(No Model.)

4 Sheets—Sheet 1.

A. JOHNSTON.

SCREW MACHINE.

No. 368,533. Patented Aug. 16, 1887.

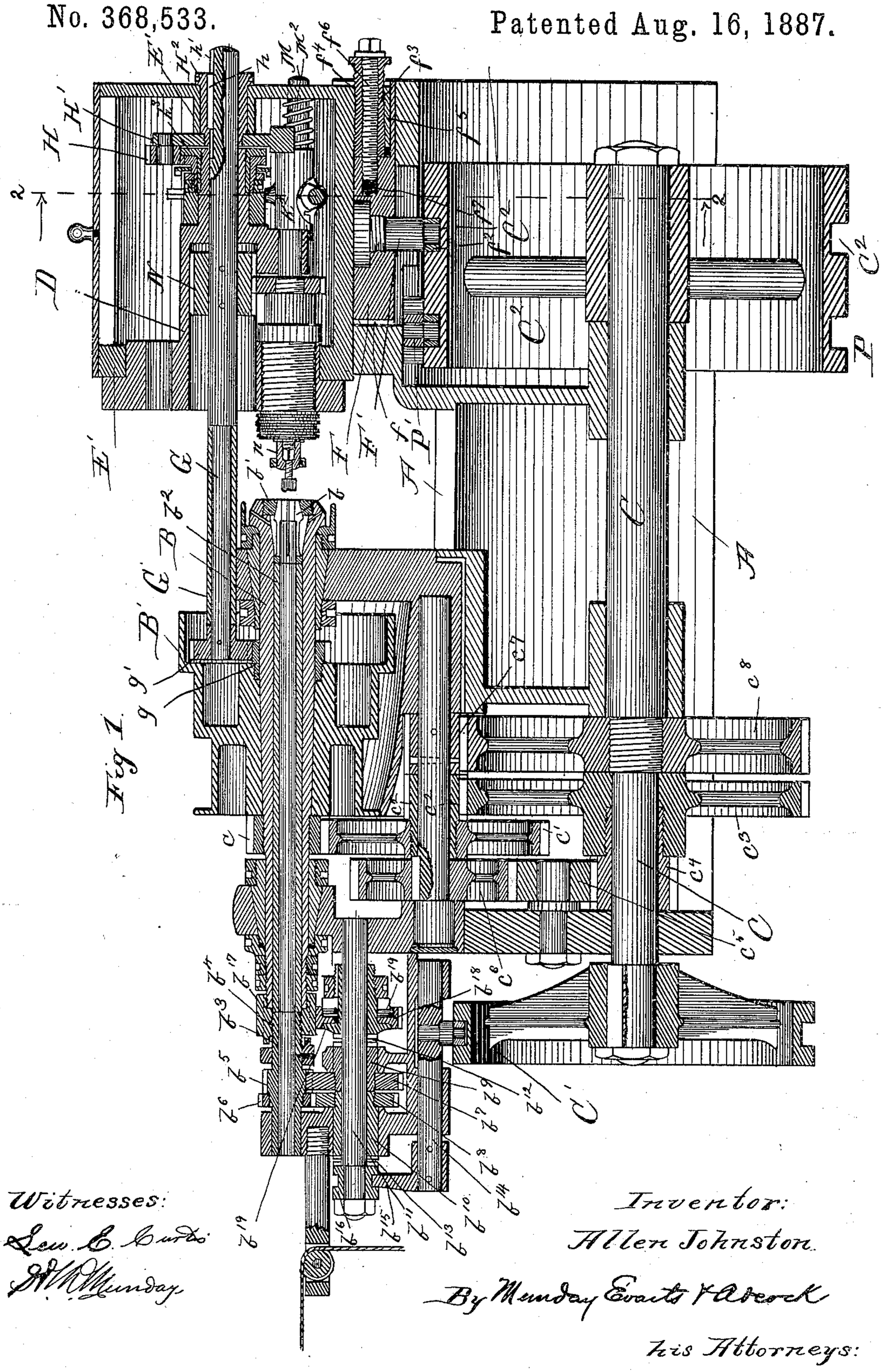

Fig 1.

