(No Model.) 6 Sheets—Sheet 1.

O. TYBERG.

AUTOMATIC STUD TURNING MACHINE.

No. 539,600. Patented May 21, 1895.

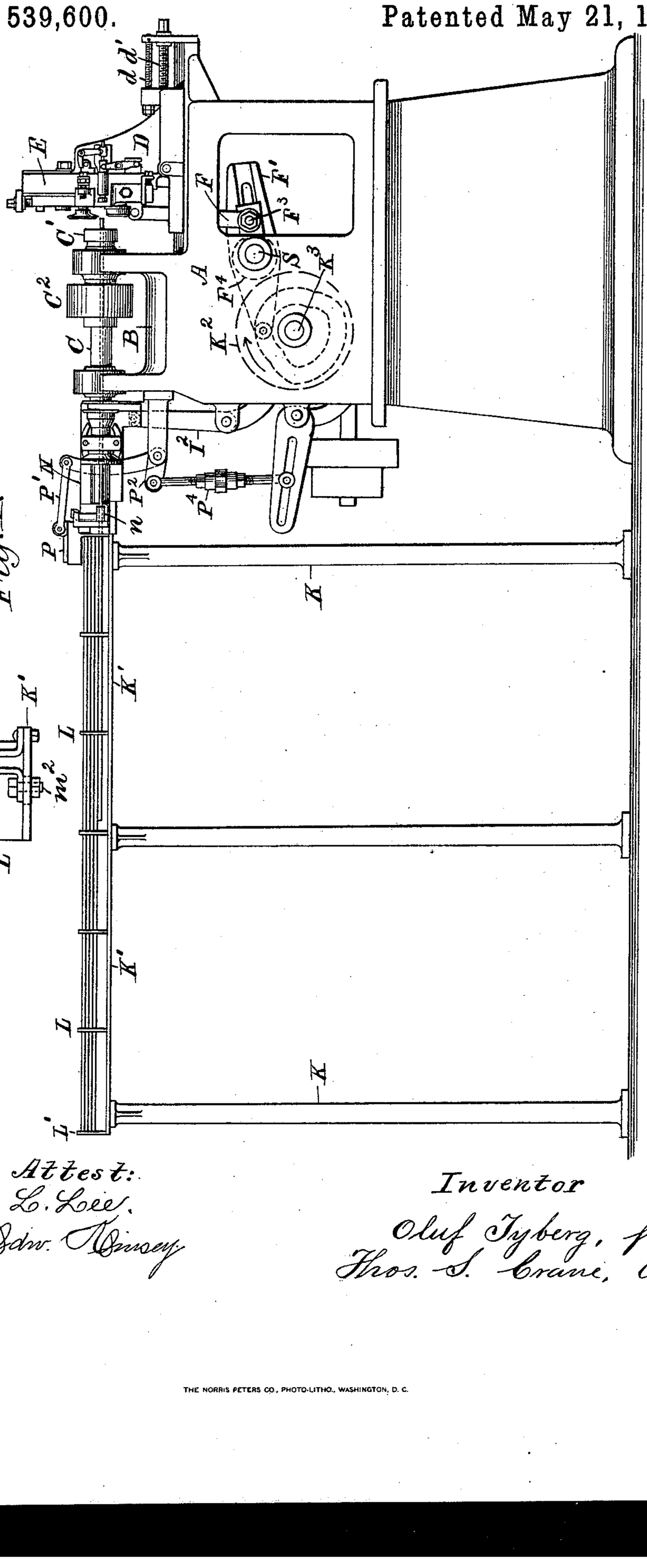

Fig. 1.

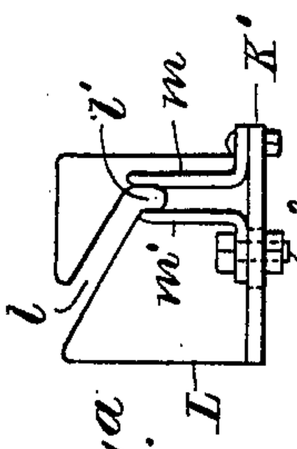

Fig. 1a.

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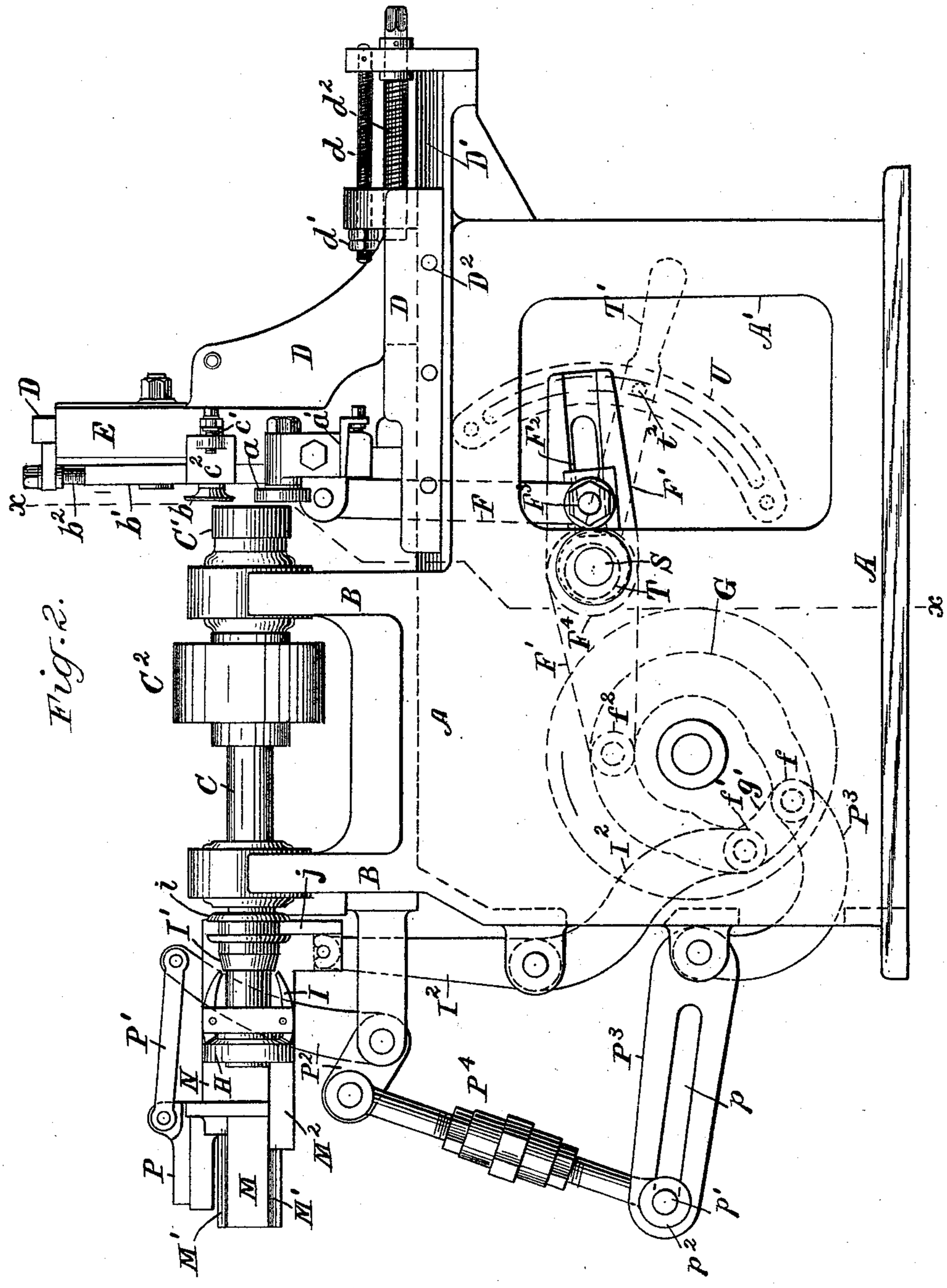

