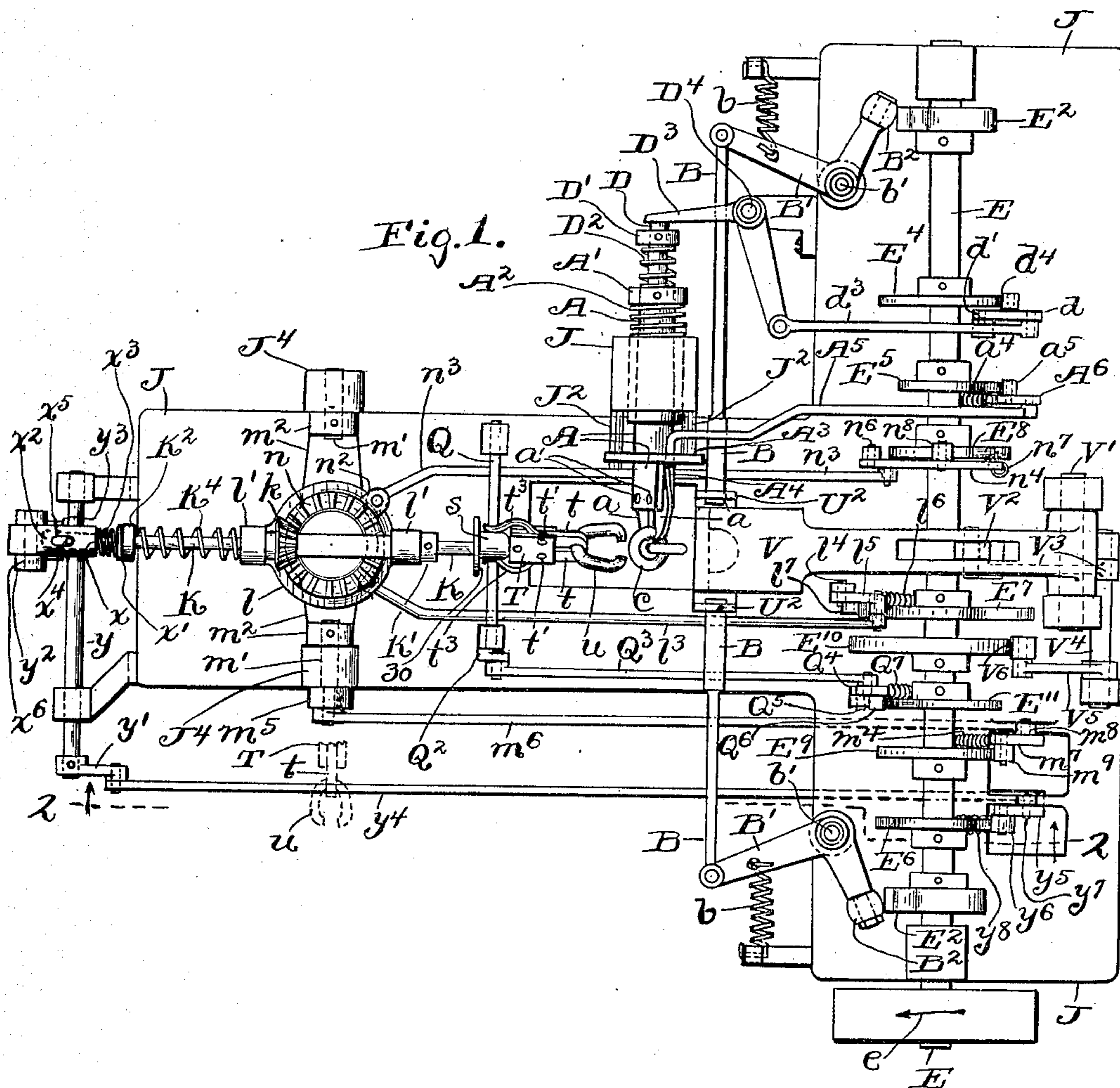


919,488.

P. H. STANDISH.
CHAIN MAKING MACHINE.
APPLICATION FILED JULY 24, 1907.

Patented Apr. 27, 1909.
6 SHEETS—SHEET 1.



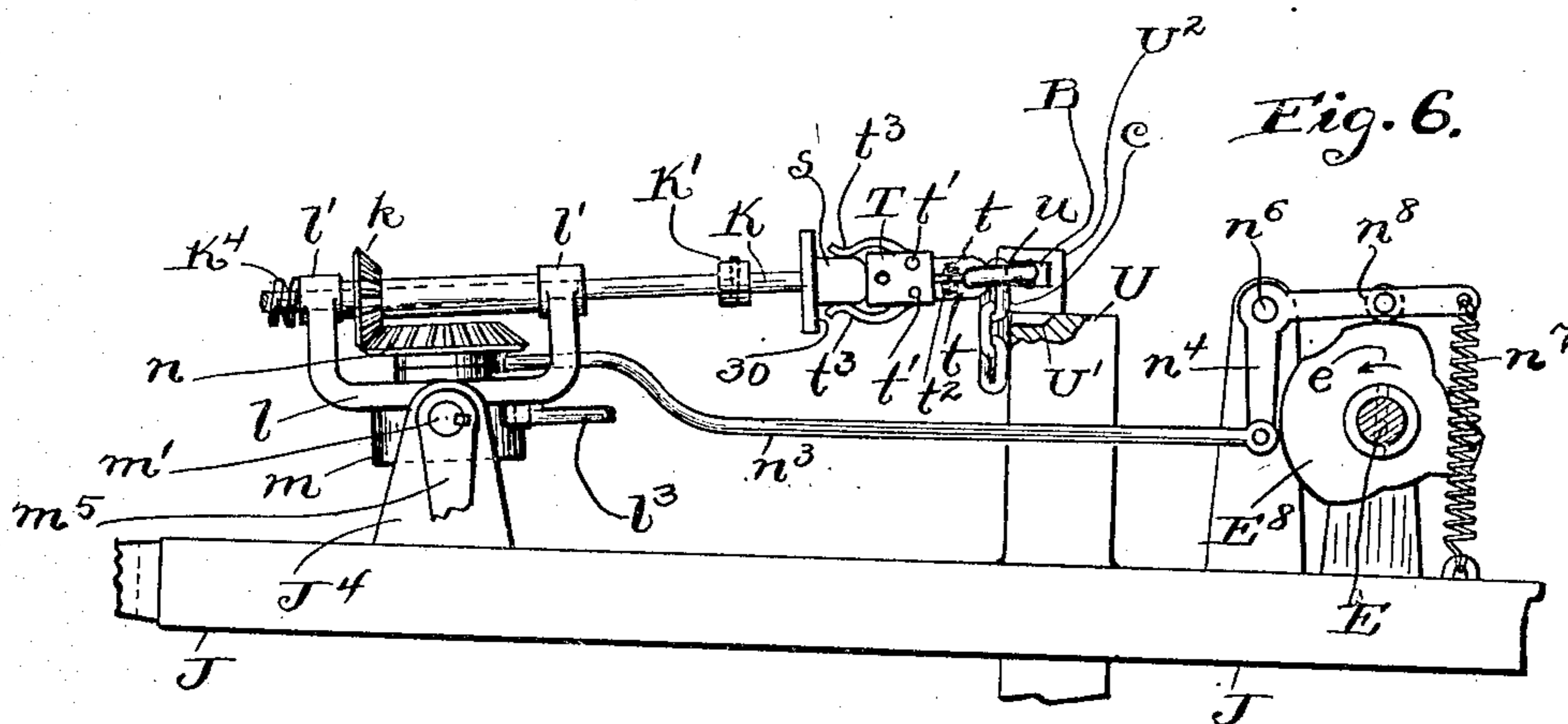
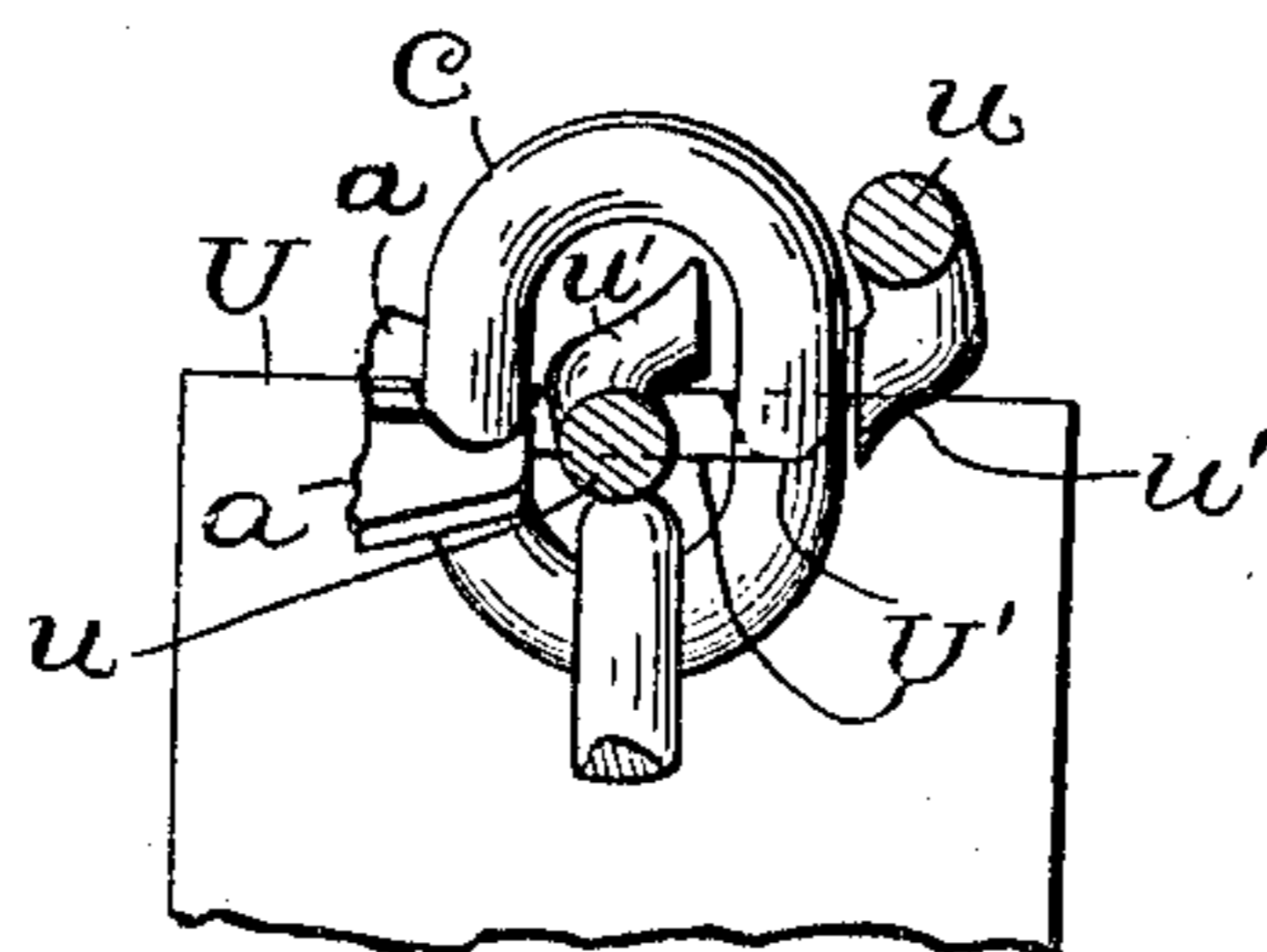
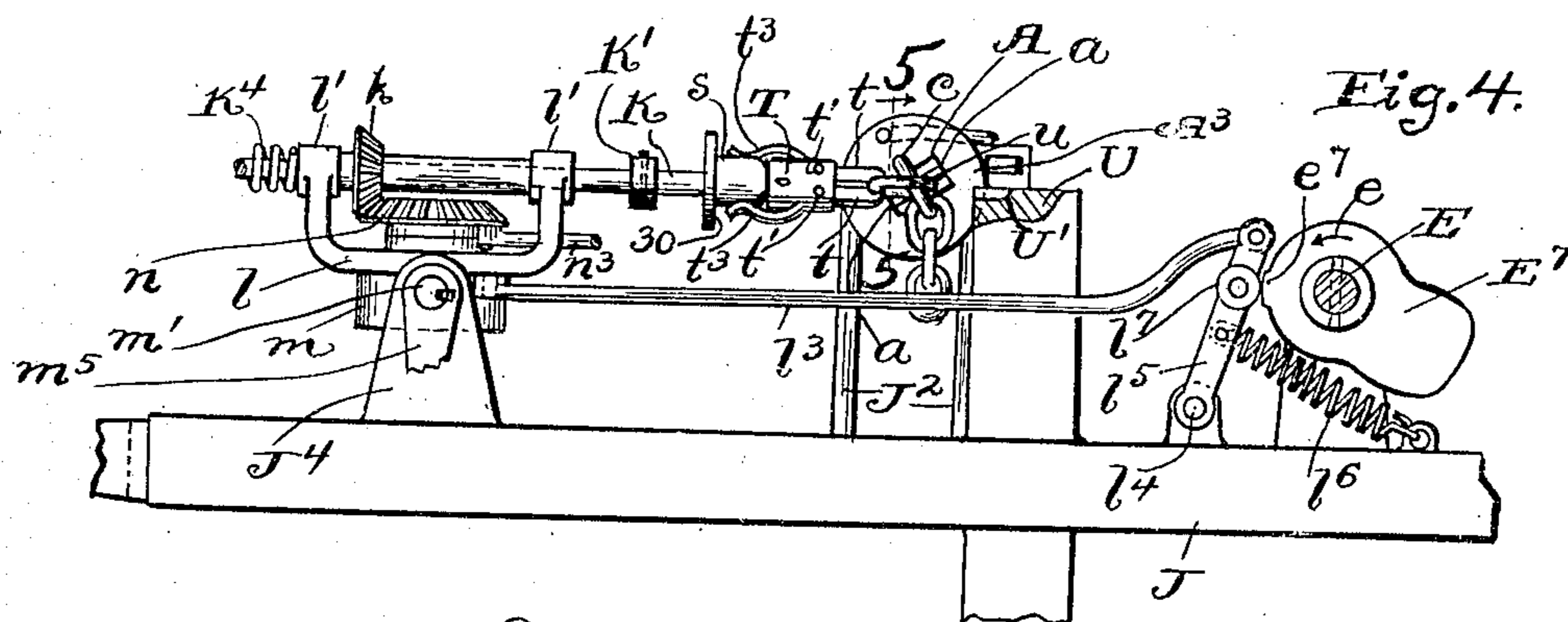
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5 SHEETS—SHEET 3.