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(No Model.)

4 Sheets—Sheet 2.

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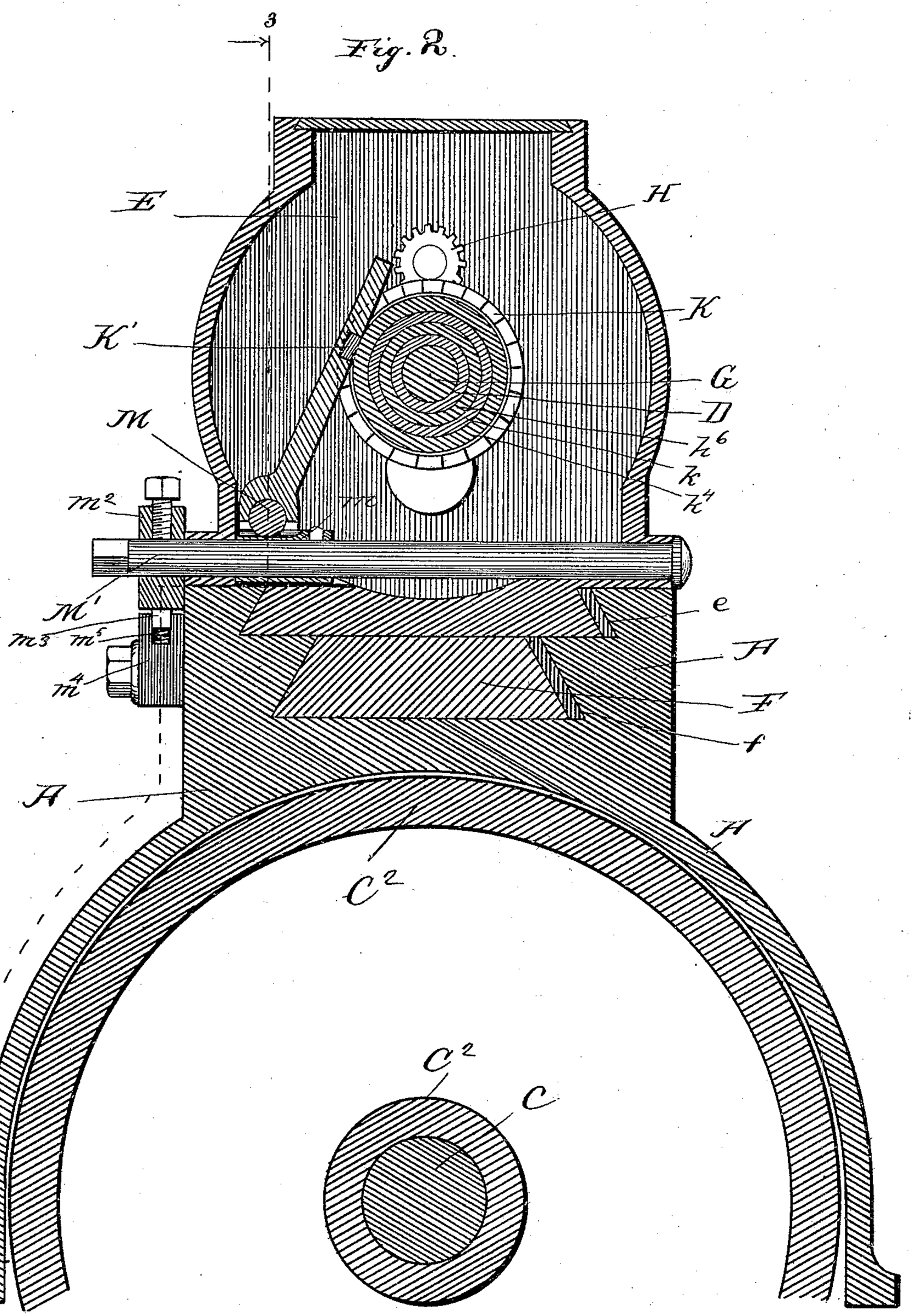
SCREW MACHINE.

