(No Model.)

3 Sheets—Sheet 1.

W. A. TUCKER.

CAPSULE JOINING MACHINE.

No. 336,177.

Patented Feb. 16, 1886.

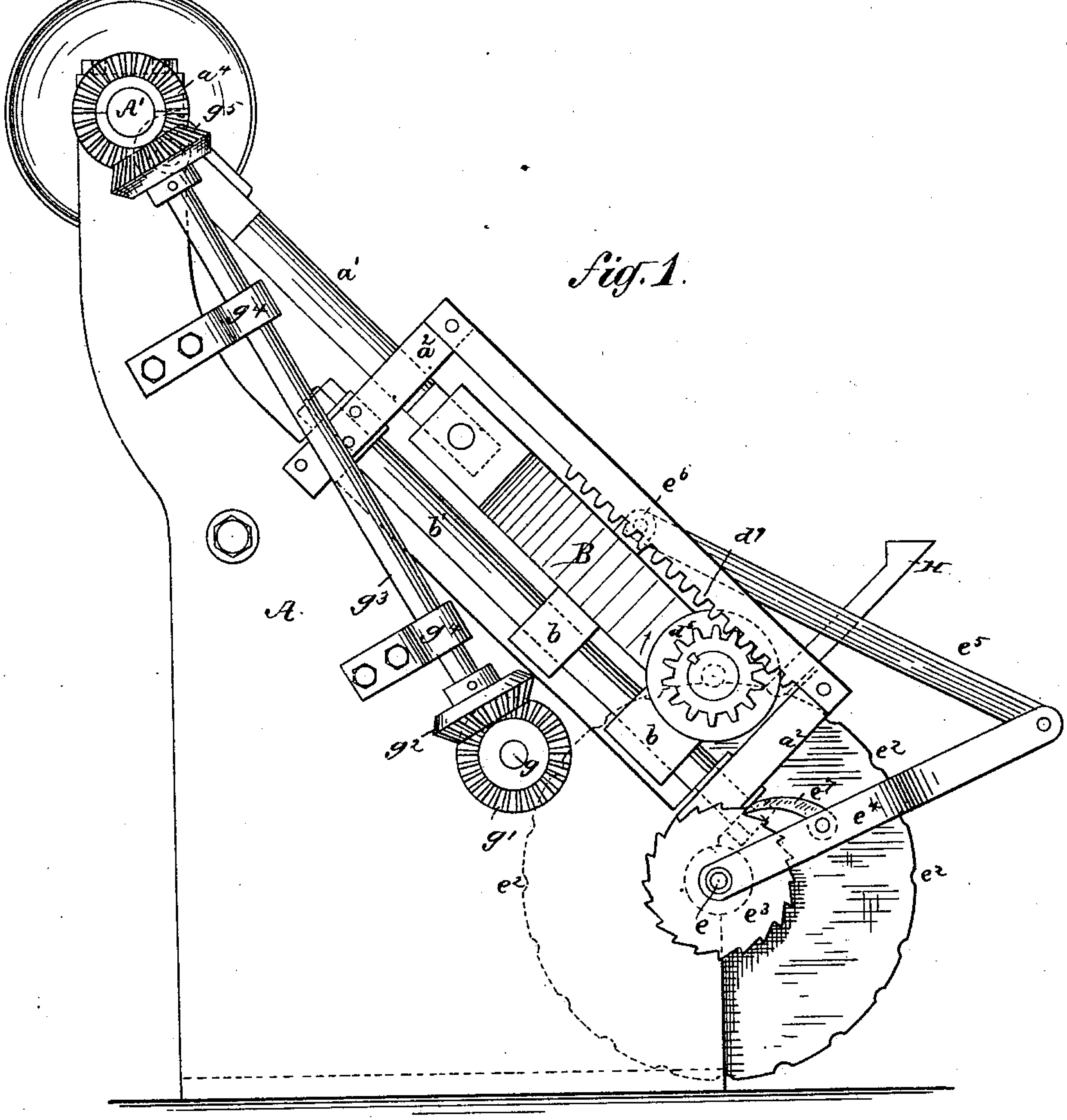

Fig. 1.

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(No Model.)

