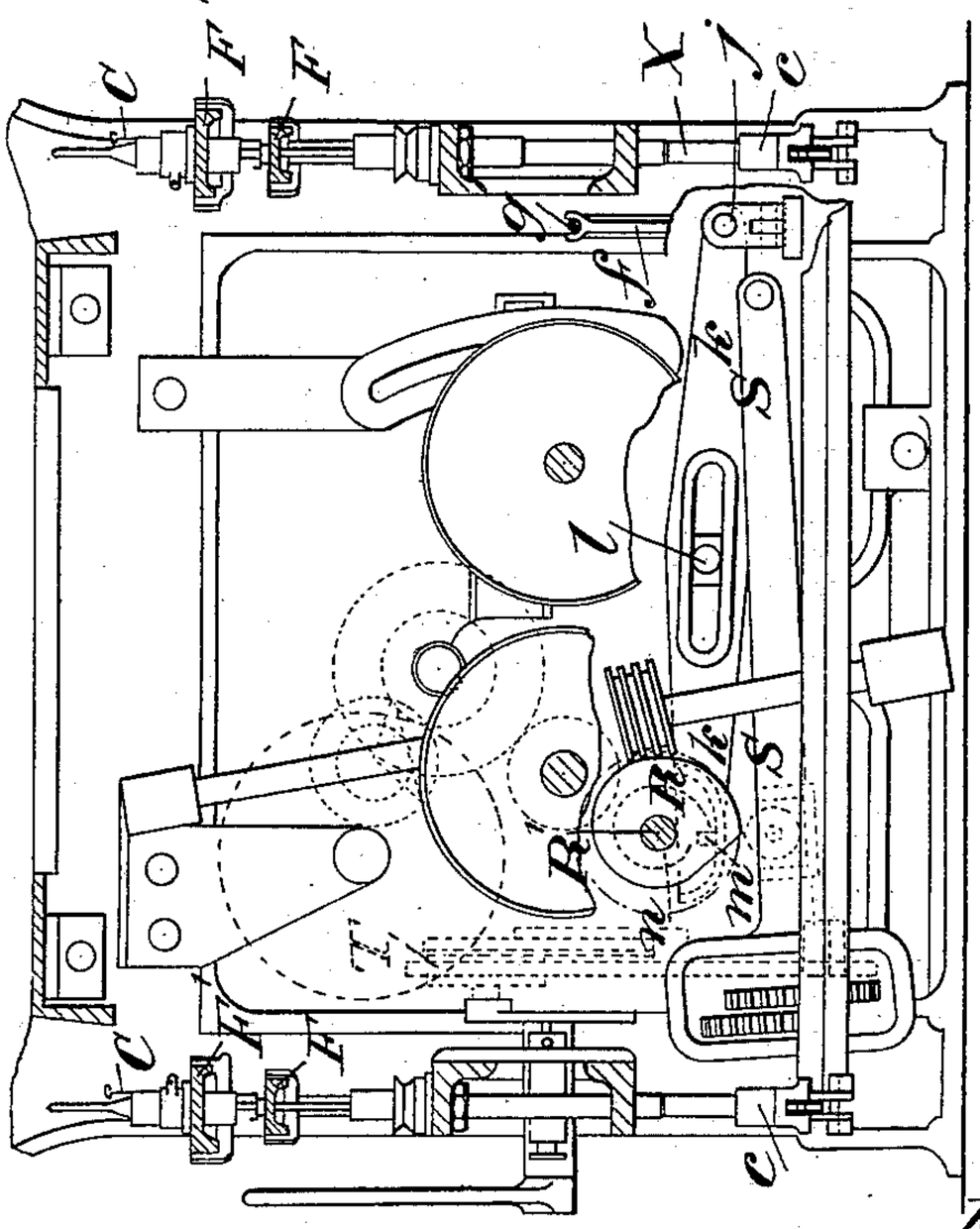



FIG. 8.

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## APPARATUS FOR SPINNING TEXTILE FIBERS.

(Application filed Nov. 10, 1896.)

(No Model.) 4 Sheets—Sheet 3.

FIG. 11.