No. 368,533. Patented Aug. 16, 1887.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

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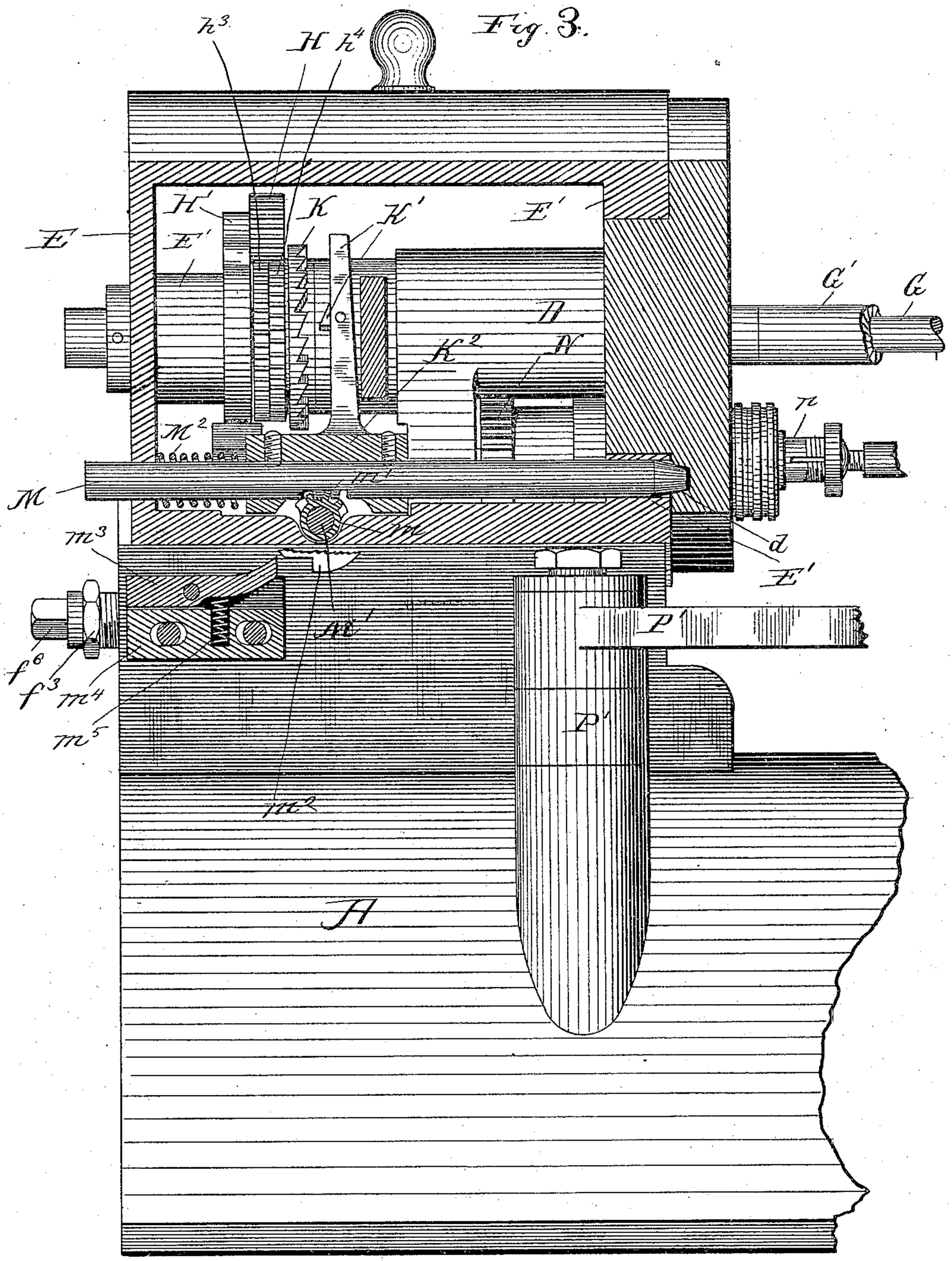
SCREW MACHINE.