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Fig. 7.

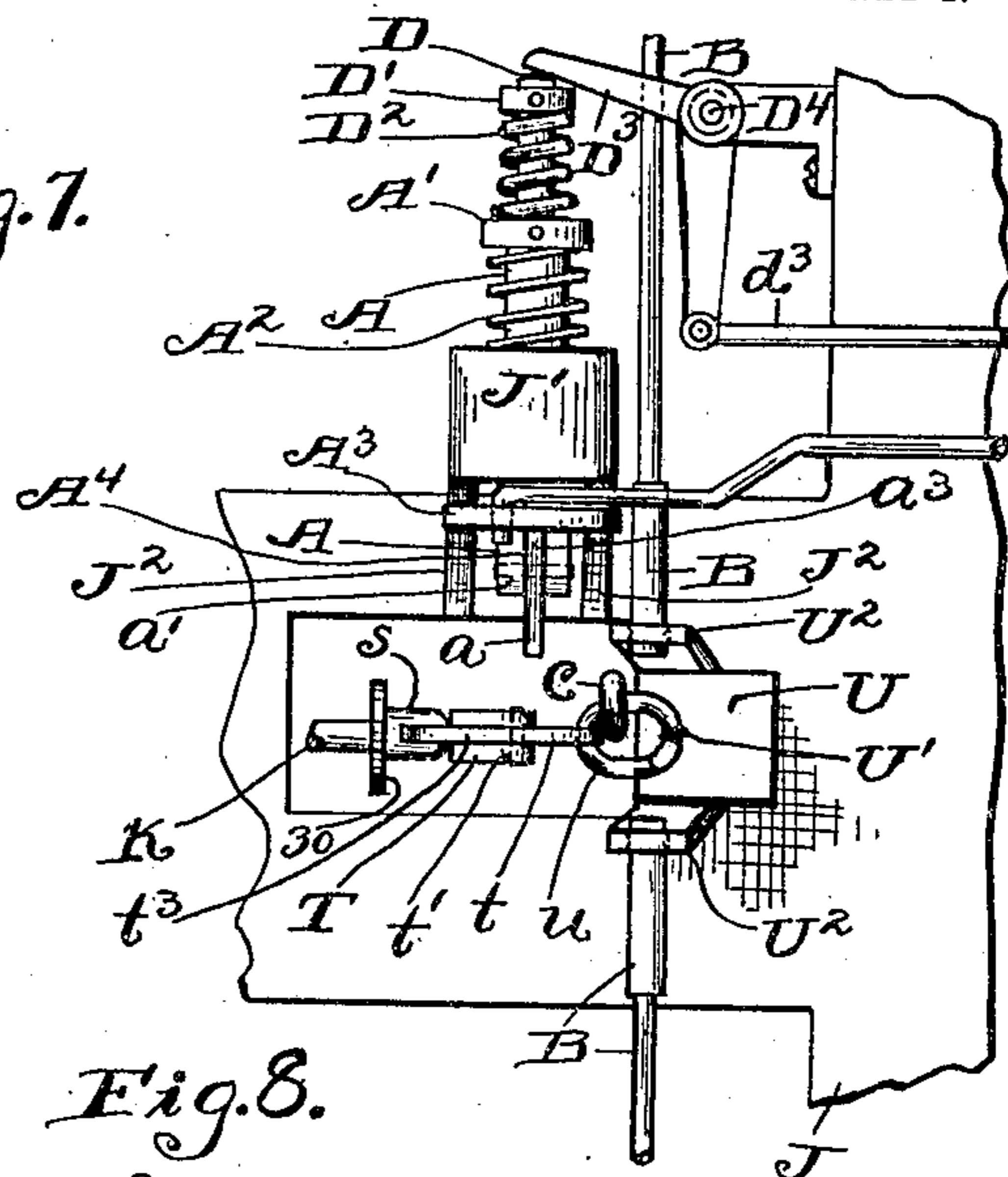


Fig. 8.

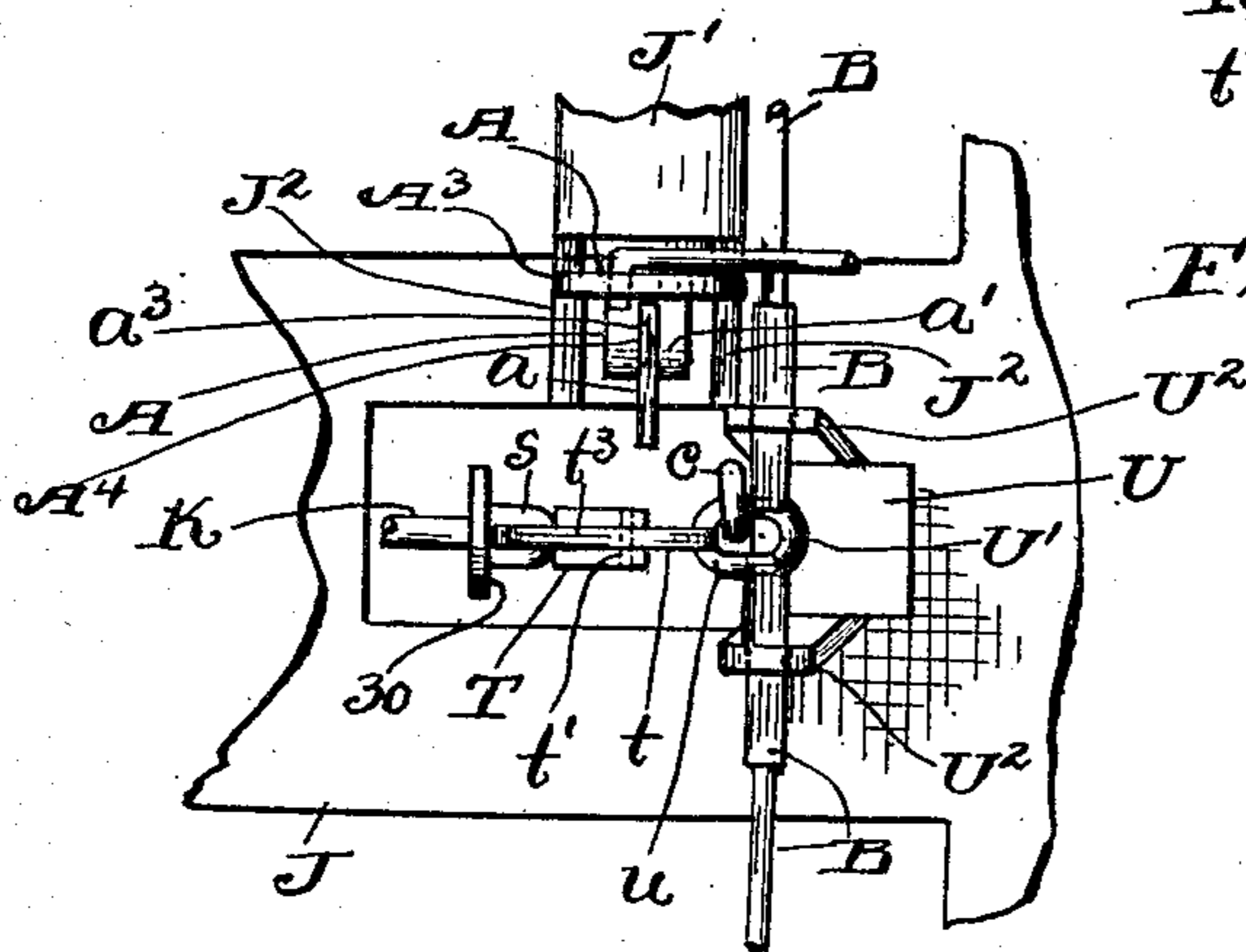


Fig. 9.