Fig. 2.

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Fig. 4.

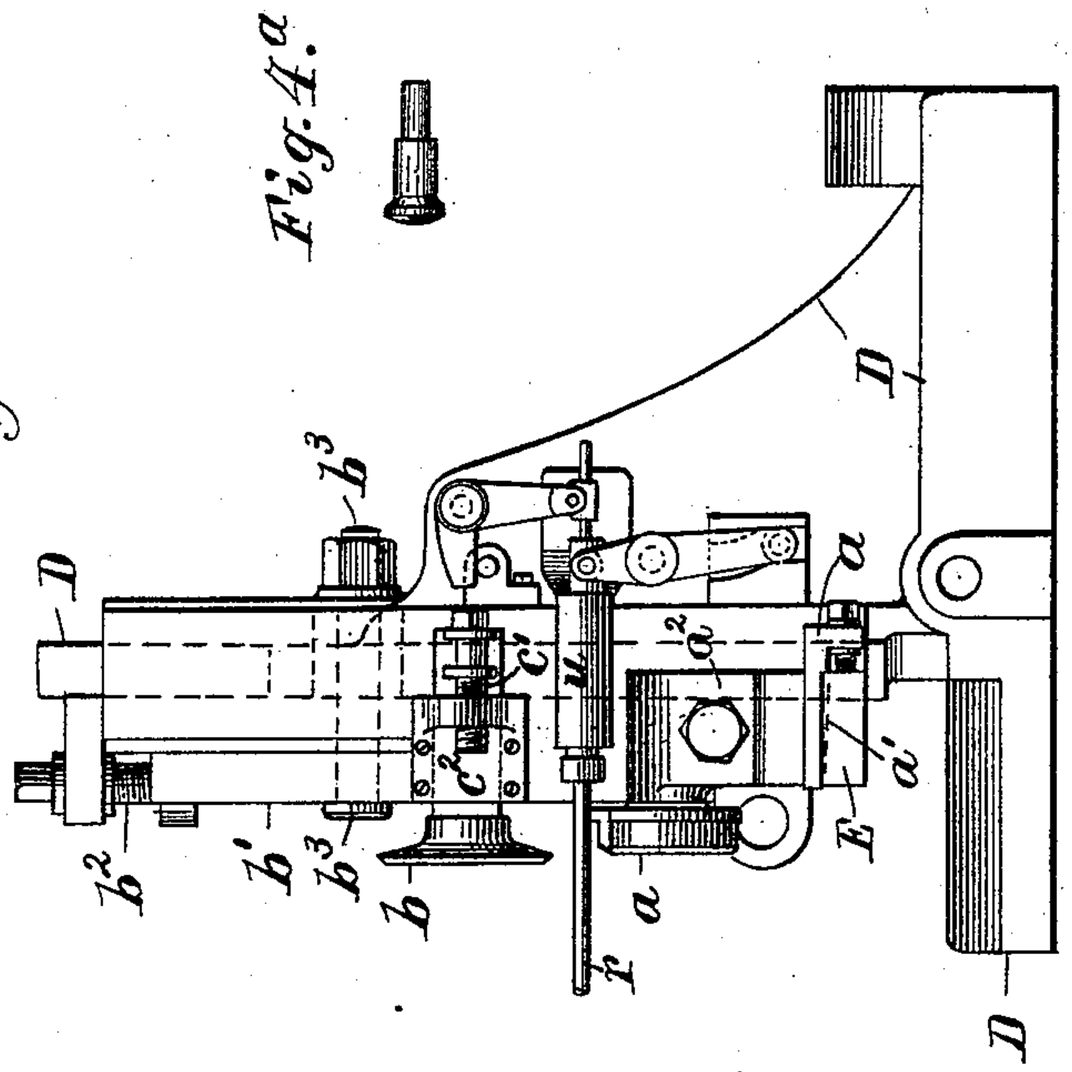

Fig. 4a.

Fig. 3.