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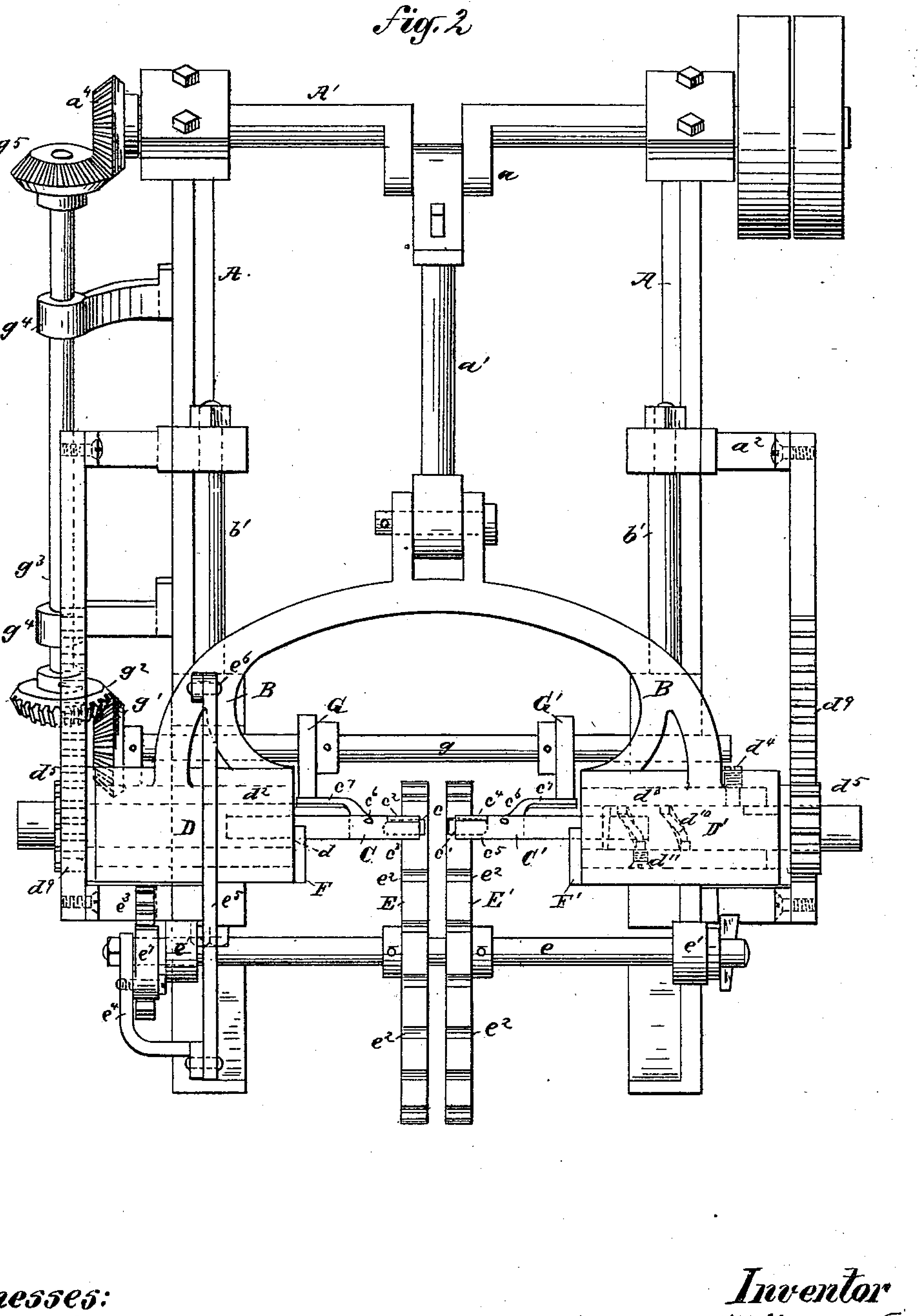
Fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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fig. 3

