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E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

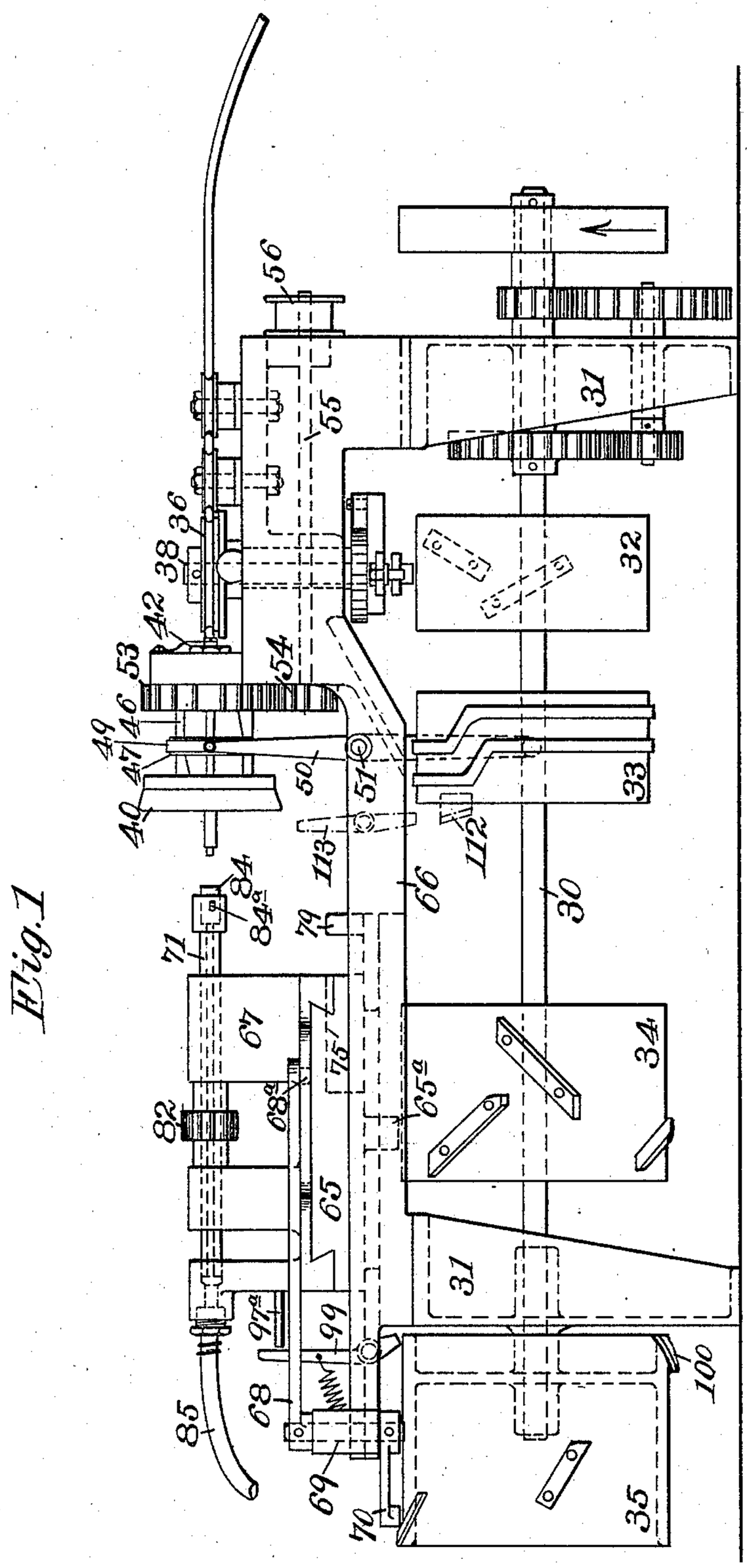

Fig. 1

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E. F. Kicker

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George Mortson.

(No Model.) 7 Sheets—Sheet 2.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

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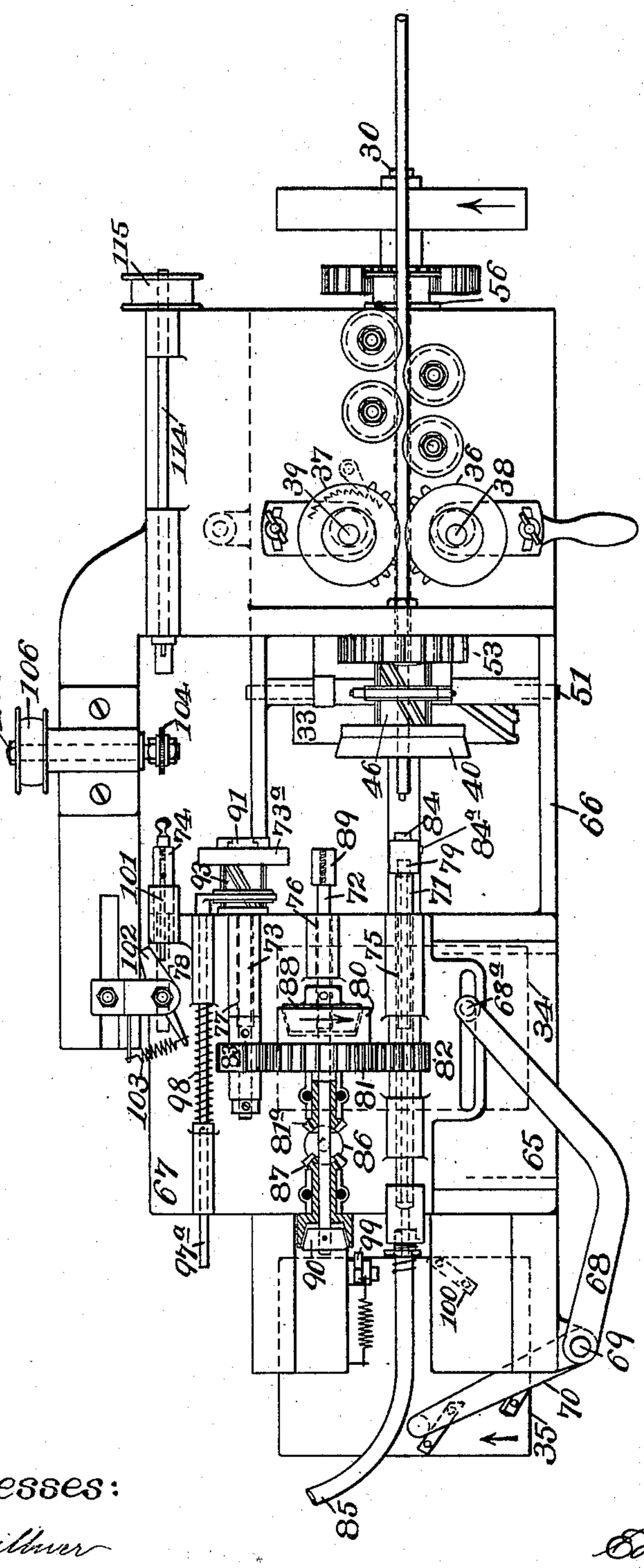
Fig. 2



Witnesses:

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(No Model.) 7 Sheets—Sheet 3.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