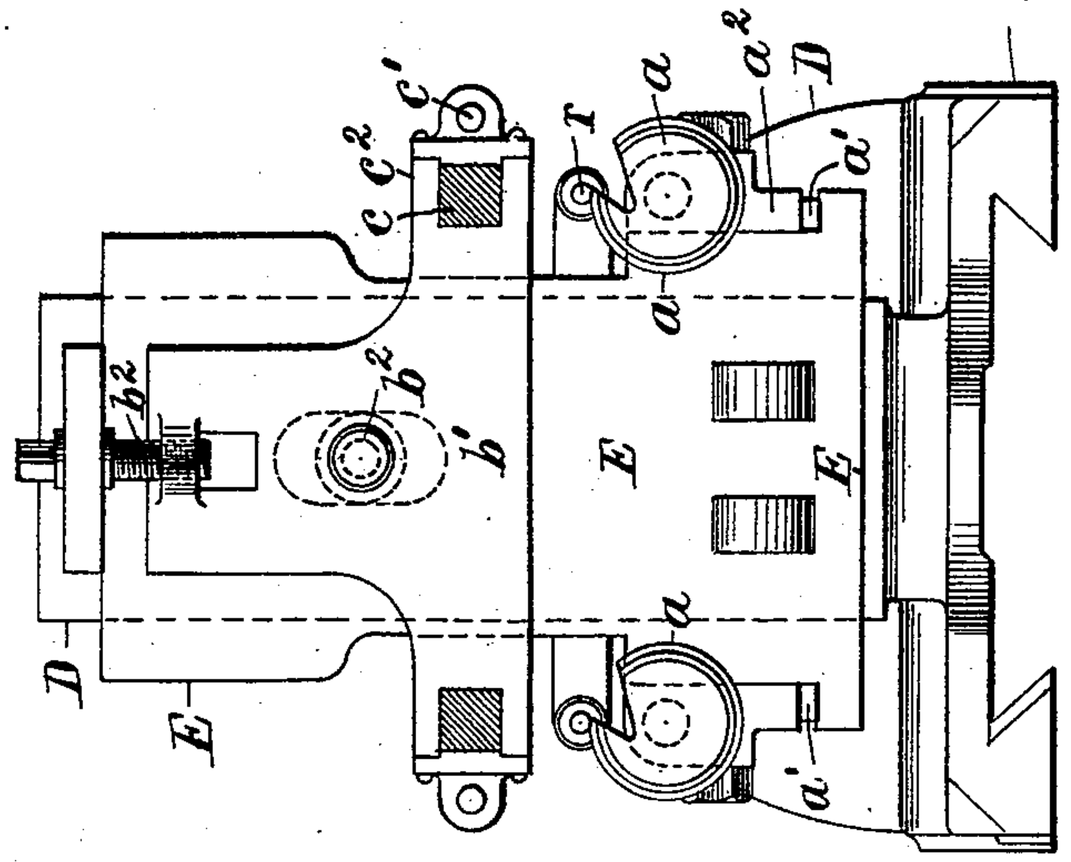

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Fig 5.

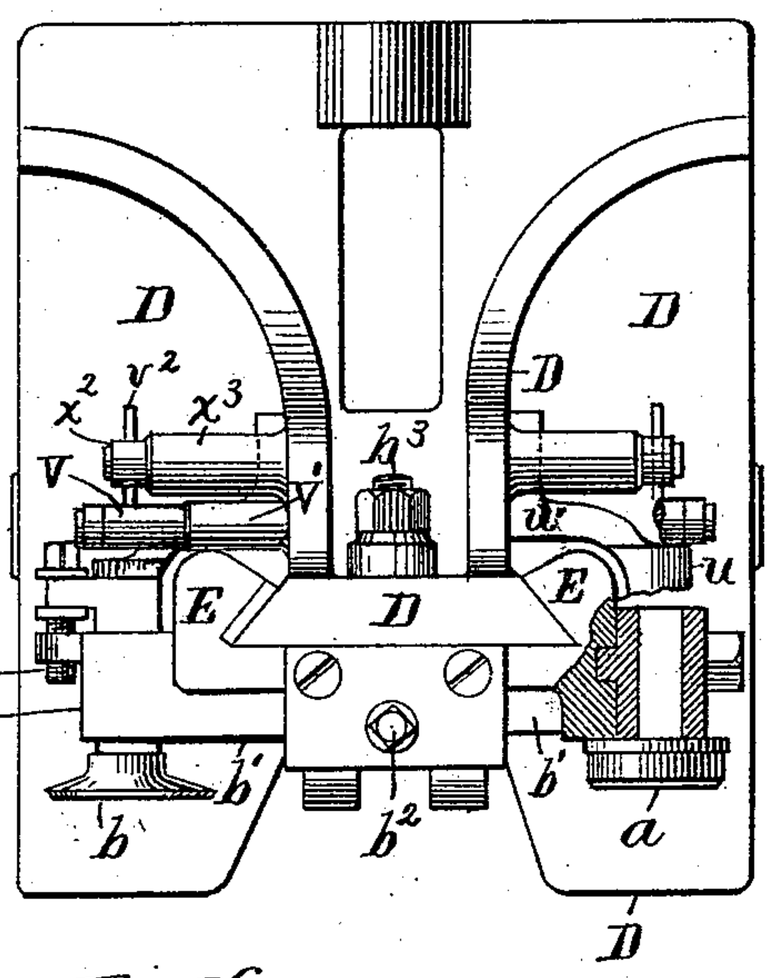

Fig 6.