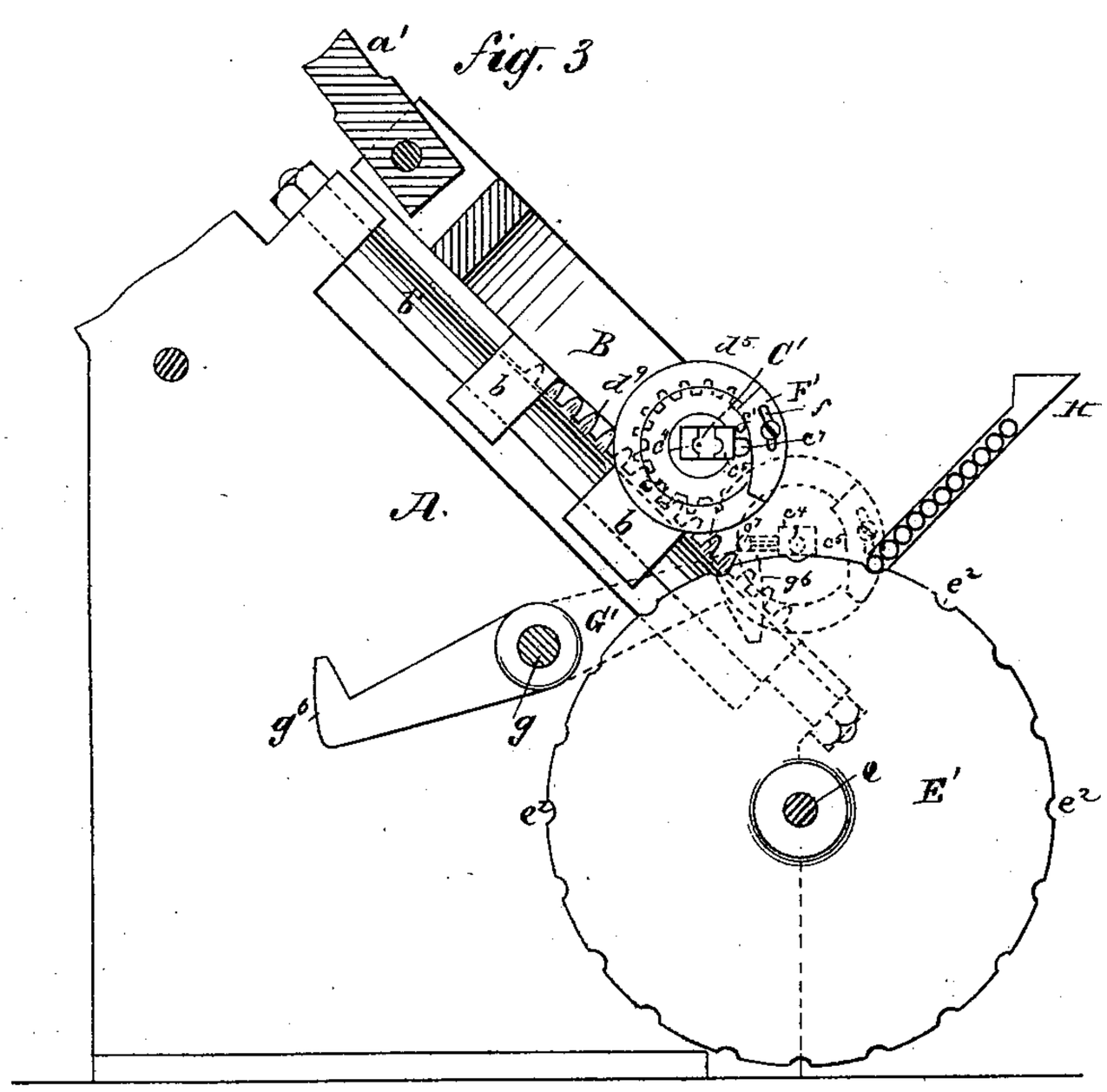
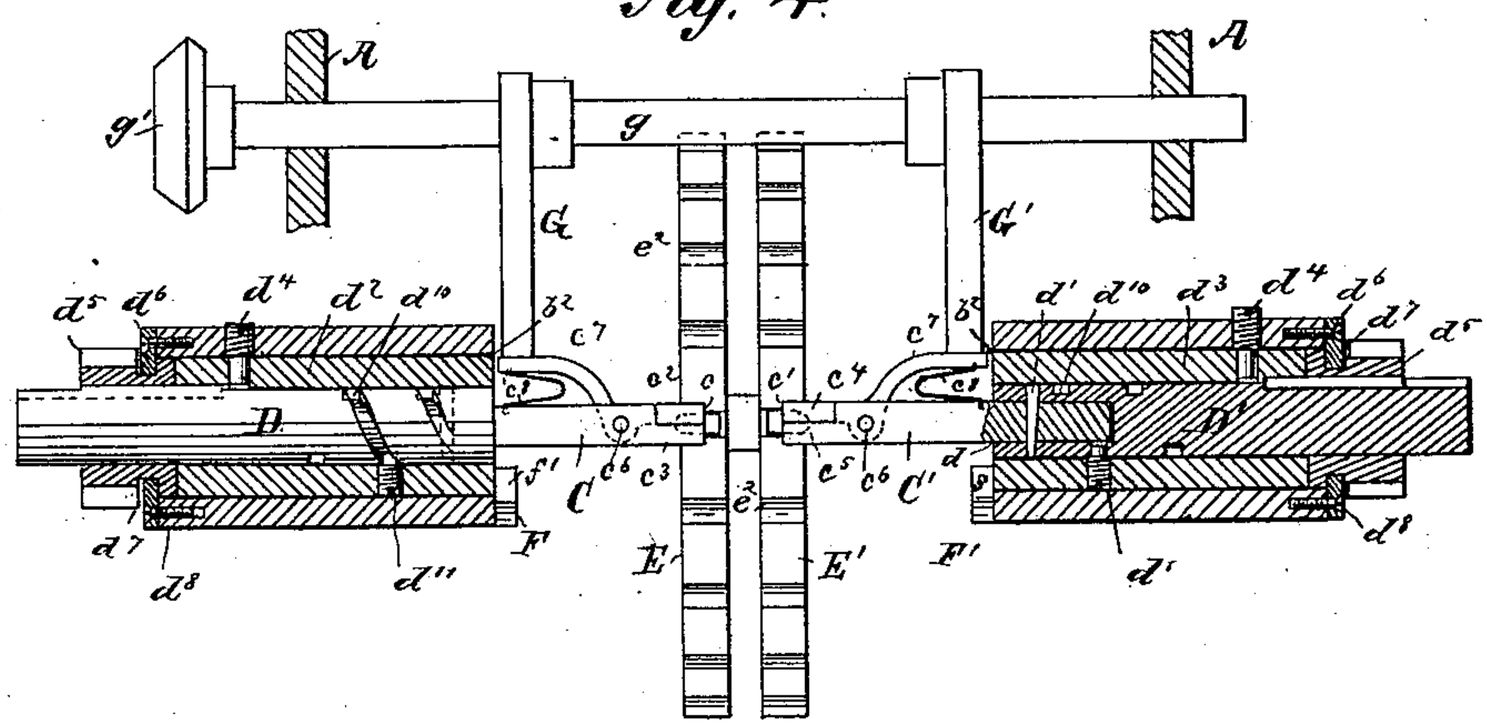


fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM A. TUCKER, OF NEW YORK, N. Y.

CAPSULE-JOINING MACHINE.

SPECIFICATION forming part of Letters Patent No. 336,177, dated February 16, 1886.

Application filed April 27, 1885. Serial No. 163,501. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. TUCKER, of the city of New York, in the county and State of New York, and a citizen of the United States of America, have invented a new and Improved Capsule-Joining Machine, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of the same.

My invention relates to the joining or uniting, by fitting one within the other, of the two halves of a capsule; and my invention consists in a machine containing the devices and combinations of devices hereinafter described and claimed, whereby this joining or uniting of the halves of capsules is accomplished.

Figure 1, Sheet 1, is a side elevation of a machine containing my invention. Fig. 2, Sheet 2, is a front elevation of the same. Fig. 3 is a vertical central section of the same on a line between the feed rolls or wheels; and Fig. 4 is a transverse vertical section of the parts and devices whereby the gripping-arms, hereinafter described, are actuated to be rotated, and showing also the feed rolls or wheels in peripheral elevation.

A is the frame of the machine, in the upper part of which is journaled the main driving-shaft A′.

B is a carriage arranged to reciprocally traverse the frame, and moving on bearings *b*, working on ways *b′*, mounted on the frame and actuated by the crank *a* on the main shaft through the connecting-rod *a′*.