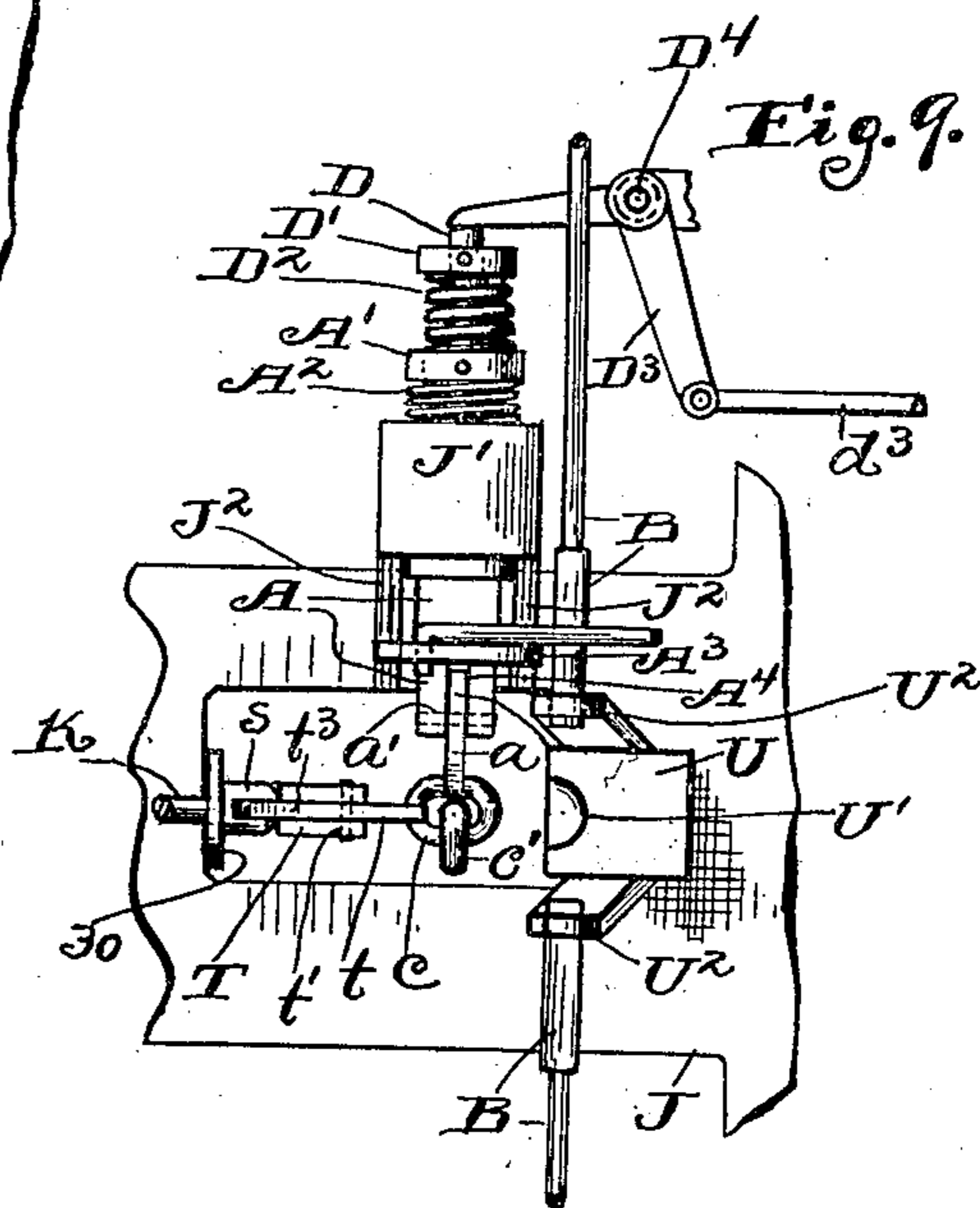
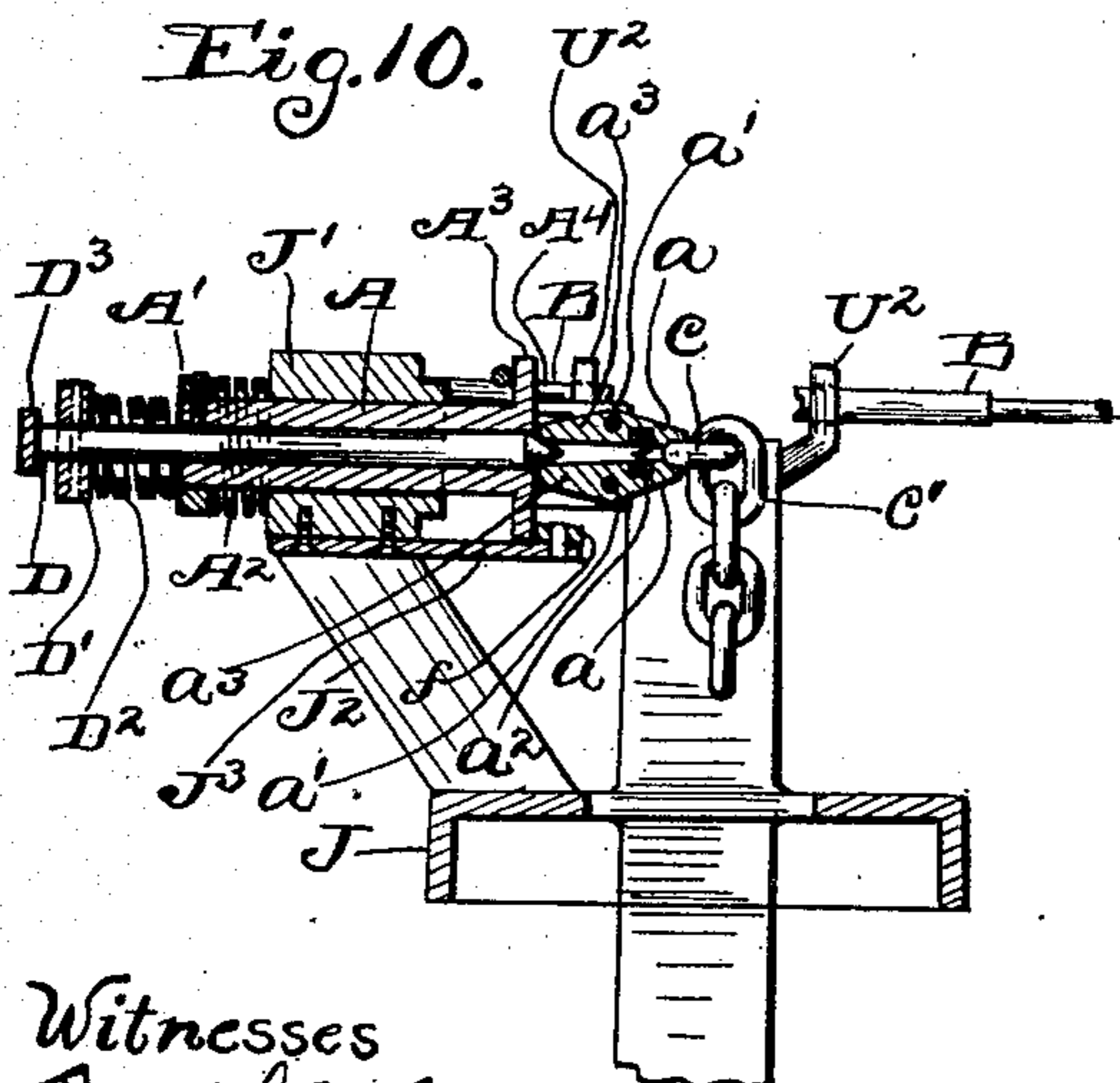


Fig. 10.