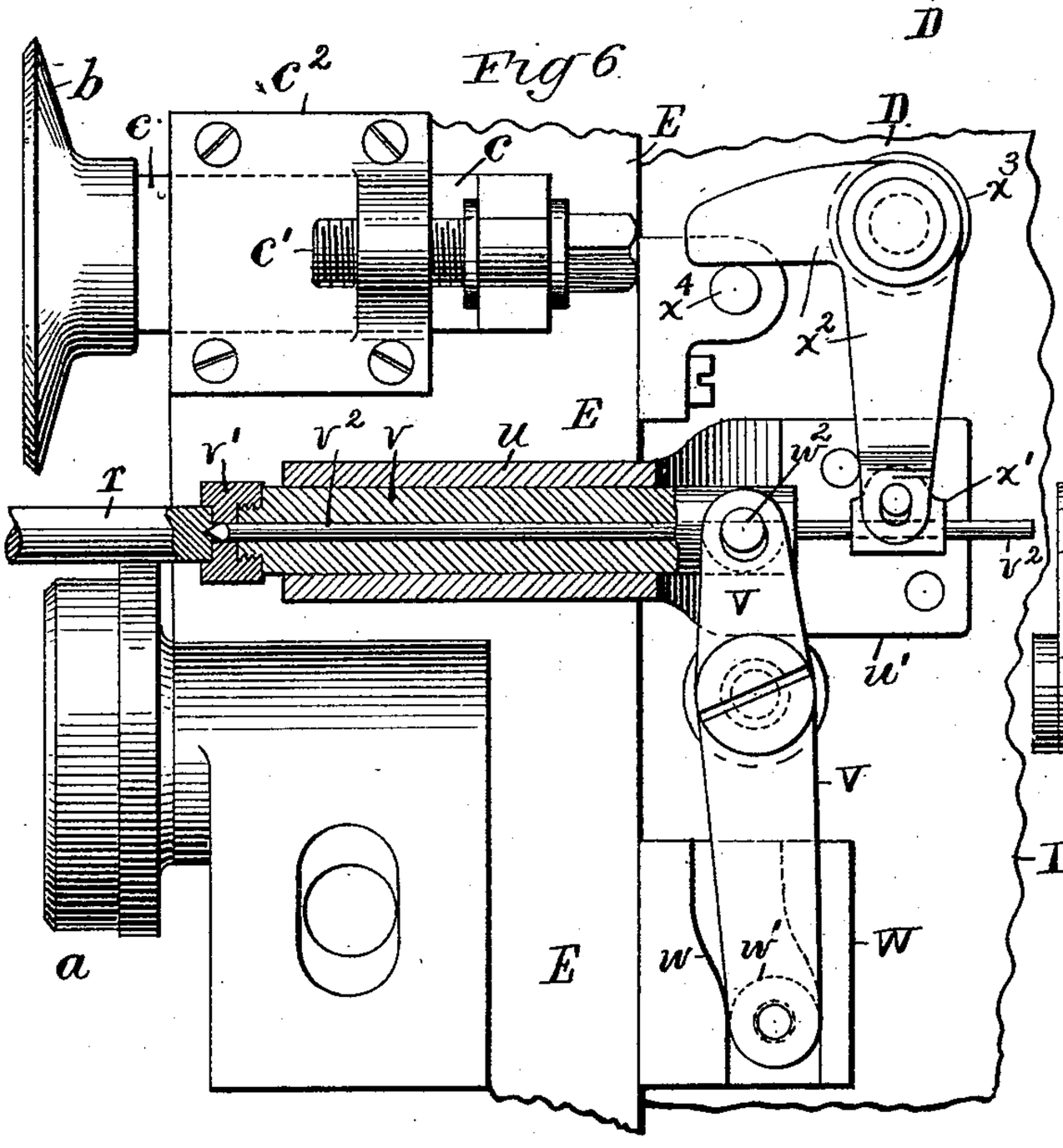

Fig 7.

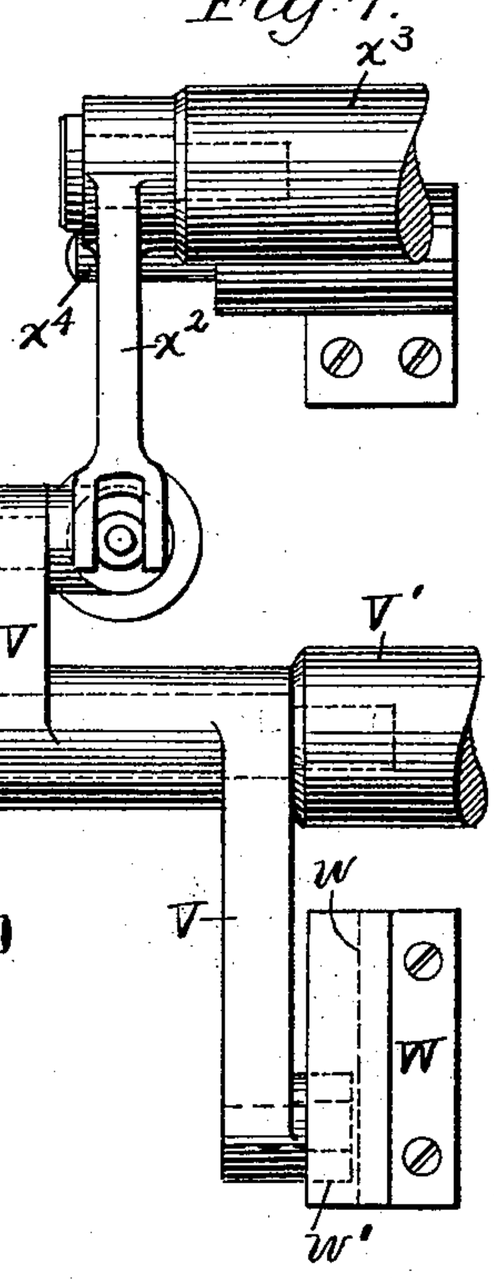

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Fig. 7.

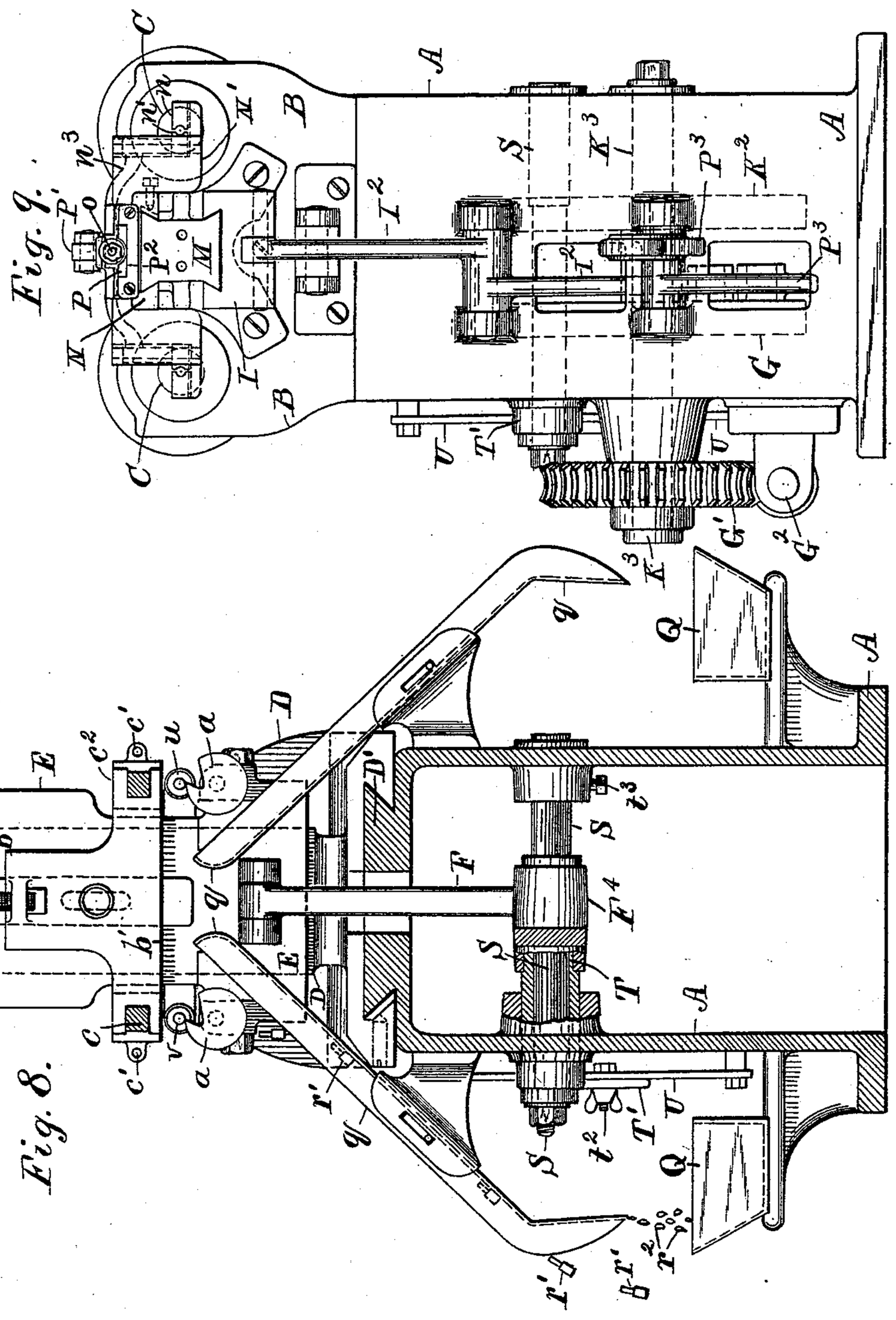

Fig. 8.

