

(No Model.)

8 Sheets—Sheet 1.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.

(No Model.)

8 Sheets—Sheet 2.

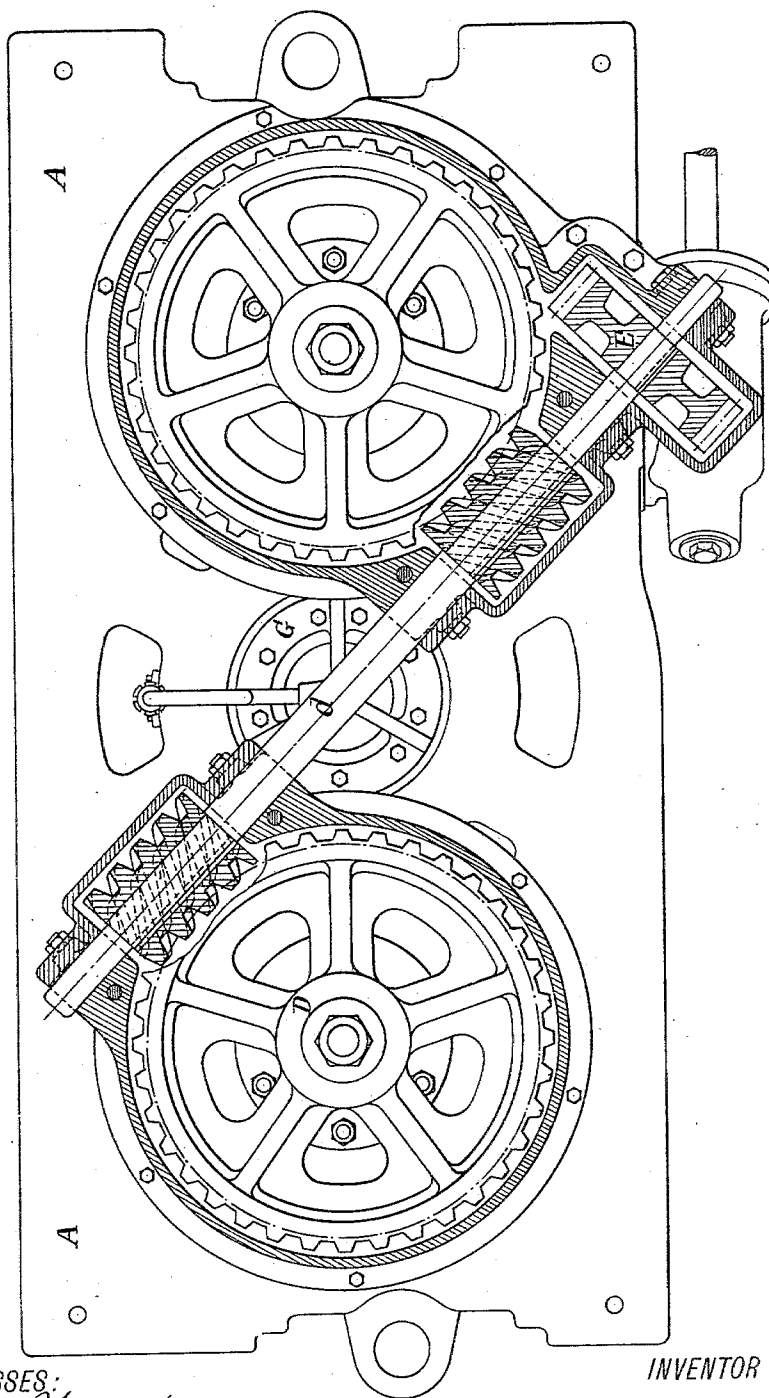
W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.

-Fig. 3-



WITNESSES:

John L. Phillips

E. W. Harper

INVENTOR

Wm. Sellers

(No Model.)

8 Sheets—Sheet 3.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.

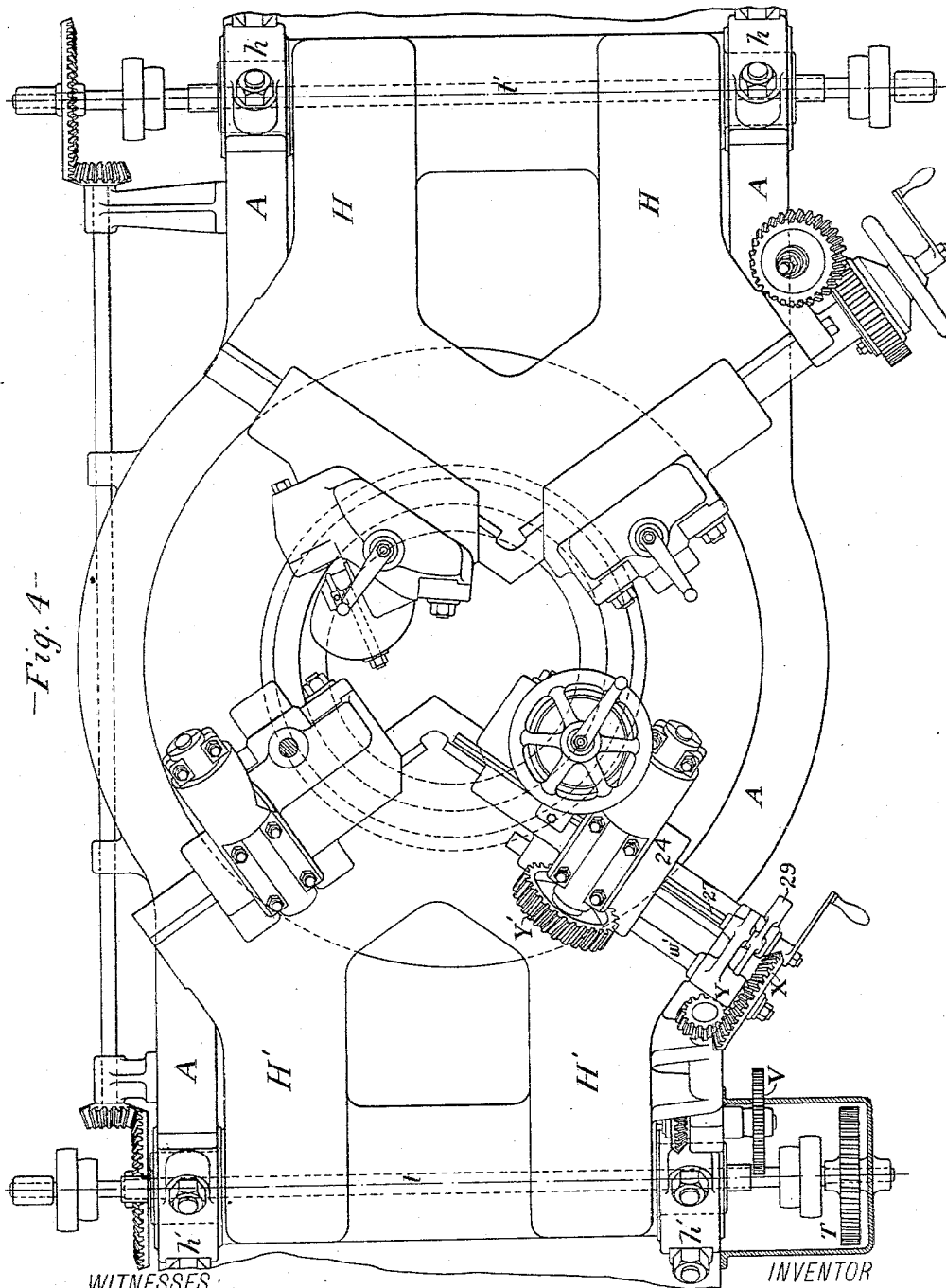


Fig. 4--

WITNESSES:

John L. Phillips

E. A. Harper

INVENTOR

Wm. Sellers

(No Model.)