Fig. 3

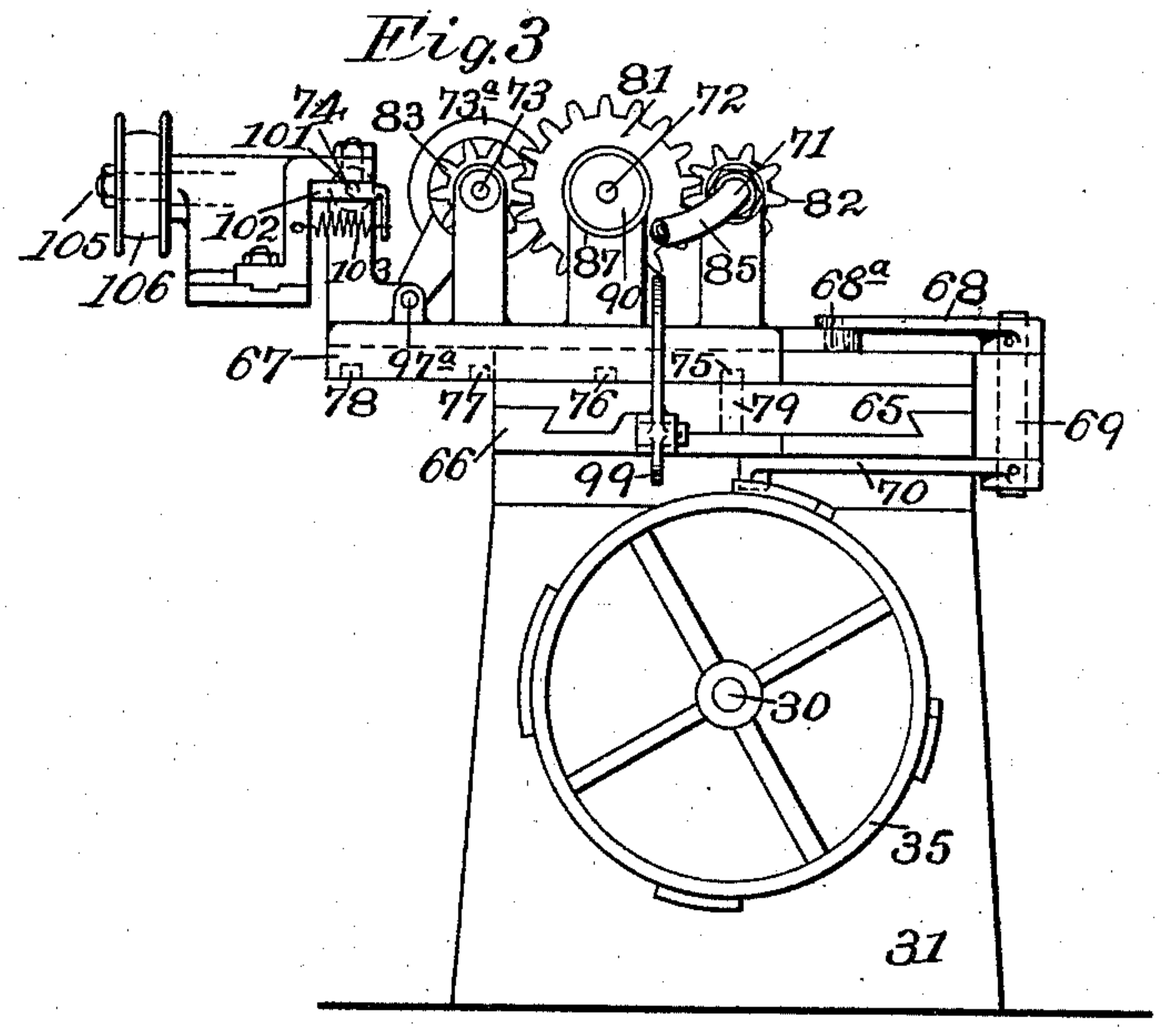
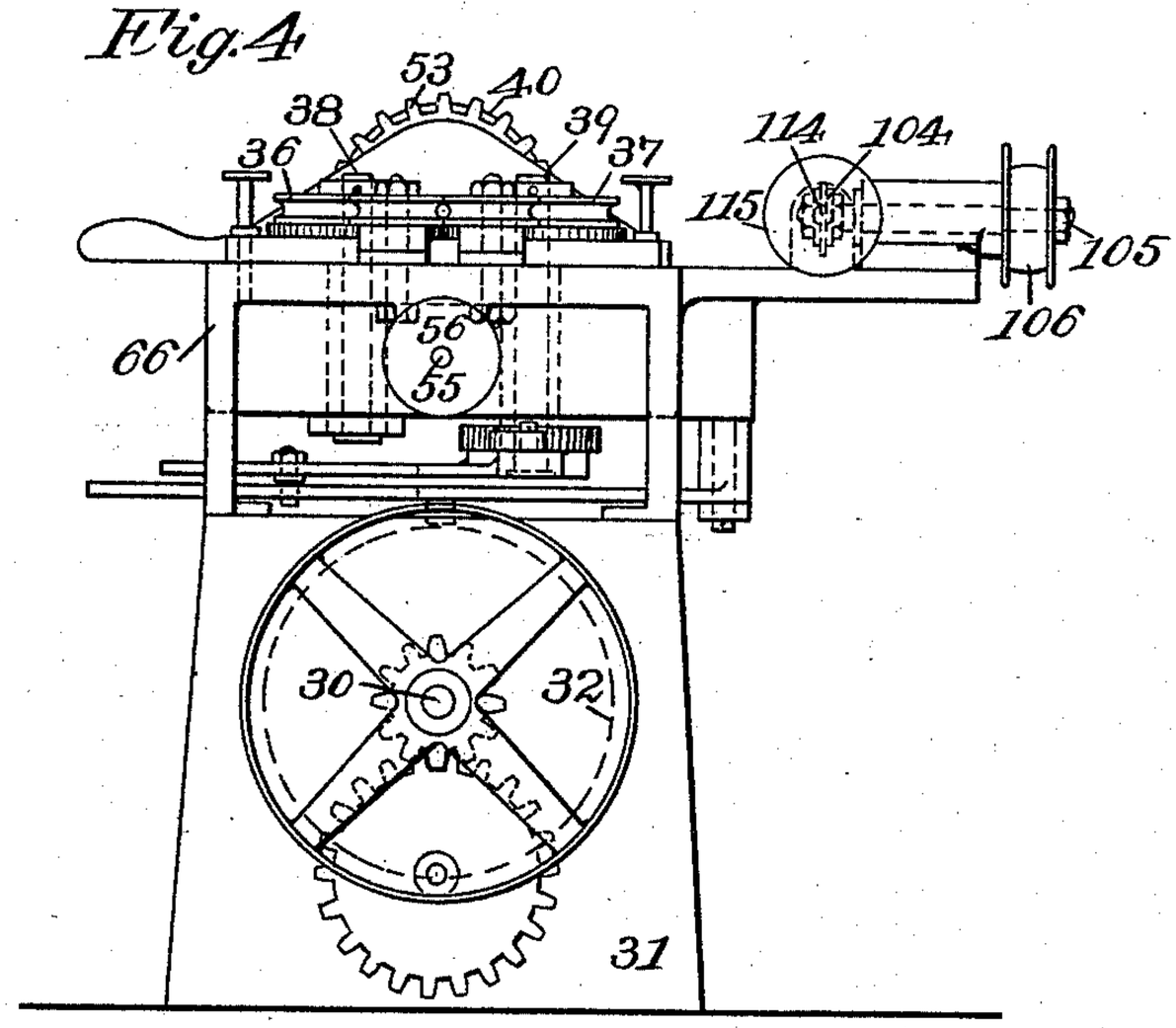


Fig. 4



Witnesses:

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(No Model.) 7 Sheets—Sheet 4.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