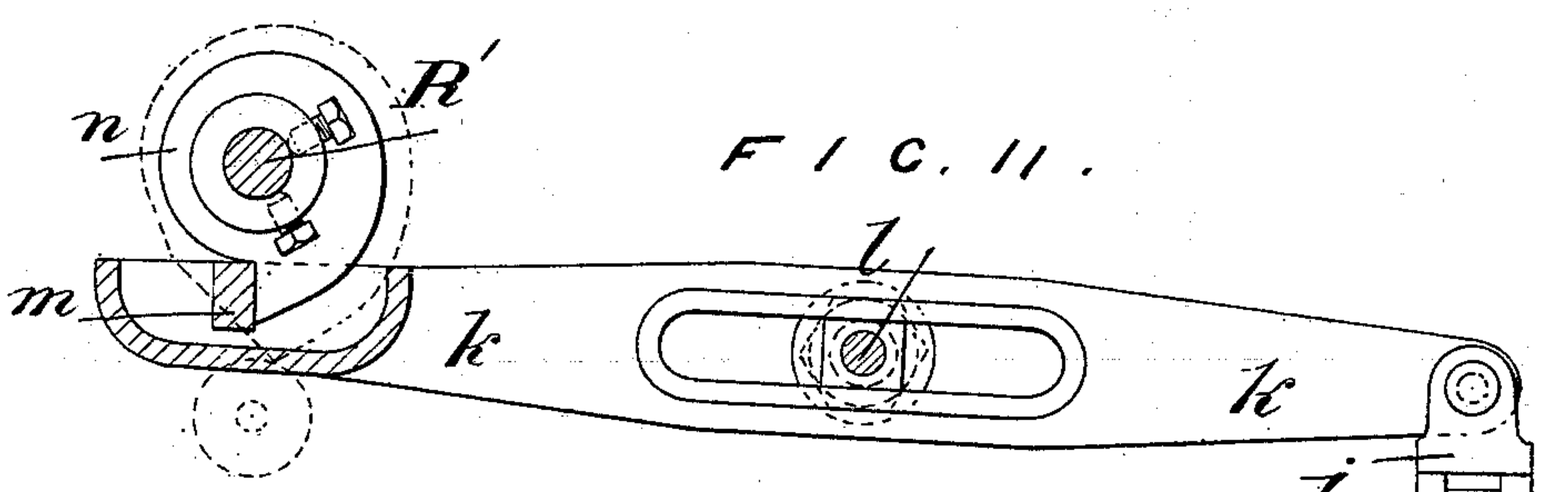



FIG. 12.

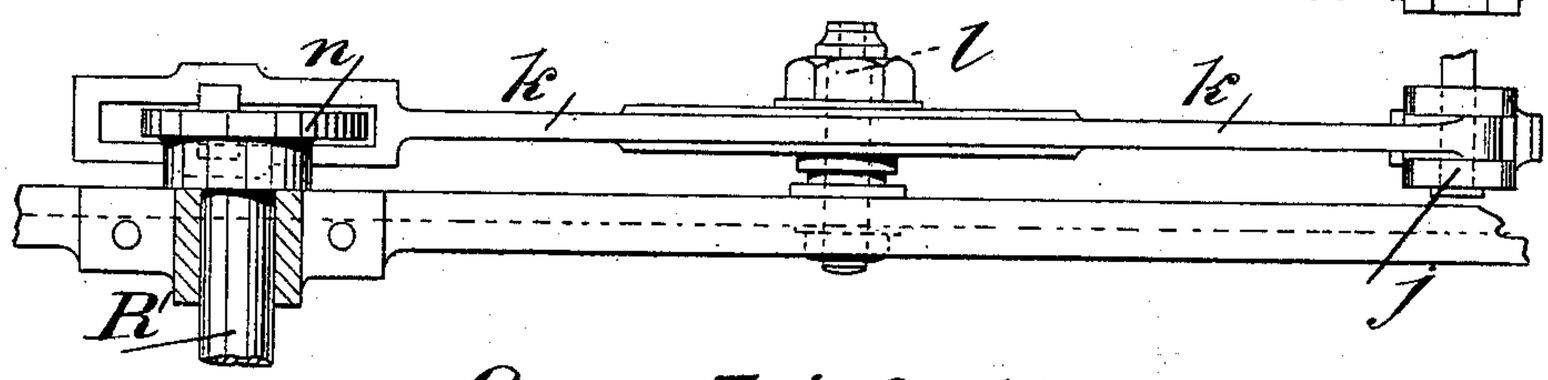



FIG. 13

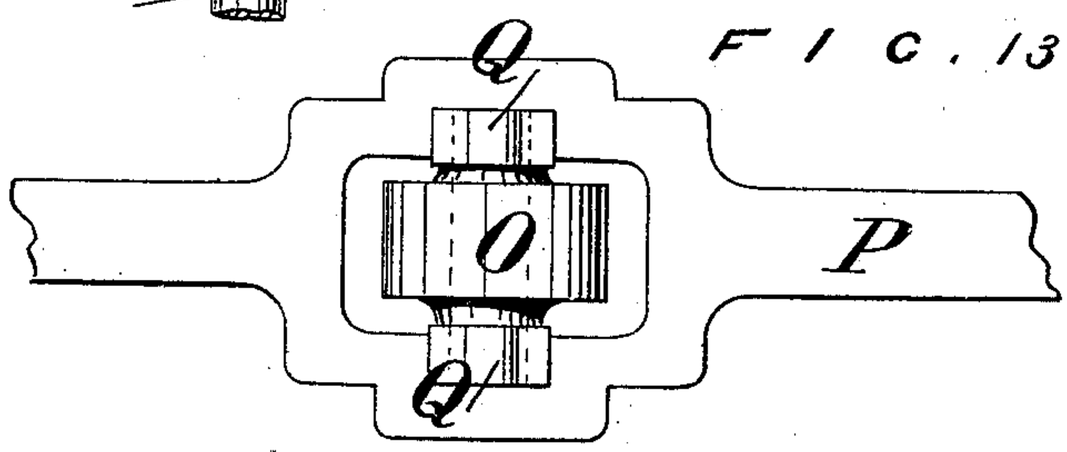



FIG. 14.