No. 368,533. Patented Aug. 16, 1887.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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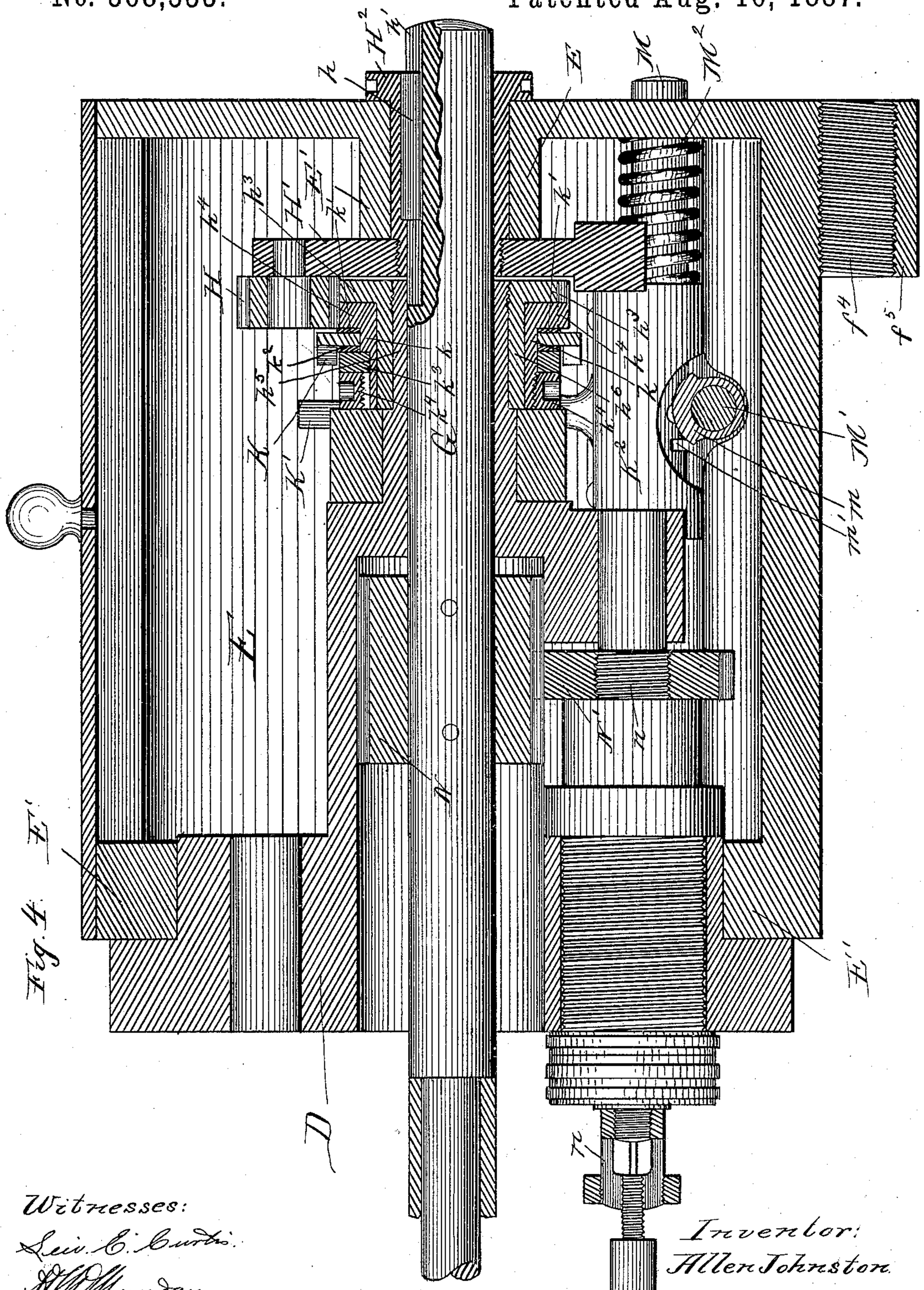

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UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

SCREW-MACHINE.