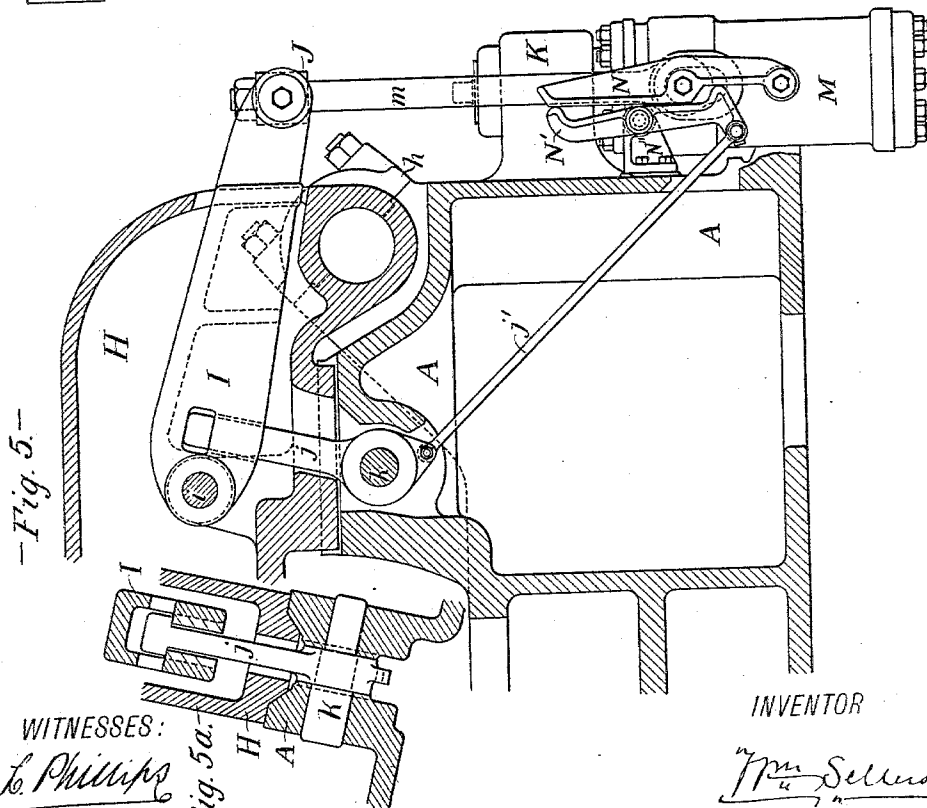
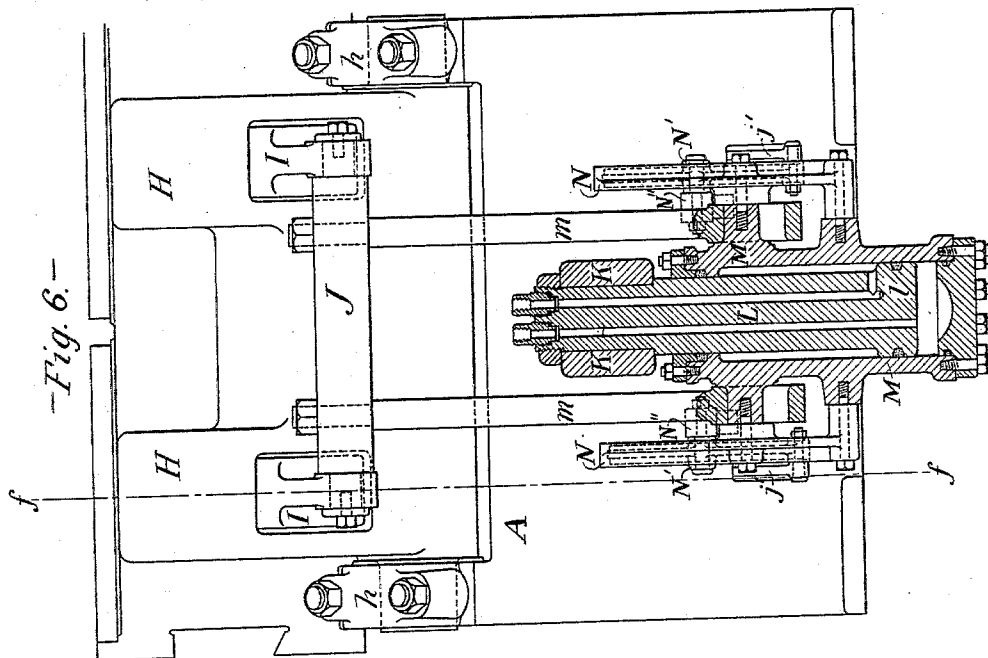
8 Sheets—Sheet 4.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.



WITNESSES:
John L. Phillips

E. A. Harper

Fig. 5a.

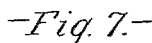
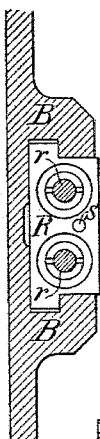
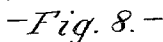
INVENTOR

Wm. Sellers

8 Sheets—Sheet 5.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.
No. 566,702. Patented Aug. 25, 1896.

Patented Aug. 25, 1896.



WITNESSES:

INVENTOR

John L. Phillips

E. N. Harper

Mr. Sellers

(No Model.)