Fig. 6

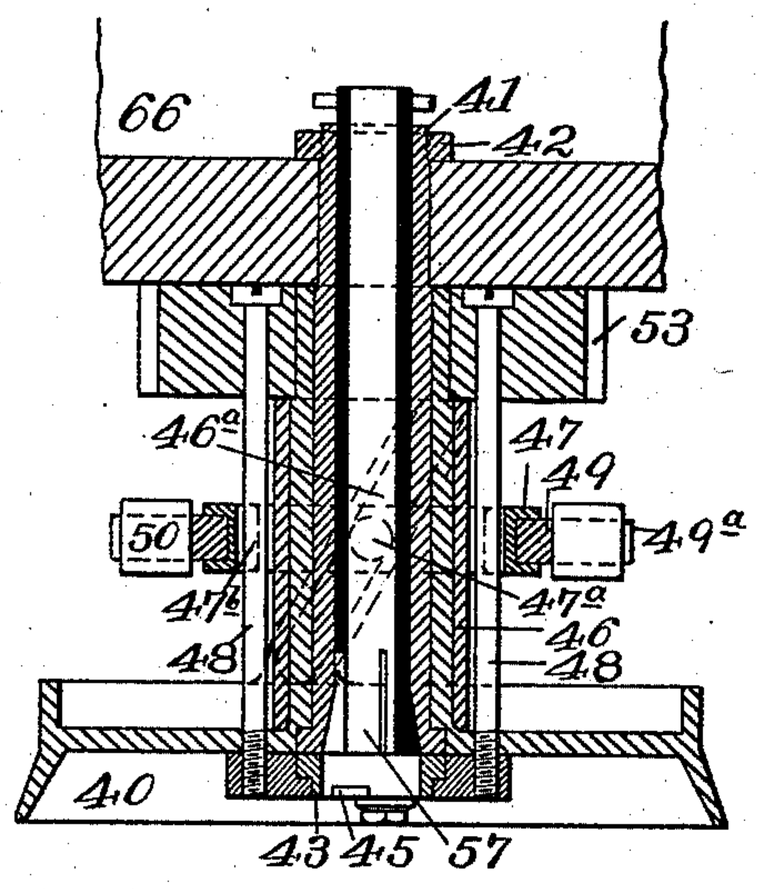


Fig. 8

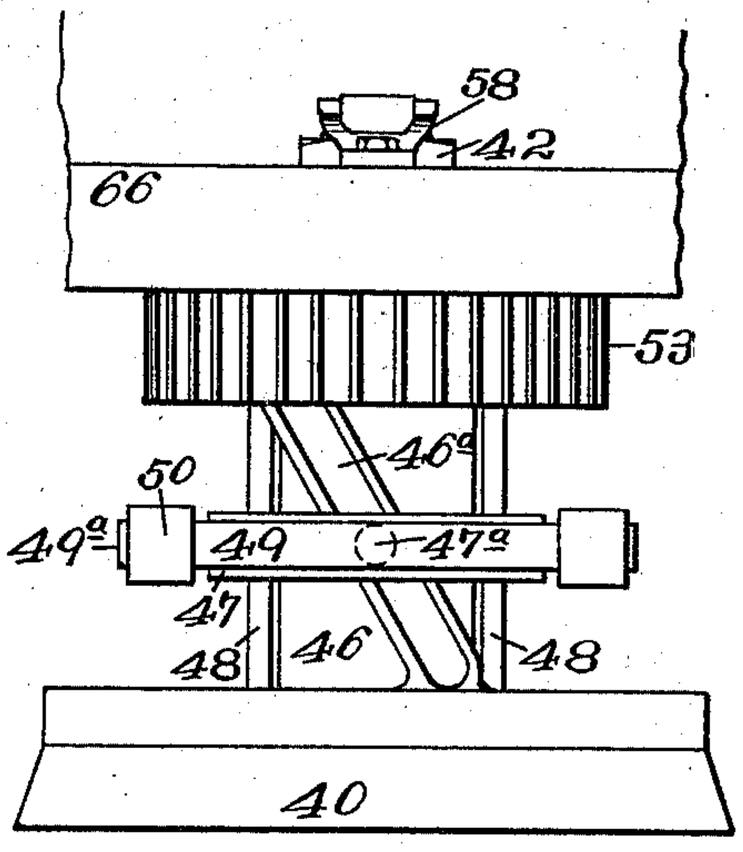


Fig. 5

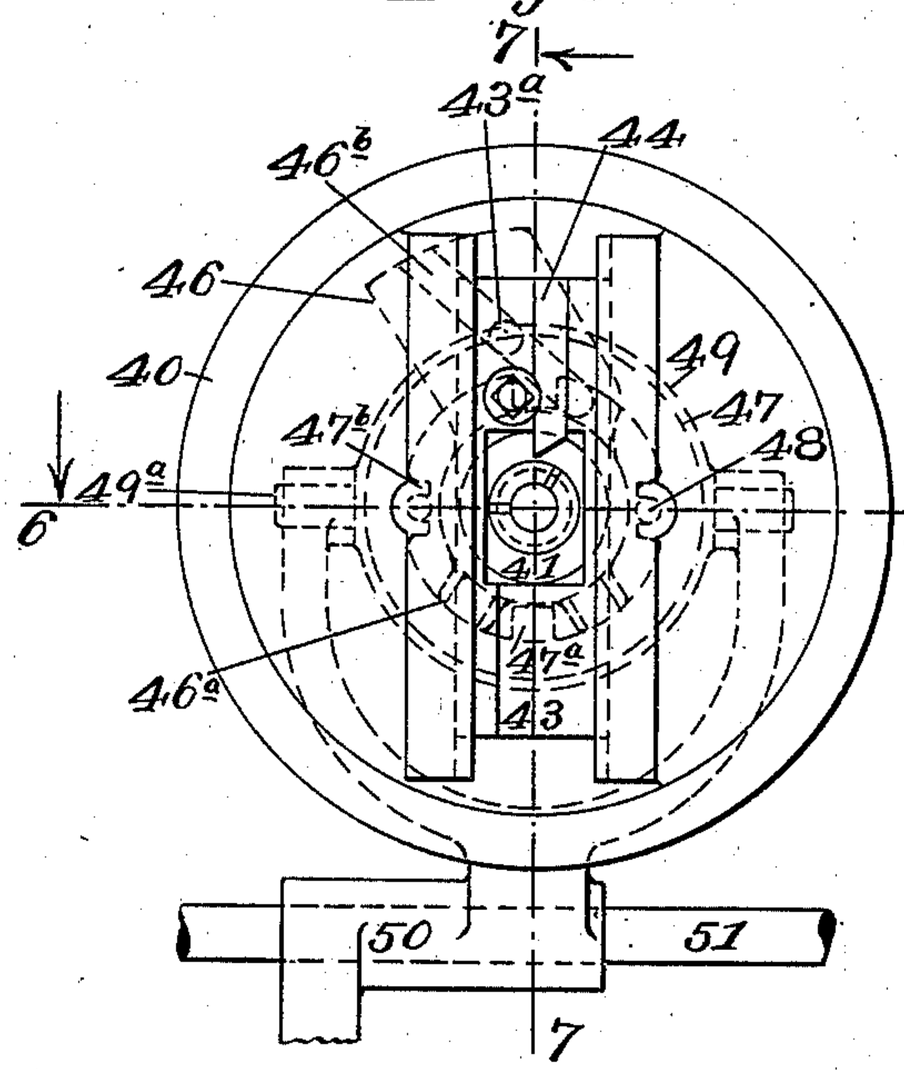
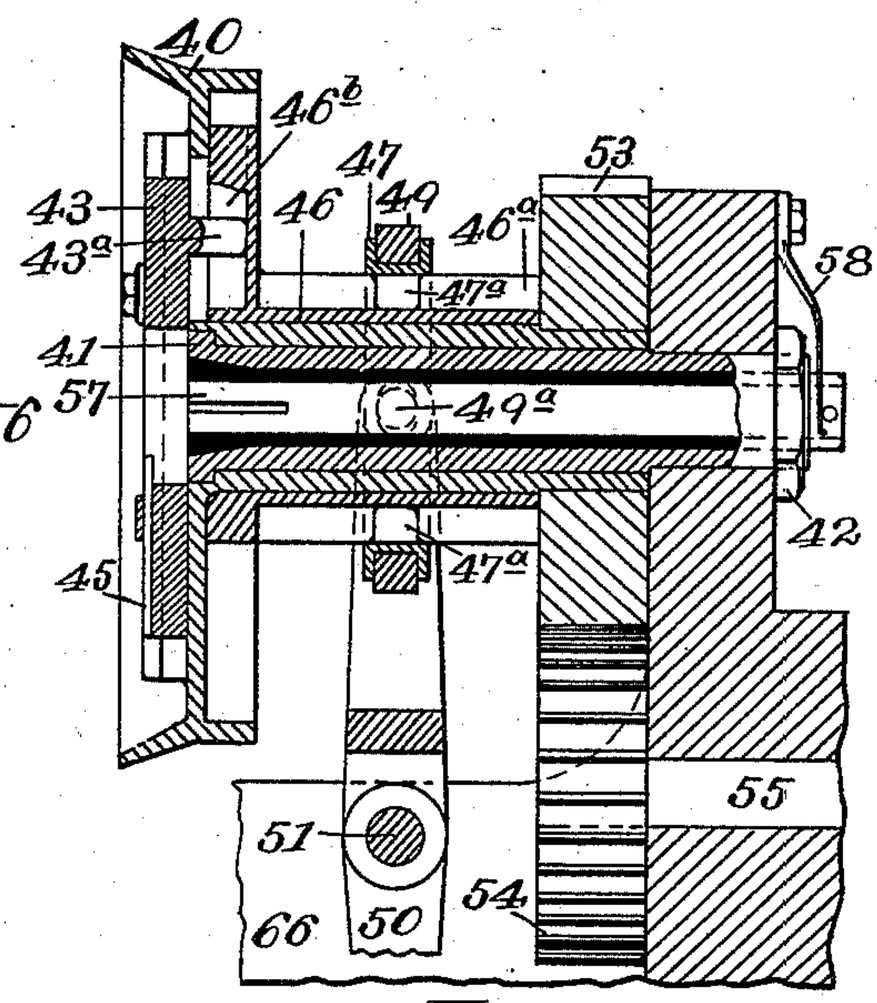


Fig. 7



Witnesses:
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(No Model.) 7 Sheets—Sheet 5.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