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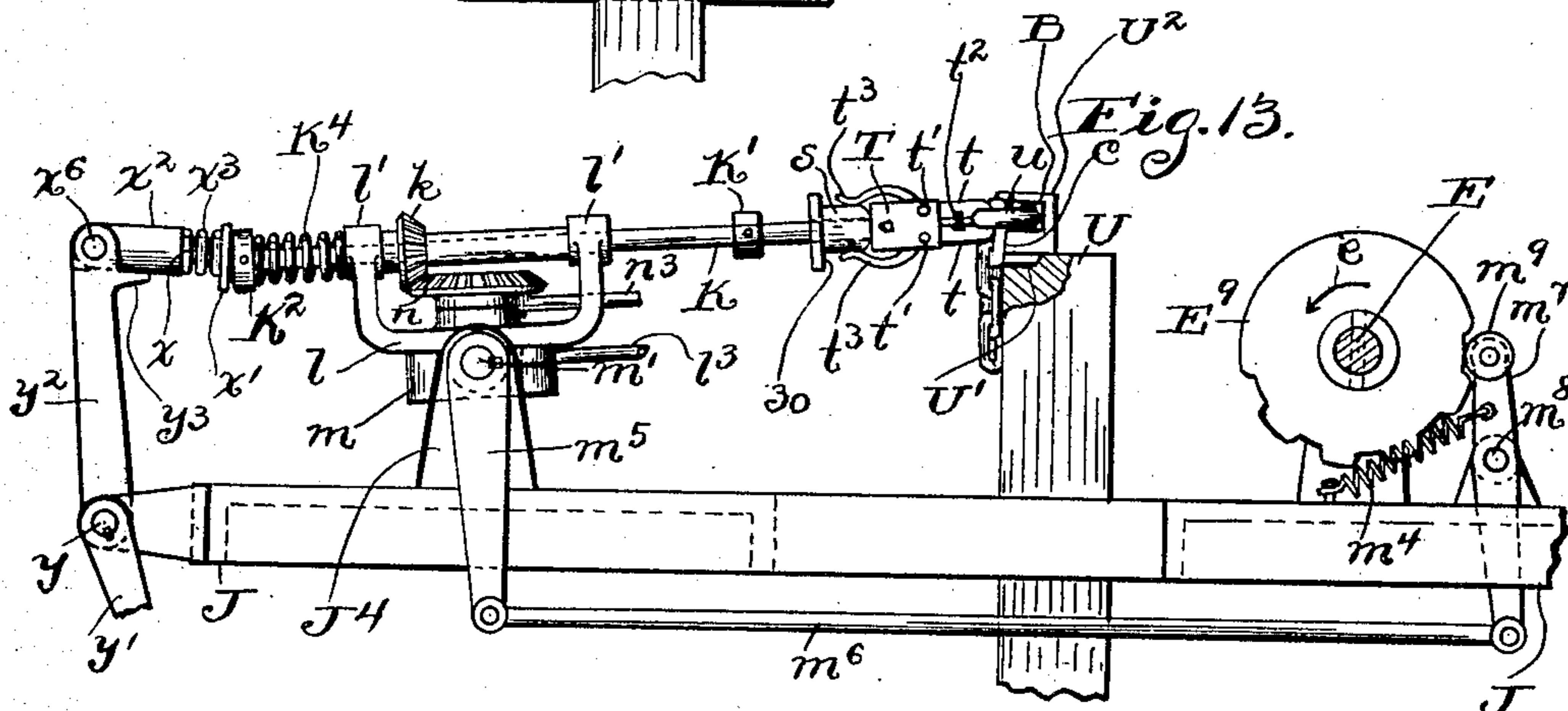
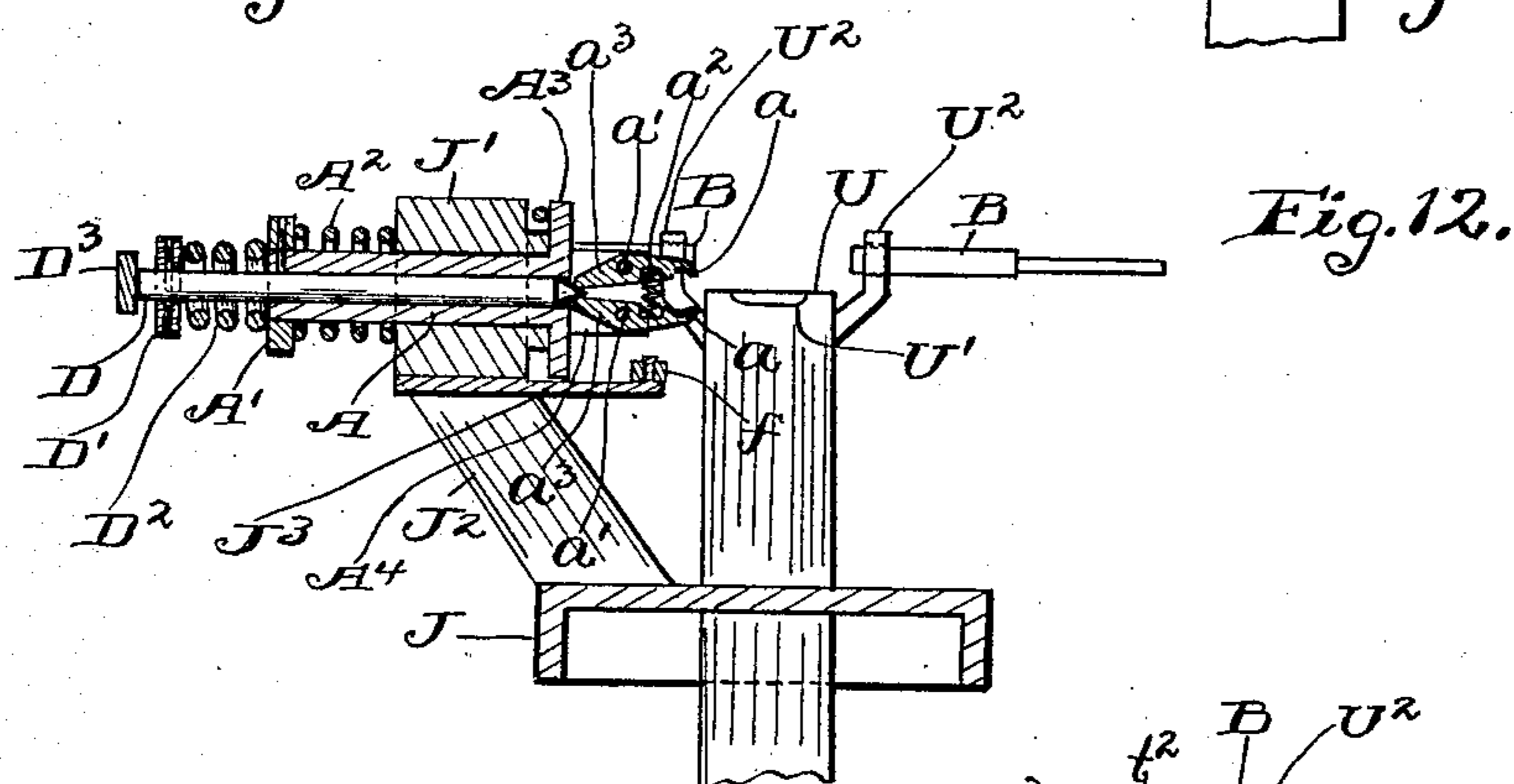
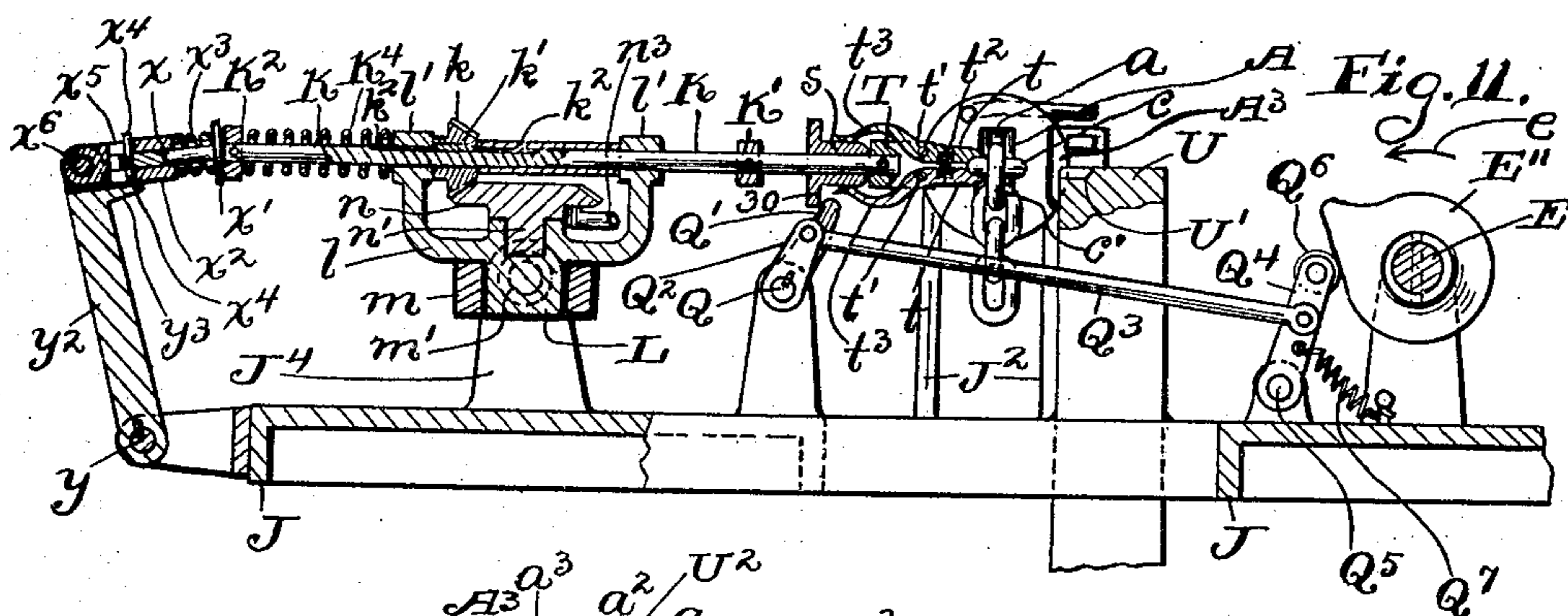
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

PHILANDER H. STANDISH, OF CLEVELAND, OHIO.

CHAIN-MAKING MACHINE.

No. 919,488.

Specification of Letters Patent.

Patented April 27, 1909.

Application filed July 24, 1907. Serial No. 385,320.

To all whom it may concern:

Be it known that I, PHILANDER H. STANDISH, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Chain-Making Machines; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in machines for making chain, and pertains more especially to machines for making welded chain.

The primary object of this invention is to make welded chain with such facility that the cost of such chain is materially reduced.

With this object in view, and to the end of realizing any other advantages hereinafter appearing, this invention consists in certain features of construction, and combinations of parts, hereinafter described, pointed out in the claims and illustrated in the accompanying drawings.