8 Sheets—Sheet 6.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896

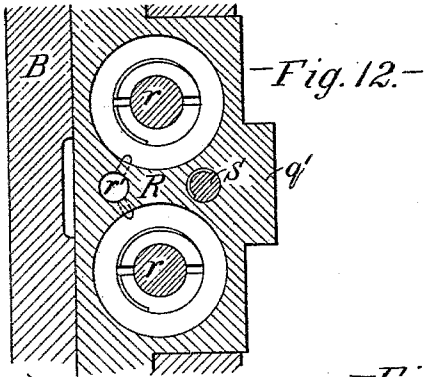
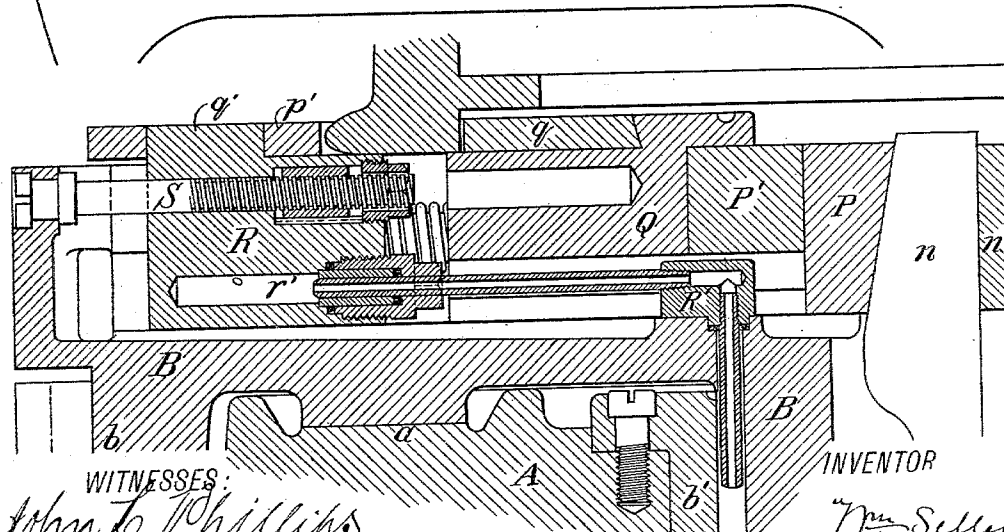
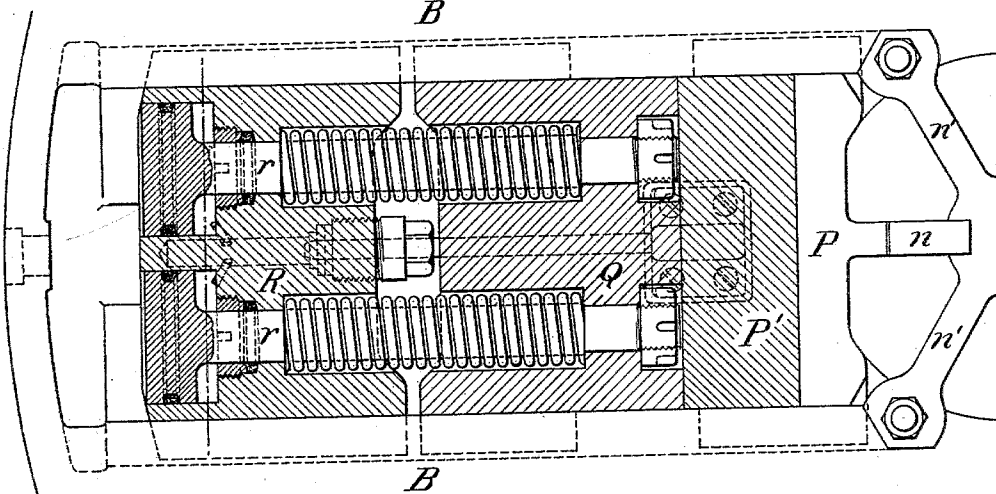


Fig. 12.—



WITNESSES:

John L. Phillips

E. A. Harper

Fig. 10.—

INVENTOR

Wm. Sellers

(No Model.)

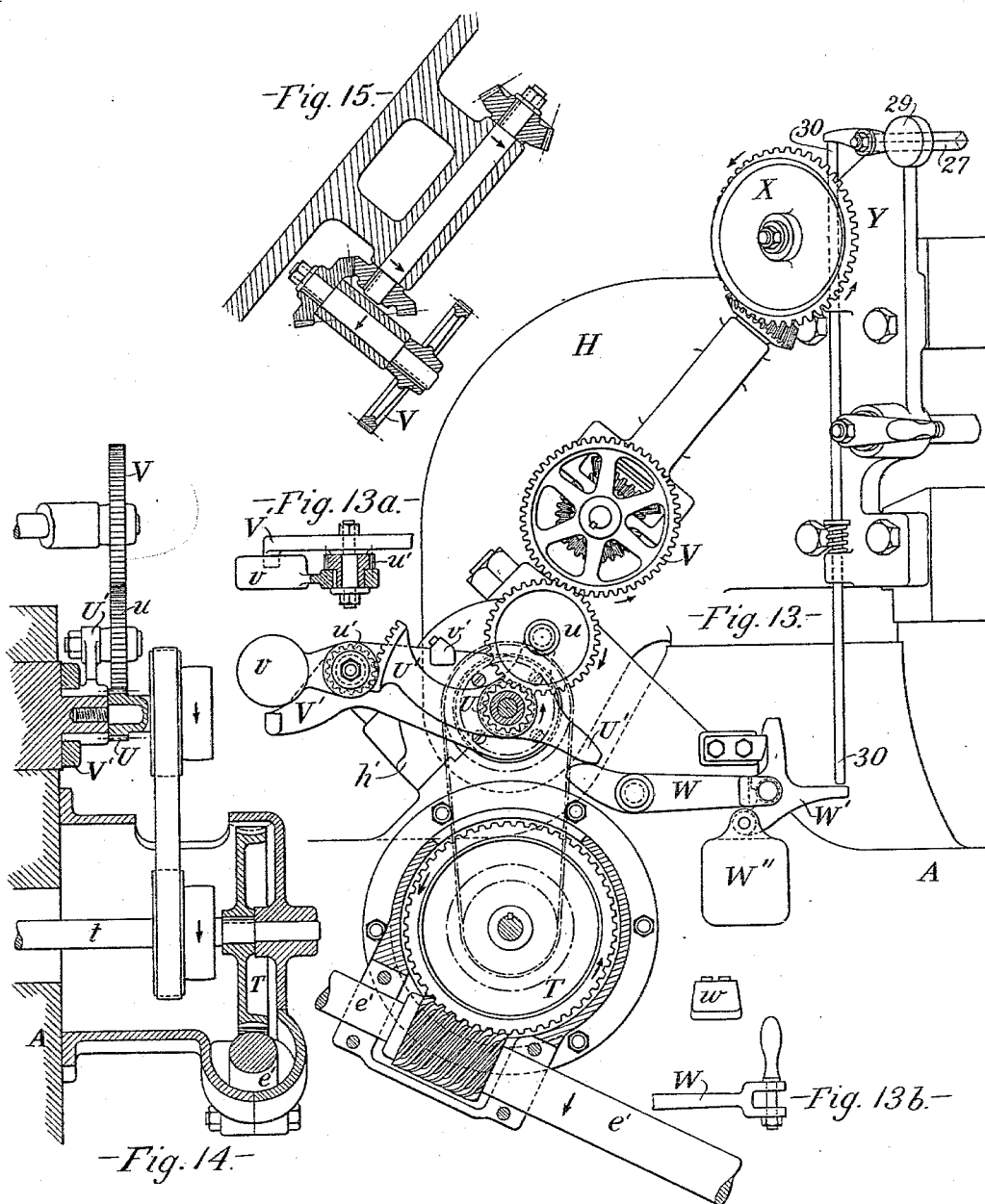
8 Sheets—Sheet 7.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.