SPECIFICATION forming part of Letters Patent No. 368,533, dated August 16, 1887.

Application filed April 13, 1887. Serial No. 234,631. (No model.)

To all whom it may concern:

Be it known that I, ALLEN JOHNSTON, a citizen of the United States, residing in Ottumwa, in the county of Wapello and State of Iowa, have invented a new and useful Improvement in Screw-Machines, of which the following is a specification.

My invention relates to metal screw-machines, and more particularly to improvements in the mechanism for automatically operating the revolving turret or frame in which the several tools are mounted.

The invention is an improvement upon the machine heretofore patented to me in Letters Patent No. 316,788, of April 28, 1885, and wherein the revolving turret is mounted with its axis horizontal and parallel to the axis of the chuck-spindle.

My invention consists in an intermittently-rotating turret the axis of which is parallel to the axis of the chuck-spindle, in combination with a rotary shaft, upon which the turret rotates as an axis and by which it is driven.

It further consists, in connection with the turret and its axial driving-shaft, of planet-gears for communicating motion from said shaft to the turret.

It further consists, in connection with the turret and its axial driving-shaft, of a pair of differential gears, one connected with the turret and one loose thereon, both said differential gears meshing with the revolving planet-gear.

It further consists, in connection with the intermittently-rotating turret, its continuously-rotating driving-shaft, and suitable connecting mechanism, of a steady-pin adapted to arrest and lock the rotation of the turret.

It further consists, in connection with an intermittent rotary turret, of a continuously-rotating driving-shaft arranged and operating to rotate the turret continuously until its motion is checked by the steady-pin entering a socket in the turret.

It further consists, in connection with a slide carrying the tool-bearing intermittently-rotating turret, of a steady-pin, also carried upon said slide, and mechanism for reciprocating said steady-pin in said slide.

It further consists in a tool-bearing turret mounted upon a compound or double slide, one slide always being moved forward to the same point by a cam or other mechanism for advancing the tool to its work, and the other slide or part being adjustable on the main slide, so that the turret and its tools can be adjusted either forward or backward.

My invention also consists in the novel devices and novel combinations of devices or parts herein shown and described, and more particularly pointed out in the claims.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a central longitudinal vertical section of a machine embodying my invention. Fig. 2 is a vertical cross-section on line 2 2 of Fig. 1. Fig. 3 is a vertical section on line 3 3 of Fig. 2, and Fig. 4 is an enlarged central longitudinal section of the rotating turret.

In said drawings, A represents the frame of the machine, which may be of any suitable construction; B, the chuck-spindle, and B′ the pulley for driving said spindle. The chuck-jaws *b* are closed by their endwise or reciprocating movement against the inclines or wedges *b′*. The chuck-jaws *b* are forced forward to close upon the rod or work by any suitable means—for example, that shown and described in my former patent above referred to. For convenience, I have illustrated in the drawings the same chuck and chuck-operating mechanism which is shown and described in my Patent No. 363,144, dated May 17, 1887. The chuck-jaws *b* abut directly against the sleeve b^2, which is forced forward by the screw-sleeve b^3, the threads of which screw in or out of the threaded sleeve b^4, which is rigidly secured to or made integral with the chuck-spindle B. The screw-sleeve b^3 is driven faster or slower than the chuck-spindle by the gears b^5 b^6 on said screw-sleeve, which mesh with the gears b^7 b^8 on the clutch-sleeves b^9 b^{10}, which are both loose on the counter-shaft b^{11}. The shaft b^{11} is furnished with two clutches, b^{12} b^{13}, which alternately engage the clutch-sleeves b^9 b^{10}. The shaft b^{11} is reciprocated to cause one or other of said clutches to be engaged or both of them disengaged by means of a cam, C′, on the cam-shaft C, which operates through the sliding bar b^{14}, arm b^{15}, and grooved collar b^{16}. The shaft b^{11} is revolved by a gear, b^{17}, on the chuck-spindle, which meshes with a friction-gear, b^{18}, clamped between the collars or

rings b^{19} b^{19} on the shaft b^{11}. The cam-shaft C is driven from the chuck-spindle by a train of intermeshing reducing-gears, $c\,c'\,c^2\,c^3\,c^4\,c^5\,c^6\,c^7\,c^8$, or other suitable or equivalent mechanism. My present invention does not consist in this chuck or chuck-operating part of the screw-machine, and for a more full description thereof I would refer to my aforesaid Patent No. 363,144.

