No. 635,215. Patented Oct. 17, 1899.

R. H. WHITE.

MACHINE FOR MAKING BALLS.

(Application filed Aug. 8, 1898.)

(No Model.) 4 Sheets—Sheet 1.

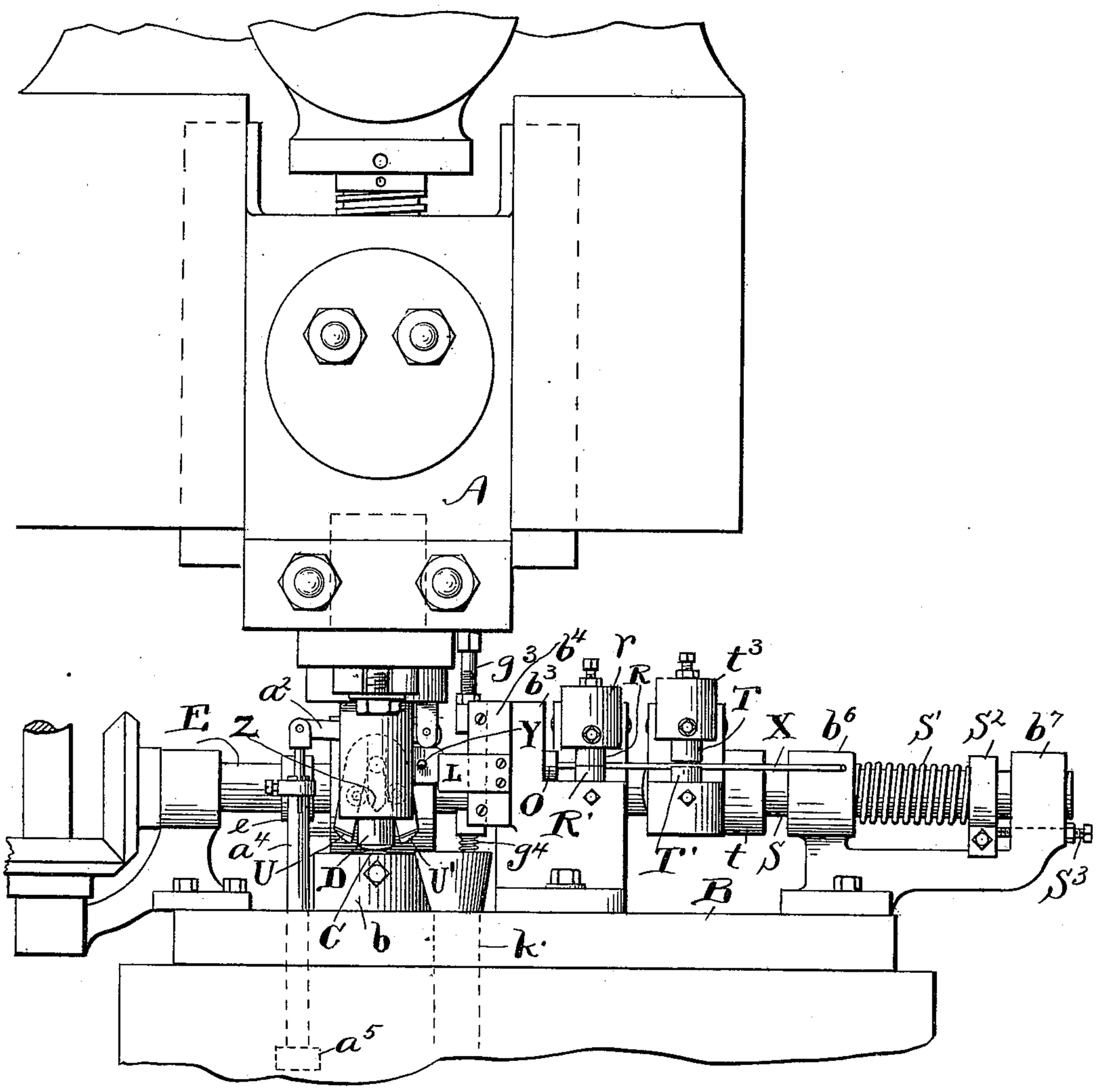


Fig. 1.

Witnesses,
E. B. Gilchrist
Philip E. Knowlton

Inventor,
Rollin H. White
By his attorneys
Thurston & Bates

No. 635,215

Patented Oct. 17, 1899.