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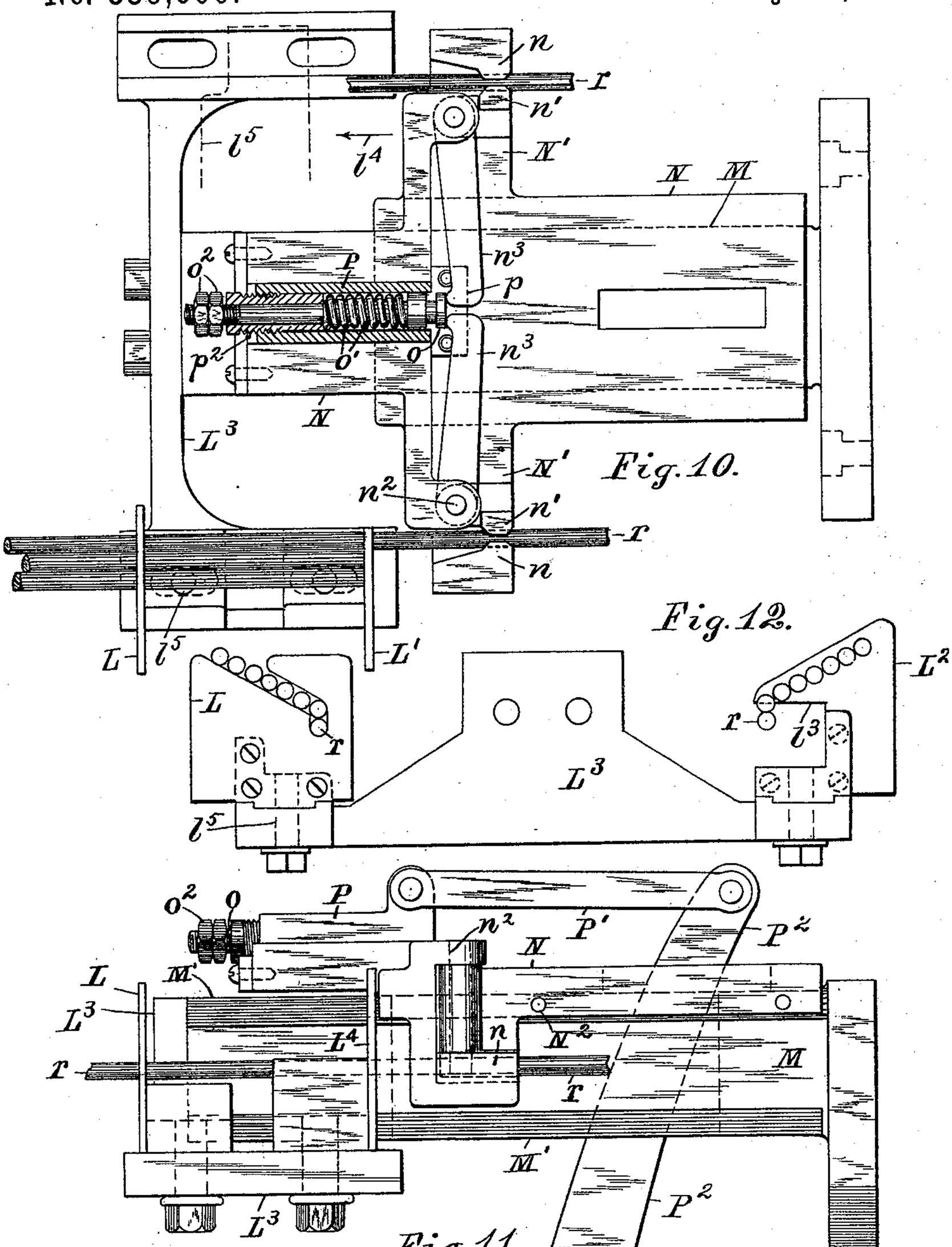

Fig. 10.

Fig. 12.

Fig. 11.

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UNITED STATES PATENT OFFICE.

OLUF TYBERG, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE GARVIN MACHINE COMPANY, OF NEW YORK.

AUTOMATIC STUD-TURNING MACHINE.

SPECIFICATION forming part of Letters Patent No. 539,600, dated May 21, 1895.

Application filed April 20, 1894. Serial No. 508,279. (No model.)

To all whom it may concern:

Be it known that I, OLUF TYBERG, a subject of the King of Denmark, residing at Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Automatic Stud-Turning Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a novel arrangement of the spindles, the slide or carrier for the cutting tools, and the feed mechanism, for a duplex stud turning machine; and the objects of the invention are to stiffen and strengthen the tool supports while facilitating the discharge of the work-pieces or studs from the machine, to feed a succession of the stock or blank rods automatically to the feed jaws, and to reduce the number of parts by actuating the chuck clamps and feeding mechanism by connections to a single cam.

These improvements, with others, are illustrated in the annexed drawings, in which—

Figure 1 is a side elevation of the entire machine with some of the minor details omitted. Fig. 1^a is an end view of the bed and cheeks for the rod-guide upon a larger scale. Fig. 2 is a side elevation of the box-frame and the operative parts, omitting certain details. Fig. 3 is a view upon the inner side of the movable head carrying the cutters, and Fig. 4 a side elevation of the same. Fig. 4^a is an enlarged view of one stud. Fig. 5 is a plan of the head; Fig. 6, a side elevation, drawn full size, partly in section where hatched, of the devices for centering the blank. Fig. 7 is an end view of the parts at the right hand of Fig. 6. Fig. 8 is a cross-section of the box-frame carrying the operative parts, taken on line $x\,x$ in Fig. 2. Fig. 9 is a rear elevation of the machine with the rod-guides entirely removed. Fig. 10 is a plan of the feeding-slide, and Fig. 11 a side elevation of the same with the bracket for carrying the slide detached from the rear of the main frame. Fig. 12 is an elevation of the cross-piece having a feed-rod guide at one end and the gage or stop at the opposite end.