D represents the intermittently-revolving tool-bearing turret mounted in suitable bearings, E′, in the slide E. The slide E is mounted in suitable guideways, *e*, on the frame A. The slide F is mounted in guideways *f* on the frame A, and is reciprocated longitudinally to advance the tools carried by the turret to and from their work by means of a cam, C^2, on the cam-shaft, C. The slide F is connected with the cam-groove C^2 by a pin, F′, carrying the friction-roller f^2. The slide E is adjustable on the slide F, so that the turret and its tools may be adjusted forward or backward, as required, the slide F being advanced and retracted always to the same extent by its operating-cam. Any suitable means may be employed for adjusting the turret-carrying slide E on the cam-slide F. I prefer to employ for this purpose, as shown in the drawings, a threaded nut or sleeve, f^3, which works in a screw-threaded hole, f^4, in the flange or projection f^5 on the slide E. This sleeve f^3 is also furnished with a screw, f^6, which enters a threaded hole, f^7, in the slide F. The end of the threaded sleeve f^3 abuts against the slide F. By turning the threaded sleeve and the screw f^6 the slide E may be adjusted as desired on the slide F. The axis of the turret D, thus journaled on the double or compound slide E F, is parallel to the axis of the chuck-spindle B.

Intermittent rotary motion is communicated to the longitudinally-sliding turret D through an axial shaft, G, which fits loosely in a central or axial hole in the turret and is continuously rotated by means of a gear, *g*, on the chuck-spindle B, which meshes with a gear, *g′*, on the shaft G. The outer end of the shaft G is supported by or journaled in a sleeve or other suitable bearing, G′, secured to the frame A. The gears *g g′* are preferably mounted within the hollow driving-pulley B′, as shown in the drawings, as the machine is thereby made more compact. Intermittent rotary motion is communicated from the continuously-rotating shaft G to the intermittently-rotating longitudinally-sliding turret D by means of a planet-gear, H, which is journaled upon an arm, H′, secured to a sleeve, H^2, which is keyed to the shaft G by a key, *h*, which fits in a longitudinal groove, *h′*, in the shaft G, and which is journaled in the interior hub, E′, of the slide E. This planet-gear H meshes with a pair of differential gears, h^3 h^4, one of which has a greater number of teeth than the other. The gear h^3 preferably has forty-four teeth, and the gear h^4 forty-five teeth. The gear h^3 is secured to a hub or shoulder, h^5, on the turret D. The gear h^4 is journaled upon a flange or hub, h^6, on the gear h^3. The planet-gear H, carried by the shaft G, revolves around the differential gears h^3 h^4, with which it meshes, and at each revolution of the shaft G it turns one of the differential gears h^3 h^4 the distance of one tooth in respect to the other. When the turret is held stationary by the steady-pin or other holding device, the gear h^4 will be turned a distance of one tooth at each revolution of the planet-gear, and when, on the other hand, the gear h^4, which is loose on the turret, is held stationary, the gear h^3 and the turret to which it is fixed will turn the distance of one tooth. So far as this planet-gear feature of my invention is concerned, any suitable device or mechanism may be employed for automatically chucking or holding the differential gear h^4 stationary at suitable intervals. I have, however, invented a special form of mechanism for this purpose, which I prefer to employ and which I will now proceed to describe.