WITNESSES:

John L. Phillips

E. A. Harper

INVENTOR

Wm. Sellers

(No Model.)

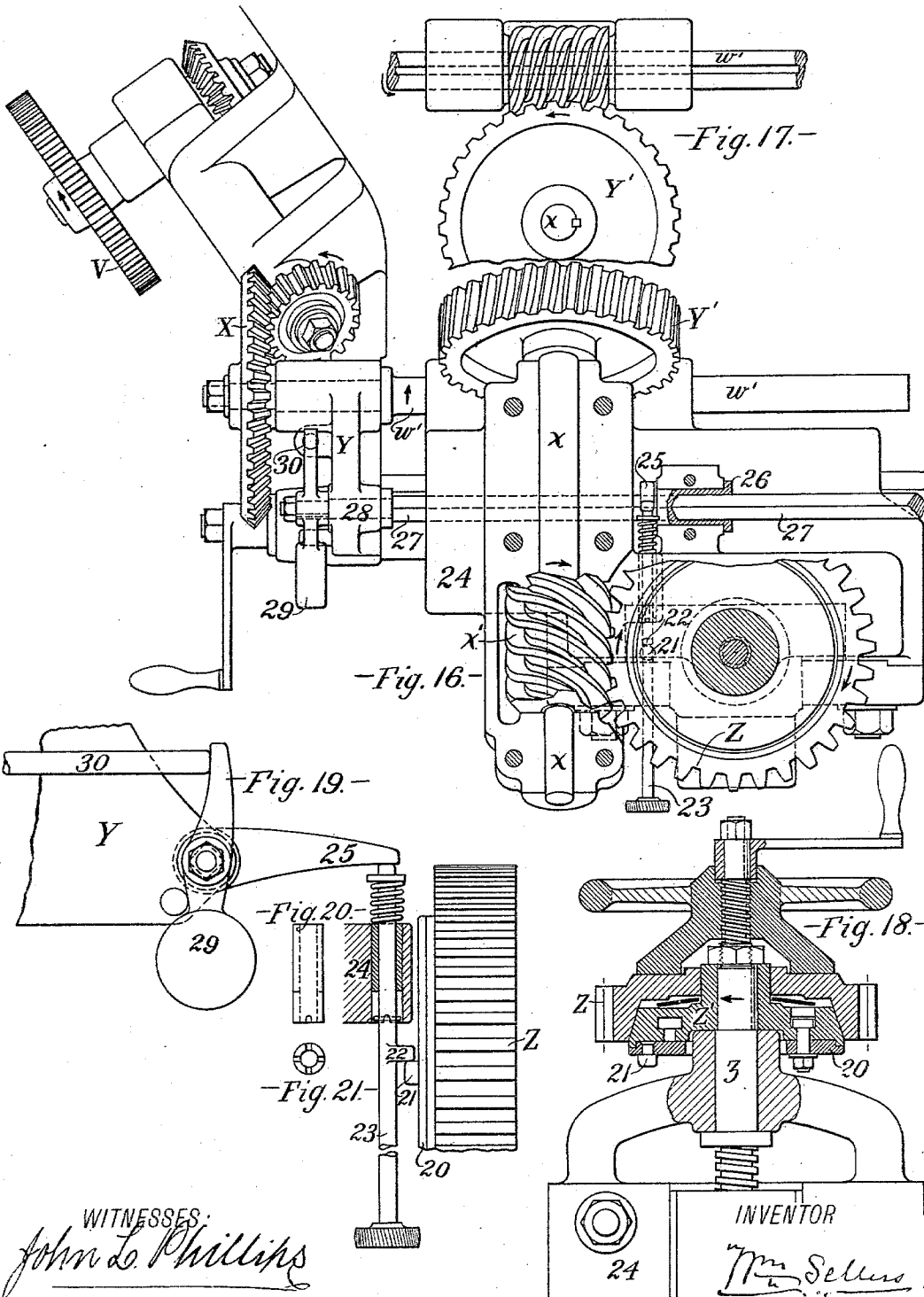
8 Sheets—Sheet 8.

W. SELLERS.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY WHEELS.

No. 566,702.

Patented Aug. 25, 1896.



WITNESSES:

John L. Phillips

E. A. Harper

UNITED STATES PATENT OFFICE.

WILLIAM SELLERS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
WILLIAM SELLERS & COMPANY, INCORPORATED, OF SAME PLACE.

MACHINE FOR TURNING STEEL TIRES FOR RAILWAY-WHEELS.

SPECIFICATION forming part of Letters Patent No. 566,702, dated August 25, 1896.

Application filed October 2, 1894. Serial No. 524,746. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SELLERS, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Machines for Turning Steel Tires for Railway-Wheels, of which the following is a specification.

My invention relates to that class of turning machines or mills in which the work to be turned revolves about a vertical axis, although my improvements are also applicable to turning-lathes in which the work revolves about a horizontal axis.

When the rolled-steel tire is finished at the rolling-mill, it has very nearly the shape intended for it, when it is ready to be secured upon the wheel center, which, with the tire, makes the complete railway-wheel. Consequently it must be held by friction to the face-plate which supports it during the operation of turning it. The exigencies of modern practice require that it shall be chucked or automatically centered upon the face-plate, and to secure the necessary friction to hold the tire when subjected to the strain of the cutting-tools in turning it the pressure of the chuck-jaw upon the inner circumference of the tire must be very great. This pressure, applied, as it always is, at three places around its inner circumference, is in fact so great that the tire is invariably sprung and in this condition it is turned upon its interior and exterior circumference to its finished size. When such a tire is released from the chucking strain and removed from the turning-machine it must be more or less out of truth as a cylinder, and from this cause it is practically impossible to make such tires interchangeable upon the wheel centers. This difficulty is increased by the extreme width of cut, which to expedite the work has now become the modern practice, the width being limited only by the ability to hold the tire securely under the cut, but as the surfaces, which may be turned at one time, are almost always three, and frequently four, the capacity for holding the tire promptly and securely is much less than the capacity for turning it.

It is one object of my invention therefore to turn tires so accurately to size that they will be interchangeable upon the wheel cen-

ters, whereby we may have standard sizes of wheel centers with tires that will fit them whenever it is desirable to assemble them for new work or to replace a worn-out or defective tire with a new one.

Another object is to hold the tire so firmly under the turning operation that three or four cuts may be taken at the same time, each of them the full width of the surface to be turned.

Another object is, while holding the tire firmly for the turning operation, to hold it without straining it, so that when finished it may be truly cylindrical.

Another object is to stop the feeding movement of the turning-tools automatically as each one of them reaches the position which will give the proper size to the surface it is acting upon, whereby the operator will be enabled to adjust and control them all with facility, and another object is to automatically remove, replace, and secure the slide-rests which control the movement of the cutting-tools with such facility that the operator can remove a finished tire and exchange it for a rough one and secure it without attention to the movements of the slide-rests.