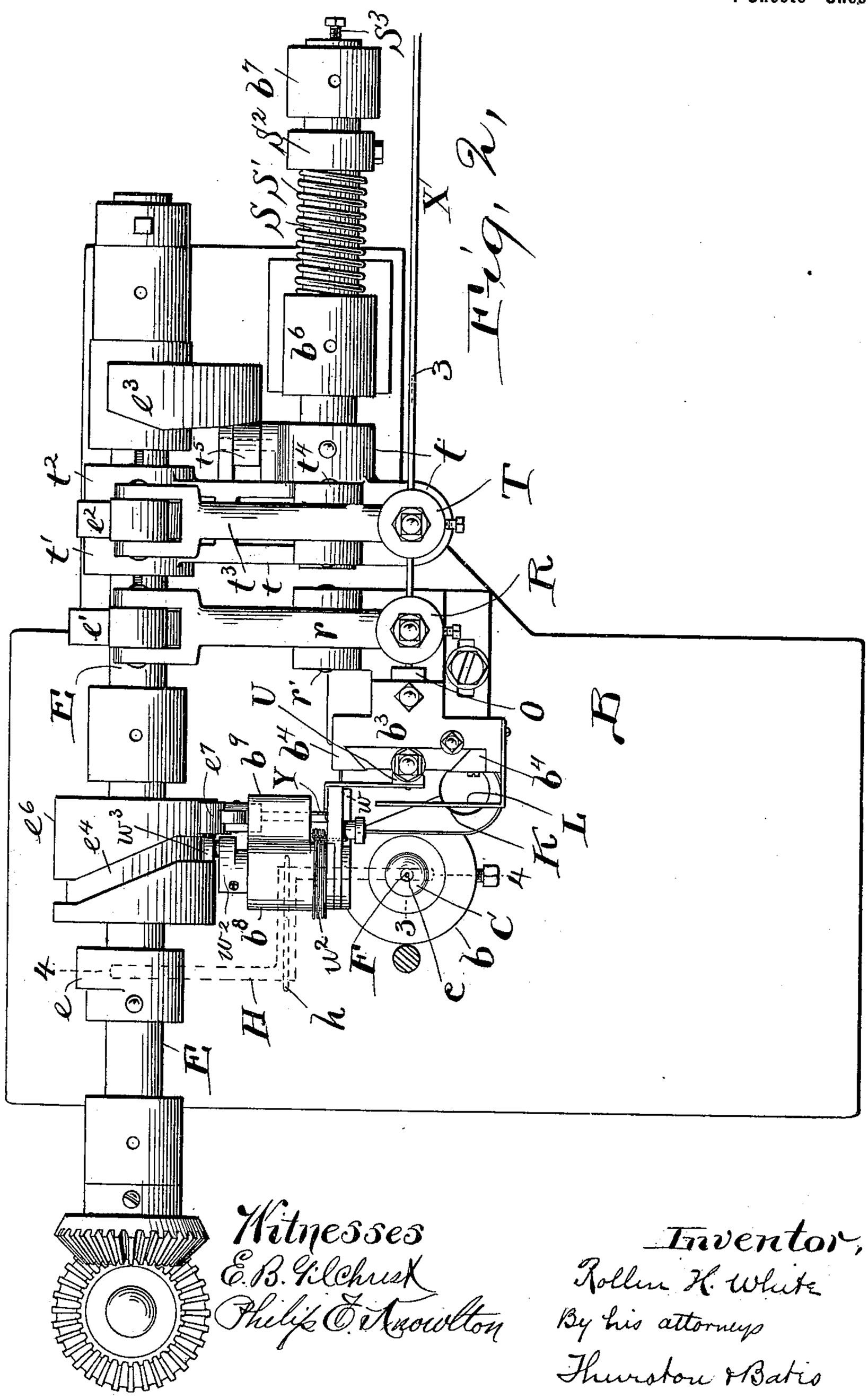
R. H. WHITE.

MACHINE FOR MAKING BALLS.

(Application filed Aug. 8, 1898.)

(No Model.)

4 Sheets—Sheet 2.



Witnesses
E. B. Gilchrist
Philip E. Knowlton

Inventor,
Rollin H. White
By his attorneys
Thurston & Bates

No. 635,215. Patented Oct. 17, 1899.