In the said drawings, Figure 1 is a top plan of a machine embodying my invention. Fig. 2 is a vertical section on line 2—2, Fig. 1, looking in the direction indicated by the arrow. Fig. 3 is a sectional view in detail, illustrating the mechanism employed in turning the chain-holding tongs and also showing the anvil and the blank-carrying jaws of the blank-feeding tongs. Fig. 3 is drawn on a larger scale than Figs. 1 and 2. Fig. 4 is a side view, partly in section, mainly illustrating the mechanism employed in swinging the blank-feeding tongs laterally, and also showing the insertion of a blank into the link last welded. Fig. 5 is an enlarged vertical section, in detail, on line 5—5, Fig. 4, looking toward the anvil. Fig. 6 is an elevation, partly in section, illustrative of the mechanism employed in turning the blank-feeding tongs. Fig. 7 is a top plan of the chain-holding tongs and also shows the feeding of the blank next to be welded to and between two bars employed in forcing the separated ends of the blank toward each other preparatory to the delivery of the blank to the anvil. Fig. 8 is a top plan illustrative of the operation of the said bars. Fig. 9 is a top plan of the chain-holding tongs and also shows the withdrawal of a welded link from the anvil. Fig. 10 is a central longitudinal section taken vertically through the chain-holding tongs

and shows the link last welded gripped by the jaws of the said tongs. Fig. 11 is a central longitudinal section taken vertically through the blank-feeding tongs and also shows a portion of the mechanism employed in shifting the said tongs endwise and the mechanism for rendering inoperative the sleeve employed in closing the jaws of the blank-feeding tongs. Fig. 12 is a central longitudinal section taken vertically through the chain-holding tongs, looking in the direction of the anvil, and shows the jaws of the said tongs in their non-grasping or open position. Fig. 13 is an elevation, partly in section, of the mechanism employed to swing the blank-feeding tongs in a vertical plane. Figs. 4, 6, 7, 8, 9, 10, 11, 12 and 13 are drawn on the same scale as Figs. 1 and 2.

Referring to the drawings, *u* represents a blank which is to be added to the chain-link last welded by the machine. The blank *u* is U-shaped and has its ends *u'* somewhat projecting toward each other and spread apart laterally as shown very clearly in Fig. 5. The ends *u'* of the blank are heated in any approved manner preparatory to operating on the blank and preferably preparatory to the delivery of the blank to the blank-feeding tongs hereinafter described. Means for heating the ends of chain-link-blanks are too well known in the art to require illustration and description in this specification.

My improved machine comprises blank-feeding tongs for receiving and conveying the heated blank to the chain-link last formed and welded and for holding the blank during its attachment to the said link and during the welding operation upon the blank and long enough after the welding operation until the link formed during the said welding operation has been withdrawn from the welding means and grasped by chain-holding tongs.

T indicates the body-portion or stock of the said blank-feeding tongs, which stock or body-portion is fixed to one end of a laterally extending oscillatory shaft *K* which (see Figs. 1, 2 and 11) has bearing in two boxes *l'* which are spaced longitudinally of the shaft a suitable distance from the tongs and centrally between the tongs-bearing end and opposite end of the shaft. The boxes *l'* are integral or rigid with a table *l* which (see Fig. 11) is provided with a depending axle *L* which has lateral bearing in a correspondingly arranged upright box *m* which is supported as will hereinafter appear. The turn-

table *l* is mounted on the upper end of the box *m*.

The jaws *t* of the blank-feeding tongs are pivoted, as at *t'*, to the body-portion *T* transversely of the shaft *K* and are consequently capable of swinging toward and from each other to close and open the tongs respectively. A suitably applied spring *t*² (see Figs. 3 and 11) interposed between the jaws *t* and between the axes and the outer or blank-grasping ends of the jaws acts to retain the jaws swung apart and consequently open.

The blank-feeding tongs are arranged at one side of and a suitable distance from a cam-shaft *E* which is rotated in the direction indicated by the arrow *e* and supported from the stationary framework *J* of the machine, and the shaft *K* and consequently the tongs when they are in position at one extremity of their lateral movement and adapted to feed the blank borne thereby toward the anvil *U* of blank-welding means, are, as shown in Figs. 1, 2 and 4, arranged in a horizontal plane and at a right angle to the cam-shaft. The said blank-welding means comprise the said anvil and a hammer *V*.

Means for closing the jaws *t* of the blank-feeding tongs and holding the said jaws closed immediately upon the reception by and between the said jaws of a blank are provided and (see Figs. 1, 2, 4 and 11) comprise a sleeve *s* which is loosely mounted on and shiftable endwise of the shaft *K* between the turn-table *l* and the tongs. Each jaw *t* is provided with a rearwardly projecting arm *t*³, and the outer ends of the jaw-arms *t*³ diverge toward their outer or free extremities, and the sleeve *s* is rounded at its forward end to facilitate the passage of the sleeve forwardly between the jaw-arms against the action of the spring *t*². A collar *K'* suitably fixed on the shaft *K* and smaller in external diameter than the rear end of the sleeve *s* is arranged to limit the rearward movement of the sleeve. The sleeve *s* is actuated in the direction required to close the jaws *t* by hand or by suitably operated mechanism which is not shown or described in this specification.

The blank-feeding tongs are preparatory to the reception and grasping of a blank by the said tongs swung laterally in a horizontal plane to bring the tongs into the position shown in dotted lines Fig. 1, in which position of the tongs a blank *u* is supplied in any approved manner to the tongs. The actuation of the tongs-bearing shaft and consequently the tongs borne by the said shaft laterally in a horizontal plane is effected by turning the turn-table *l* which is turned in the one direction or the other according as the tongs are to be brought into their blank-receiving position or into position for feeding the blank endwise and forwardly to the anvil *U*.

The means for actuating the turn-table *l* and consequently swing the tongs-bearing

shaft *K* laterally (see Figs. 1 and 4) preferably comprise a cam *E*⁷ and a spring *l*⁶ for turning the turn-table *l* in opposite directions respectively. The cam *E*⁷ is operatively mounted on the shaft *E* and has its working peripheral surface engaged by a roller *l*⁷ borne by a lever *l*⁵ which is fulcrumed, as at *l*⁴, horizontally and parallelly with the shaft *E*, to a stationary object, such, for instance, as a member of the framework *J*. The lever *l*⁵ is operatively connected by a connecting rod *l*³ with the turn-table *l*. A suitably applied spring *l*⁶, which is shown attached at one end to the lever *l*⁴ and at its other end to the stationary framework *J*, acts to retain the roller-bearing arm of the lever *l*⁴ in engagement with the cam *E*⁷, and the parts are so arranged and timed and the trend of the working peripheral surface of the cam *E*⁷ is such that the blank-feeding tongs is swung to receive a blank into the position shown in dotted lines Fig. 1 against the action of the spring *l*⁶ and the said spring swings the tongs from the said last-mentioned position into the position shown in solid lines, Figs. 1, 2 and 3, and the shape of the said cam is also such as to accommodate the endwise movement of the shaft *K* and connected tongs in the last-mentioned position of the said tongs, and when the said tongs has been brought into the last-mentioned position shown in Figs. 2 and 3, the shaft *K* is shifted endwise and forwardly, as will hereinafter appear, to feed the blank into a recess *U'* formed in the top of the adjacent portion of the anvil where the blank is operated upon by the cooperating anvil and hammer.

In the position shown in Figs. 2 and 3 and in solid lines Fig. 1, the blank-feeding tongs holds the blank directly forward of the forward end of the anvil-recess *U'*, and consequently to accommodate the forcing of the separated ends *u'* of the blank toward each other over the anvil preparatory to the entering of the anvil-recess *U'* by the said ends of the blank the blank-feeding tongs are swung upwardly somewhat or elevated after the insertion of one of the said ends of the blank into the link last welded or formed and preparatory to the delivery of the blank into the anvil-recess, as will hereinafter more clearly appear.

The shaft *K* and consequently the blank-feeding tongs upon their lateral movement into the position shown in Figs. 2 and 3 are actuated endwise forwardly toward the anvil, and during the forwardly endwise movement of the blank-feeding tongs an end of the blank borne by the said tongs is inserted into the last-made link *c* held by chain-holding tongs hereinafter described and arranged at the left-hand side of the endwise travel of the blank-feeding tongs, and *A* (see Figs. 1, 3, 4, 10 and 12) repre-

sents the body-portion or stock of the chain-holding tongs, and a , the jaws of the last-mentioned tongs.

The means for effecting the forwardly endwise movement of the tongs-bearing shaft K to actuate the blank-feeding tongs forwardly as required to add the blank to the last-made chain-link held by the chain-holding tongs comprise the following:—The shaft K (see Figs. 1, 2, 11 and 13) extends from the blank-feeding tongs which are arranged at one side of the table l as shown through the boxes l' and l'' and a suitable distance beyond the opposite side of the table and provided at the last-mentioned side and a suitable distance from the table with a collar K^2 fixed to the shaft in any approved manner.

A spiral spring K^4 is mounted and confined on the shaft K between the collar K^2 and the adjacent box l' and acts to retain the shaft and consequently the blank-feeding tongs in their rearward position. The shaft K is arranged to be actuated forwardly against the action of the spring K^4 by the head x' formed upon the forward end of a push-bar x which is shiftable endwise forwardly and rearwardly relative to the rear end of the shaft K and has bearing in a sleeve x^2 loosely mounted on and shiftable endwise of the said bar. A spiral spring x^3 is mounted and confined on the bar x between the head x' and the sleeve x^2 . The bar x is provided with a pin x^4 which engages a slot x^5 formed in and extending a suitable distance longitudinally of the sleeve x^2 . The pin x^4 engages the forward end wall of the said slot in the rearward position of the sleeve. The spring x^3 , which is somewhat stiffer than the spring K^4 , acts to push the bar x forwardly, and the engagement of the pin x^4 with the forward end wall of the slot x^5 limits the forward movement of the bar independently of the bar-embracing sleeve x^2 . A shaft y , arranged horizontally and parallel with the cam-shaft E, is located below the sleeve and supported from members of the framework J. The shaft y is operatively provided with a depending arm y^1 which is operatively connected by a rod y^4 with an upright tilting lever y^5 fulcrumed, as at y^7 , horizontally and parallelly with the cam-shaft E, to the framework J. The lever y^5 is provided at its upper end and above the fulcrum y^7 with a roller y^6 which engages the working peripheral surface of a cam E^6 with which the shaft E is operatively provided. The shaft y is also operatively provided with an upwardly projecting arm y^2 which is operatively attached at its upper end to the sleeve x^2 shown pivoted, as at x^6 , to the arm y^2 parallelly with the fulcrum y^7 . The arm y^2 is provided with a projecting lug y^3 which extends under the sleeve x^2 and forms a seat or bottom bearing for the sleeve. A suitably applied spring y^8 acts to

retain the said sleeve in its outer position and also acts to retain the roller y^6 of the lever y^5 in engagement with the cam E, which spring is shown attached at one end to the lever near the fulcrum of the lever and at its opposite end to the framework J. The arrangement of the parts is such and the peripheral working surface of the cam E^6 has such trend that as soon as the shaft K and connected blank-feeding tongs have been swung laterally into the position shown in Fig. 2 and in solid lines Fig. 1, the cam E^6 actuates the lever y^5 against the action of the spring y^8 and in the direction required to oscillate the shaft y in the direction required to effect the forward movement of the sleeve x^2 and push-bar x and thereby result in the actuation of the tongs-bearing shaft K forwardly against the action of the spring K^4 and far enough to connect the blank borne by the blank-feeding tongs with the link held by the chain-holding tongs and bring the blank into position between two pressure-exerting bars B arranged above the anvil-recess U' and parallelly with the cam-shaft E at opposite sides respectively of the anvil, and the trend of the aforesaid surface of the cam-wheel E^6 is furthermore such that the blank-feeding tongs are held in their forward position until the ends u' of the blank have been properly forced toward each other by the bars B and until the work upon the blank by the hammer G and anvil U has been completed, whereupon the tongs-bearing shaft K is rendered free to be returned into its rear position by the spring K^4 .