To these ends my invention consists in first centering or chucking the tire upon its inner circumference and then gripping it upon its exterior, so that the chucking pressure upon the inner circumference will be little more than sufficient to center the tire, while the central chuck forms an abutment against which the exterior pressures are exerted, so as to grip the tire between the two.

It further consists in the arrangement of apparatus whereby these consecutive movements of centering and gripping will be automatic.

It further consists in arranging the slide-rests upon axle-frames on opposite sides of the face-plate, each axle-frame operated by a device which at one end of its stroke locks an axle-frame and its slide-rests securely to the bed, and in moving to the other end of its stroke it first unlocks the axle-frames from the bed and then rotates them about their axes, so as to elevate and move the slide-rests apart and afford room for removing the finished tire and replacing it with a rough one.

It further consists in latching the feed-gearing for each slide-rest in its driving position and unlatching it automatically by an adjustable stop, whereby the feed-gearing will drive itself out of gear without feeding the tool after the gearing is unlatched; and it further consists in an arrangement of gearing for driving the face-plate on opposite sides of its axis of rotation, so that the strain of driving shall be equal on each of the opposite sides.

In order that I may more fully explain my improvements, I will now refer to the drawings which form a part of this specification, in which—

Figure 1 represents a side elevation of my turning-mill, partly in section. Fig. 2 is a plan of the spiral and spur driving-gear, which are shown on the side of Fig. 1. Fig. 3 is a view looking upward of the bed and the gearing upon its under side with the covers of the worm-wheels and worms removed. Fig. 4 is a plan of the bed of the machine with the slide-rests and their supporting-axes in position above it. Fig. 5 is a vertical section of the bed and the axle-frame which carries the slide-rests in a plane that would pass through one of the arms which rotates the axle at one end of the machine, showing the machinery of rotation; and Fig. 5^a shows its locking-bolt. Fig. 6 is an end elevation of the same, showing the hydraulic cylinder which rotates the axle in section through its vertical axis. Fig. 7 is an enlarged section of the face-plate shown in section in Fig. 1. Fig. 8 is a plan of the same, showing one of the chucks and its gripper in section. Fig. 9 is an end view of the gripper with a portion of the face-plate in section. Fig. 10 is an enlarged elevation in section of a chuck and its gripper with a portion of the face-plate. Fig. 11 is a plan of the same in section through the axis of the compressing or gripping cylinders. Fig. 12 is a cross-section of these cylinders. Fig. 13 is a side elevation of one end of the turning-mill, showing the feeding and the stop movements of one of the slide-rests. Figs. 13^a and 13^b are plans of details in Fig. 13. Fig. 14 is an end elevation of the same. Fig. 15 is a longitudinal section in the axis of the inclined feed-shaft shown in Fig. 13. Fig. 16 is a plan of the top of the vertical slide of the slide-rest shown in Fig. 13. Fig. 17 is an end view of the worm-wheel and worm on the bevel-wheel shaft of Fig. 16. Fig. 18 is a sectional elevation of the spiral gear and its friction-clutch shown in plan on Fig. 16. Fig. 19 is a side view, on an enlarged scale, of this spiral gear, showing the stop-motion which is in plan on Fig. 16. Fig. 20 is a view of the locking-bushing in section on Fig. 19, and Fig. 21 is an end view of the same.

In all of the figures similar letters indicate similar parts.

Referring now to Fig. 1, A A is the bed, in the center of which the face-plate with its spindle B B is shown partly in section, the vertical support for which, *a*, is annular and

rests on a corresponding surface of the bed, with ribs on each side of the surface on the bed, as shown, to retain the oil. Near the periphery of the face-plate B B is an annular rib *b* with gear-teeth on its exterior surface, by means of which the face-plate is rotated when driven by the pinion C, mounted upon the shaft *c c*. The upper end of this shaft revolves freely in the bearing cast with the bed A A on its upper side, as shown, while the lower end of the shaft is supported in the bushing *c' c'*, the outer diameter of which is larger than the pinion, so that the pinion, bushing, and shaft may be inserted together into the bed A A, to which the bushing is securely attached by bolts, which pass through the flange on the lower end of the bushing and screw into the bed, as shown. On the lower end of the shaft *c c* is mounted and securely fastened thereto a worm-wheel D, which is driven by a worm mounted upon the shaft *d*. A similar driving system is placed upon the opposite end of the bed, so that the face-plate B B may be driven upon opposite sides, and that the strain of driving may be equally divided between the two systems. This will be more clearly understood from Sheet 2, Fig. 3, in which the worm-wheel D and the worm-shaft *d* are shown. The two worms on this shaft have, respectively, right and left hand threads that each may push or pull against the other, and the shaft is diagonal to the bed that the worms may gear upon opposite sides of the worm-wheels, and thereby drive both worm-wheels in the same direction, so that both may act to turn the face-plate in one direction.

It must be noted that the worms are not bound endwise, so that the face-plate alone may act as a balance-beam to keep the worms in the same angular position to the worm-wheels and thereby distribute the load equally between the two worms.

On the outer end of the worm-shaft *d* is mounted and firmly secured a spiral wheel E, which is driven by the worm *e*, Fig. 1, mounted upon the inclined shaft *e' e'*, supported on the side of the bed A A by suitable stands securely attached to the bed, as shown. On the outer end of this shaft is secured a bevel-wheel, which meshes with the bevel-pinion mounted upon the horizontal shaft across the end of the bed A A, which supports it, so as to firmly maintain the driving-pulley F against the strain of the belt, which drives the face-plate B B through the two systems of gearing now described.

The axial position of the face-plate is fixed in the bed A A by the bushing *b' b'*, the circumference of which is turned to fit accurately in the bed, while its inner surface fits the spindle B of the face-plate and permits the spindle to turn freely therein. Upon the lower end of the spindle is bolted the annular plate G, which extends beyond the spindle, so as to fit under the bushing *b' b'*, thereby preventing the face-plate from lifting with

any kind of a cut. This annular plate G is provided with three arms to a central hub on both sides of the arms, the object of which will be explained hereinafter.

5 The arrangement of the slide-rests in plan is shown in Fig. 4, from which it will be understood that there are four, two upon each end of the bed, each pair of slide-rests movable upon the end surfaces of the axle-frames 10 H H and H' H', which surfaces are at an angle to each other, so that the slide-rests on opposite sides of the bed may not interfere. Each frame is provided on each side with journals supported in bearings *h h* and *h' h'*, cast with 15 the bed A A and provided with caps bolted to the body of the bearing, so that each frame may be conveniently attached to the bed and may rotate about the axes of its journals through an angle of ninety degrees.

20 All of the slide-rests when in position for working have a horizontal and a vertical movement; but the automatic feeds are arranged for a vertical or a horizontal movement only, dependent upon the character of work each 25 is intended to perform. As thus arranged, it is evident that the slide-rests are above and so cover the tire to be turned that it would be practically impossible to remove the finished tire and replace it with a rough one, 30 and for this reason, as also to avoid any movement of the slide-rests on the axle-frames to change tires, the frames H H and H' H' are arranged to rotate about horizontal axes, whereby the finished tire will be completely 35 uncovered, and it may then be removed and a rough one substituted without any interference with the slide-rests. The means by which this is accomplished are shown in Figs. 5 and 6, and, as the frames H H and H' H' 40 are of the same construction and mode of operation, the description of one will serve for both.