Fig. 10

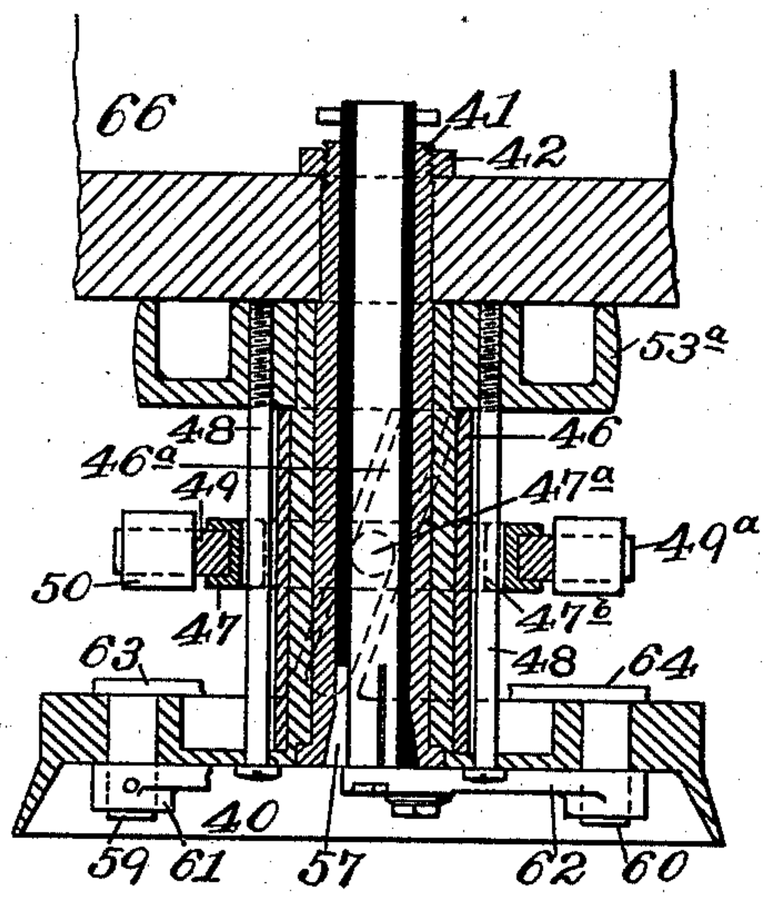


Fig. 12

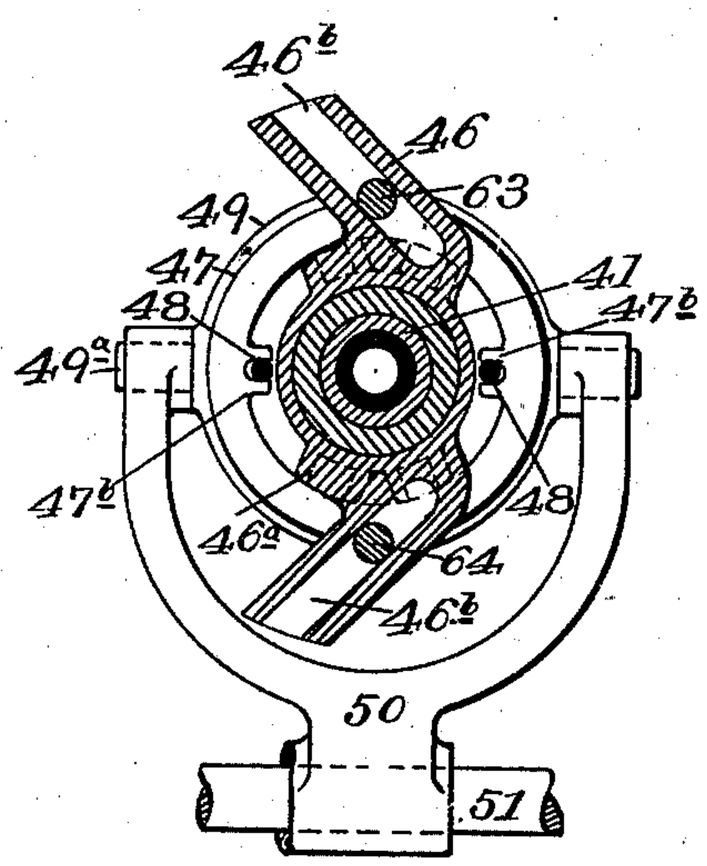


Fig. 9

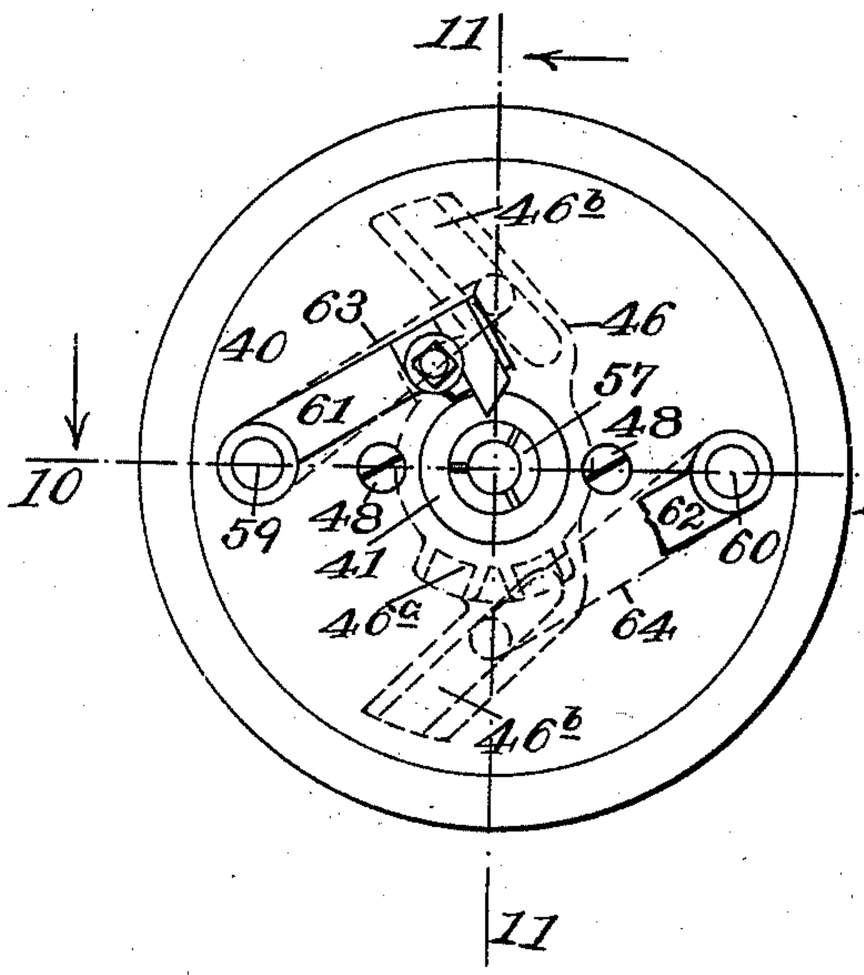
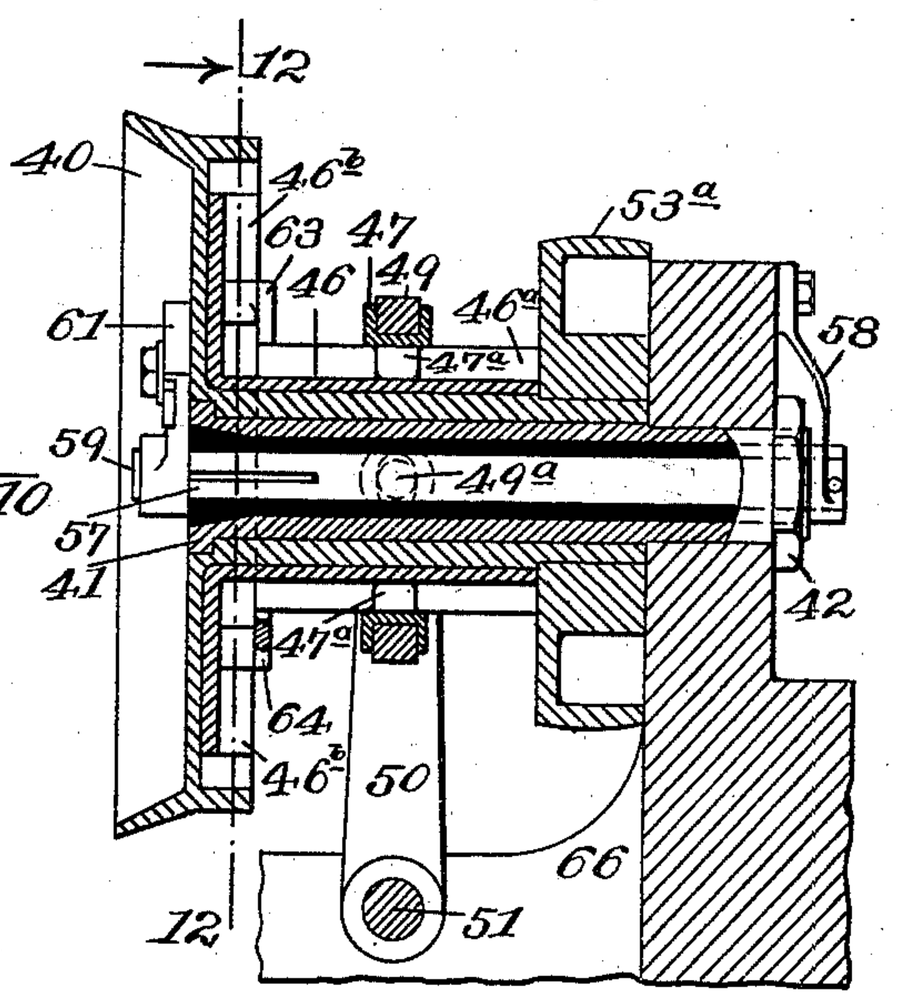


Fig. 11



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(No Model.) 7 Sheets—Sheet 6.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

Fig. 16

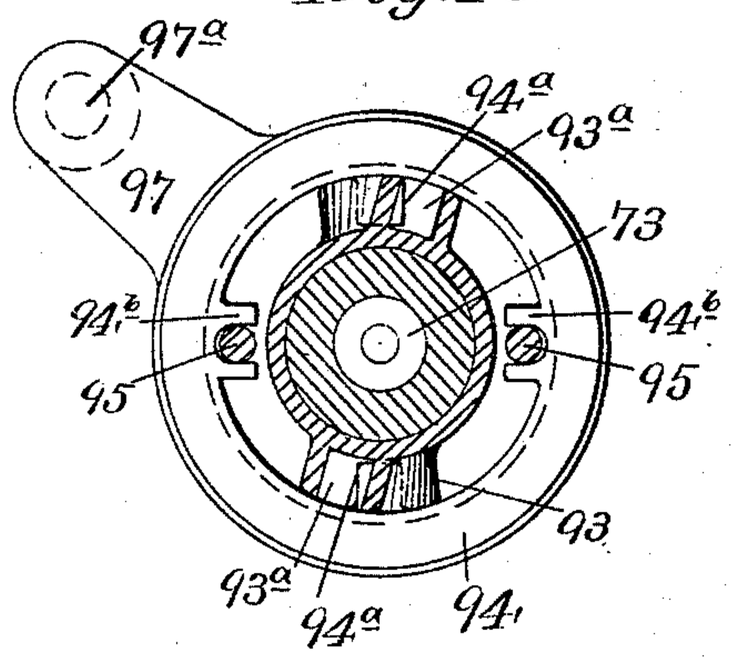


Fig. 13.