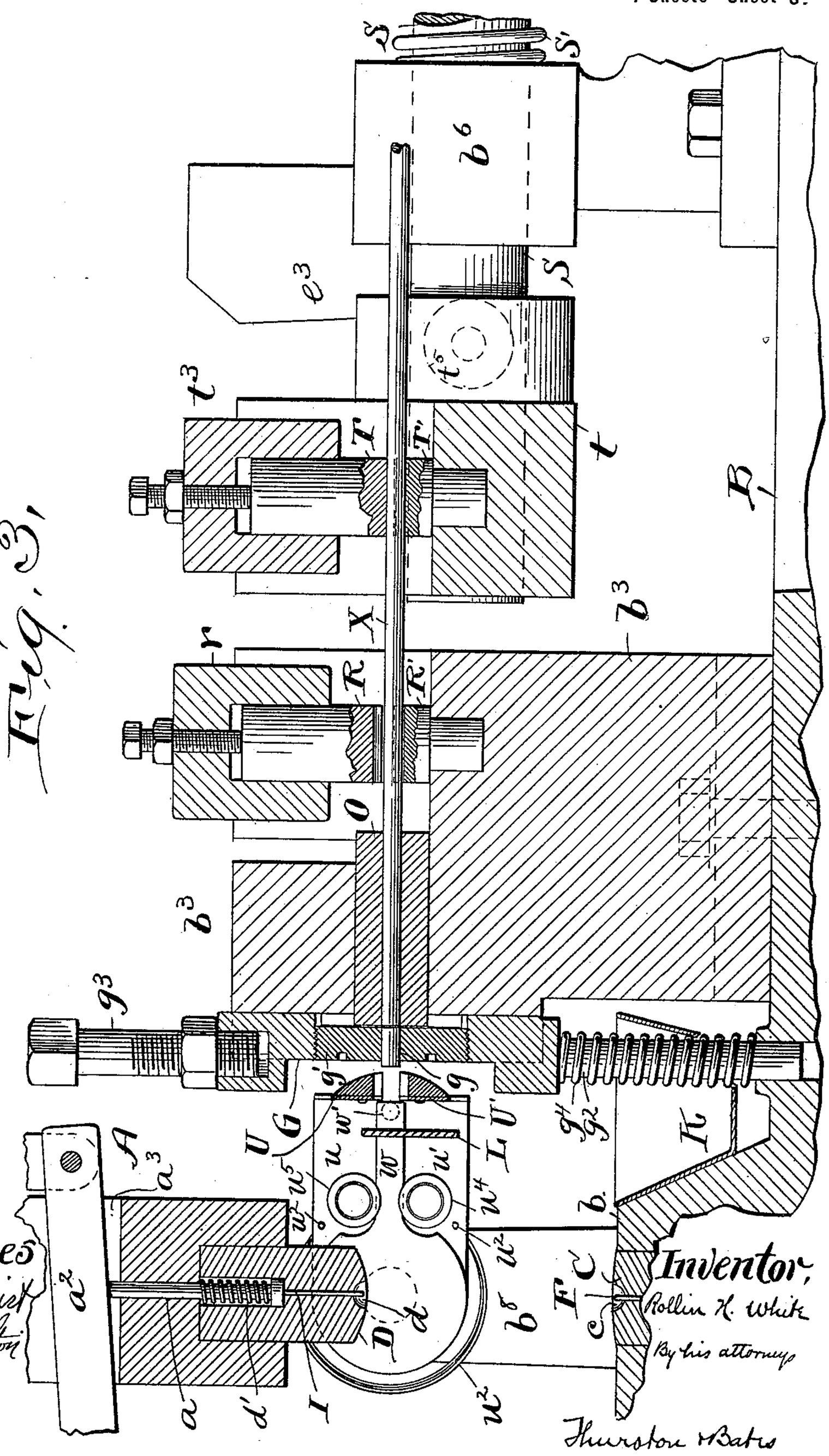
R. H. WHITE.

MACHINE FOR MAKING BALLS.

(Application filed Aug. 8, 1898.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



Witnesses
E. B. Gilchrist
P. E. Knowlton

Inventor:
Rollin H. White
By his attorneys
Thurston & Bates

No. 635,215. Patented Oct. 17, 1899.

R. H. WHITE.

MACHINE FOR MAKING BALLS.