Fig. 5 represents a section through one of the arms of H H and the bed A A on the 45 dotted line *f f*, Fig. 6, the interior arrangement of each arm being the same. There are therefore two lever-arms I I, both alike, one in each arm of the frame, and the side view of one of these levers is shown in Fig. 5.

50 These levers are pivoted at *i* in the arms of the frame H H, and their outer ends are united by the cross-head J, which rotates freely in the ends of the levers to which it is attached. At the outer end of the frame H H, 55 through which the levers I I pass to the cross-head J, I provide a lost motion above and below the levers, as shown, the purpose of which will be explained later. Near the pivot *i* I provide a T-headed bolt *j*, the lower end 60 of which is pivoted to the bed A A at *k*, so that the T head or upper end may move from and toward the pivot *i*. When this head is nearest the pivot *i*, it is over a projection in the lever I, which will prevent this lever from 65 raising, (see Fig. 5^a;) but when it is moved the proper distance from the pivot *i* it escapes

from the projection and the lever I can be raised freely.

At the end of the bed A A and under the center of the cross-head J, I provide a strong 70 support K, cast with the bed, the outer end of which support is bored out to receive and support the piston-rod L, Fig. 6, which is securely attached to the support K. The lower end of this piston-rod L is provided with a 75 piston *l*, and through the piston-rod are two small conduits, one of which opens above and the other below the piston *l*. These conduits are for the supply of water-pressure from any convenient source, the one opening 80 above the piston *l* having a constant pressure, the other regulated by a valve so as to admit fluid-pressure to the under side of the piston, or to permit it to escape at will. Surrounding the piston-rod L and the piston *l* I provide 85 a cylinder M, which at the upper end is packed around the piston-rod and the piston is packed against the interior of the cylinder. This cylinder M is suspended from the cross-head J by two links *m m*, which at their upper 90 ends pass through the cross-head and are secured by nuts on its upper side, while their lower ends have elongated eyes to provide lost motion on the trunnions outside of the cylinder about which they can vibrate. 95

At the outer end of each trunnion on the cylinder M, and each securely attached at two points to the cylinder, I provide fixed 100 cams N, which move with the cylinder and always maintain the same relation thereto. Between these cams and the bed A A, I provide lever-cams N', pivoted at the center and each supported from the bed A A by the 105 stands N², so that when the cylinder M with its fixed cams N is moved downward from the position shown in the drawings the first effect will be to move the outer ends of the levers I I downward, and at the same time to cause the lever-cams N' to vibrate on their 110 pivots, the lower ends moving toward the bed A A. This end of the lever-cams is attached to the T-headed bolt *j* by the rod *j'*, and the movement above described will cause the T-head of the bolt *j* to move away from the 115 pivot *i* and clear of the projection from the arm I on its under side. The pivoted end of the arm I is now free to rise, and a continuation of this downward movement of the cylinder M will take up the lost motion in the links *m m* and under the outer ends of 120 the arms I, which will then bring up on the frame H H and cause it to rotate about its journals in the bearings *h h* on each side of the bed A A.

The length of the cylinder M is so proportioned to the rotating movement of the frame 125 H H that when the cylinder comes in contact with the piston *l* the slide-rests on the inner end of the frame H H will have raised and retired the required amount. Reversing the 130 movement of the cylinder M will first cause the slide-rests to descend until the frame H

H rests upon the top of the bed A A. Next, the T-headed bolt *j* will be shot into the position shown upon the drawings, and the pressure to force the cylinder upward continuing its further movement will be arrested by the T-headed bolt *j*, the reaction then forcing the frame H H down upon the bed A A with a force limited only by the fluid-pressure and the strength of the bolt *j*. The surface of the bed against which the frame H H is thus forced is shown in Fig. 5^a, so that this frame is locked in its position on the bed both vertically and horizontally.

From the foregoing it will be seen that it is the constant pressure on the upper end of the cylinder M which lowers and locks the frame H H to the bed, and it is the intermittent action upon the other end which raises the frame H H and supports it when raised, so that one movement of the valve which regulates the flow of fluid-pressure to the lower end of the cylinder unlocks, raises, and supports the slide-rests in the raised position, and the reverse movement of the valve lowers and locks them to the bed.

The details of the face-plate B B for chucking, gripping, and supporting the tire are shown in Figs. 7, 8, and 9.

The chucking is effected upon the interior surface of the tire. The means for accomplishing this are shown principally in Fig. 7 and consists of three wedges *n n n*, the upper ends of which are guided and backed up by the tripod *n' n' n'*, the ends of which are accurately fitted and securely bolted to the face-plate B B. The lower ends of these wedges are securely fastened to the cylinder O, which fits over and is packed against an upwardly-projecting hub from the upper side of the three arms on the interior of the annular plate G. On the under side of the three arms is another hub, projecting downward, upon which is mounted and supported by a nut and washer at the lower end of the hub a stationary cylinder *o*, so that the supporting-hub can revolve freely within this cylinder. This cylinder is connected to any convenient fluid-pressure of the requisite intensity by the bent pipe *p*, to which the pressure is admitted and released by a suitable valve.

The interior of the cylinder *o* is packed against the hub above and below the pipe *p* to prevent the escape of fluid between the hub and the cylinder, and communication is made across the hub from the cylinder to a conduit in the center of the hub, which passes upward through the hubs below and above the three arms of the annular plate G to the cylinder O, to which the three wedges *n n n* are attached. With this arrangement when pressure is admitted to the pipe *p* the cylinder O will be forced upward and the wedges *n n n* will press the blocks P P P outward, as they slide freely in and are supported in the L-shaped openings in the upper side of the face-plate B B, as shown in Fig. 9. These blocks are permanently fixed in the face-

plate and have on their sides, next the center of the plate, projections which fit against the face of the wedges *n n n*. The opposite sides of the blocks are plain, against which abut distance-blocks P' P' P'. These may be changed to wider or to narrower ones to suit the diameter of the tire which is to be chucked. Against these distance-blocks the chucking-blocks Q Q Q are forced, as will be explained later. The upper sides of these chucking-blocks are provided with abutment-flanges, which extend backward over the distance-blocks and laterally over the joints between the chucking-blocks and the face-plate, in which the chucking-blocks slide, and upward a sufficient amount to form abutments for the rocking clamps *q q q*, which act against the interior surface of the tire. These rocking clamps are circular next the abutment-flanges, which in turn are curved to fit the rocking clamps. The opposite sides of the rocking clamps approximate the curvature of the tire, but at each end of a clamp is a slight projection to come against the tire, so that the rocking clamp can only touch the tire at its ends, whereby the pressure of chucking will adjust the rocking clamp in the abutment-flanges, so that the clamp will press the tire at both ends alike.