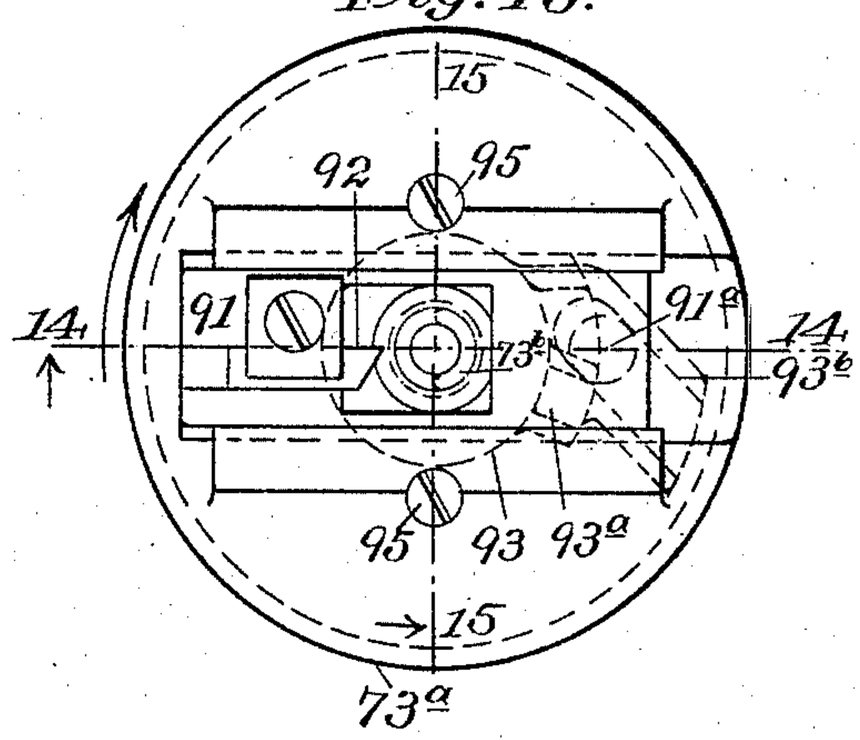


Fig. 15

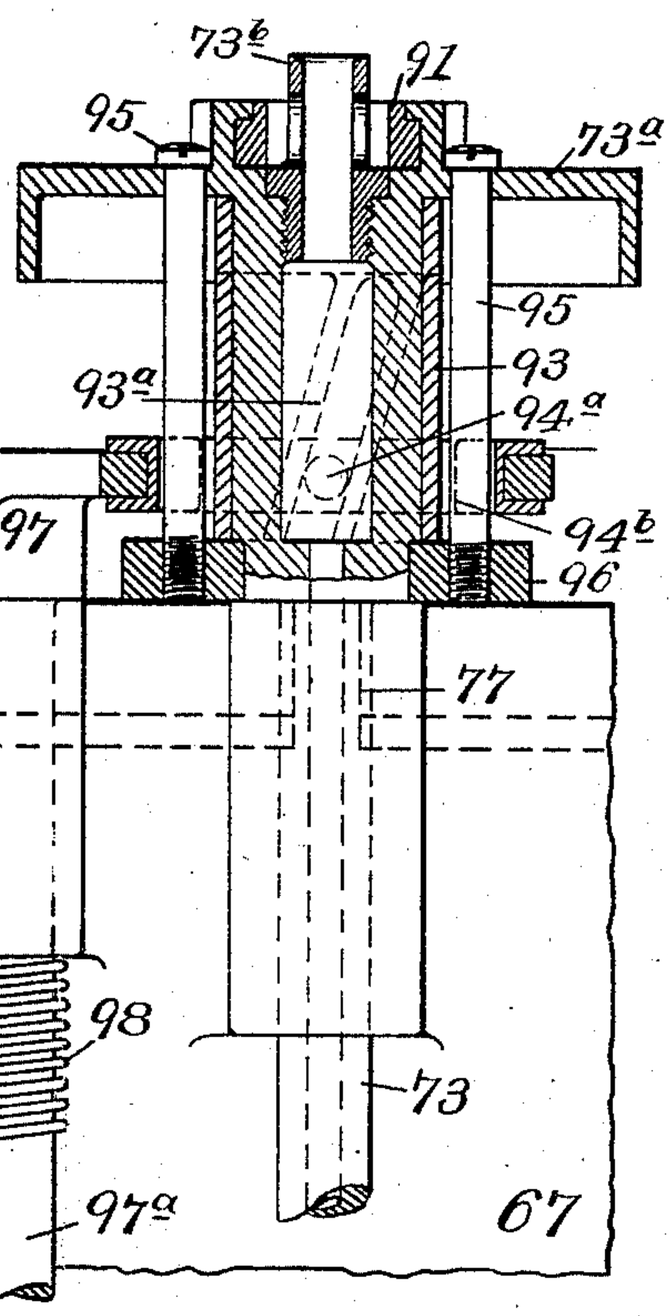
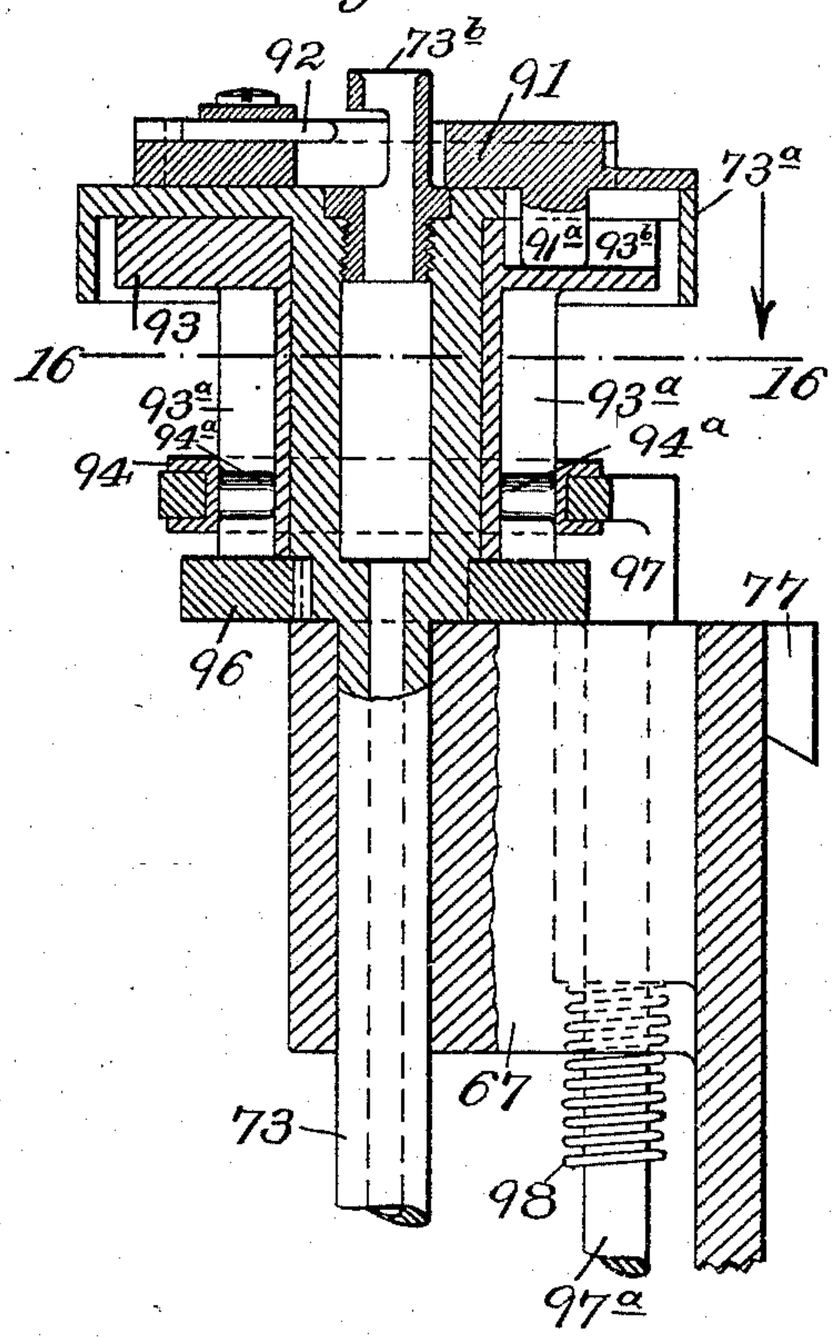


Fig. 14



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(No Model.) 7 Sheets—Sheet 7.

E. E. CLAUSSEN & G. MORTSON.

METAL SCREW MACHINE.

No. 540,233. Patented June 4, 1895.