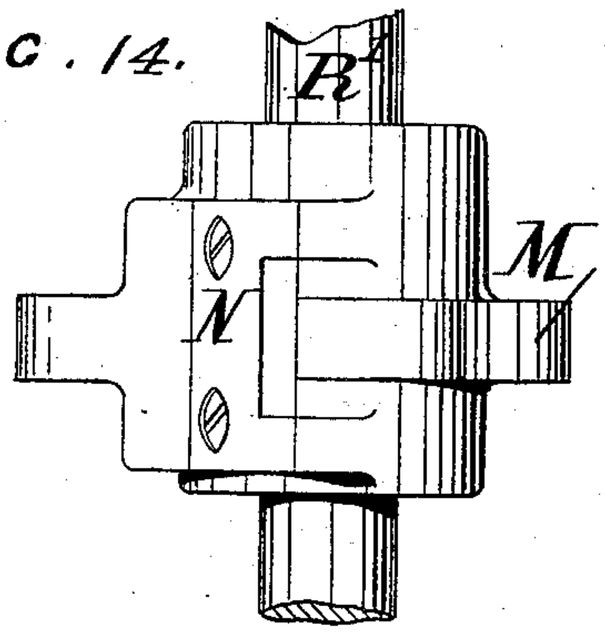
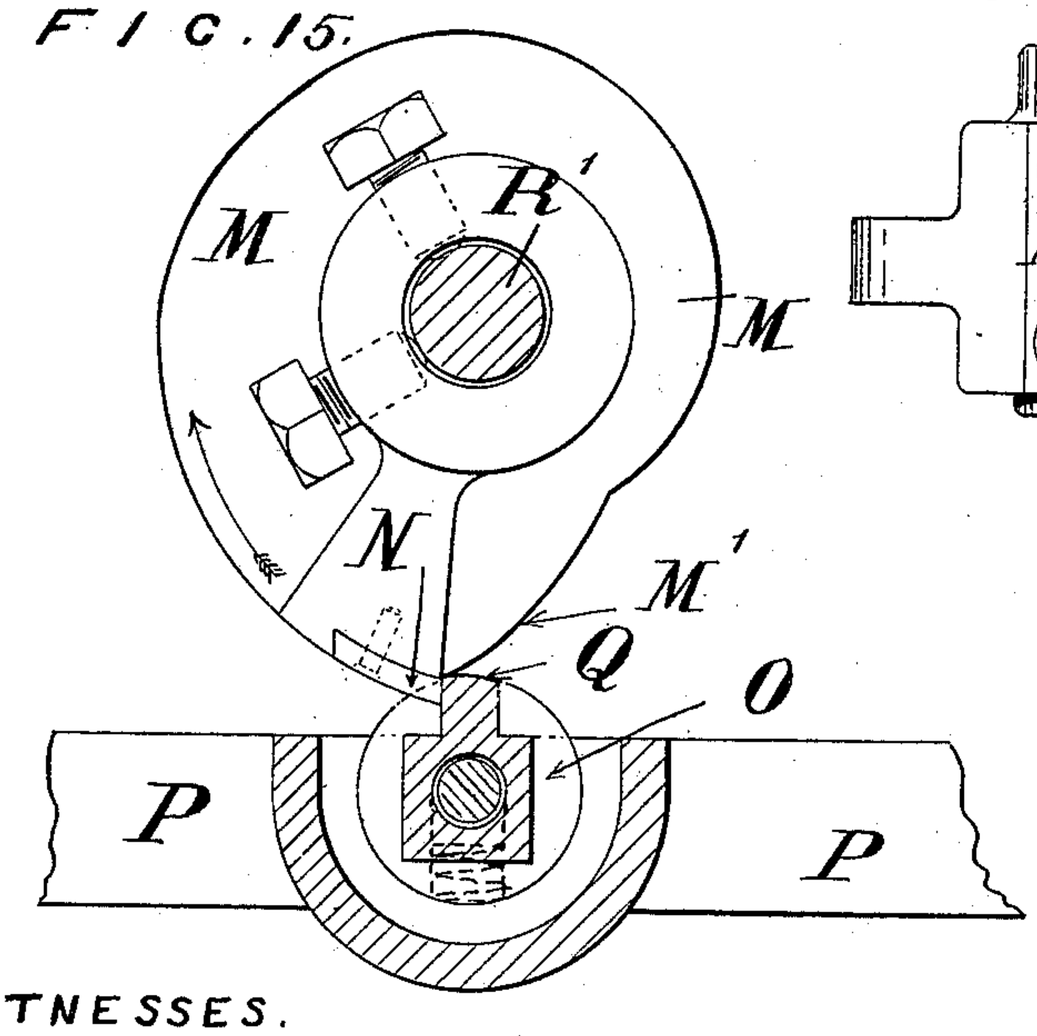



FIG. 15.

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(No Model.) 4 Sheets—Sheet 4.

FIG. 16.

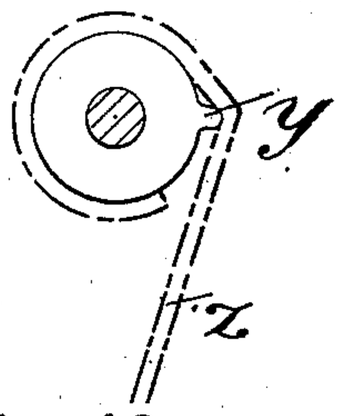



FIG. 17.