C and C′ are the capsule gripping and joining arms, which are mounted, respectively, on the opposite sides of the carriage-frame, and extend inwardly therefrom on the same axial line and with their inner ends opposed to each other. The opposed faces of the inner ends of the arms are recessed, as shown at *c* and *c′*, these recesses being adapted to receive, respectively, the two halves of which a capsule is composed, with the closed end of the half-capsule seated in the bottom of the recess and the open ends or mouths of the halves extended somewhat beyond the recesses. A capsule being formed with one half of a less diameter than the other, so that the mouth of one may pass into and fit the mouth of the other, the two halves thus seated in the recessed arms having the same axial line and being opposed to each other, are in position to be joined or united by passing the mouth of one half into the mouth of the other. The recessed ends of the arms C and C′ are divided longitudinally and centrally of the recesses into the jaws c^2 c^3 and c^4 c^5, respectively. These jaws are pivoted together, as shown at c^6, and they are held closed by means of a lever, c^7, extending from one of the jaws of each pair longitudinally of the arms C and C′ and controlled by a spring, c^8. These arms C and C′, one or both, have a longitudinal reciprocatory motion, whereby the opposed recessed capsule-holding ends alternately approach toward and recede from each other, and at the same time one or both of said arms have a reciprocatory rotary motion, the rotation of one arm, when both are rotated, being in the opposite direction to the rotation of the other arm.

The desirable means by which these described motions are given to the said arms consist in the following devices: The arms are respectively fixed in a recess or socket, *d*, preferably by a pin or key, *d′*, in the ends of the shafts D and D′, these shafts being respectively journaled in sleeves d^2 d^3, which are fixed, preferably by a pin or screw, d^4, in recesses b^2 in the opposite sides of the carriage-frame B. Upon the outward ends of these shafts is feathered a driving-pinion, d^5, which is held in its place by the ring d^6, fitting loosely into a circumferential groove, d^7, on the hub of the pinion, and secured to the outward end of the carriage-frame B by screws or bolts d^8. The driving-pinion d^5 engages a rack, d^9, mounted on the machine-frame A by supports or arms a^2, and when both shafts D and D′ are rotated the racks d^9 are diametrically oppositely located as to the common axial line of the shafts, one being over the pinion on one shaft and the other being under the pinion on the other shaft, whereby, when the shafts are rotated, owing to the reciprocation of the carriage B on the frame, the shafts, and consequently the arms C and C′, will be given an oppositely-directed reciprocatory rotary motion. Each shaft D and D′ is provided with a worm-groove, d^{10}, into which takes a stud or pin, d^{11}, set in the sleeves d^2 d^3, whereby the reciprocation of the carriage B will at the same time that it

gives the described reciprocatory rotary motion to the shafts also give said shafts and the arms C and C′, carried thereby, a longitudinal reciprocatory motion, causing the opposed ends of the arms C and C′ to alternately approach toward and recede from each other.

It is evident that by means of the described construction and arrangement of the parts either of the shafts D D′, carrying the arms C C′, may be withdrawn from the carriage-frame by simply unbolting the ring d^6 and unseating the screw-pin d^4, and then sliding the sleeves and their contained devices out through the outward end of the carriage-frame. It is also evident, as hereinbefore intimated, that both of the capsule holding and joining arms may be given the described motions, or that one of them may be rigid and the other be given the motions stated. I find it desirable, however, that both of the arms have the described concurrent motions.

At E and E′ are shown the feed devices which carry the capsule-halves to the jaws of the arms C and C′. These devices are preferably in the form of wheels or disks, which are fixed on a shaft, *e*, journaled in bearings *e′* in the machine-frame A, and are so placed that the periphery of each one is vertically beneath the jaws of the arm, to which it feeds a half-capsule when the carriage B, bearing the arms, is at the limit of its downward movement. These devices are coincidently notched at e^2 to receive and carry the half-capsules, and they are given an intermittent rotary motion, which may be accomplished by means of a ratchet, e^3, fixed on the shaft *e*, operated by a pawl, e^7, carried by a lever, e^4, which swings on the shaft *e*, as shown, and is actuated by the reciprocating carriage B, through the rod e^5, which is pivoted at one end to the extremity of the lever e^4 and at the other to the carriage at e^6.

Upon the inner side or face of the carriage-frame B are fixed the cam-blocks F and F′, which are preferably adjustable by means of the slots *f*. These cam-blocks are so located and arranged relatively to the levers c^7 of the jaws of the arms C and C′ that when the carriage B has reached the limit of its upward movement the levers c^7, by the rotation of the arms C C′, will engage the face *f′* of the cam-blocks and be depressed, overcoming the springs c^8, and thus causing the jaws c^2 c^3 and c^4 c^5 to open.