Fig. 17

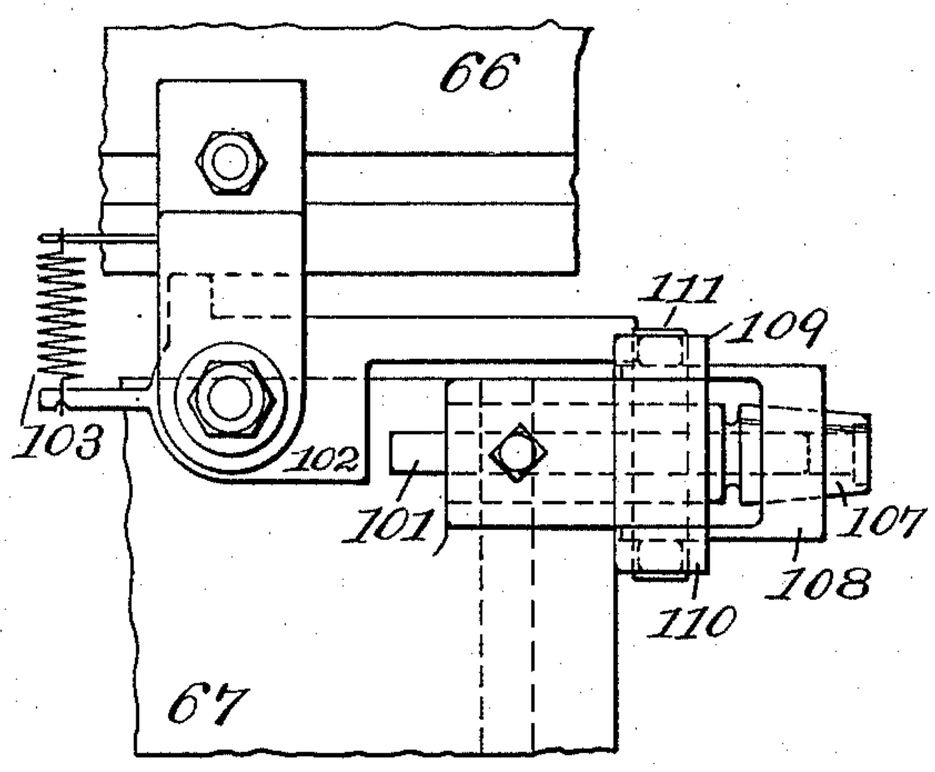


Fig. 18

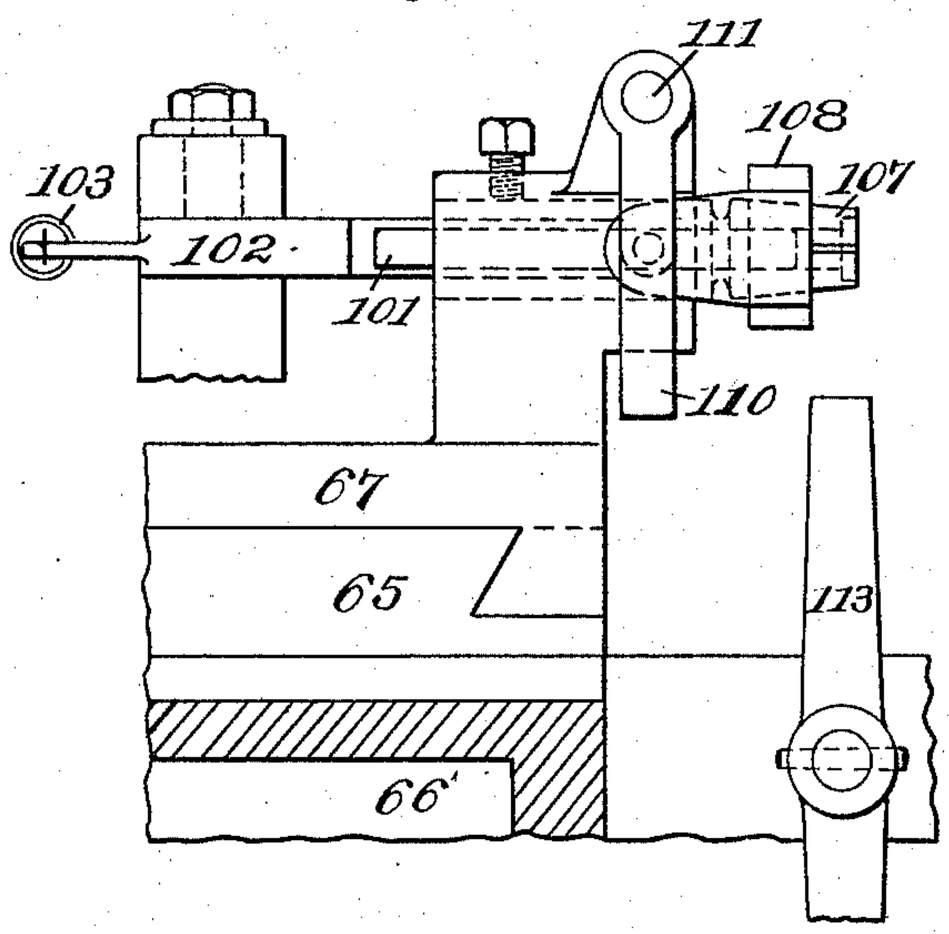
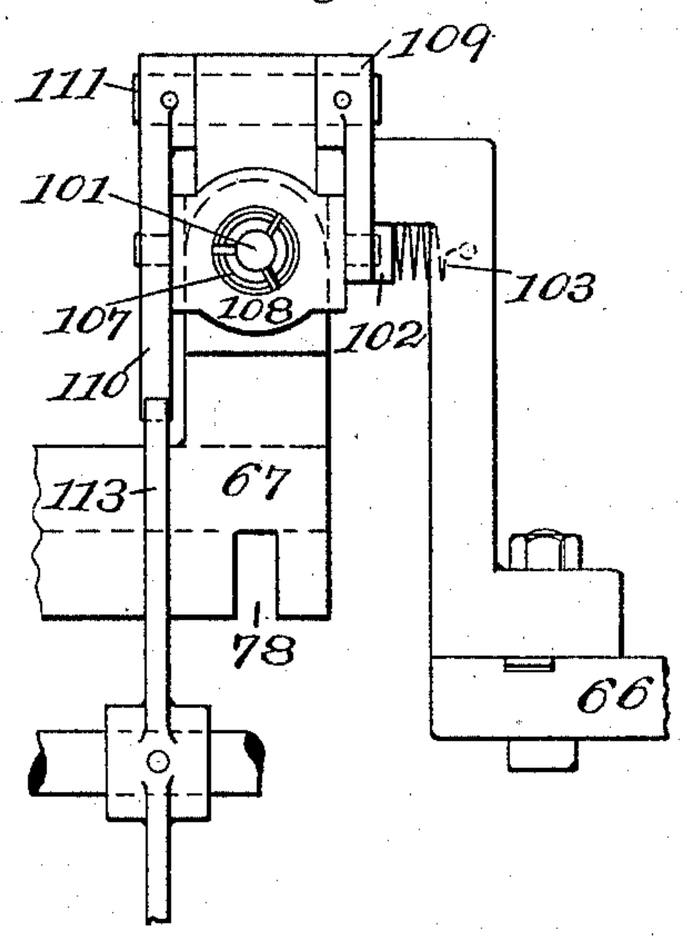


Fig. 19



Witnesses:
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Inventors:
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George Mortson.

UNITED STATES PATENT OFFICE.

EDWARD E. CLAUSSEN AND GEORGE MORTSON, OF HARTFORD, CONNECTICUT, ASSIGNORS TO THEMSELVES AND EMIL F. LINKE, OF SAME PLACE.

METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 540,233, dated June 4, 1895.

Application filed April 13, 1894. Serial No. 507,368. (No model.)

To all whom it may concern.

Be it known that we, EDWARD E. CLAUSSEN and GEORGE MORTSON, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Metal-Screw Machines, of which the following is a full, clear, and exact specification.

Our invention relates to improvements in machinery for making screws, pins, binding posts and numerous other articles from a coil or indefinite length of wire in which the wire is held against rotation and presented to the action of revolving tools which shape and finish those articles as may be desired.

In Letters Patent No. 504,102, granted to Edward E. Claussen August 29, 1893, a machine is shown and described, which is in some respects similar, as there is also a wire held stationary and a series of revolving tool spindles brought successively into operation, but our present application possesses important points of difference in the arrangements and particular construction and combination as hereinafter set forth.

Our invention relates to improved devices for forming and cutting off the screw blanks which devices may commence their operations before the principal spindles have finished their operations upon the blank, thus giving ample time for the forming and cutting off tools to finish the top of the head of the screw and so improving and turning out superior work.

It is evident, that the fast rotating box tools do not permit a sufficient quantity of lubricant to get on to the tool and prevent it from heating and thus losing its temper, if the lubricant is applied in the usual manner. In our improved machine we therefore use a hollow spindle at the end of which is held the box tool with its bushing and force the oil through the same thus striking the tool direct and receiving the full benefit of the lubricant used.

It relates also to improved devices for gripping and removing the blank and performing any desired operation such as slotting, slabbing, drilling or turning upon the reversed end of the screw or piece of work without delaying or hindering the action of the principal tool spindle upon the succeeding blank.

Figure 1 of the drawings is a front view of our improved machine. Fig. 2 is a plan view of Fig. 1, and Figs. 3 and 4 are left and right hand end views, respectively, of that which is shown in Fig. 1. Fig. 5 represents an enlarged end view of the cutting-off and forming head. Figs. 6 and 7 are sections taken on lines 6 6 and 7 7, respectively, of Fig. 5; and Fig. 8 is an outside plan view of that which is shown in Fig. 5. Fig. 9 is a front view of a modification of the cutting-off and forming head, and Figs. 10 and 11 are sectional plan and side views taken on lines 10 10 and 11 11 of Fig. 9, respectively. Fig. 12 represents a sectional end view on lines 12 12 of Fig. 11. Fig. 13 shows an enlarged end view of the shaping-head. Figs. 14 and 15 represent sectional side and plan views on lines 14 14 and 15 15, respectively, of that which is shown in Fig. 13. Fig. 16 represents a sectional end view on line 16 16 of Fig. 14. Figs. 17, 18, and 19 are enlarged plan, side, and end views of the gripping and ejecting device.

A description will first be given of the construction and operation of each section of the machine, and afterward their combined mode of operation will be described.

The driving mechanism consists of the cam shaft 30 journaled in the legs 31 and driven by a suitable pulley and gearing. Upon that cam shaft are mounted the wire feed cam 32, the cutting off cam wheel 33, the carriage cam wheel 34 and the cross slide cam wheel 35. These cam wheels are provided with detachable cam strips which are adjustable to give the desired motions.