The box m is supported as required to render it capable of being swung in a vertical plane as will hereinafter appear, and consequently the head x' of the push-bar x has the dimensions necessary to insure a proper engagement of the push-bar with the shaft K, and it will be observed that the spring x^3 affords relief to prevent breakage or injury to any member of the apparatus by any obstruction to the passage of the blank toward the anvil or into the anvil-recess U' . In other words the bar x and spring x^3 form somewhat yieldable means for actuating the shaft K and consequently the blank-feeding tongs forwardly endwise toward the anvil.

During the operation upon the blank by the bars B and blank-welding means and during the withdrawal of the last-made link from the anvil until the said link has been grasped by the chain-holding tongs the blank-feeding tongs have their jaws t arranged the one above the other and in the same plane vertically, as shown in Figs. 7, 8, 9, 11 and 13.

The chain-holding tongs, during the withdrawal of the last-made link from the anvil until the said link has been grasped and thereupon only held by the said tongs, have their jaws a arranged the one above the

other and in the same plane vertically as shown in Figs. 9 and 10.

The chain-holding tongs are turnable, and also shiftable endwise as will hereinafter appear toward and from the endwise travel of the blank-feeding tongs, and the arrangement of the parts is such that a link held by the chain-holding tongs to receive a blank when the chain-holding tongs are in their inner or forward position, is arranged directly forward of the forward end of the anvil-recess U' between the latter and the blank held by the blank-feeding tongs as shown in Figs. 1, 2 and 3. To freely accommodate therefore the passage of that end of the blank which is nearer to the chain-holding tongs into the last-made link held by the said tongs the blank-feeding tongs are given about an eighth of a turn to the left, as shown very clearly in Figs. 3, 4 and 5, and somewhat swung or actuated laterally to the right by the portion e' of the cam E' (see Fig. 4) to shift the blank somewhat to the right or away from the chain-holding tongs as shown very clearly in Figs. 4 and 5.

The body-portion or stock A of the chain-holding tongs is arranged horizontally and parallel with the cam-shaft E (see Fig. 1). The stock A (see also Figs. 7, 9, 10 and 12) has bearing in a correspondingly arranged box J' which is formed upon or rigid with any stationary object such, for instance, as projecting members J^2 of the framework J.

The jaws a of the chain-holding tongs are pivoted, as at a' , to the stock A horizontally and transversely of the stock and are consequently capable of swinging toward and from each other to close and open the tongs respectively. A suitably applied spring a^2 , which is interposed between the jaws a and between the axes and the outer or grasping ends of the jaws, acts to retain the jaws swung apart and consequently open.

The chain-holding tongs are actuated into their forward or inner position to receive the last-made link as soon as the said link has been withdrawn from the anvil by the blank-feeding tongs as shown in Fig. 9. Of course the jaws a are open, as shown in Fig. 12, to receive the said link, and means for closing the said jaws immediately upon the reception by and between the jaws of the link are provided and (see Figs. 1, 10 and 12) comprise a rod D which is arranged centrally and longitudinally of and has bearing in the stock A. Both the stock A and rod D move endwise together during the endwise actuation of the stock A but the rod D is also shiftable endwise independently of the stock A when the latter is in its forward or inner position. Each jaw a is provided with a rearwardly projecting arm a^3 , and the adjacent and forward or inner end of the rod D tapers and in the open or nongrasping position of the jaws a extends somewhat between the outer

ends of the said jaw-arms and is therefore arranged to farther separate the said jaw-arms upon the forward or inward actuation of the rod independently of the stock A and thereby close the said jaws, as shown in Fig. 10, against the action of the spring a^2 . The stock A of the chain-holding tongs extends through and a suitable distance beyond the outer end of the box J' , and a collar A' is mounted on and fixed to the said stock a suitable distance from the outer end of the said box. A spiral spring A^2 is mounted and confined on the stock A between the box J' and the collar A' . The spring A^2 acts to retain the stock A and consequently the chain-holding tongs in their rearward and outer or inoperative position. The stock A is provided externally and adjacent the free ends of the jaw-arms a^3 with a laterally projecting annular flange A^3 , and the said stock forward of the said flange is slotted longitudinally, as at A^4 , to accommodate the location and operation of the jaws a and their said arms. In the forward or inner position of the chain-holding tongs, as shown in Fig. 10, the flange A^3 abuts against the peripheral surface of a suitably arranged antifriction roller f which is suitably supported from any stationary object as, for instance, an arm or bracket J^3 rigid with the box J. The roller f limits the forward or inward movement of the chain-holding tongs and constitutes an antifriction end bearing or stop for the stock A when the latter while in its forward or inner position is oscillated or turned to turn the chain-holding tongs, and I would here remark that the means for turning the chain-holding tongs (see Figs. 1 and 3) comprise cam-actuated mechanism and a spiral spring a^4 for turning the said tongs in opposite directions respectively, and the said cam-actuated mechanism comprises a rod A^5 which is operatively connected at one end with the stock A at the flange A^3 and at its other end with the upper end of an upright lever A^6 which (see Fig. 3) is fulcrumed, as at a^6 , horizontally and parallelly with the cam-shaft E, to the framework J. The lever A^6 is provided between its fulcrum and the rod A^5 with a roller a^5 which engages the working peripheral surface of a cam E^5 with which the shaft E is operatively provided. The spring a^4 acts to retain the roller a^5 of the lever A^6 in engagement with the cam E^5 , which spring is shown attached at one end to the lever and at its opposite end to the framework J.

The rod D extends a suitable distance beyond the rear or outer end of the stock A of the chain-holding tongs, and a collar D' is mounted on and fixed to the rod rearwardly of and a suitable distance from the stock A. A spiral spring D^2 is mounted and confined on the rod D between the collar D' and the rear or outer end of the stock A. The spring D^2 acts to retain the rod D in its outer and in-

operative position shown in Fig. 12 in which the greater portion of the tapered forward end of the rod is rearward of the jaw-arms a^3 and the jaws a are open, as already indicated.

The outer end of the rod D (see Figs. 1, 7, 9, 10 and 12) is overlapped by one arm of a bell-crank lever D^3 which is fulcrumed vertically, as at D^4 , to any stationary object such, for instance, as a member of the framework J, and has its other arm operatively connected by a rod d^3 (see Fig. 1) with an upright lever d which is fulcrumed, as at d' , horizontally and parallelly with the shaft E, to the framework J. The lever d^5 is provided with a roller d^4 which engages the working peripheral surface of a cam E^4 with which the shaft E is operatively provided.

The spring E^2 is stiffer than the spring A^2 so that the latter will yield before the former, and consequently during the operation of the cam-actuated mechanism comprising the lever d , rod d^3 and lever D^3 to actuate the rod D forwardly or inwardly the stock A of the chain-holding tongs is actuated forwardly or inwardly against the action of the spring A^2 until the stock comes in contact with the stop-forming roller f , and the throw of the cam E^4 is long enough to actuate the rod D forwardly against the action of the spring D^2 as soon as the forward or inward movement of the stock A of the chain-moving tongs has been arrested by the roller or stop f , and the forward or inward movement of the rod D independently of the said stock results, as already indicated, in the closing of the jaws a of the chain-holding tongs. Obviously the spring A^2 also acts to retain the roller d^4 of the lever d in contact with the cam E^4 . The arrangement of the parts is such and the cam E^4 has such shape and dimensions that the chain-holding tongs are brought into position to receive the last-made link upon the withdrawal of the said link from the anvil as shown in Fig. 9, and the jaws of the said tongs are actuated toward each other to grasp the link at the left-hand side.

As already indicated, the last-made link is arranged horizontally while in the anvil-recess U' and during the feeding of the link from the anvil to the chain-holding tongs which have their jaws a arranged in the same plane vertically during the reception of the link by the chain-holding tongs, as already indicated, and the parts are so arranged and timed that the chain-holding tongs, after the reception by them of the link and preparatory to the insertion into the said link of the link-entering end of the blank next to be fed to the anvil, are oscillated or turned, by the operation of the mechanism actuated by the cam E^5 against the action of the spring a^4 , to cause the link to face laterally toward the approaching blank as shown in Figs. 1, 2 and 3 and thereby to bring the opening in the

link in position to receive the link-entering end of the blank, as shown in Figs. 4 and 5, and the link in its blank-receiving position leans somewhat toward the approaching blank so that the upper portion of the turned link is nearer the approaching blank than the lower portion of the said link and overhangs the link-entering end of the blank before the said end has entered the link and thereby facilitates and positively insures the proper entrance of the said end of the blank into the link. The parts are also so arranged and timed that the cam-actuated mechanism comprising the lever d , rod d^3 and lever D^3 shall actuate the chain-holding tongs forwardly or inwardly to receive the last-made link, that as soon as the link-entering end of the blank next to be welded has been inserted into the said link during the blank-feeding movement of the blank-feeding tongs the rod D is rendered free to move rearwardly or outwardly into its inoperative position and actuated into its said position by the spring D^2 so as to result in the actuation of the jaws a of the chain-holding tongs by the spring a^2 into their nongrasping or open and inoperative position to release the link which thereupon hangs from the blank and is carried with the blank during the remainder of the blank-feeding movement of the blank-feeding tongs, as shown in Figs. 6, 7 and 8, and the blank-feeding tongs are swung upwardly somewhat, as shown in Figs. 6 and 13, upon the release of the link by the chain-holding tongs during the said remainder of the said movement of the blank-feeding tongs so as to bring the blank into position over the anvil-recess U' and between the pressure-exerting bars B at the end of the said movement, as shown in Fig. 7, whereupon the said bars are operated to force the separated ends of the blank toward each other, as shown in Fig. 8. The parts are also so arranged and timed that immediately upon the release of the last-made link by the chain-holding tongs and consequently upon the delivery of the said link to the blank being fed to the anvil, the chain-holding tongs are rendered free to be turned by the spring a^4 into their position wherein their jaws a are arranged in the same plane vertically, as shown in Figs. 7, 8, 9 and 10, as required for the reception of the link into which the said blank is to be converted, and the blank-holding tongs, during the remainder of its blank-feeding movement after the said delivery of the link to the said blank from the chain-holding tongs, is turned, as will hereinafter appear, to bring the jaws t of the blank-feeding tongs into the same plane vertically, as shown in Figs. 6, 7, 8 and 13, as required to cause the blank to properly enter the anvil-recess U' during the delivery of the said blank to the anvil-recess, and the said jaws remain in their last-mentioned relative position until the link into

which the said blank is to be converted has been formed and fed and delivered to the chain-holding tongs by the blank-feeding tongs, as shown in Figs. 9, 10 and 11, and released by the last-mentioned tongs.