K is a clutch-ring mounted upon the flange or shoulder *k* on the gear h^4, and preferably having a frictional connection with said gear instead of a rigid connection, so that the clutch-ring may slip on the gear in case the clutch should be engaged by the companion part K′ of the clutch before the turret is released from the steady-pin, if the steady-pin should be engaged with the turret before the parts K K′ of the clutch are disengaged. The frictional connection between the clutch K and the gear h^4 is effected by the friction-collars k' k^2, between which the clutch-ring is pressed by the collar k^3 and the threaded collar or ring k^4. By turning the threaded collar k^4 the degree of friction or resistance may be adjusted.

The clutch-arm K′ is a part of or carried upon a sleeve, K^2, secured to the steady-pin M. The steady-pin M is mounted in suitable bearings upon the turret-slide E, and enters suitable sockets, *d*, in the turret D and serves to fix and hold the turret in proper position to align the several tools carried by the turret with the chuck. This steady-pin is reciprocated on the slide E, to cause it to engage and disengage the sockets in the turret and cause the clutch-arm K′ to engage and disengage the clutch K by means of a rock-shaft, M′, having a toothed segment, *m*, the teeth of which mesh with the rack-teeth *m′* on the steady-pin. The rock-shaft M′ is rotated or rocked by a notched disk or projection, m^2, secured to said rock-shaft, which engages a stationary spring-pawl, m^3, secured to the frame of the machine, and which engages the notched disk m^2 as the slide E is reciprocated by the cam C^2. The pawl m^3 is pivoted to an adjustable block, m^4, attached to the frame, so that the position of the pawl may be adjusted in relation to the notched disk m^3, carried by the slide E.

m^5 is the spring which holds the pivoted pawl in position. In the drawings the turret is shown in its advanced position, and as the turret is retracted by the cam C^2 the pawl m^3 will engage the notched disk m^2 and turn the

rock-shaft, and thus withdraw the steady-pin and engage the clutch-arm K′ with the clutch K after the steady-pin has become disengaged from its socket in the turret. When the clutch K K′ is thus engaged and the turret and its tools withdrawn from the work, the differential gear h^4 will thus be held stationary and the turret rotated to bring another tool into position for operation upon the stock or work held by the chuck. After the turret is thus rotated by the differential gears and planet-gear until another socket, *d*, in the turret is brought opposite the steady-pin, the steady-pin will be forced into the socket by the spring M^2, which abuts against the slide E at one end and the sleeve K^2 on the steady-pin at the other. The pawl m^3 is pivoted so that the notched disk m^2 may ride over the same by the further movement of the slide after said notched disk is turned by the pawl. The sockets for the steady-pin should be made conical.

N is a gear on the shaft G, which meshes with a gear, N′, on the spindle of the threading-tool *n*, and by which the threading tool is revolved.

P represents a cam on the cam-wheel C^2, and P′ a lever operated by the cam for actuating the cutting-off tool. In the drawings only one tool is shown on the turret. The turret may, however, be furnished with any number of different tools desired, as is customary in automatic screw-machines. The turret D is of course provided with a steady-pin socket, *d*, for each tool to align the same with the chuck-spindle. The mechanism for operating the cutting-off tool, as well as the means for rotating the threading-tool from the shaft G, are fully shown and described in my previous patent before referred to, and as these features are not part of my present invention or improvement they need not be here described.

By my present invention it will be observed that the turret is continuously rotated by the continuously-revolving axial shaft G until the steady-pin enters the socket in the turret, when its motion is arrested by the steady-pin, the clutch-arm K′ being disengaged from the clutch K by the movement of the steady-pin as the same enters its socket in the turret. The turret may also be rotated either a whole or any part of a rotation, as desired, according as the turret is provided with one or more sockets for the steady-pin to enter. The machine is thus readily adapted for the use of any number of different tools on the turret, as desired, and whether the turret has one tool or more it will be driven continuously until the socket is brought opposite the steady-pin.

The shaft which rotates the turret need not pass through it, but may be located at any suitable position for communicating power to the turret to rotate the same.

I claim—

1. In an automatic screw-machine, the combination, with a tool-bearing revolving turret, of a compound or double slide, one part of said slide being adjustable on the other and carrying the turret, and the other part of said slide always moved forward to the same point by the cam or other actuating mechanism, so that the turret with its tool can be adjusted either farther forward or back, substantially as specified.