At G G′ are shown double cams fixed on a shaft, *g*, journaled in the frame A, and driven by a pinion, *g′*, which is actuated by a pinion, g^2, on the shaft g^3, journaled at g^4 on the frame and driven by pinion g^5 from pinion a^4 on the main shaft A′. These double cams are so located and arranged relatively to the described levers c^7 of the jaws of the arms C and C′ that when the carriage B has approached closely to the limit of its downward movement the levers c^7 will engage the face g^6 of the cams G G′ and be depressed, overcoming the springs c^8, thus causing the gripping-jaws c^2 c^3 and c^4 c^5 to open and receive their respective half-capsules from the feed-wheels, and then escape from said face g^6 of the cams, whereby the jaws will be released, and by action of their controlling-springs will close upon and hold the said half-capsules. The half-capsules may be fed to each of the notched feed-wheels by a hopper, such as is shown at H.

I do not intend to limit myself to the precise devices herein described, whereby the named motions are given to the gripping-jaws and the feed-wheels; any other known equivalent devices may be employed for this purpose.

The operation of my machine is as follows: The halves of the capsules, with their open ends opposed to each other, are fed down through the hoppers H to the peripheries of the wheels E and E′, and there the two halves which are to form a capsule fall into two of the coincident notches on the wheels, and are carried therein to the gripping-jaws. The carriage B has now reached the limit of its downward movement, and the gripping jaws c^2 c^3 and c^4 c^5 are held open by the engagement of the levers c^7 and face g^6 of cams G G′. At the moment when the limit of this downward movement is attained the open gripping-jaws descend upon and inclose the respective capsule-halves, and the levers c^7 escaping the cams G G′ the jaws close upon and take up the capsule-halves in the position shown in dotted lines in Fig. 3. It is desirable that there should be some little lost motion at this point to the carriage B, which may be provided for at the joint thereto of the rod *a′*, so that an appreciable space of time may elapse when the carriage has descended to the limit of its course, and before it begins its ascent, so that the gripping-jaws may close on the capsule-halves by the escape of the levers c^7 from the cams G G′ before the ascent of the carriage is begun. The carriage then begins its upward movement, and, as hereinbefore described, the jaws carrying the capsule-halves will approach each other, and the mouth of the smaller half-capsule will be passed into the mouth of the larger half, and at the same time the half-capsules—one or both—will be rotated, and thereby the passing of one of the halves into the other and the joining and fitting of them together will be assisted and facilitated. The capsule-halves being thus united, the carriage B will approach the limit of its upward movement, and the levers c^7, by the rotation of the gripping-jaws, will be brought into engagement with the faces *f′* of the cam-blocks F and F′, whereby, when the carriage has reached the limit of its upward movement the gripping-jaws will be opened into the position shown in full lines in Fig. 3 and the completed capsule will escape from the jaws and fall into a suitable receptacle. The levers c^7 will then escape the cams F and F′, and the gripping-jaws will close and the carriage will begin its descent, the gripping-jaws being then

reversely rotated and drawn backward from each other. On reaching the limit of its downward movement the levers c^7 will engage the face g^6 of the cams G G′, and the jaws will thereby open and will range, respectively, over the feed-wheels E and E′, and the feed-wheels having, by the mechanism hereinbefore described, been rotated the space to the next notches, two new capsule-halves therein will be brought to the jaws, which, closing by the escape of the levers c^7 from the cams G G′, will take up the said new halves and grip them, as described, preparatory to the joining thereof, as set forth.

The operation of the machine is continuous, successive capsule-halves being fed up to the jaws, which grip and then unite and drop them, and then take up successive halves, as described.

It is evident that other devices than those described may be employed to give the gripping-jaws—one or both—their specified longitudinal reciprocatory and rotary reciprocatory motions, and that the reciprocatory motion of the carriage B may be given by a cam in place of the crank-shaft and connecting-rod shown.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a capsule-joining machine, the combination of the half-capsule-gripping jaws opposed to each other and arranged on a common longitudinal axial line, and devices, substantially as described, whereby one or both have a longitudinal reciprocating motion and a reciprocating rotary motion, as and for the purpose specified.