Only the cam for actuating the tool slide is shown in Fig. 1, and the cam for actuating the chuck clamps and feeding mechanism in Fig. 2; while both cams are shown in Fig. 9.

Fig. 1 is drawn on half the scale of Fig. 2, and the remaining figures upon a still larger scale, to show the details of construction.

The machine is illustrated with a box frame A carrying a head B, in which are mounted two parallel spindles C rotated upon the same level and carrying chucks C′ upon their forward ends. A bracket D is fitted to move to and from the chucks upon horizontal ways D′, a threaded gage bar d being provided with nuts d' to adjust the bracket, and a screw d^2 to set the bracket against the nuts. Set screws D^2 in the side of the bracket secure it rigidly to the ways when adjusted. A vertical tool slide E is reciprocated with a fixed stroke upon the front of the bracket by a link F connected with an oscillating lever F′. Such lever is actuated by a roll f^2 fitted to a cam K^2, upon a shaft K^3, and rotated by worm wheel G′ and worm shaft G^2.

Forming tools a are clamped upon the sides of the slide E in holders a^2 adjusted vertically thereon by wedges a'. These tools, as shown in Fig. 3, consist of disks with a cutting notch in the edge, and having the proper profile to shape a stud, such as is shown in Fig. 4^a. Such forming cutters are used, as the cutting edge may be resharpened without changing its form. The cut off tools b of similar construction are mounted upon the slide E by attachment to an adjustable plate b' (Fig. 3) having a screw b^2 to set the same to and from the forming tools. When thus adjusted, the plate b' is clamped to the slide E by bolt b^3. The cut off tools are held rigidly upon shanks c which are adjustable in the plate b' to and from the chucks C′, by screws c'. Each of the chucks C′ may be provided with suitable clamping jaws, which would be actuated through an internal sleeve and an attached collar H which is shifted longitudinally by the lever arms I and cone I′.

A stand K carrying a flat bed K′ is shown in Fig. 1, to support a series of stock rods J from which the studs are formed. The bottom rod of the series is shown extended through the feed clamping jaws n and outside of the chuck C′, (Fig. 1.)

A bracket M with dovetails M′ upon its upper and lower edges, is projected from the rear of the head B, and a feed slide N is mounted thereon and provided with arms N′ carrying fixed jaws *n* for clamping the feed rod. The movable jaws *n′* are pivoted upon the arms N′, close to the fixed jaws, by pins n^2, and attached to levers n^3, whose inner ends rest upon a spring stud *o* mounted adjustably in an auxiliary slide P, which is fitted movably upon the feed slide N. The auxiliary slide P is reciprocated by a link P′, and its movement, as shown in Figs. 10 and 11, is restricted by a stop p^2 attached to the slide. The head of the stud *o* is pressed normally outward by a spring *o′* within the auxiliary slide, and its projection is limited by adjusting nuts o^2 to prevent it from closing the clamping jaws *n*, *n′*, too tightly.

The bed K′ upon the stand K is provided with a series of transverse guides L, and with a stop or gage L′ for the outer ends of the rods. The guides are formed each with an inclined slot *l* open at the top to insert the rods, and terminated at the lower end with a short vertical extension or slot *l′* at the lower end, and the bed K is provided with laterally adjustable cheeks at the opposite sides of such vertical slot.

A cross piece L^4 is attached to the bracket M as shown in Figs. 10 to 12 inclusive, and supports a rod, gage or stop L′ adjacent to the jaws *n*, and also one of the guides L adjacent to such stop, to direct the lowest rod of the series into the jaws. The stop L′ and guide L are supported adjustably upon the cross piece L^4 by bolts l^5 to adapt them for various strokes of the feed jaws. The stop L^3 is formed with a notch or passage l^3 through which the jaws *n*, *n′*, are moved by the reciprocation of the slide N; the jaws passing back of the stop, as indicated by the arrow l^4 in Fig. 10, to the position indicated by dotted lines l^5, where they grasp the rod and propel it forward through the spindle, and beyond the chuck, as shown in Fig. 1.

The feed slide N is provided with set screws N^2 to press a gib adjustably upon the bracket M to produce a frictional resistance to its movement. When the link P′ is reciprocated, the auxiliary slide P strikes the stops p^2, and through these stops carries the slide with it in either direction. The clamping jaws *n*, *n′*, slip over the rod in the backward movement of the feed slide, and grasp the rod in the forward movement, the stud *o′* exerting an elastic pressure upon the jaws in such forward movement. The movement of the auxiliary slide back and forth upon the feed slide N thus varies the operation of the spring *o′* upon the movable jaws, relaxing the pressure of the spring during their backward movement, and thus relieving the jaws from the rod during their backward movement, and compressing the spring during the first part of the forward movement until the movable jaws bite the rod *r*, after which the feed and auxiliary slides move forward together.

The jaws of the chuck may be changed as is common, to fit rods of different sizes; the hollow within the spindle being bushed by a piece of tubing, to center the small rods within the spindle. The bottom rod in the guides then operates to push forward the rod within such centering tube, and thus feeds it to the chuck until it is wholly worked up. The slots *l* in the rod guides operate, as shown in Fig. 12, to sustain a series of the rods in readiness for use, and to feed them automatically downward into line with the clamping jaws, each rod taking the place of the one in the vertical slot when the latter is wholly withdrawn by the feeding mechanism. By inclining the slot *l*, the weight upon the bottom rod is greatly diminished; while the movement of the series downward is maintained. The spindles C are continuously rotated by pulleys C^2, and the rod grasped by the chuck C′ is therefore spun around in the guides at a high velocity. The centrifugal force would cause the rear end of the rod to fly out of the guide if it were not restrained laterally; for which purpose the longitudinal cheeks *m* are mounted upon the bed K at the sides of the slot *l′*. One or both of such cheeks may be made adjustable by the screws m^2. The cheeks are shown in Fig. 1ª, but are omitted in Fig. 1 to show the lower rod in line with the feeding jaws.