The gripping-blocks R R R are attached to the chucking-blocks Q Q Q by the piston-rods and pistons *r r r*, and they are pressed apart by the spiral springs which surround the piston-rods and abut against shoulders in the chucking and gripping blocks, respectively, as shown more clearly in Fig. 11.

The gripping-block is forced against the chucking-block by fluid-pressure admitted under each piston from the central conduit *r'*, (shown in Figs. 7, 10, and 12,) with the openings connecting them at the bottom of the cylinders in dotted lines. This fluid-pressure reaches each one of the gripping-blocks R R R through a pipe similar to that shown in Fig. 7, which passes down the side, but within the periphery of the spindle B, and connects by a conduit drilled through each one of the three arms of the annular plate G with the central conduit and the bent pipe *p*. The upper horizontal pipe of this system, which connects with the gripping-block R, slides through a stuffing-box in the end of this block. The other end of this pipe is firmly secured to the block R', which is bolted to the face-plate B and serves as an elbow to connect with the vertical pipe in the side of the spindle which forms part of the face-plate. (See Figs. 10 and 11.)

The chucking and gripping blocks are adjusted approximately to their proper position for operating upon each nominal size of tire by a screw S for each set of chucking and gripping blocks. This screw S is attached to the outer flange of the face-plate so as to rotate freely therein without the capability of moving longitudinally. The nut for this screw is fitted in the gripping-block R, so that

it cannot revolve, but it is provided with end movement sufficient to allow for any variation in any nominal size of tire, whereby the chucking and gripping functions of these blocks will not be affected by this adjusting-screw and nut when operating upon the various sizes of tire the machine is designed to turn, but the screw and nut then add another function, that is, they form an abutment against which the spiral springs between the chucking and gripping blocks force the gripping block, which then in turn becomes an abutment to force the chucking-block against the wedges $n\ n\ n$, thereby separating the rocking clamps on the chucking and gripping blocks, respectively, so as to admit a rough tire between them with facility.

The rocking clamp on the gripping-block, unlike that on the chucking-block, vibrates about a pin formed on the top of the gripping-block, as will be seen in Figs. 7, 8, and 10, in which $p' p' p'$ are the outer rocking clamps, and q' the pins about which they vibrate, but these rocking clamps, like the inner ones, are provided with projections at their ends, whereby the pressure of gripping will adjust the clamp on the pin, so that the clamp will press the tire at both ends alike.

The operation of chucking and gripping with the apparatus described is as follows: A tire being in place, the valve is opened to admit fluid-pressure to the pipe p , which will at once distribute itself throughout the system, but the spiral springs between the chucking and gripping blocks resist the closing of the grippers, while the edges $n\ n\ n$ have nothing but the friction of the chucking and gripping blocks to resist their movements. Consequently the chucking operation takes place first, and when this is effected the springs can no longer resist the pressure of the gripping-cylinders, the piston-rods of which are attached to the chucking-blocks, so that the tire is then gripped between the two blocks. The pressure on the inside of the tire for chucking it is regulated by the size of the cylinder which moves the wedges, the taper of the wedges, and the pressure of the fluid, which latter will be the same on the gripping-cylinders. The proportions of the cylinder and wedges are such, however, as to effect but little more pressure upon the inside of the tire in the first instance than that required for moving it on the face-plate, which the gripping-pressure exerted, as it must be on both sides of the tire alike, has no tendency to disturb. The feed-motions for the several slide-rests are in the first instance taken off from the inclined shaft $e' e'$, Fig. 1, through the worm about the middle of the shaft, which gears with the worm-wheel T on the end of the shaft t , Fig. 4, which passes through and across one end of the bed $A\ A$ to a bevel-wheel on the opposite side of the bed, which in turn gears with a bevel-pinion on a shaft which passes along that side of the bed to a similar bevel-

pinion near the other end of the bed, where it gears with a bevel-wheel on a shaft t' , which passes through and across that end of the bed. As thus arranged the feed-shafts t and t' have the same velocity of rotation, and on each shaft are two cone-pulleys to convey motion to the slide-rest, each cone-pulley controlling the feed to one slide-rest. A gear-wheel or a train of gearing may be substituted for the cone-pulleys and belts shown on the drawings. The further transmission of this feeding-motion will be better understood by referring to Sheet 7, where the parts involved are shown upon a larger scale, and as the arrangement is the same for all of the slide-rests the description of one will serve for all.

Motion is transmitted from the cone-pulley on the shaft t by a belt to the cone-pulley mounted upon the hub of the pinion U , which rotates freely on a stud securely fastened to the end of the axle of the frame $H\ H$ and in the center thereof. This axle of the frame $H\ H$ projects beyond the bed $A\ A$ and is there reduced in diameter to afford support for the vibrating frame U' , which supports the idler-wheel u , through which motion is transmitted from the pinion U to the wheel V , mounted on the side of the axle-frame $H\ H$, as shown in Fig. 15. The vibrating frame U' has a twofold capacity, one of safety, to release or to throw out the feed if from any cause the strain of the cut should become so great as to endanger the feed-gearing, the other of finish, to throw the feeding-motion out of gear when the required size of the tire under the particular cut controlled by it has been attained.

The safety appliance will be understood, after observing that the frame U' is provided at one end with a gear-segment, the teeth of which mesh with a pinion u' , mounted upon a stud secured to the frame V' , Fig. 13^a, which frame is fastened upon the end of the axle of the frame $H\ H$, as shown in Figs. 13 and 14. On the hub of the pinion u' is firmly secured an arm from the weight v , which is supported in the position shown by a projection from the frame V' , Fig. 13^a. The arrow upon the pinion U shows the direction of its rotation, and the strain upon the idler-wheel u in transmitting motion to the wheel V , with such direction of rotation in the pinion U , will tend to force the wheel u toward the weight v , and thereby rotate the frame U' about its support. Such a movement would cause the gear-segment to rotate the pinion u' and raise the weight v off from its support toward the perpendicular, and if it passed this the weight would then fall over and rest upon the stop v' on the upper edge of the frame V' . The rotation of the pinion u' would have then so rotated the frame U' as to throw the idler-wheel u out of gear with the wheel V , which would arrest the feed-motion at once. The finish arrest produces the same movement of the weight v and the vibrating frame U' , which

latter has a projection or toe opposite to the gear-segment that is on the other end of the frame. Under this toe and resting against it is one end of a lever *W* of the first order, which has its fulcrum or axis of vibration fixed in the side of the bed *A A*. The other end of this lever is forked, as shown in Fig. 13^b, and in this fork is mounted a weighted latch *W'*, Fig. 13, the upper end latching over a support fastened upon the bed *A A*, and to the lower end a weight *W*² is suspended, so as to hold the latch in place. A tailpiece projects horizontally from this weighted latch, so that when pressed downward it will release the latch, which, with its weight, will then be suspended from the end of the lever *W*. The descent of this end of the lever will be resisted by the toe of the vibrating frame *U'*, and the weight *W*² must be such as to rotate this frame and raise the weight *v* to and beyond the perpendicular, when its descent to the stop *v'* will cause the arrest of the feed-motion, as before described. The further descent of the weight *W*² is arrested by the stop *w* on the side of the bed *A A*, on which it will rest, until the latch is reset by raising this end of the lever *W* by means of the handle shown in Fig. 13^b. The rod which depresses the tailpiece of the catch is shown on Fig. 13, and the means by which it is actuated at the proper moment of time will be described later.