2. The combination, with cam-slide F, of an adjustable slide, E, mounted upon and carried by said slide F, and a tool-bearing turret, D, mounted upon said adjustable slide E, substantially as specified.

3. In an automatic screw-machine, an intermittently-rotary tool-bearing turret, in combination with a continuously-rotating shaft arranged to rotate the turret continuously until the motion of the turret is checked by a steady-pin entering the socket in the turret, substantially as specified.

4. The combination, with an intermittent rotary turret, of a continuously-rotating shaft passing through the turret and mechanism for intermittently rotating said turret from said shaft, substantially as specified.

5. In an automatic screw-machine, a rotary shaft, a turret, a planet-gear, and a gear intermeshing therewith for intermittently rotating said turret from said shaft, substantially as specified.

6. The combination of turret D with rotary shaft G, a planet-gear, and a pair of differential gears, substantially as specified.

7. The combination, with turret D, of rotary shaft G, a planet-gear, a pair of differential gears, and a clutch or equivalent mechanism for holding one of said differential gears, substantially as specified.

8. In an automatic screw-machine, a turret rotating upon a rotary shaft by being connected therewith by planet-gear, substantially as specified.

9. A reciprocating and intermittently rotating turret, in combination with a slide and its steady-pin, operating by its backward movement to release the turret from the slide and lock the turret to the mechanism by which it is rotated, and by its forward movement to release the turret from the said mechanism and lock the turret to the slide, substantially as specified.

10. The combination of turret D, continuously-rotating axial shaft G, a planet-gear carried by said shaft, a differential gear meshing therewith carried by said turret, a loose differential gear furnished with a clutch, as K, a clutch, as K′, and a steady-pin, substantially as specified.

11. The combination of turret D, axial shaft G, planet-gear H, differential gears h^3 h^4, clutch K, and clutch-arm K′, said clutch K having a frictional connection with said differential gear h^4, substantially as specified.

12. The combination of turret D, axial shaft G, planet-gear H, differential gears h^3 h^4, clutch K, and clutch-arm K′, said clutch K having a

frictional connection with said differential gear h^4, and a steady-pin, M, substantially as specified.

13. The combination of turret D, axial shaft G, planet-gear H, differential gears h^3 h^4, clutch K, and clutch arm K′, said clutch K having a frictional connection with said differential gear h^4, a steady-pin, M, and a rock-shaft, M′, mounted upon a reciprocating slide, a rack and gear connecting said steady-pin and rock-shaft, and a pawl for operating said rock-shaft by the movement of said slide, substantially as specified.

14. The combination, with a turret, of the reciprocating slide upon which it is mounted, a sliding pin furnished with a rack, a rock-shaft carried upon said slide and furnished with a gear, and a notched disk or projection on the frame of the machine for operating said rock-shaft, substantially as specified.

15. The combination, with the turret, of the reciprocating slide and a steady-pin furnished with a clutch, as K′, whereby the movement of the steady-pin to engage the turret from the slide operates to disengage or engage said clutch K′ with the clutch of the turret-rotating mechanism, substantially as specified.

16. The combination, in an automatic screw-machine, of the chuck-spindle B, a rotating shaft, G, geared to said chuck-spindle, a turret, D, rotating upon said shaft G as an axis, and mechanism for communicating an intermittent rotary motion from said shaft G to said turret, substantially as specified.

17. The combination of chuck-spindle B, shaft G, geared to said chuck-spindle, turret D, intermittently rotating upon said shaft G, planet-gear H, arm H′, sleeve H^2, differential gears h^3 h^4, and clutch K K′, substantially as specified.

18. The combination of chuck-spindle B, shaft G, geared to said chuck-spindle, turret D, intermittently rotating upon said shaft G, planet-gear H, arm H′, sleeve H^2, differential gears h^3 h^4, clutch K K′, and a sliding pin, M, for engaging and disengaging said clutch K K′, substantially as specified.

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