A slider M^2 is fitted to the lower dovetail upon the bracket M and carries a yoke *j* fitted to collars *i* upon the cone I′, and such slider is reciprocated in a proper sequence to the feed slide N, to close the chuck jaws upon the rod *r* when the forward stroke of the feed jaws is concluded, by means of the same cam G. This cam is mounted on shaft K^3, and provided with a single groove, as shown in Fig. 2, in which are fitted at different points the rolls *f*, *f′*, which actuate respectively the feed slide and the chuck. The roll *f* is connected with the link P′ by bent levers P^2 and P^3, which are united by an extensible link P^4, the lower end of which is jointed adjustably to a slot *p* in the lever P^3 by a bolt *p′* and nut p^2. The stroke and position of the feed slide upon the bracket M may thus be varied at pleasure. The roll *f′* is connected with the slide *j* through a lever I^2.

A projection *g′* in the cam groove operates to first move the feed slide forward and then close the chuck jaws. The cam K^2, shown in Fig. 1, then operates to move the tool slide up and down one complete stroke before the feed is renewed. The cam K^2, upon the upward stroke of the tool slide, moves the forming tool *a* upward quickly, and then feeds it slowly against the blank or rod *r*, and shapes it in the desired manner; the reverse movement of the tool slide retracting the forming tool and cutting off the finished stud by the cutter *b*. The retraction of the cut-off tool commences before the rod is fed forward, the

stroke of the slide being proportioned to move the forming tool upward nearly to its operative position as the feeding of the rod is concluded. The cut is thus commenced directly upon the completion of the feeding movement, and the stud is finished and delivered from the machine with great rapidity.

Means is in practice provided for discharging a lubricant upon the rod, and chutes *q* are inclined beneath the cutters, to catch the lubricant and the chips discharged from the cutters; which it will be understood are attached rigidly to the tool slide.

Fig. 8 shows means for separating the studs from the chips and lubricant, by arranging an oil pan Q beneath the lower end of each chute, with its edge a little beyond the bottom of the chute. With this arrangement the momentum of the studs *r'* as they slide down the chute carry them beyond the edge of the oil pan, while the oil and chips adhering to the end of the chute drip into the pan, as indicated by the particles r^2. The studs may be caught in a separate receptacle. The pivot S for the lever F' is provided at one end with a sleeve T extended through one side of the box frame, as shown in Fig. 8, and provided upon its outer end with a hand-lever T'. The inner end of the sleeve is made eccentric and fitted within the hub F^4 of the lever F', and the handle T' is clamped by a bolt t^2 to a slotted segment U upon one side of the frame, as shown in Fig. 2. The pivot S is fastened rigidly, as by screw t^3, in its outer bearing, and the fulcrum of the lever is thus rendered firm, while the eccentric is so proportioned as to slightly vary the center of the lever by moving the handle T'.

Heretofore, duplex stud machines have been constructed with one of the chuck spindles arranged above the other upon a horizontal frame, with the cutter slide movable horizontally; in which case the upper cutter or forming tool for the upper spindle is much farther than the other from the cutter slide, and the tool support for such upper cutter is necessarily weaker and more liable to vibration. With one spindle above the other, the lower spindle is much less accessible. If a chute be employed to protect it from the lubricant, the chips, and the finished studs discharge from the upper cutter.

With the present construction the spindles may both be set close to the frame, and the forming tools arranged at the same height above the base of the bracket D; by which arrangement the tools are supported with great firmness, and are equally accessible upon either side of the machine; while the discharge of the chips and the finished studs from both of the cutters is effected, as shown in Fig. 8, without obstructing access to either. The stroke of the slide, for making studs of various sizes, is varied, with the use of the cam K^2, by adjusting the lower end of the link F to a slot F^2 in the lever F'; while the forming cutters *a* are adjusted independently upon the slide E, by means of the wedges *a'*, so as to finish the two studs when desired of exactly the same diameter. An opening A' is shown in Fig. 2 in the side of the box frame, to give access to the bolt F^3 for adjusting the same. A door may be fitted to the opening A'.

The cut off tools *b* are omitted from Fig. 3, to show their shanks *c* clamped in boxes c^2 in which they are adjustable to and from the chucks C' by the screws *c'*. The point at which the stud is cut off is varied by adjusting such screw and then clamping the shank of the cutter by the cap of the box c^2.

The screw d^2 serves to set the bracket D to and from the chucks C' to admit a forming tool of the desired width, and the gage *d'* permits the readjustment of the bracket in precisely the same position, when it has been drawn backward for inspection or sharpening of the tools.

The adjustment of the plate *b'* upon the tool slide E permits the adjustment of the cut off tools in conformity with the stroke given to the slide, and all the parts are thus adapted for a wide range of variation in their work.

In Figs. 3 to 7 inclusive, means are shown for gaging the length of the work piece, and steadying the end of the rod *r* adjacent to the cutting tools, and also for centering or countersinking the end of the rod when required. Means are also shown for retracting the centering and drilling devices from the end of the rod. A tubular bearing *u* is shown attached by a foot *u'* to the bracket D, in the rear of the cutter slide E, to which the bearings of the tools *a* and *b* are secured. A gage spindle *v* is fitted to the bearing *u* in line with the chuck spindle C, to carry a socket support *v'* for the end of the rod *r*. The spindle is automatically retracted by a lever V pivoted to a boss V' upon the bracket D. A block W containing a cam groove *w* is attached to the rear edge of the tool slide E, and operates upon a roller *w'* in one end of the lever V; the other end being jointed by a pin w^2 to the spindle *v*. A part of the fixtures is broken away in Fig. 5. Fig. 6 shows these parts of their natural size, with the socket *v'* inclosing the end of the rod *r*. The cam groove *w* is made parallel at each end with the movement of the slide, and inclined between the ends; thus shifting the lever V at the middle of its stroke and holding it stationary when the cutters *a* and *b* are operating upon the rod.

The cam block W operates as a sliding cam, moving downward with the slide E at the close of the forming operation, and the groove *w* then acting upon the lever V to retract the socket *v'*. A drill v^2 is shown inserted through the spindle *v* for centering or countersinking the end of the rod; and such drill is provided at the rear end with a block *x'* attached rigidly thereto and connected by a pin to a bell crank x^2 which is pivoted upon a boss x^3 on the bracket D. The tool slide E is provided

with a pin x^4 which operates upon one arm of the bell crank when the tool slide rises during the operation of the forming tool, and drives the drill forward into the end of the rotating rod, thus countersinking it as desired.

The gage spindle v may be provided with a conical socket or a point, or any other suitable appliance to steady the end of the rod.

From the above description it will be seen that the means for actuating the feed mechanism and the chucks by a single cam, greatly simplifies the construction, and that the application of the slide N and M^2 to the single bracket M enables the same bracket to hold the feeding mechanism and the clamp actuating mechanism in line with the spindles.