2. In a capsule-joining machine, the combination, with the half-capsule-gripping jaws arranged opposedly on a common longitudinal axial line, and feed-wheels, one for each pair of jaws, peripherally notched to receive and carry the half-capsules, of devices, substantially as described, whereby said jaws—one or both—have a longitudinal reciprocatory and reciprocatory rotary motion, and said feed-wheels have an intermittent rotary motion, as and for the purpose set forth.

3. In a capsule-joining machine, the combination, with the peripherally-notched feed-wheels and the opposed gripping-jaws, of devices, substantially as described, whereby said wheels are intermittently rotated, and said jaws have a longitudinal reciprocatory and reciprocatory rotary motion, and open to take up a half-capsule at the limit of their motions in one direction, and to release the completed capsule at the limit of their motions in the opposite direction, and are maintained closed during more or less of their motions in either direction, as described, and for the purpose specified.

4. In a capsule-joining machine, the combination, with a carriage having a reciprocal traverse of the machine, and the half-capsule-gripping jaws mounted opposedly and on a common longitudinal axial line on the carriage, of devices, substantially as described, intermediate the carriage and the gripping-jaws, whereby the reciprocation of the carriage gives the jaws—one or both—a longitudinal reciprocatory and a reciprocatory rotary motion, as and for the purpose specified.

5. In a capsule-joining machine, the combination, with a carriage having a reciprocal traverse of the machine, and the half-capsule-gripping jaws mounted opposedly and on a common longitudinal axial line on the carriage, and the peripherally-notched half-capsule feed-wheels, of devices, substantially as described, intermediate the carriage and the gripping-jaws and the feed-wheels, respectively, whereby the reciprocation of the carriage gives, respectively, the jaws—one or both—a longitudinal reciprocatory and a reciprocatory rotary motion, and the feed-wheels intermittent rotary motion concurrent therewith, as and for the purpose specified.

6. The combination, in a capsule-joining machine, of the reciprocating carriage B, carrying the opposed arms C C′, having the capsule-gripping jaws, said arms being—one or both—provided with a shaft, D and D′, having worm-grooves d^{10}, sleeve d^3, pin d^{11}, pinion d^5, and rack d^9, as and for the purpose specified.

7. The combination, in a capsule-joining machine, of arm C, carrying capsule-gripping jaws, and detachably seated in socket d in shaft D, which has worm-groove d^{10}, sleeve d^3, carrying pin d^{11}, and seated in recess b^2 in carriage B, pin d^4, pinion d^5, having annular groove d^7, and ring d^6, as and for the purpose specified.

8. In a capsule-joining machine, the combination, with the reciprocating carriage B, carrying the capsule-gripping jaws having a longitudinal reciprocatory and reciprocatory rotary motion, of the peripherally-notched feed-wheels E and E′ on shaft e, ratchet e^3, lever e^4, pawls e^7, and rod e^5, pivoted to the carriage at e^6, as and for the purpose specified.

9. In a capsule-joining machine, the capsule-gripping jaws c^2 c^3 and c^4 c^5, carried by arms C and C′, and having levers c^7 and springs c^8, as and for the purpose specified.

10. In a capsule-joining machine, the combination, with the reciprocating carriage carrying the capsule-gripping jaws—one or both—having a longitudinal reciprocatory and reciprocatory rotary motion, and provided with levers c^7, of the cams F and F′—one or both—having bearing-face f', as and for the purpose specified.

11. In a capsule-joining-machine, the combination, with the reciprocating carriage carrying the capsule-gripping jaws—one or both—having a longitudinal reciprocatory and reciprocatory rotary motion, and provided with spring-levers c^7, of the rotating cams G and G′—one or both—having the bearing-face g^6, as and for the purpose specified.

12. In a capsule-joining machine, the com-

bination, with the reciprocating carriage B, operated by rod a' and crank a on main shaft A', and carrying the gripping-jaws—one or both—having the described reciprocatory motion and controlled by the spring-levers c^7, of the cams G and G'—one or both—having faces g^6, and mounted on shaft g and driven by pinion g', pinion g^2, shaft g^3, pinion g^5, and pinion a^4, as and for the purpose specified.

13. In a capsule-joining machine, the combination, with the reciprocating carriage B, carrying the arms C and C', bearing the capsule-gripping jaws, having—one or both—the described reciprocatory motions, and provided with levers c^7, of the cam-blocks F and F', one or both, secured to the inward face of the carriage-frame, as and for the purpose specified.

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