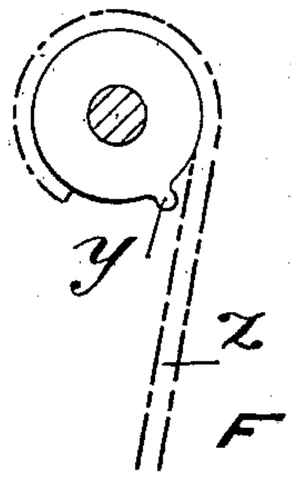



FIG. 18.

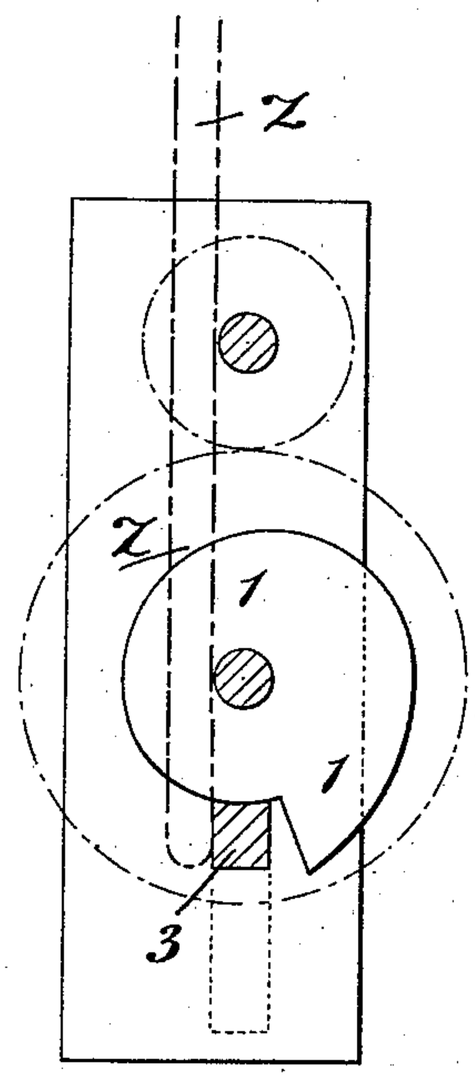
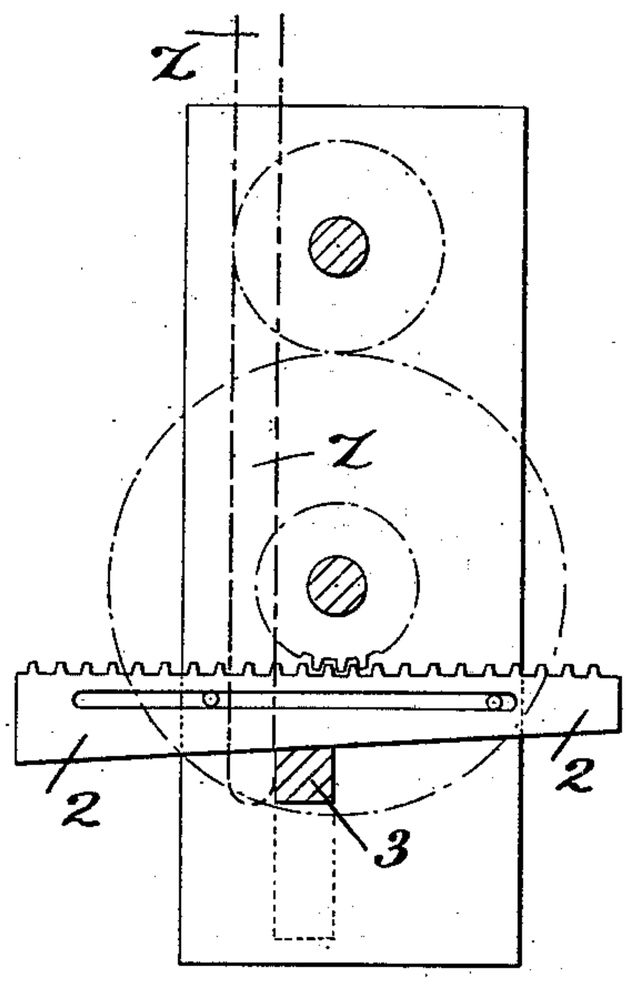



FIG. 19.

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# UNITED STATES PATENT OFFICE.

RICHARD TODD, OF HEATON CHAPEL, AND JESSE AINSWORTH STOTT, OF MANCHESTER, ENGLAND.

## APPARATUS FOR SPINNING TEXTILE FIBERS.

SPECIFICATION forming part of Letters Patent No. 624,266, dated May 2, 1899.

Application filed November 10, 1896. Serial No. 611,650. (No model.)

*To all whom it may concern:*

Be it known that we, RICHARD TODD, manufacturer, of Heather Bank, Heaton Chapel, and JESSE AINSWORTH STOTT, architect and engineer, of 5 Cross street, Manchester, in the county of Lancaster, England, subjects of the Queen of Great Britain and Ireland, have invented certain new and useful Improvements in Apparatus for Spinning Textile Fibers, (for which we have obtained patents in Great Britain, No. 21,414, dated November 12, 1895, and No. 22,377, dated October 9, 1896, and in Switzerland, No. 13,397, dated November 16, 1896,) of which the following is a specification.