The pressure-exerting bars B are arranged in line endwise. The bars B are simultaneously reciprocated endwise and are moved toward or from each other to operate upon or release the blank. The bars B have bearing in boxes U² arranged at the sides of and rigid with the anvil. The bars B are actuated toward each other by suitably supported cam-actuated bell-crank levers B' against the action of suitably applied springs b. That is, each bar B is operatively connected at its outer end with one arm of a bell-crank lever B' which is arranged in a horizontal plane and fulcrumed vertically, as at b', to any stationary object, such, for instance, as a member of the framework J, and has its other arm provided with a roller B² which engages the working peripheral surface of a cam E² with which the shaft E is operatively provided. Each spring b is attached at one end to the connected lever B' and at its other end to any stationary object such, for instance, as a member of the framework J. The arrangement of the parts is such and the cams E² have such shape that immediately upon the actuation of the blank over and into position to descend into the anvil-recess U' the levers B' are actuated against the action of the springs b so as to effect the movement of the bars B toward each other into engagement with the outer side of opposite ends respectively of a blank and thereupon force the said ends of the blank together, as shown in Fig. 8, and the shape of the cams E² is furthermore such that immediately upon the forcing of the ends of the blank toward each other the bars B are separated by the springs b, whereupon the shaft K and consequently the blank-feeding tongs are swung in the direction required to lower the blank into the anvil-recess U' preparatory to the delivery of the first blow upon the ends of the blank by the hammer V.

As soon as the blank has been brought into position within the anvil-recess U' the hammer V is actuated to deliver four successive blows upon the blank to weld or unite the ends of the blank together. The hammer V (see Figs. 1 and 2) is arranged to swing in a vertical plane above the anvil U, being pivoted, as at V', horizontally and parallelly with the cam-shaft E to any stationary object such, for instance, as a member of the framework J, and the hammer is operatively connected by a link V² with an arm V³ of a shaft V⁴ which is arranged parallel with the cam-shaft E and a suitable distance below the hammer and supported from the said framework. The shaft V⁴ is also operatively

provided with an arm V⁵ which is provided with a roller V⁶ engaged by a cam E¹⁰ with which the shaft E is operatively provided, which cam has the shape required to cause the hammer to deliver four successive blows during each rotation of the cam-shaft. The hammer V is arranged to deliver its blows by gravity and the arrangement of the parts and the trend of the working surfaces of the cam E¹⁰ are such that the hammer is raised preparatory to the insertion of the blank into the anvil-recess U' and that immediately upon the delivery of a blank to the anvil the shaft V⁴ is oscillated in opposite directions alternately until the hammer has delivered four blows upon the blank.

To properly weld the ends of the blank together the hammer-blows should be alternately delivered upon opposite sides of the blank, and hence means for giving the blank-feeding tongs and blank to be welded a half turn in the interval of time between successive hammer-blows are provided and (see Figs. 1 and 6) preferably comprise a bevel-gear k which is operatively mounted on the shaft K between the boxes l' and l' by the well known means of groove-and-feather, as at k', as shown in Fig. 11, and the groove of the last-mentioned means extends far enough longitudinally of the shaft, as at k², and arranged as required to accommodate the forwardly endwise movement of the shaft. The gear k meshes with a diametrically larger bevel-gear n arranged under the shaft K and between the shaft and the turn-table l and rests upon the latter. The gear n is twice as large diametrically and consequently has twice as many teeth as the gear k. The gear n is provided (see Fig. 11) with a depending axle n' arranged centrally of and having lateral bearing in the turn-table l. The gear n (see Fig. 1) is provided at one side with a laterally projecting arm n² which is operatively connected by a connecting rod n³ with one arm of a bell-crank-lever n⁴ which (see Figs. 1 and 6) is fulcrumed, as at n⁵, horizontally and parallelly with the cam-shaft E, to any stationary object such for instance as a member of the framework J and has its other arm provided with a roller n⁸ which engages the peripheral working surface of a cam E⁸ operatively mounted on the shaft E, and the said lever is held with its roller in engagement with the said surface by a suitably applied spring n⁷ which is shown attached at one end to the said lever and at its other end to the framework J.

The tongs-bearing shaft K and consequently the blank-feeding tongs must be swung or moved upwardly to bring the blank out of the anvil-recess U' in order to permit the turning of the blank as hereinbefore described, and the means whereby the swinging or movement of the tongs upwardly from the anvil is effected preparatory to each half

turn given to the tongs between successive blows of the hammer V (see Figs. 1 and 13) comprise a cam E⁹ operatively mounted on the cam-shaft E and having a peripheral working surface engaged by the roller m⁹ borne by the upper end of an upright lever m⁷ fulcrumed at any suitable point between its ends, as at m⁸, horizontally and parallelly with the said shaft, to any stationary object such, for instance, as the framework J and is operatively connected at its lower end by a connecting rod m⁶ with an arm m⁵ depending from and operatively connected with the box m. The box m (see Figs. 1, 2 and 13) is pivotally supported from any stationary object, such, for instance, as the framework J, having two laterally projecting arms m² arranged at opposite sides respectively of the box and provided with trunnions m' which are arranged horizontally and in line endwise and parallel with a cam-shaft E and have bearing in members J⁴ of the framework J, and the arm m⁵ is operatively connected with one of the trunnions m'. A suitably applied spring m⁴ acts to retain the roller-bearing lever m⁷ in engagement with the cam E⁹ and consequently acts to retain the tongs-bearing shaft K in its downwardly swung or horizontal position. The spring m⁴ is shown attached at one end to the lever m⁷ above the fulcrum of the lever, and at its other end to the stationary framework J. The arrangement of the parts and the trend of the working surfaces of the cams E⁸ and E⁹ are such that as soon as the hammer G between successive blow-delivering movements of the hammer has swung upwardly far enough to permit the raising of the blank-bearing tongs above the anvil far enough to accommodate turning of a blank the said tongs is given a half turn. The shape of the cam E⁸ is furthermore such that the tongs-bearing shaft and consequently the blank-feeding tongs are turned in opposite directions alternately upon successive upward movements of the blank upwardly from the anvil so that the hammer-blows are delivered upon opposite sides of the blank alternately. The shape of the cam E⁹ is such, as already indicated, that the blank-feeding tongs and consequently the blank are raised during the feeding movement of the tongs after the insertion of the link-entering end of the blank into the link held by the chain-holding tongs and the release of the link by the last-mentioned tongs so that the blank then carrying the said link is brought into position over the anvil-recess U' where, as already indicated, the ends of the blank are operated upon by the bars B preparatory to the lowering of the blank into the said recess. The shape of the cam E⁹ is also such that the blank as soon as operated upon and thereupon released by the bars B is lowered into the anvil-recess U'.

As a finished link, having withdrawn from

the anvil by the blank-feeding tongs, is grasped by the chain-holding tongs, as shown in Figs. 9, 10 and 11, during the rearwardly endwise movement of the shaft K and connected tongs the sleeve s is withdrawn from between the jaw-arms t³ by means which preferably comprise an arm Q' operatively mounted (see Figs. 1 and 11) on a shaft Q which is supported from the framework J and arranged horizontally and parallelly with the cam-shaft E about midway between the turn-table l and the stationary framework J. The shaft Q is operatively provided at one end with an upwardly projecting arm Q² operatively connected by a rod Q³ with a lever Q⁴ which is fulcrumed, as at Q⁵, horizontally and parallelly with the shafts Q and E, to the framework J and bears a roller Q⁶ which engages the peripheral working surface of a cam E¹¹ operatively mounted on the cam-shaft E. The roller-bearing lever Q⁴ is continually held in engagement with the said surface of the cam E¹¹ by a suitably applied spring Q⁷ which is shown attached at one end to the link Q³ and at its other end to the framework J. The parts are so arranged and the cam E¹¹ has such shape that immediately upon the withdrawal of a link from the anvil to the position shown in Figs. 9, 10 and 11 the arm Q' of the shaft Q comes into engagement with a forwardly facing annular shoulder 30 formed on the sleeve s, as shown in Fig. 11, and thereupon actuates the sleeve rearwardly against the action of the spring Q⁷ far enough to permit the blank-feeding tongs to open and release the said link.

The trend of the cam E⁸ is furthermore such that immediately upon the release of the finished link by the blank-feeding tongs during the withdrawal of the link from the anvil and after the said link has been grasped by the chain-holding tongs, the said shaft K and connected blank-feeding tongs are given an eighth of a turn as required to present the next blank to be received by the blank-feeding tongs in proper position relative to the last-made link held by the chain-holding tongs. I would also remark that preferably the shape of the cam E⁹ is also such that the shaft K and connected blank-feeding tongs dwell momentarily during the grasping by the chain-holding tongs of the link withdrawn from the anvil by the blank-feeding tongs, although the release of the link by the last-mentioned tongs and the grasping of the link by the chain-holding tongs may be simultaneous. The making of cams of any particular shape or configuration to produce or permit any special movements of cam-actuated members or mechanism at predetermined times is so well understood in the arts that illustration in greater detail or extended description of the shape or operation of the cams hereinbefore referred to is not

considered necessary in this specification. I would also remark that the second last made link *c'* (see Figs. 9, 10 and 11) during the withdrawal of the last-made link *c* from the anvil strikes against the jaws *a* of the chain-holding tongs and is driven or pushed by the said jaws out of their way in the direction of the anvil and to the opposite side of the last-mentioned link so that the said second last-made link does not interfere with the proper grasping of the last-made link by the said jaws.