The wire feed mechanism consists of the drawing rolls 36 and 37 mounted on shafts 38 and 39 respectively. The wire straightening and feeding mechanisms are identical in operation as well as in construction with those shown and described in Letters Patent No. 504,102, granted to Edward E. Claussen, August 29, 1893, and need no further description.

The forming and cutting off mechanism consists of the head 40 mounted on the stud 41 which is held rigidly by nut 42 in the bed 66. The head carries upon its face the tool

slide 43 sliding in ways of that head and on that slide are fastened the forming tool 44 and the cutting off tool 45. Upon the hub of the head 40 is loosely mounted the oscillating cam 46 which consists of the two oppositely disposed spirally cut cam grooves 46^a on the periphery of the hub of said cam and the flanged extension into which is cut the tangential face cam groove 46^b. The tangential face cam groove 46^b is in engagement with the projection 43^a integral with the tool slide 43. The spirally cut cam grooves 46^a receive the projections 47^a of the flanged annular collar 47 which surrounds the hub of the oscillating cam. The flanged annular collar 47 carries also lugs 47^b, through which the bolts 48 pass, which serve to hold the head tight to its driver 53 and also serve as a spline to prevent the annular collar 47 from turning when moving the same to or from the head for the purpose as hereinafter described. When the annular collar 47 is moved in the direction of the head 40 the lugs 47^b will slide on the bolts 48 keeping it in the same relative position to the head, and as the projections 47^a engage with the spiral grooves it will impart an oscillatory motion to the flanged extension into which is cut the groove 46^b and thus force the tool slide with the forming tool 44 toward the center. If the annular collar is moved away from the head it will move the tool slide carrying the forming tool 44 in the opposite direction and bring the cutting off tool into engagement with the wire. Loosely mounted and surrounding the annular collar 47 is the ring 49 having on each side a stud 49^a fitted to the bifurcated lever 50 on the shaft 51 pivoted in the bed 66 and which receives an oscillatory motion from the cam 33. The head 40 is caused to rotate by the gear 53, keyed to its hub the two being held together by bolts 48, meshing into gear 54 on shaft 55 the outer end of which has fastened to it the pulley 56 driven by a belt from any convenient counter shaft.

The construction as previously described is preferable, but it is not essential to have the ring 49 surrounding the flanged annular collar 47 and it could be dispensed with altogether as projections on the bifurcated lever 50 could enter between the flanges of the annular collar and operate the same direct. We have also shown two oppositely disposed spiral cam grooves 46^a in preference to one, as the cutting-off head is thus equalized and counterbalanced, essential in any fast rotating device. Instead of using a forming tool in the tool carrying slide a knurling tool could be substituted. The stud 41 is hollow and slightly conical at the front inner end and adapted to receive a chuck 57, which may be changed to suit the different sizes of wire and which also prevents the wire from vibrating when operated upon by the different tools, as the spring 58 always keeps the chuck pressed back into its conical seat.

In Figs. 9 to 12 inclusive a modification is shown where instead of a sliding tool carriage two swinging tool carrying arms are used. Journaled upon the head 40 are the shafts 59 and 60 having fixed upon their left hand ends the tool arms 61 and 62 respectively. One arm is provided with a forming tool to form and cut down the stock while the other is provided with a cutting-off tool to sever the finished article from the rod. The shafts 59 and 60 have fixed upon their right hand ends the arms 63 and 64 respectively provided with projections engaging the tangential face cam grooves 46^b of the oscillating cam 46 and which is in other respects exactly the same as heretofore described. When the ring 47 is moved in one direction it will impart an oscillatory motion to the cam 46 thus bringing the tool arm with its forming tool closer to the center to form and shape the head and the cutting-off arm away from the same. Similar action takes place when moving the ring 47 away from the head. The arm carrying the forming tool swings away from the center and the cutting off tool approaches the center and severs the blank from the rod. The head receives its rotary motion from pulley 53^a driven direct from an overhead counter shaft.

The carriage 65 is supported in guides or ways in the bed 66 of the machine and is reciprocated by the engagement of the lug 65^a on the carriage with cam strips on cam 34 at suitable intervals and to the desired extent. The cross slide 67 is supported in guides on the carriage and receives its lateral movement from the arm 68 with projection 68^a engaged in the slot of the cross slide. The other end of the arm is fastened on the shaft 69 which is journaled on the bed and carries on its lower end the cam arm 70 which receives motion from the cam 35 to the proper extent so as to bring the centers of the cutting down spindle 71, the threading spindle 72, the shaping spindle 73 and chuck 74 into line successively with the wire rod. Longitudinal slots are planed directly under and in line with each spindle into the cross slides as 75, 76, 77, 78 which enter a stationary locking bolt 79 fastened on the bed and thus guide and steady the cross slide and bring the respective spindles into exact alignment when operating upon the blank. When the carriage 65 is drawn back, as represented in Fig. 1, the cross slide is free to receive a lateral motion and bring the succeeding spindle into operative position. The spindles receive their rotary motion from a belt running on pulley 80 which is free to revolve on the spindle 72, and which has fastened thereto the driving gear 81 meshing into gears 82 and 83 fastened to the spindles 71 and 73 respectively. The cutting-down spindle 71 carries on its right hand end an ordinary box tool 84^a into which is fastened at its leading end a bushing 84 to guide and steady the tool when being forced upon the wire. The spindle 71 is hollow and is connected at the left hand end to a flexible tube 85 by means of stuffing box and gland

through which any lubricating fluid, generally oil or soapsuds, may be forced from a pump arranged on the machine to prevent the tool from heating and losing its temper and to supply abundant lubricant to the bushing which is liable to mar and scratch the wire and also to carry away the chips and stop the tool from being clogged up and thus giving the tool an unobstructed and easy working. Integral with the driving gear 81 is the bevel gear 81[a] meshing into the intermediate gear 86 on its stud and said gear meshing into the bevel gear 87 journaled in the cross slide, so that the spindle 72 passes concentrically through the gears 81[a] and 87. The leading end of the spindle 72 carries fixed upon it the friction collar 88 which engages with a corresponding recess in the pulley 80, and when the carriage 65 advances the friction collar 88 engages with the pulley 80 and thus runs the die 89 on the screw. Upon the opposite end of the shaft 72 is held a similar collar 90 which engages with a corresponding friction groove on the gear 87 and when the carriage returns the friction collar 90 engages with its gear 87 and thus the die is run off from the screw.

The shaping device is best shown in enlarged scale in Figs. 13 to 16 inclusive. It is in some respects of similar construction as the forming and cutting off device and it consists of the head 73[a] and the bushing 73[b] carried on the leading end of the spindle 73, and it carries the tool slide 91 in ways on that head and to which are fastened the shaping tool 92 and a projection 91[a]. Upon the spindle 73 and adjacent to the head 73[a] is mounted free to oscillate the oscillating cam 93 which consists of the two oppositely disposed spirally cut cam grooves 93[a] on the periphery of the hub of said cam and the flanged extension into which is cut the tangential face cam groove 93[b] which operates the tool slide 91 by the projection 91[a]. The spirally cut cam grooves 93[a] receive the projections 94[a] of the flanged annular collar 94 mounted concentrically and loosely on the hub of the oscillating cam 93, and said collar carries also the lugs 94[b] through which the bolts 95 pass. The bolts 95 serve to hold the collar 96 tight to the head and also act as a spline to prevent the annular collar 94 from turning when moving the same toward the head 73[a] which is done by the yoke 97 encircling the flanged annular collar 94 the stem 97[a] being mounted in a hub of the cross slide 67 and always held in its rearward position by the action of the spring 98 pressing against the collar fixed to the stem. When the shaping tool is brought into an operative position or in line with the wire rod the yoke stem 97[a] will be located directly opposite the arm 99 mounted on the bed of the machine and operated by a cam piece 100 on cam wheel 55. As the carriage is moved forward the arm 99 engages with its cam piece and presses the yoke stem 97[a] forward thus oscillating the oscillating cam and moving the shaping tool 92 nearer the center. By suitably forming the cam pieces almost any desired shape can be turned on the wire. Instead of the tool slide 91 a tool carrying arm can be employed as shown in Figs. 9 to 12 inclusive. The spindle is shown hollow so that oil may be forced through the same as described and for the purpose specified in the foregoing paragraph.

The transferring and gripping device serves to support and steady the blank during the forming and cutting-off operations and after the blank has been severed from the rod transfers the same into the position as shown in Figs. 2 and 3 with the blank gripped in its split chuck 74 which is of proper size and shape to hold the body of the screw and firmly held in cross slide 67. As the cross slide moves into the position shown in Fig. 2 the ejector pin 101 strikes the yielding finger 102 held in its normal position by spring 103. The carriage then advances and carries the screw blank against a saw 104 on shaft 105 receiving a rotary motion from pulley 106 which can be driven from any convenient overhead counter shaft; at the same time the cutting-down spindle 71 with its tool and bushing 84 operating on the succeeding blank. As the carriage retracts to disengage the spindle 71 from the rod the ejector pin 101 collides with the finger 102 and forces the slotted screw out of the chuck 74 into a convenient box. For slotting screws and for drilling it is necessary to grip the articles quite firmly and we have therefore shown in Figs. 17, 18 and 19 a device which accomplishes this result. The saw with its arbor and bracket may be removed and a drill inserted in the spindle 114. The chuck 107 is firmly held in cross slide 67. It is of conical form over which is fitted the yoke 108, the rear ends of which are pivoted to the arms 109 and 110 pinned to the shaft 111 in the cross slide. When the chuck 107 is in alignment with the wire rod and passed upon the body of the screw the yoke is forced back upon the chuck causing it to grip the blank firmly by the cam piece 112 on cam wheel 33 acting against lever 113 which forces back the arm 110. As the cross slide moves into the position shown in Fig. 2 the ejector pin 101 strikes the yielding finger 102 held in its normal position by spring 103. The carriage then advances and carries the blank against the drill in the drilling spindle 114 which receives its motion from a pulley 115 driven from any convenient counter shaft above. When the carriage retracts the arm 109 collides with a projecting branch of the yielding finger and loosens the chuck 108, and continuing on its backward motion the ejector pin 101 also comes in contact with the yielding finger and ejects the screw out of the chuck into a convenient box.