Our invention relates to improved means for spinning yarns upon the bare spindle of the ordinary diameter in frames principally of the throstle type. Under our invention the spinning is effected by the aid of an elastic whip-traveler and by mechanism the principle of which is set forth in certain prior United States Patents, Nos. 40,957, 40,958, 40,959, and 40,960, granted to Ernst Gessner and now in force. In the specifications of the said patents a ferrule or ring is described, fitting the spindle loosely and carrying an elastic or rigid arm, with an eye through which the yarn passes to the cop or spindle. We prefer to use an eye of an elongated C shape, the front closed curve of the loop through which the yarn passes being shorter and lighter than the back open or free end. The object of thus giving weight to the rear of the eye is to insure that the heavier end will always through centrifugal force lie outward and so keep the arm or whip-traveler from twisting and catching the yarn. We also place a collar on the spindle just beneath the cop to prevent the eye of the traveler from approaching too closely and fouling the strands coiled on the spindle at the commencement of the cop.

Our present invention refers, among other things, to the employment of means whereby the fingers on the ferrule can be properly bent and shaped before being placed in the race of the carrying-ring. To effect this, we form the carrying-ring or its cap or cover in such a manner as to admit the bent fingers. For instance, we might make the ring with a gap or gaps filled by a removable cod-piece or cod-pieces, which could be easily taken out to admit the bent fingers and then be replaced. We might make the ring in two or more parts. Instead of forming the carrying or socket ring as a separate body we might form it in the thickness of the rail by suitable boring or cutting tools. A bush in the foot of the socket might carry the requisite raised rib at the foot. The caps or covers are held down on the sockets or rail by spring or other suitable clamps or holders. To obtain concentricity of the spindle with the socket-ring and the confining-sleeve or curb-ring set forth in the aforesaid British specification of Richard Todd, we prefer to make the ring which carries the said curbing-sleeve easily adjustable horizontally on the top lifting-rail, so that the sleeves can be set absolutely concentric with the spindles, or we may make the confining-sleeve or curb-ring fixed and the socket-ring adjustable horizontally. Therefore in setting the spindles of a frame made according to our invention we adjust the bolsters of the spindles in the fixed rail so as to be concentric with the socket-rings in the lower lifting-rail, (and in which the fingers of the ferrule run,) and we then adjust the confining-sleeves or curb-rings to be concentric with the spindles, or vice versa. The adjustment and fixing of the sleeves are most easily effected by having broad-headed screws and spring washers or clips, each of which laps over the flanges of two adjacent rings, so as to bind the same when adjustment has been effected. We might, however, use any other suitable clamps or holders.

In carrying our invention into effect we harden and polish the interior of the aforesaid curb-sleeves, thereby reducing the friction between the sleeve and the arm of the whip-traveler. In spinning-cops, and especially when spinning upon the bare spindle, as has been carried into effect by us, it is desirable to have a very quick reversal of the copping motion at the cop-tip. At present the copping-cam operates the rising and falling rail-lever and mechanism from a bowl running on the face of the cam. The rotundity of this bowl is an obstacle to obtaining the sudden drop which is necessary to effect the desired quick reversal, because the round

bowl instead of dropping smartly rolls over the edge of the break in the cam-surface. To help this, we use a steel block having a flat face and sharp corner placed side by side with the bowl. The cam-surface is also made broader for a small portion of the circumference, so as to provide a resting-surface for the block. The bowl rolls on the cam, as usual, until it encounters the break, when the block takes the weight from the bowl and rests on the cam-surface, completing the raising of the rails and remaining in contact with the cam-surface until exactly the point of reversal is reached, whereupon the corner of the block passes the edge of the break in the cam, and in a moment the rails drop, the reversal of the copping motion being sudden and sharp. By the indicated means a very neat, clear, firm, and sharp cop-tip is obtained. In the case of long frames, where the weight of the rails is so considerable that so sudden a drop of both rails at once might injuriously shake the frames, we suddenly drop the under rail only at the moment of reversal, the two rails then descending together at a less pace. To do this, we provide a second cam operating a second lever and working secondary lifting-levers pivoted on the ordinary lifting-levers. The rails are mounted separately on internal and external carrying-pokers and are separated by suitable springs. As the rails are raised the lower rail acquires a somewhat quicker lift from the said additional cam, and the springs between the rails are compressed when the rails reach the top of their lift. At this point the reversal of both rails takes place; but the release of the lower rail allows the compressed springs to jerk it downward and away from the upper rail, the fall being limited by a cotter fixed in the inner poker and passing through slots in the side of the outer poker, and we may soften this blow by a suitable air-cushion cylinder and piston. The two rails then complete their descent at an equal pace. By this arrangement the frame is saved from the shock which is likely to occur in long frames were both rails suddenly dropped at the same time. We also modify the means for taking up the copping-chain in frames of this description.

To render our said invention fully understood, we will now proceed to describe the same with reference to the annexed four sheets of drawings.