(Application filed Aug. 8, 1898.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

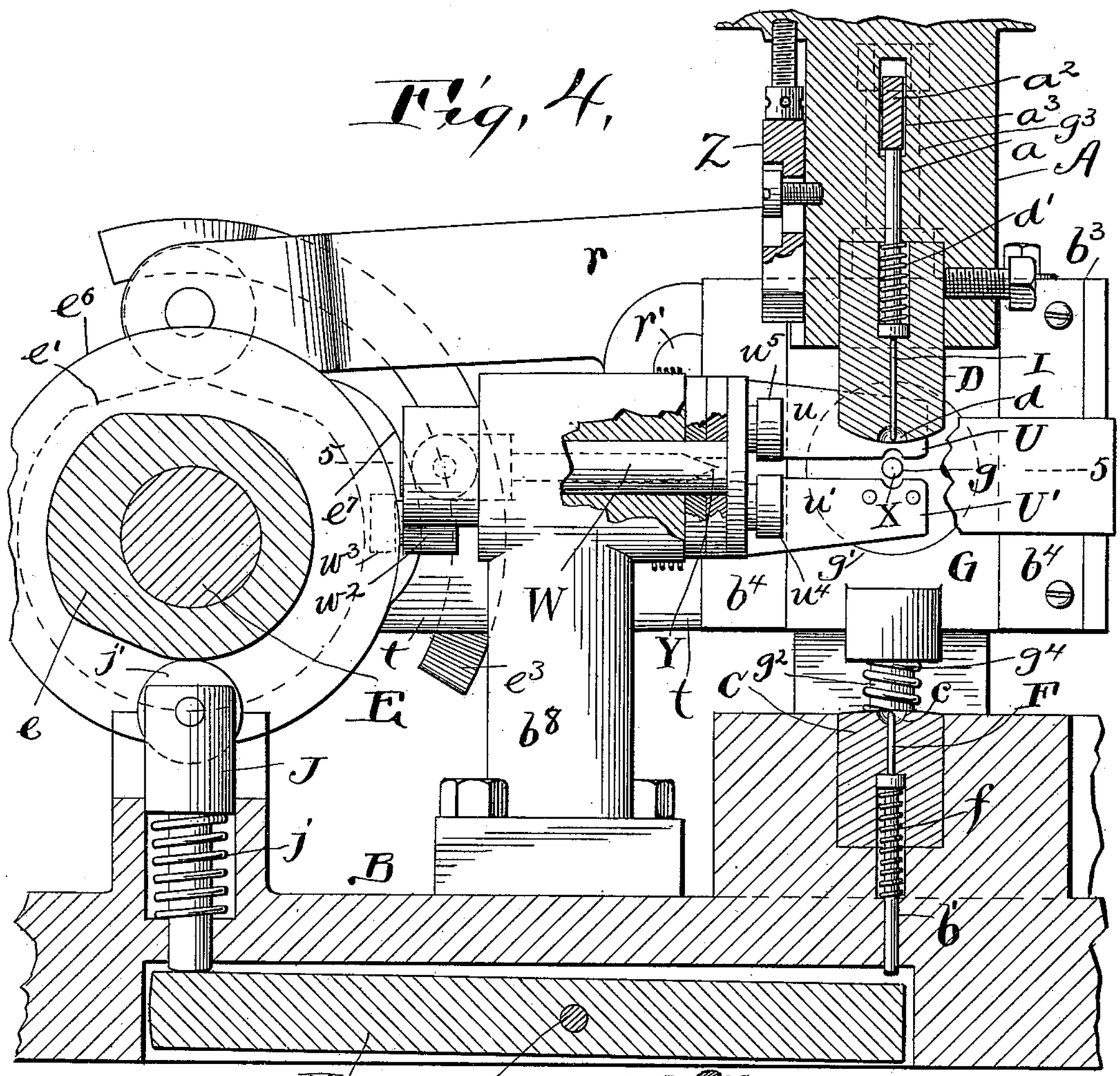
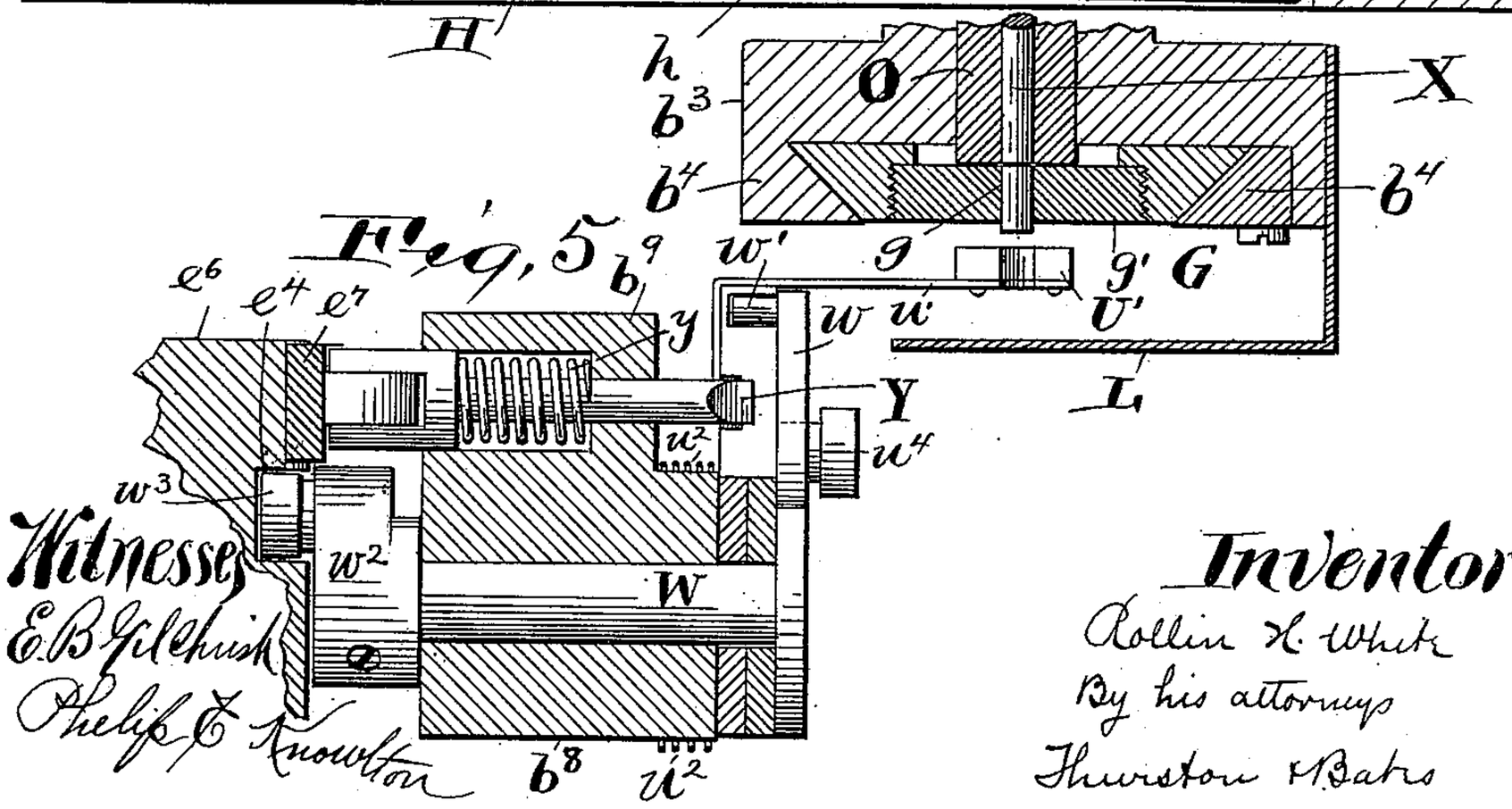