The above description has carried the feed-motion to the wheel *V*, from which it is carried by the gearing shown in Fig. 15 to the bevel-wheel *X*, Fig. 13. Its further transmission can be followed on Sheet 8, where the wheels *V* and *X* are shown in Fig. 16. The bevel-wheel *X* is mounted upon the end of the shaft *w'*, which is supported next the bevel-wheel in a bearing forming a part of the frame *Y*, bolted to the end of the cross-head of a slide-rest on the axle-frame *H H*, and it is also supported in two bearings cast on the back of the slide-rest, between which is a worm feathered to the shaft *w'*, as shown in Fig. 17. This worm drives the worm-wheel *Y'* on the shaft *x*, that carries the worm *x'*, which drives the worm-wheel *Z* on the end of the feed-screw of the slide-rest that carries the turning-tool. This worm-wheel *Z* is shown in vertical section in Fig. 18. It forms one half of a friction-clutch, by which it rotates the feed-screw *z*. The other half of this friction-clutch *Z'* is keyed to the feed-screw *z* and held against the shoulder under it by the hexagonal nut above it. The friction-clutch is tightened, so as to drive the feed-screw through the worm-wheel *Z* by the hand-wheel with bell-shaped hub above it, and above this is a crank-handle keyed to the feed-screw, by means of which this screw can be turned by hand when the friction-clutch is loosened. On the under side of the lower half of the friction-clutch *Z'* an annular plate 20 is provided, which has a stop-pin 21, riveted firmly thereto. This annular plate is secured to *Z'* by bolts, the heads of which can traverse a

circular **T**-shaped slot in *Z'*, so that the stop 21 can be rotated to any position about the axis of *Z'* and be firmly secured thereat. The pitch of the feed-screw is such that one revolution is more than sufficient to advance the cutting-tool farther than it needs to go, to reduce the surface of the tire it acts upon to the required dimensions. Consequently the stop 21 can be so adjusted that it will always arrive at the position shown in Fig. 16 when the feed-motion should be stopped.

Fig. 19 is a side elevation of the worm-wheel *Z*, showing the annular plate 20 and stop 21 on its under side, as it is seen in Fig. 16. The arrows, Fig. 16, show the direction of rotation of the worm-wheel, which is such as to force it against the stop 22 on the small rod 23, that is supported in a bushing, Fig. 20, firmly secured in a projection from the slide-rest 24. The rod 23 is provided with a cross-pin which projects from it on each side so as to fit in a slot in the bushing, as shown in Fig. 20, in slide-rest 24. On one end of the rod 23 is a milled head, and on the opposite end is a washer secured upon the rod, and between it and 24 is a spiral spring which, with slight pressure against the spring, maintains the rod in the angular position shown. When it is desired that the stop 21 shall not come into contact with stop 22, take the milled head and draw it back until the cross-pin in 23 is withdrawn from the slot, then turn the rod one-quarter revolution, then release the milled head, when the spiral ring will force the rod forward and the cross-pin in 23 will enter the short slot or notch in the end of the bushing, where it will be locked, so that the stops 21 and 22 can no longer come into contact.

In the position of the stops shown in the drawings, 21 rotating in the direction shown in Fig. 16, the rod 23 will be forced against the tailpiece 25, which is mounted upon a bushing 26, that rotates freely in a stand secured upon the slide-rest. This bushing is provided with a square hole, through which the square shaft 27 can slide freely, so that in whatever position along the shaft the bushing may be pressure against the tailpiece 25 by the rod 23 will cause the shaft to rotate proportionately to the movement of the rod. The outer end of this rod is turned cylindrical to fit the bearing 28 on the stand *Y*, Figs. 13 and 16, and outside of this bearing a weighted tailpiece 29 is fitted, the weighted end tending to rotate the square shaft 27 and force the tailpiece 25 to press against the rod 23. Referring now to Fig. 13, it will be seen that when the feed-wheel *Z*, Fig. 16, rotates, as shown, so that the stop 21 comes into contact with the stop 22, the rotation continuing will force the rod 23 to press against the tailpiece 25, rotating the square shaft 27, which causes the weighted tailpiece 29 to press the rod 30 downward, thereby releasing the weighted latch *W'* and arresting the feed-motion, as before described.

Fig. 8 shows that the tire is chucked and gripped at three points in its circumference, which leaves a considerable portion of the tire unsupported vertically between the points at which it is chucked and gripped. The vertical pressure of the cut between its points of support may have a tendency to loosen the tire where supported by the chucks, and to prevent this I provide the supports 31 31 31, which are fitted upon a depressed portion of the face-plate B B, so as to have a radial movement thereon. These three supports are each divided vertically, as shown in Fig. 7, and the two parts of each support are moved toward or from each other by the screw 32, provided with a milled head-handle by which it is turned, and a collar between which is a bearing formed of one of the parts of 31, while the thread of the screw is fitted into the other part as a nut. The upper ends of both parts of 31 are beveled, as shown in Fig. 7, and on top of them is a plate 33, correspondingly beveled on its under side, so that by moving the two parts of 32 toward or from each other the plate 33 will be raised or lowered, and the top of it can be thus accurately adjusted to fit under and to support the tire against any vertical strain.

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

1. A slide-rest which overhangs the work upon which its cutting-tool operates, in combination with apparatus which automatically locks and unlocks the slide-rest to and from its supporting-bed, and removes and replaces it from and to its overhanging position.

2. A series of chucking-blocks, and mech-

anism for moving the same simultaneously to fix the tire concentric with its axis of rotation, in combination with a gripping-block attached to a chucking-block, whereby a section of the tire may be clamped between the chucking-block and its gripping-block.

3. A series of chucking-blocks and a gripping-block attached to a chucking-block, in combination with apparatus, which actuates the series of chucking-blocks and the gripping-block automatically and *serialim*, substantially as described.

4. A rotatable face-plate, supporting a series of chucking-blocks, with a gripping-block attached to a chucking-block, and a slide-rest geared with the rotatable face-plate, to advance the cutting-tool proportionate to the rotation of the face-plate, in combination with means for automatically arresting the advance of the cutting-tool, when the proper dimension has been attained in that part of the tire upon which the cutting-tool is operating.

5. A gear-wheel, rotated by a pinion at each of two points on the gear-wheel diametrically opposed, each pinion mounted upon a shaft driven by a worm-wheel, in combination with a worm-shaft, upon which are mounted worms with right and left hand threads respectively, which gear with the worm-wheels on the pinion-shafts, whereby a driving strain on the worm-shaft produces no side pressure on the gear-wheel.

WM. SELLERS.

Witnesses:

E. R. HARPER,

JOHN L. PHILLIPS.