On Sheet 1, Figures 1 and 2 show the improved form of whip-traveler eye. Fig. $2^a$ shows the collar on the spindle for preventing the too close approach of the traveler-eye when the cop is being started. Figs. 3 to 6 show different modes of forming the ring-socket cap so as to facilitate the easy insertion of the bent arms of the ferrule. Fig. 7 is a partial front elevation of a spinning or throstle frame fitted with our improvements. On Sheet 2, Fig. 8 is a cross-section of the frame shown in Fig. 7. Figs. 9 and 10 show our improved method of connecting the upper and lower rails by springs, so as to insure a rapid reversal and withdrawal of the traveler-eye and yarn and so as to make a clean and firm nose on the cop. On Sheet 3, Figs. 11 and 12 show a secondary copping lever and cam for obtaining a quick fall away from the noses of the cops. Figs. 13, 14, and 15 illustrate an appliance for the same object fitted to the ordinary copping cam and lever. On Sheet 4, Figs. 16, 17, 18, and 19 illustrate the improved means for taking up the lifting-chain by the apparatus carried by the copping-lever.

Referring to Sheet 1, the improved form of whip-traveler eye is shown in Figs. 1 and 2. The improved eye is of an elongated **C** form, as shown. As indicated in Fig. 1, the yarn coming from the drawing-rollers passes through the closed shorter end of the loop C′. The open free end of the loop being heavier than the closed end turns naturally outward by centrifugal force as the whip-traveler C flies around, the shorter closed end turning toward the cop B. This keeps the yarn from catching or flying out of the eye. In operating with the whip-traveler described we have found that the loop of the traveler is apt to catch in the bottom of the cop when beginning to spin the cop. This is caused by the traveler-loop C′, which is intended to rise higher at each lift of the rails, not always doing so, owing to the unavoidable imperfection of the mechanism, which sometimes even drops the traveler-loop lower at one lift than it did at the previous lift. When this happens, the loop of the traveler is apt to dig into and foul the layer of yarn previously wound on, resulting sometimes in breakage. To prevent a too close approach of the traveler-head to the cop at the time when the cop is being started, we mount a small collar or disk *x* on the spindle just below the bottom of the cop, as shown in Fig. $2^a$. This collar acts as a fence to keep the traveler a certain distance from the spindle until the cop has become wound to such a thickness that centrifugal force is sufficient to prevent the traveler from digging into the cop. In a specification of even date herewith, Serial No. 611,649, we describe certain means for facilitating the insertion of the bent fingers of the ferrule into the socket ring-race. Figs. 3 to 6 in the drawings to the present specification illustrate additional improvements having the same object. As shown in Figs. 4 and 5, we might introduce the fingers of the ferrule by furnishing the socket ring-cap E′ with a removable cod-piece $E^3$, which could be slipped out to permit of the entry of the fingers and slipped back into position after the fingers had been introduced. Another mode would be to form the cap E′ in two pieces either by a straight cut, as in Fig. 5, or by a break-joint division, as in Fig. 6. In all of these arrangements the desired object is obtainable—viz., the placing of the already-bent fingers of the ferrule in the socket-race, thus avoiding the

necessity for bending the fingers after or while they are being placed in the race.

In spinning cops by our approved apparatus we provide means for forming the cops with firm and clean-spun tips or "noses." This result we obtain by causing the lifting-rail to reverse sharply and drop for a slight distance from the tip. The ordinary heart or copping cam does not permit of this quick reversal, seeing that the bowl rolls so slowly over the apex of the cam that quick reversal is impossible. To effect the required result, we either form the cam and working parts in such a manner as to give the said quick drop or reversal or we use a subsidiary cam which will bring about the desired results. Figs. 7 to 15 are intended to illustrate these parts of our invention. To begin with the simplest arrangement, we will first of all refer to Figs. 13, 14, and 15 on Sheet 3. For example, the cam marked M and appearing in Fig. 15 is the cam we should use in substitution for the ordinary heart-cam. The apex of this cam is made broader than the remaining part and is covered by a hardened-steel plate or shield N, secured by screws to the cam, as shown. The ordinary bowl O, which is carried in the ordinary lever P, rolls on the working face M of the cam. Side by side with the bowl O we mount flat fixed steel snugs Q. When the cam in revolving brings its wider part under the said flat snugs, the snugs slide thereon. When the bowl O comes to the apex of the working surface M, instead of rolling leisurely over it, as at present, the snugs Q, bearing on the steel facings N, keep the bowl O from rolling over and support it until it has passed the apex for some distance. The continued revolution of the cam M causes the steel facing N to pass from beneath the snugs, whereupon the lever P jerks up, the bowl O striking upon the downward slope M′ of the cam M, which latter continues its revolution until the motion just described is repeated. The result of this sudden spring of the lever P toward the center of the cam M is that the lifting-rail F drops suddenly at the moment of reversal and the yarn is pulled quickly from the tip by the eye of the whip-traveler, leaving the tip clean and sharp. The formation of the cam M, with its enlarged steel-faced surface, will be more apparent from the inverted plan view Fig. 14, while the bowl Q and flat studs mounted in the lever P are also shown clearly in plan in Fig. 13. To soften the shock when the bowl O drops on the face of the cam M, we may bed springs beneath the bearings of the bowl O, as shown in Fig. 15.