What I claim is:—

1. In a chain-making machine, the combination, with blank-welding means, tongs adapted to feed a link-blank to and movable endwise toward and from the blank-welding means, means for forcing the separated ends of the blank toward each other preparatory to the welding operation, of endwise movable chain-holding tongs for presenting the last link added to the chain in such position relative to the blank borne by the first-mentioned tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into the said link, means whereby the chain-holding tongs are caused to release the said link upon the passage of the said end of the blank into the link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the said link by the blank-feeding tongs from the blank-welding means, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

2. In a chain-making machine, blank-welding means, tongs adapted to feed a link-blank to and movable toward and from the blank-welding means, means for forcing the separated ends of the blank toward each other preparatory to the welding operation, chain-holding means for presenting the last link added to the chain in such position relative to the blank borne by the first-mentioned tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into the said link, means whereby the chain-holding means are caused to release the said link upon the passage of the said end of the blank into the link, means whereby the chain-holding means are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding tongs from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding means.

3. In a chain-making machine, blank-welding means, laterally movable turnable tongs adapted to feed a link-blank to and

shiftable endwise toward and from the blank-welding means, and means for forcing the ends of the blank toward each other preparatory to the welding operation, endwise movable turnable chain-holding tongs, means whereby the chain-holding tongs and the blank-feeding tongs are relatively turned to cause the last link added to the chain to be presented by the chain-holding tongs in such position relative to the blank borne by the blank-feeding tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into the said link, means whereby the chain-holding tongs are caused to release the said link upon the passage of the said end of the blank into the link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding tongs from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

4. In a chain-making machine, blank-welding means, laterally movable turnable blank-feeding tongs adapted to feed a link-blank to and shiftable toward and from the blank-welding means, said tongs being supported as required to render them capable of being swung in a vertical plane; means for actuating the blank-feeding tongs toward and from the blank-welding means; means for turning the blank-feeding tongs; means for swinging the tongs in a vertical plane; means for forcing the separated ends of the blank toward each other preparatory to the welding operation, turnable chain-holding tongs shiftable relative to the travel of the blank-feeding tongs for presenting the last link added to the chain in such position relative to the blank borne by the blank-feeding tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into the said link; means for shifting the chain-holding tongs relative to the travel of the blank-feeding tongs; means for turning the chain-holding tongs; means whereby the chain-holding tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the said link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding tongs from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

5. In a chain-making machine, blank-welding means, laterally movable turnable

tongs adapted to feed a link-blank to and movable endwise toward and from the blank-welding means, means for actuating the blank-feeding tongs relative to the blank-welding means, means for forcing the separated ends of the blank toward each other preparatory to the welding operation, turnable chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding tongs and adapted to present the last link added to the chain in such position relative to the blank borne by the blank-feeding tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into said link; means for actuating the chain-holding tongs endwise, means for turning the chain-holding tongs, means whereby the chain-holding tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the said link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding tongs from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

6. In a chain-making machine, blank-welding means, tongs adapted to feed a link-blank to and movable toward and from the blank-welding means, means for actuating the blank-feeding tongs to feed the blank to the blank-welding means, means for withdrawing the blank-feeding tongs from the blank-welding means, means for forcing the separated ends of the blank toward each other, preparatory to the welding operation, a chain-holding device movable toward and from the line of travel of the blank-feeding tongs and adapted to present the last link added to the chain in such position relative to the blank borne by the blank-feeding tongs that one end of the blank during the actuation of the blank-feeding tongs toward the blank-welding means shall pass into the said link; means whereby the chain-holding device is caused to release the said link upon the passage of the said end of the blank into the link; means whereby the chain-holding device is operated to grasp the last-mentioned link upon the withdrawal of the link by the blank-feeding tongs from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding tongs are caused to release the last-mentioned link upon the grasping of the link by the chain-holding device.

7. In a chain-making machine, blank-welding means, a device for feeding the blank to the blank-welding means and effecting the

removal from the blank-welding means of a link formed by the operation upon the blank by the blank-welding means, means for forcing the separated ends of the blank toward each other preparatory to the welding operation, chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and adapted to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into the said link, means for actuating the chain-holding tongs endwise, means whereby the chain-holding tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

8. In a chain-making machine, the combination, with blank-welding means, a device for feeding the blank to the blank-welding means and effecting the removal from the blank-welding means of a link formed by the operation upon the blank by the blank-welding means, and means for forcing the separated ends of the blank toward each other preparatory to the welding operation, of chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and turnable in its forward position to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into the said link, means for actuating the chain-holding tongs endwise, means whereby the chain-holding tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

9. In a chain-making machine, the combination, with blank-welding means, a device for feeding the blank to the blank-welding means and effecting the removal from the

blank-welding means of a link formed by the operation upon the blank by the blank-welding means, and means for forcing the separated ends of the blank toward each other preparatory to the welding operation, of turnable chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and adapted in its forward position to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into the said link, means for actuating the chain-feeding tongs endwise, means for turning the chain-holding tongs, means whereby the chain-holding tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the chain-holding tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the chain-holding tongs.

10. In a chain-making machine, the combination, with blank-welding means, a device for feeding the blank to the blank-welding means and effecting the removal from the blank-welding means of a link formed by the operation upon the blank by the blank-welding means, and means for forcing the separated ends of the blank toward each other preparatory to the welding operation, of turnable chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and adapted in its forward position to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into the said link, means for actuating the tongs endwise, means for turning the tongs, means for limiting the forward movement of the tongs, means whereby the tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the tongs.

11. In a chain-making machine, the com-

bination, with blank-welding means, a device for feeding the blank to the blank-welding means and effecting the removal from the blank-welding means of a link formed by the operation upon the blank by the blank-welding means, and means for forcing the ends of the blank toward each other preparatory to the welding operation, of turnable chain-holding tongs arranged at one side of and having a limited range of movement endwise toward and from the line of travel of the blank-feeding device and adapted to be turned in its forward position to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into the said link, means for actuating the tongs endwise, means whereby the tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the tongs.

12. In a chain-making machine, the combination, with blank-welding means, a device for feeding the blank to the blank-welding means and effecting the withdrawal from the blank-welding means of the link formed by the operation upon the blank by blank-welding means, and means for forcing the ends of the blank toward each other preparatory to the welding operation, of turnable chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and adapted to be turned in its forward position to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into said link, cam-actuated mechanism for actuating the tongs endwise in one direction, means for actuating the tongs in the opposite direction, means for turning the tongs, means whereby the tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link, means whereby the tongs are operated to grasp the last-made link upon the withdrawal of the link by the blank-feeding device from the blank-welding means and hold the link until the reception of a blank by the link, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link by the tongs.

13. In a chain-making machine, the combination, with endwise movable blank-feeding tongs, of chain-holding tongs arranged at one side of and shiftable endwise toward
5 and from the line of endwise travel of the blank-feeding tongs and having a suitably supported stock and link-grasping jaws pivotally supported from the stock and adapted to be relatively operated to grasp or release
10 a link; means for operating the jaws, and means whereby the blank-feeding tongs are operated to feed or convey relative to the chain-holding tongs.

14. In a chain-making machine, the combination, with endwise movable blank-feeding tongs, and means for effecting the endwise movement of the said tongs, of chain-holding tongs arranged at one side of and shiftable endwise toward and from the line
20 of endwise travel of the blank-feeding tongs and having a suitable supported stock and link-grasping jaws supported from the stock and relatively movable to grasp or release a link; means for effecting the endwise move-
25 ment of the chain-holding tongs; means acting to retain the aforesaid jaws open; means for operating the jaws to grasp a link entered between the jaws; means whereby the last-mentioned jaw-operating means are rendered inoperative upon the passage into the
30 said link of an end of the blank to be fed by the blank-feeding tongs to the chain-holding tongs, and means whereby the blank-feeding tongs are caused to release the last-made link conveyed by the blank-feeding tongs to the chain-holding tongs upon the grasping of the link by the said jaws.

15. In a chain-making machine, the combination, with endwise shiftable laterally
40 extending oscillatory blank-feeding tongs, which tongs are supported to render them capable of being swung laterally and in a vertical plane; means for effecting the endwise movement of the said tongs; means
45 whereby the blank-feeding tongs are swung laterally; means whereby the blank-feeding tongs are swung in a vertical plane, and means for oscillating the tongs, of a suitably supported oscillatory chain-holding tongs
50 arranged at one side of and shiftable endwise toward and from the line of endwise travel of the blank-feeding tongs; means for effecting the endwise movement of the chain-holding tongs, and means for oscillating the
55 chain-holding tongs.

16. In a chain-making machine having a turnable stock provided at one end with two link-grasping jaws pivotally supported from the stock and relatively movable to grasp or
60 release a link, which jaws are each provided with an arm projecting toward the rear end

of the stock; a box affording bearing to the stock; means for turning the stock; a stop for limiting the rearward movement of the chain-holding tongs; means acting to retain
65 the chain-holding tongs in their rearward position; means acting to retain the aforesaid jaws open; a rod extending through the stock and adapted during the forward movement of the rod to actuate the jaw-arms to cause
70 the jaws to grasp a link entered between the jaws; a spiral spring mounted and confined on the rod at the outer end of the stock and acting to retain the rod in its outer position and instrumental in transmitting motion to
75 the stock during the inward movement of the rod; means for actuating the said rod inwardly, and a stop arranged to limit the forward movement of the stock before the end of the forward movement of the rod. 80

17. In a chain-making machine, the combination, with blank-welding means comprising an anvil provided in the top thereof with a recess adapted to receive the blank to be operated upon and open at the front of the
85 anvil, a device for feeding the blank to the blank-welding means and effecting the withdrawal from the blank-welding means of a link formed by the operation upon the blank by the blank-welding means, and means for
90 forcing the ends of the blank together preparatory to the welding operation, of chain-holding tongs arranged at one side of and shiftable endwise toward and from the line of travel of the blank-feeding device and adapted
95 in its forward position to hold a link in line horizontally with the aforesaid recess and turnable to present the last link added to the chain in such position relative to the blank borne by the blank-feeding device that one
100 end of the blank during the actuation of the blank-feeding device toward the blank-welding means shall pass into said link; means for actuating the tongs endwise; means for turning the tongs; means whereby
105 the tongs are caused to release the said link upon the passage of the aforesaid end of the blank into the link and hold the link until the reception of a blank by the link; means whereby the tongs are caused to grasp the
110 last-made link upon the withdrawal of the said link by the blank-feeding device from the anvil, and means whereby the blank-feeding device is caused to release the last-mentioned link upon the grasping of the link
115 by the said tongs.

In testimony whereof, I sign the foregoing specification, in the presence of two witnesses.

PHILANDER H. STANDISH.

Witnesses:

C. H. DORER,

VICTOR C. LYNCH.