Fig. 5



Inventor,
Rollin H. White
By his attorneys
Thurston & Bates

UNITED STATES PATENT OFFICE.

ROLLIN H. WHITE, OF CLEVELAND, OHIO.

MACHINE FOR MAKING BALLS.

SPECIFICATION forming part of Letters Patent No. 635,215, dated October 17, 1899.

Application filed August 8, 1898. Serial No. 688,038. (No model.)

To all whom it may concern:

Be it known that I, ROLLIN H. WHITE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Machines for Making Balls, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to a machine especially designed for making steel balls by automatically cutting from steel wire blanks of the proper size and pressing said blanks between suitable dies into spherical form.

The invention consists in the construction and combination of parts shown and described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a front elevation of a machine embodying the invention. Fig. 2 is a plan view of the same with the plunger and parts carried thereby not shown. Fig. 3 is a sectional front elevation on line 3 3 of Fig. 2. Fig. 4 is a sectional side elevation on line 4 4 of Fig. 2. Fig. 5 is a sectional plan view in the plane indicated by line 5 5 of Fig. 4, showing the mechanism for cutting off the blanks and delivering the same to the dies.

The invention is adapted for any well-known form of press having a vertically-reciprocating plunger. Therefore it is not thought necessary to show all of the plunger or any of the mechanism for operating it.

Referring to the parts by letters, A represents the vertically-reciprocating plunger of such a press.

B represents the bed-plate. The fixed die C is set into a socket in a block *b*, which is secured upon or formed as a part of this bed-plate. The upper end of this die is preferably convexly arched, and in the middle of its upper end is a hemispherical recess *c*.

D represents the movable die, which is secured in the lower end of the plunger. Its lower end is preferably convexly arched, and in the middle of this lower end is a hemispherical recess *d*.