One objection to the sudden drop of the lifting-rails F F′ is that in a long frame the weight of the falling rails causes the frame to experience a shock. To avoid this drawback, we arrange to drop the lower rail F only, the upper rail F′ being more slowly lowered in the ordinary manner and by the ordinary copping-cam. To effect this result, we in the first place arrange the ordinary copping-cam R (see Fig. 11, Sheet 3) and ordinary copping-lever S and connect this ordinary copping-lever S in the usual manner through the barrel T and quadrant U (see Fig. 7) to the levers V, which operate the rails. The levers V directly operate the upper rail F′, this rail therefore rising and falling in the ordinary manner. The lower rail F, carrying the socket-rings and whip-travelers, is not rigidly connected to the rail F′, but has a spring or yielding connection of the following nature: On the rail F′ are brackets W, (see Figs. 9 and 10,) in which are suspended sleeves X. In the center of the sleeve is a poker Y, terminating in a foot Y′, which rests upon a lever *b*, the function of which will be afterward explained. The rail F is hung by the sleeves X to the rail F′, the sleeves X having an enlargement at the upper end which engages with the bracket W. (See the sectional view Fig. 10.) A cotter Z passes through the boss *a′* of the bracket *a*, secured to the rail F, and also through the central poker Y, and thus constitutes a point of suspension. It will, however, be noted that slots are cut in the wall of the sleeve X where the cotter Z passes through. These slots are longer than the width of the cotter, so that there is room for longitudinal play. The sleeve X extends down to the foot *c*, against which the bowl *d* of the lever V presses. Disregarding other arrangements, in the meantime it will be apparent that when the frame is at work (the cam R and copping-lever S acting in the usual manner) the sleeve X and two rails F and F′ would rise and fall with the ordinary regular copping movements; but to produce the combined dual motion we require to have an additional cam and lifting-levers which make the rail F move upward faster than the rail F′, compressing the springs *e* between the rails and at the top of the stroke suddenly releasing the rail F and allowing the springs *e* to jerk or kick the lower rail F downward for the distance by which it has overtaken the upper rail F′. This distance through which the lower rail is thus suddenly dropped is comparatively slight, but it is sufficient to give the necessary quick retraction of the eyes C′ of the whip-travelers C from the noses of the cops. The coiled springs *e* are placed between the brackets W and the face of the rail F, so as to permit of the approach of the rail F toward the rail F′. As has already been said, the enlarged foot Y′ of the solid central poker Y rests on a horizontal lever *b*, this lever being pivoted on the lever V. Upon the pivots of the levers *b* are fixed other levers *f*, which extend perpendicularly and are worked by a rod *g*, which extends along the frame and is connected to a bell-crank lever *h*, centered at *i′* at the end of the frame. The horizontal arm of the bell-crank lever *h* is connected by a link *j* to one end of a lever *k*, which rocks upon an adjustable center pivot *l*, arranged in a slot about the middle

of the lever. The other end of the lever *k* is furnished with a steel follower *m*, which works against a cam *n*, fixed on the shaft R′ of the ordinary copping-cam R. The cam *n* and the steel follower *m* on the end of the lever *k* appear in Fig. 11, while the cam and lever are shown fully and to an enlarged scale in Figs. 14 and 15, Sheet 3. It will be seen that a portion of the cam *n* is concentric with the shaft and a portion swells outward and terminates suddenly in a drop. Now it will be easily understood that if the lever which is actuated by the cam *n* is mounted on a lever already receiving separate and independent motion from another cam, as is here the case, the swell on the periphery of the cam *n* will give the excess motion, which enables the lower rail F to creep up toward the upper rail F′. This is what actually takes place. The lever V receives its motion from the ordinary copping-cam R and carries on its back the secondary lever *b*. This secondary lever *b* receives its separate and independent motion from the cam *n* in the manner described, and thus the cumulative motion of the lever *b* is derived from the motion of the cam R plus the motion of the cam *n*. The result of the arrangement is that as the rails are nearing the end of the upward stroke the rail F begins to gain upon the rail F′, compressing the spring *e* as it does so. When the rails have reached the top of their stroke and the yarn is at the nose of the spindle, the sharp drop on the periphery of the cam *n* comes opposite to the steel bit *m* on the lever *k*. The cam *n* thus ceasing to exercise its compressing pressure, the springs *e* are released and immediately shoot the lower rail F downward for a short distance, thus obtaining the sharp and quick reversal from the noses of the cops, which is necessary to produce the desired sharpness and firmness in the cop-nose. After this sudden drop of the rail F the two rails descend together in the usual manner. To prevent the rail F from dropping with too sudden a shock, we might attach the end of the rod *g* to the piston *o* of a buffing or air cylinder *p*, or other means for softening the shock might be employed.

There are different ways of readily and easily securing the curbing-sleeves G to the rail F′. For example, as shown in Fig. 9, we might mount a split collar *r* upon the rail, with a tightening-screw *r′* to draw the halves together. When the curbing-sleeve G has been placed in the said collar, the tightening of the screw *r′* causes the collar *r* to grip the sleeve G equally all around, thus obviating the possibility of crushing or distorting the sleeve G. This is important, because we have found in practice that if the interior of the sleeve G is not truly round the whip-traveler C grinds and does not work well. Another advantage of this mode of securing the sleeve G is that by having a wide clearing-hole through the rail F′, as appears in Fig. 11, the sleeve G, with its collar, can be set and adjusted on the rail, so as to get the center of the sleeve exactly in line with the center of the socket-ring E E′ in the rail F beneath and truly concentric with the spindle. These also are important points, as without exactitude of this sort the whip-traveler will never work well. To bind the collar and sleeves to the rail F′, we might use a steel-washer K, held to the rail by a screw K′. The facility for relatively setting the sleeve G and the socket-ring might also be obtained by making the sleeve a fixture and the socket-ring adjustable, as is shown, for example, on the right-hand side of Fig. 10. Here the socket-ring E is set in the rail F in a hole wide enough to permit of adjustment, while the sleeve G is held in a collar passing through the rail F′ and not permitting of adjustment.