Where these improvements are applied to a duplex stud machine, a single cam and connections may be used for actuating the feeding and chuck mechanisms, and the number of parts thus greatly reduced; while the actuation of the single tool slide E also serves to actuate the required tools in a suitable manner to operate upon two work pieces rotated simultaneously by the two spindles.

Having thus set forth the nature of the invention, what is claimed herein is—

1. An organized machine for turning studs, comprising the following agencies: a spindle, a chuck carried thereby, suitable means for opening and closing the chuck, a reciprocating feed slide carrying jaws in line with the rear end of the spindle, one of the jaws being stationary upon the slide and the other pressed elastically thereto and adapted to feed the rod forward into the chuck by an elastic grip upon the rod, and means for relieving such elastic grip during the backward movement of the slide and jaws, substantially as herein set forth.

2. In a stud machine, the combination, with the feed slide N carrying fixed and movable jaws, with lever to actuate the latter, of the auxiliary slide P fitted movably upon the feed slide N with means for producing an elastic grip upon the rod and means for reciprocating the auxiliary slide, substantially as herein set forth.

3. In a stud machine, the combination, with a spindle carrying a chuck and suitable devices for feeding a rod through the same, of a movable tool slide provided with a forming tool and cut off tool, as set forth, an outwardly inclined chute for discharging the studs, and an oil pan with its edge below the edge of the chute, and the chute operating to separate the studs from the chips, substantially as herein set forth.

4. In a stud machine, the combination, with a chuck and spindle and means for automatically clamping the rod intermediate to the movement of the feed jaws, of the feed slide N carrying fixed and movable jaws with a lever to actuate the movable jaw, and a spring for pressing such lever, the auxiliary slide P fitted movably upon the feed slide N and operating during the feeding movement to compress the spring, and during the reverse movement to relax the spring and thereby release the grip of the movable jaw, and suitable connections to the auxiliary slide and the chuck for actuating them successively, substantially as herein set forth.

5. In a stud machine, the combination, with a suitable bed and a head having horizontal spindle with chuck and means for feeding a rod through the same, of a sliding bracket horizontally adjustable to and from the spindle chuck, with the rod d and gage nut fitted adjustably thereto, the screw d^2 for setting the bracket to the gage, and a tool slide movable vertically with a uniform stroke upon the bracket, and a forming tool and cut off tool adjusted upon the tool slide, as herein set forth.

6. In a stud machine, the combination, with a suitable bed and a head carrying a horizontal spindle with a chuck and means for feeding a rod through the same, of a vertically movable tool slide provided with tools for forming and cutting off the stud as set forth, a lever having a pivot with adjustable eccentric bearing, a cam for actuating one end of the lever, a link extended from the slide and connected by slot and adjustable bolt with the opposite end of the lever, and a handle with clamping device for adjusting the eccentric bearing, substantially as herein set forth.

7. In a stud machine, the combination, with a spindle and chuck for clamping the rod, of a slide reciprocated vertically with a uniform stroke before the chucks and carrying the tools for forming and cutting off, as set forth, reciprocating jaws for feeding the rod through such chuck, means for actuating the chuck to clamp the rod intermediate to the movement of the feed jaws, the rotary cam G with single groove, the levers having rolls f, f', fitted to different parts of the same groove, and connections to such levers for actuating the feeding jaws and the chuck clamps in the proper sequence, substantially as herein set forth.

8. In a stud machine, the combination, with a spindle and chuck for clamping the rod and clamping jaws reciprocated longitudinally along the rod, of the bed K′ extended in the rear of the spindle, vertical stops for guiding the ends of a series of rods, and a series of transverse guides at intervals along the rods and adapted to hold the lower rod in line with the aperture between the reciprocating jaws, substantially as herein set forth,

9. In a stud machine, the combination, with the reciprocating clamping jaws for automatically grasping a rod, of the bed K′ extended in the rear of the spindle, the series of transverse guides provided with guide slots to hold a series of rods, and the cheeks to hold the bottom rod from lateral motion, substantially as herein set forth.

10. In a stud machine, the combination, with

the reciprocating feeding jaws for automatically grasping a rod, of vertical stops at the end of the rod, with suitable passage l^3 through the forward stop for the clamping jaws, and a guide or guides for holding a series of the rods between the stops with the bottom rod in line with the jaws, as herein set forth.

11. In a stud machine, the combination, with a chuck spindle and a tool slide reciprocated transversely before the chuck with a forming cutter thereon, of the stationary bearing u carrying the gage spindle v in line with the chuck and a lever V actuated by a sliding cam to reciprocate the gage spindle, as herein set forth.

12. In a stud machine, the combination, with a chuck spindle and a tool slide reciprocated transversely before the chuck with a forming cutter thereon, of the stationary bearing u carrying the gage spindle v in line with the chuck, a drill inserted through the gage spindle, and means connected with the moving tool slide for pressing the drill into the end of the rod, substantially as herein set forth.

13. In a duplex stud machine, the combination, with a suitable bed and a head having two parallel spindles rotated upon the same level, of a sliding bracket horizontally adjustable to and from the spindle chucks with a gage d, d', and means, as the screw d^2, for setting the bracket to the gage, a tool slide movable vertically with a uniform stroke upon the bracket and provided with two forming tools and two cut off tools, substantially as herein set forth.

14. In a duplex stud machine, the combination, with a suitable bed and a head having two parallel spindles rotated upon the same level of a vertically moving tool slide, provided with two forming tools and two cut off tools as set forth, a lever having a pivot with adjustable eccentric bearing, a cam for actuating one end of the lever, and a link connecting the tool slide adjustably with the opposite end of the lever, substantially as herein set forth.

15. In an organized machine for turning studs, the combination, with two parallel spindles carrying chucks and rotated upon the same level, of a tool slide reciprocated vertically with a uniform stroke before the chucks and carrying forming tools and cut off tools, as set forth, duplex reciprocating jaws for feeding two rods simultaneously, the rotary cam G with single groove, and the levers I^2 and P^3 having rolls f' and f fitted to different parts of the same groove, with connections for actuating the chuck clamps and the feeding jaws successively, as herein set forth.

16. The feeding mechanism for a duplex stud machine, consisting of the bracket M affixed to the spindle head, the feed slide N carrying the fixed jaws n and the movable jaws n' with levers n^3, the slide P with stop upon the feed slide and the stud o with spring for pressing it toward the feed levers, and a cam with connections for reciprocating the slide P, as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

OLUF TYBERG.

Witnesses:
E. F. BATES,
THOMAS S. CRANE.