A vertically-movable ejector-pin F lies and is movable in a hole *b'* in the bed-plate and in the lower die, and the upper end of this pin projects into the recess *c*, being held in this position normally by a light spring *f*. The lower end of this pin projects below the bed-plate and lies above one end of a rocking lever H, which is pivoted to the bed-plate at *h*. The other end of this lever lies just below a vertically-movable rod J, which projects through the bed-plate and is held in its raised position by a spring *j*. The upper end of this rod (which may carry a friction-roller *j'*) is engaged by a cam *e* on the constantly-driven shaft E. It might be here stated that this shaft carries a plurality of cams, by means of which various parts of the machine are operated in proper sequence. The cam *e* pushes the rod J downward and the press-plunger begins to rise after a ball has been completed. This rocks the lever H, whereby the ejector F is pushed upward, positively assisting its spring, with the result of pushing the ball from the recess *c*. In the upper die is a similar ejector I, which is vertically movable in a hole *a* in the die and the plunger A. The lower end of this ejector projects into the recess *d*, in which position it is normally held by a light spring *d'*. A lever a^2 is pivoted to the plunger A and passes through a slot a^3 therein. This lever rests upon the upper end of the ejector I. Secured to the free end of this lever and hanging downward therefrom is a rod a^4, which passes through a hole in the bed-plate. When the plunger begins to rise, the spring *d'* and the weight of the lever a^2 and the attached rod a^4 will generally force the ejector downward relatively to the plunger and die and push the ball out of the die. If, however, the ball is not pushed out then and in the manner stated, a head a^5 on the lower end of the rod a^4 strikes the bed-plate at or just before the time the plunger reaches its highest point, and this causes the lever to rock, so as to positively force the ejector downward and push the ball out of the recess *d*.

The blanks to be pressed into spherical form between the dies are cut automatically from a wire X, which is periodically fed along the proper distance. The blanks so cut are carried by certain jaws, to be presently explained, to a position to be acted upon by the dies. The wire X passes through a horizontal hole in a hardened block O, which is set in a block b^3, which is secured upon or fastened to the

bed-plate. A shearing-plate G is vertically movable upon the face of said block b^3 in suitable guides b^4. It is provided with a hole g, which when said shearing-plate is in its raised position is in line with the hole in the block O, through which the wire passes. This hole g is preferably in a hardened plate g', which may be screwed into the shearing-plate, thereby becoming in effect a part of said plate. This plate G is held in its raised position by a spring g^4, which surrounds a bar g^2, which projects downward from the lower end of this shearing-plate and passes into a guiding-hole in the bed-plate. A striker-pin g^3 screws into the upper end of this shearing-plate, and the head of this pin lies in the path of the plunger A, which plunger strikes it as it descends, thereby moving the shearing-plate downward in opposition to its spring and cutting off the wire in the hole g in said shearing-plate.

The wire is fed along and held immovable at the proper times by two pairs of jaws R R′ and T T′. The jaws R R′ are the holding-jaws, which have no movement lengthwise of the wire. The lower jaw R′ is seated in a hole in the block b^3, while the upper jaw is held in a hole in a lever r, which is pivoted at r' to said block b^3 and is moved in the closing direction by a cam e' on the shaft E, which cam engages with the rear end of said jaw-lever r.

The jaws T T′ are the feeding-jaws. The lower jaw T′ is seated in a cross-head t, which is secured to the end of a longitudinally-movable rod S. This rod is mounted in suitable brackets b^6 b^7 and is moved backward by means of a spring S′, which surrounds the rod and thrusts endwise against one of said brackets b^6 and against a collar S^2, secured upon said rod. The distance which it may be moved backward is regulated by a screw S^3, which may be adjusted through the bracket b^7 and serves as a stop by engaging with said collar S^2. The rear end of the cross-head is bifurcated and the shaft E passes through holes in the two branches t' t^2 thereof. On the shaft and having a tongue-and-groove connection with it is a cam e^2, which lies between the two branches t' t^2, whereby said cam moves with the cross-head lengthwise of the shaft E without any interruption of its operating relation with the jaw-lever t^3, which it operates. The upper jaw T is set in the end of the jaw-lever t^3, which lever is pivoted to the cross-head at t^4. The rear end of this jaw-lever rests upon the cam e^2, by which it is moved in the closing direction.