To secure that the whip-traveler shall work with the least possible friction, we harden and polish the interior circumference of the curbing-sleeves G. When this is done, we find that the frictional drag on the traveler is very slight and does not at all affect the efficient working of the appliance.

Instead of forming the carrier or socket ring E as a separate body we might bore or cut the under part of the socket out of the substance of the rail F, as shown, for example, in Fig. 10. To provide the necessary under ridge or lip to carry the traveler-fingers, we might insert a bush E× in the lower part of the recess.

To effect an approximation to a mule-cop, it is the ordinary practice to fix a snug or projection on the periphery of the chain-wheel of the copping motion, which virtually at that part increases the diameter of the wheel and causes a shorter lift at the bottom of the cop, the lift gradually increasing as the revolution of the chain-wheel takes the snug or projection out of the way of the chain. Such a snug or projection is shown in Figs. 16 and 17 on Sheet 4, Fig. 16 showing the snug *y* as taking up the chain *z*, while Fig. 17 shows the chain-wheel revolved so as to move the snug from beneath the chain. We propose that instead of the other end of the chain being wound on a wheel by the action of the ratchet and pawl at the end of the copping-lever, as usual, the ratchet and pawl shall actuate a cam 1, as in Fig. 18, or wedge 2, as in Fig. 19, which can be made the correct shape and which will operate a sliding follower 3, that will take up the chair *z* as the copping proceeds, so as to produce any build of cop that may be desired.

What we claim as our invention is—

1. In combination with the spindle, and the upwardly-extending flexible whip-traveler, the collar on the spindle below the position of the cop, substantially as described.

2. In combination the traveler-ferrule, and the socket having a cover comprising separable portions which will permit the insertion of the ferrule, substantially as described.

3. In combination the traveler-ferrule and

the socket having a cover with a separable piece E to permit the insertion of the ferrule, substantially as described.

4. In combination with the lifting-rails, the socket on one rail, the curbing-sleeve on the other rail, and the split clamping-collar with means for tightening the same about the sleeve and with means for holding the sleeve to the rail, substantially as described.

5. In combination with the lifting-rail, the traveler, the curbing-sleeve, said sleeve passing through an opening in the rail of larger diameter by which said sleeve may be adjusted laterally, and the split collar surrounding the sleeve, with means for clamping the same in place about the sleeve and means for adjustably holding the collar to the rail to permit adjustment thereof laterally of the opening, substantially as described.

6. In combination with the copping-lever and traveler, a heart-shaped cam having an additional part to present a sudden break in the cam-face, the bowl on the copping-lever having a flat contact-piece to bear on the additional part of the cam whereby the bowl will be carried forward until the flat piece reaches the break when the bowl will drop suddenly against the cam-face, producing a sudden reversal of the traveler to form a clean sharp nose to the cop, substantially as described.

7. In combination with the traveler, the copping-lever, the heart-shaped cam, the bowl on the lever, said bowl and cam having contact-surfaces to produce a sudden drop of the bowl to the cam-surface, and the spring-bearings for the bowl, substantially as described.

8. In combination, the traveler, the upper and lower rails, capable of having movement independent of each other, means for giving the rails their movements, said means comprising devices for giving the lower rail a sudden drop to reverse the traveler suddenly for making a clean sharp nose to the cop, substantially as described.

9. In combination the upper and lower rails, the traveler carried by the lower rail, means for giving the rails independent movements including devices for permitting the lower rail to drop suddenly and the spring connection between the two rails for kicking the lower rail downwardly, substantially as described.

10. In combination the upper and lower rails, the traveler carried by the lower rail, means for giving the upper rail its rising movement, the spring connection between the rails, means for lifting the lower rail in advance of the upper rail to compress the spring, said lifting means comprising devices to permit a sudden release of the lower rail, so that the spring will kick the same downward, substantially as described.

11. In combination, the two rails having independent pokers or lifting-rods, the lever and heart-shaped cam for giving the upper rail its movements, the secondary lever carried by and moving with the lever on the upper rail, with means for giving said secondary lever a movement additional to that derived from the lever of the upper rail, said secondary lever being connected to the poker of the lower rail, and the spring connection between the lifting-rails for kicking the lower rail downwardly, substantially as described.

12. In combination the two rails, the main lever and cam with connections to the upper rail, and the supplemental lever carried by the main lever and the independent cam for operating the same, said supplemental lever being connected to the lower rail, substantially as described.

13. In combination the lifting-rail, and the curbing-sleeve carried by a collar capable of adjustment on the rail so as to bring the curbing-sleeve concentric with the spindle, substantially as described.

14. In combination the lifting-rails, the curbing-sleeve, the supporting-collar and the binding-clip to hold the sleeve in the collar, substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

RICHARD TODD.
JESSE AINSWORTH STOTT.

Witnesses:
JOSHUA ENTWISLE,
RICHARD IBBERSON.