The consecutive operation of the machine as a whole is as follows: A coil of wire of suitable size is arranged upon a reel adjacent to the machine and the end of the wire is passed

through the straightening rolls, the feeding rolls 36 and 37 and the bushing 57 so that a suitable length is presented beyond the end of that bushing. The cutting down spindle 71 first operates on the rod as previously described. Then the threading spindle is brought into line and as the die is pressed against the end of the blank the clutch 88 is forced into the recess of pulley 80 by which the spindle is turned and the die forced upon the rod. When the thread is cut far enough the feed of the carriage 65 is reversed by the cam 34, the clutch 88 is released from the pulley 80 and the clutch 90 engages with the reversing gear 87 by which the die is backed off from the screw. The shaping spindle is next brought into alignment and engagement upon the wire, and as the carriage advances toward the wire the tool in the slide 91 is forced upon the same by the oscillating cam operated by the yoke 97, its stem 97ª, cam arm 99 and cam 100. Almost any shape can be produced by properly forming the two cam strips. If no forming operation is necessary upon the head of the screw the cutting-off operation may begin while the thread is being cut, and if a forming operation is needed, such as shaving or chamfering on the head, that operation may begin while the thread is being cut and be immediately followed by the cutting-off operation, during which the forming tool rests clear of the work. Meanwhile the transferring device has been brought into alignment with the wire rod the chuck passed upon the body of the screw gripped firmly by the yoke being forced backward by the arm 113 and cam 112, which after the blank has been severed from the wire is carried into position of Fig. 2 and slotted or drilled as previously described while the cutting down spindle is at work upon the next blank, which has been fed forward by the action of the feeding rolls and its cam 32.

We claim as our invention—

1. In combination with means for holding a wire rod from rotating, and which allow it to move only in the direction of its length and mounted on the bed of the machine, a revolving cutting off head provided with a transverse moving slide and interposed between the gripping device and a series of revolving parallel tool spindles, consisting of cutting down, threading and shaping spindles and a positive gripping slotting chuck operated by the cam 112 and arm 113 and for carrying the piece to the slotter, a laterally moving slide on which those spindles and that slotting chuck are mounted and means substantially as described consisting of an arm, shaft, arm and cam to bring the spindles and that chuck successively into the operative position all combined and operating substantially as described.

2. In combination with means for holding a wire rod from rotating, and which allow it to move in the direction of its length and mounted on the bed of the machine, a revolving cutting off head provided with a transverse moving slide and interposed between the gripping device and a series of revolving parallel tool spindles, consisting of cutting down, threading and shaping spindles and a positive gripping slotting chuck operated by the cam 112 and arm 113 and for carrying the piece to the slotter, and mounted on a laterally moving slide, and a reciprocating carriage on which that slide is mounted, arranged and operating to advance and retract those spindles and that chuck toward and from the rod as they are presented to it, all combined and operating substantially as described.

3. In combination with means for holding a wire rod from rotating and which allow it to move in the direction of its length and mounted on the bed of the machine, a revolving cutting off head provided with a transverse moving slide and interposed between the gripping device and a series of revolving parallel tool spindles consisting of cutting down, threading and shaping spindles and a positive gripping slotting chuck operated by the cam 112 and arm 113 and for carrying the piece to the slotter and mounted on a laterally moving slide, a carriage on which that slide is mounted, and a cam wheel arranged and operating to advance and retract that carriage to the extent and at the rate required by the respective spindles and that chuck when in their operating position all combined and operating substantially as described.

4. In combination with means for holding a wire rod from rotating, and which allow it to move in the direction of its length and mounted on the bed of the machine, a revolving cutting off head provided with a transverse moving slide and interposed between the gripping device and a series of revolving parallel tool spindles consisting of cutting down, threading and shaping spindles and a positive gripping slotting chuck operated by the cam 112 and arm 113 and for carrying the piece to the slotter and mounted on a laterally moving slide, with their axes in the same plane as that of the wire rod and parallel to each other, so that those axes may be brought successively into alignment with the axis of the wire rod and reciprocated therein for the purpose as described.

5. In combination with means for holding a wire rod from rotating, and which allow it to move in the direction of its length and mounted on the bed of the machine, a revolving cutting off head provided with a transverse moving slide and interposed between the gripping device and a series of revolving parallel tool spindles consisting of cutting down, threading and shaping spindles and a positive gripping slotting chuck for carrying the piece to the slotter and mounted on a laterally moving slide having slots corresponding with the respective spindles, a reciprocating carriage on which that slide is mounted and a guide piece fixed to the bed adapted to enter those slots for the purpose of steadying that slide while

the respective tools are in engagement and working upon the rod all combined and operating as described.

6. In combination with means for holding a wire rod from rotating, the chuck 57 concentrically mounted with that wire rod and adapted to support and prevent the same from vibrating, the revolving tool head having a tool carrier mounted thereon, and the oscillating cam having the spiral cam grooves and the face cam groove adapted to engage with the tool carrier, and carry the same toward and from the center of revolution when that oscillating cam is vibrated, all combined and operating substantially as described.

7. In combination with means for holding a wire rod from rotating, the chuck 57 concentrically mounted with that wire rod, the revolving tool head journaled on the stud 41 and provided with a tool carrier having cutting tools fixed thereto with means for advancing and retracting those tools toward and from the rod, comprising the oscillating cam, the annular collar mounted thereon, and a cam arm and cam adapted to operate that collar all combined and operating substantially as described.

8. The combination of the chuck 57 mounted internally in the stud, the revolving tool head journaled on that stud, a tool carrier mounted on that head with means substantially as described for operating the tool carrier consisting of the oscillating cam, the annular collar mounted concentrically therewith, the arm 50, and the cam 33 all combined and operating substantially as described.

9. The combination of the stationary chuck 57, the revolving head 40, the tool carrier 43 mounted thereon, the oscillating cam mounted concentrically with the axis of said head and provided with the spiral grooves 46^a and face cam groove 46^b, the gear 53, and bolts 48 connecting the head and the gear, substantially as described.

10. The combination of the stationary split chuck 57, the revolving head 40, the tool carrier 43 mounted thereon, the oscillating cam 46 mounted concentrically with the axis of said head and chuck and provided with the spiral grooves 46^a and face cam groove 46^b, the gear 53, bolts connecting the head and the gear, the annular collar 47, the ring 49, the lever 50 and cam 33, all combined and operating substantially as described.

11. The combination of straightening devices, gripping and feeding devices to feed the wire forward and prevent it from rotating and mounted on the bed of the machine, a reciprocating carriage in which is journaled a revolving spindle provided with a head, a tool carrier mounted thereon, and an oscillating cam adapted to engage with the tool carrier and move it toward and from the center of revolution as that cam is oscillated independently of the advancing movement of that carriage, substantially as described.

12. The combination of gripping and feeding devices mounted on the bed of the machine, and to feed the wire forward and prevent it from rotating, a rotating hollow spindle, the spindle head with its bushing, held concentrically with the head and adapted to pass upon and steady the wire rod, a tool carrier provided with a cutting tool, and means substantially as described for reciprocating that tool to and from the wire, consisting of the oscillating cam, the annular collar, the yoke with its stem, and the cam 100, combined and operating substantially as described.

13. The combination of a rotary spindle provided with a head, a tool carrier provided with a cutting tool, and means for reciprocating said tool carrier, consisting of the oscillating cam 93, the annular collar 94, the yoke 97 with its stem and the cam 100 substantially as described.

14. The combination of a hollow rotary spindle 73, provided with the head 73^a, the tool carrier 91 mounted thereon, the oscillating cam 93, the annular collar 94, the yoke 97 with its stem and the cam 100, substantially as described.

15. In combination with means for holding a wire rod from rotating, and with a revolving cutting off device for that rod, a chuck and its yoke adapted to pass upon and positively and firmly grip the body of the blank to support and steady the same during and after severing from that rod.

16. In combination with means for holding a wire rod from rotating and with a revolving cutting off device for that rod, the chuck 107, the yoke 108, the arm 110 the lever 113 and the cam strip 112 all substantially as described.

17. In combination with means for holding a wire rod from rotating, and with a revolving cutting off device for severing the blank from the rod, a revolving drilling spindle mounted adjacent thereto, and a chuck and its yoke mounted upon a slide to grip the blank firmly while it is being severed from the rod and also adapted to carry aside and present the reversed end of the blank to the revolving drill spindle, while the cutting down spindle is operating upon the succeeding blank substantially as described.

18. In combination the slide 67, the chuck 107, the yoke 108, the arm 109, the ejecting finger 102 and ejecting pin 101 operating to release the grip of the chuck and eject the blank substantially as described.

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Witnesses:
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