Secured to the shaft E is a cam e^3, which engages with the cross-head (preferably with a friction-roller t^5, mounted thereon) and moves it to the left in opposition to the spring S^2. The wire X passes between both pairs of jaws just explained. The cam e^2, acting upon the jaw-lever t^3, closes it upon the wire, and at the same time the cam e' so moves that it no longer acts to close the jaw-lever r. The cam e^3 then moves the cross-head t to the left, whereby the wire in the grasp of the jaws T T′ is moved in the feeding direction. Then the cam e', acting upon the jaw-lever r, closes the jaws R R′. The cam e^2 moves so as to release the jaws T T′, and the cam e^3 moves to a position which permits the spring S′ to retract the cross-head and jaws T T′. This completes one feeding movement of the wire-feeding mechanism. The plunger A then comes down, and by engaging with the striker-pin g^3, secured to the shearing-plate, moves said shearing-plate downward, the result being that so much of the wire as has been forced into the hole in said shearing-plate will be cut off, and this cut-off blank will for the time being remain in said hole.

During the next wire-feeding operation this blank is pushed out and into the embrace of two jaws U U′, by which it is carried to the dies. These two jaws are secured to the outer ends of two jaw-levers u u', which are pivoted on a rock-shaft W. The jaws are closed by the action of a spring u^2 against a pin w', which projects between them from an arm w, which is rigidly fastened to the end of said rock-shaft. By closing against this pin the jaws maintain the proper position relative to the rock-shaft, whereby the operation of the rock-shaft will carry the jaws from one operative position to the other. On the rear end of this rock-shaft, which is mounted in a suitable standard b^8, which rises from the bed-plate, is a crank w^2, carrying, preferably, a friction-roller w^3, which enters a cam-groove e^4 in the face of a disk e^6, which is secured to the shaft E. As the shaft revolves, said cam-groove and crank operate the rock-shaft, so as to carry the jaws first into position where the recess between the jaws is in line with the wire X and then to a position where said recess is in the same vertical plane as the hemispherical recesses in the two dies. The jaws are in the first of these two position when the wire-feeding mechanism acts, and as the wire is pushed along it pushes the blank which is in the hole in the shearing-plate out into the recess between said jaws. The jaws are opened to permit the blank to enter between them by means of a wedge Y, which is horizontally moved through a bracket b^9 on the standard b^8, and this wedge is moved forward, so as to cause it to enter between the two jaw-levers by a cam e^7 on the face of the disk e^6. This wedge is moved in the contrary direction by a spring y. This backward movement of the wedge, whereby the jaws are permitted to close, takes place just before the jaws move from the described position to the position in line with the dies. As the plunger descends; a wedge-bar Z, which is secured to the plunger, is moved between the two roller-studs w^4 w^5 on the jaw-levers, whereby the jaws are opened just as the upper die reaches a point where it engages with said blank. The further descent of the plunger presses the blank into spherical form in the recesses

in the two dies. The plunger then moves upward and the lower ejector is moved upward by the mechanism heretofore described for the purpose, and the finished ball is pushed out of the recess *c* into the recess between the jaws, which jaws immediately close and are then moved to the other position in line with the wire X. During the next feeding movement, which pushes a blank into the embrace of these jaws, this blank pushes the ball out of the jaws (if it did not fall out when the jaws were opened) and said ball falls into a funnel-shaped receiver K, from which it may be conducted through a pipe *k'* (indicated by dotted lines in Fig. 1) to any convenient point.

A guard-plate L, which is secured to the block b^3, lies in line with the wire X, whereby the balls as they are pushed out of the embrace of the jaws are prevented from flying to the left so far that they will not fall into this funnel-shaped receiver.

The machine described is adapted to be very readily and easily changed so that wire of different sizes may be used. It is of course necessary to remove the dies and put in new dies having hemispherical recesses of the proper size. The position of the striker-pin on the shearing-plate will then be adjusted so that the downward movement of the shearing-plate will be sufficient to cut off the wire. A new block O having a hole of suitable size for the wire may be substituted for that which is in the machine, and the position of the two jaws R and T may be regulated to adapt them to properly grasp the different-sized wire by means of the screws which screw down through the jaw-levers and bear upon the tops of the jaws.

Having described my invention, I claim—

1. In a machine for making balls, the combination of a fixed die, a reciprocating plunger, a die secured thereto, and wire-cut-off mechanism, consisting of a fixed shearing-block, a reciprocating shearing-plate having a hole adapted to receive the wire, a spring for raising said plate, and a striker-pin secured to said plate in the path of the plunger, with mechanism for feeding the wire periodically into the hole in said shearing-plate and thereby pushing out the cut-off blank, and a movable pair of jaws which grasp said blank as it is pushed out of said hole and carry and deliver it to the dies, substantially as specified.

2. In a machine for making balls, the combination of a wire-feed, a fixed shearing-block, a reciprocating shearing-plate, a fixed die, and a reciprocating die the movement of which is at right angles to the wire being fed, with a rock-shaft the axis of which is at right angles to the wire and the path of the reciprocating die, operating mechanism therefor, a pair of spring-closing jaws mounted on said rock-shaft, and wedges for opening said jaws when they are in line with the wire and with the dies, substantially as specified.

3. In a machine for making balls, the mechanism for conveying the cut-off blanks to the dies, consisting of a rock-shaft, a pair of jaw-levers carried by said rock-shaft and lying substantially at right angles to its axis, jaws secured to said levers at substantially right angles thereto, said jaws having between them a blank-holding recess which is substantially at right angles to the axis of the shaft, a spring for closing the jaws, and means for opening the jaws at both ends of their path, whereby they may grasp a blank and deliver it to the dies, substantially as specified.

4. In a machine for making balls, the combination of a rock-shaft, the arm *w* fast to said shaft and having the pin *w'*, the jaw-levers pivoted to said shaft, the jaws secured thereto, the crank-arm fast on said rock-shaft, and a cam engaging with said crank-arm, with a horizontally-movable wedge and its operating mechanism, a vertically-movable wedge and its operating mechanism, and studs on the jaw-levers with which the last-named wedge engages, substantially as specified.

5. In a machine for making balls, the combination of a fixed die, a reciprocating die, wire-feeding mechanism, and a wire cut-off, with an oscillating pair of jaws adapted to grasp the blank after it leaves the wire cut-off and to carry and deliver it to the dies, ejectors for freeing the balls from the dies, whereby said balls may be grasped by said jaws, means for opening and closing the jaws, and a funnel into which the jaws drop the finished balls, substantially as specified.

6. In a machine for making balls, the combination of a fixed die, a reciprocating die, a wire-cut-off mechanism consisting of a fixed shearing-block and a reciprocating shearing-plate having a hole which, when the plate is in its normal position, is in line with the wire, with mechanism for periodically feeding the wire into said hole and thereby pushing out the cut-off blank, a rock-shaft, a pair of jaw-levers pivotally mounted thereon and lying substantially at right angles to its axis, jaws on the outer ends of said levers lying substantially at right angles thereto, said jaws having between them a blank-holding recess, and mechanism for oscillating said rock-shaft whereby the jaws are moved backward and forward between the position where said recess is in line with the wire being fed forward, and the position where said recess is in line with the dies, substantially as and for the purpose specified.

7. In a machine for making balls, the combination of a fixed and a reciprocating die, a wire feeding and cutting-off mechanism, with a rock-shaft, an arm *w* fast to said shaft and having a pin *w'*, a pair of spring-closed jaw-levers pivoted to said shaft and lying on opposite sides of said pin, jaws secured to said levers, mechanism for oscillating said rock-shaft, a horizontal movable wedge and its operating mechanism adapted to open said jaws when they are at one end of their path, and a vertically-movable wedge and its operating

mechanism adapted to open said jaws when they are at the other end of their path, substantially as specified.

8. In a machine for making balls, wire-feeding mechanism, consisting of the combination of a pair of jaws having no movement lengthwise of the wire, a shaft, and a cam secured thereto which engages with and operates the movable jaw, with a spring-retracted rod, a cross-head secured thereto having a bifurcated rear end, a cam on said shaft lying between the forks of said rear end and having a tongue-and-grooved connection with the shaft, a jaw fixed to the cross-head, a movable jaw-lever pivoted to the cross-head and engaging with said cam, and a cam secured to the shaft engaging with said cross-head, substantially as specified.

9. In a machine for making balls, the combination of a fixed die, a reciprocating die, wire-feeding mechanism, a fixed shearing-plate, and a reciprocating shearing-plate having a hole in which the end of the wire is pushed by the wire-feeding mechanism, and the cut-off blank is held until pushed out by the wire during the next wire-feeding operation, with a rock-shaft, a pair of jaws mounted thereon and having between them a blank-holding recess which is at right angles to the axis of the shaft, and mechanism for oscillating said shaft whereby the jaws are moved backward and forward between a position where said recess is in line with the dies and a position where said recess is in line with the wire, whereby the cut-off blank is fed into said recess and then carried and delivered to the dies, substantially as specified.

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

ROLLIN H. WHITE.

Witnesses:
E. L. THURSTON,
PHILIP E. KNOWLTON.