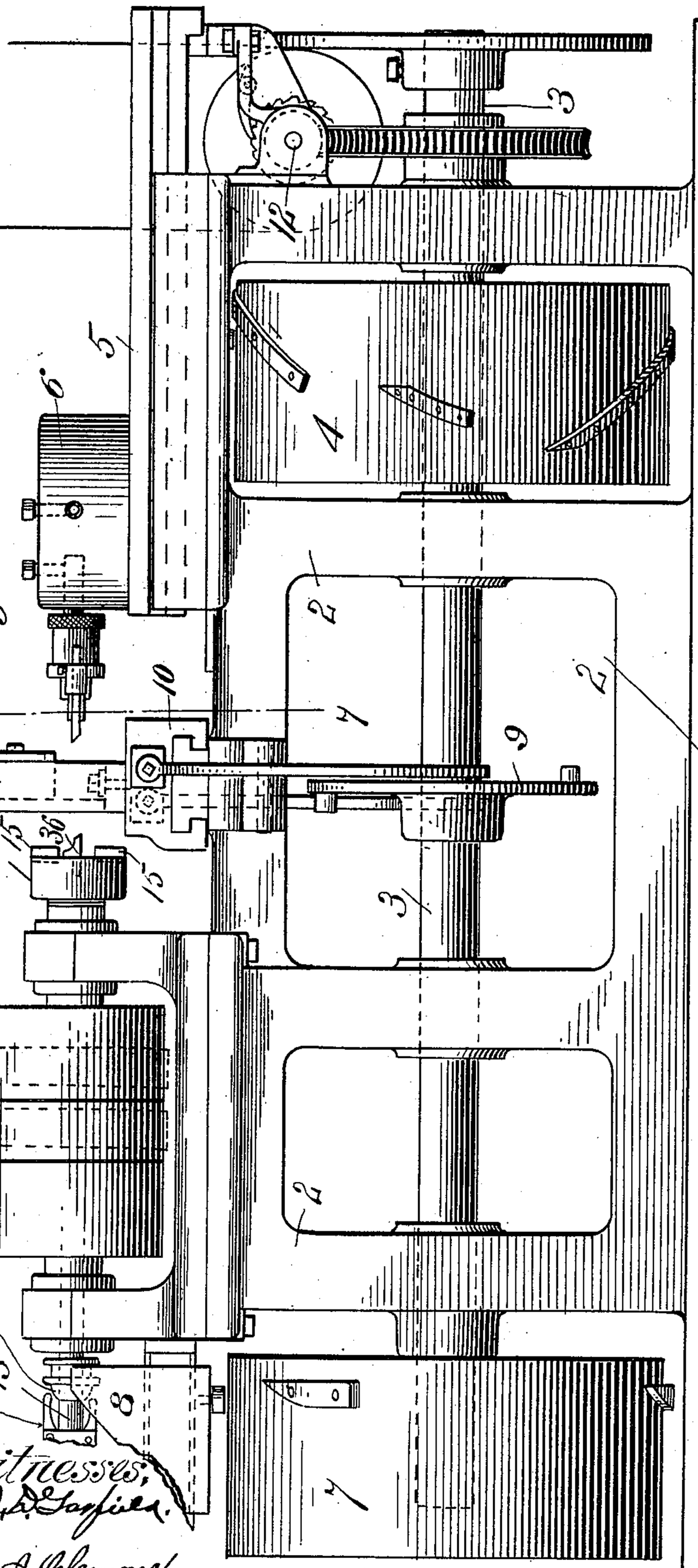
No. 629,714. Patented July 25, 1899.

E. M. COUCH.

DEVICE FOR AUTOMATICALLY FEEDING ARTICLES TO SCREW MACHINE CHUCKS.

(Application filed June 23, 1898.)

(No Model.) 5 Sheets—Sheet 1.



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(No Model.) 5 Sheets—Sheet 2.

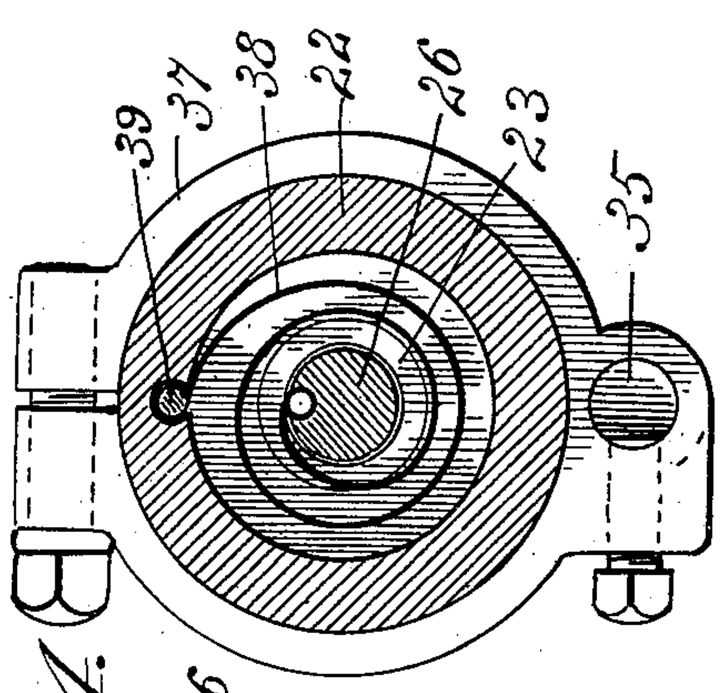

Fig. 4.

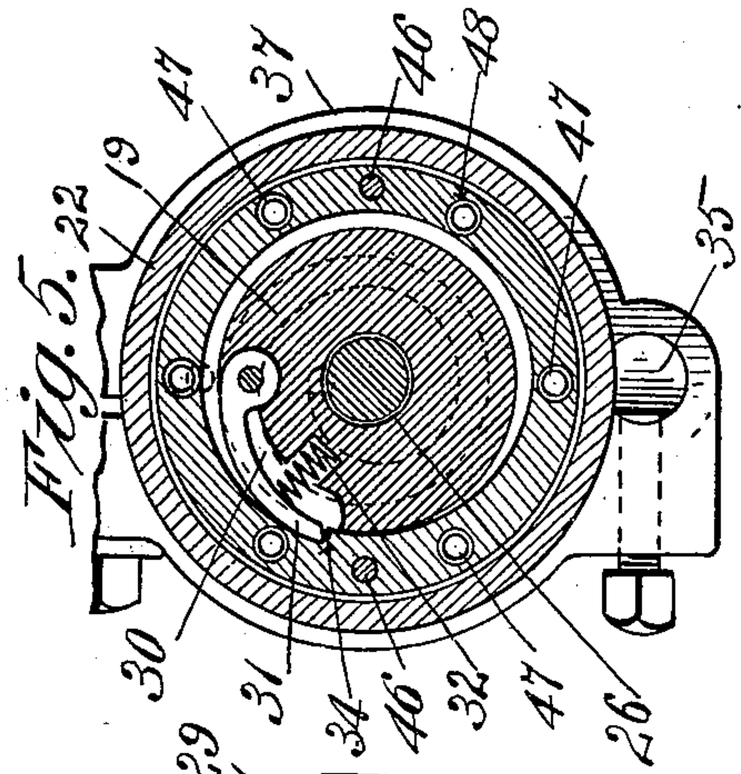

Fig. 5.

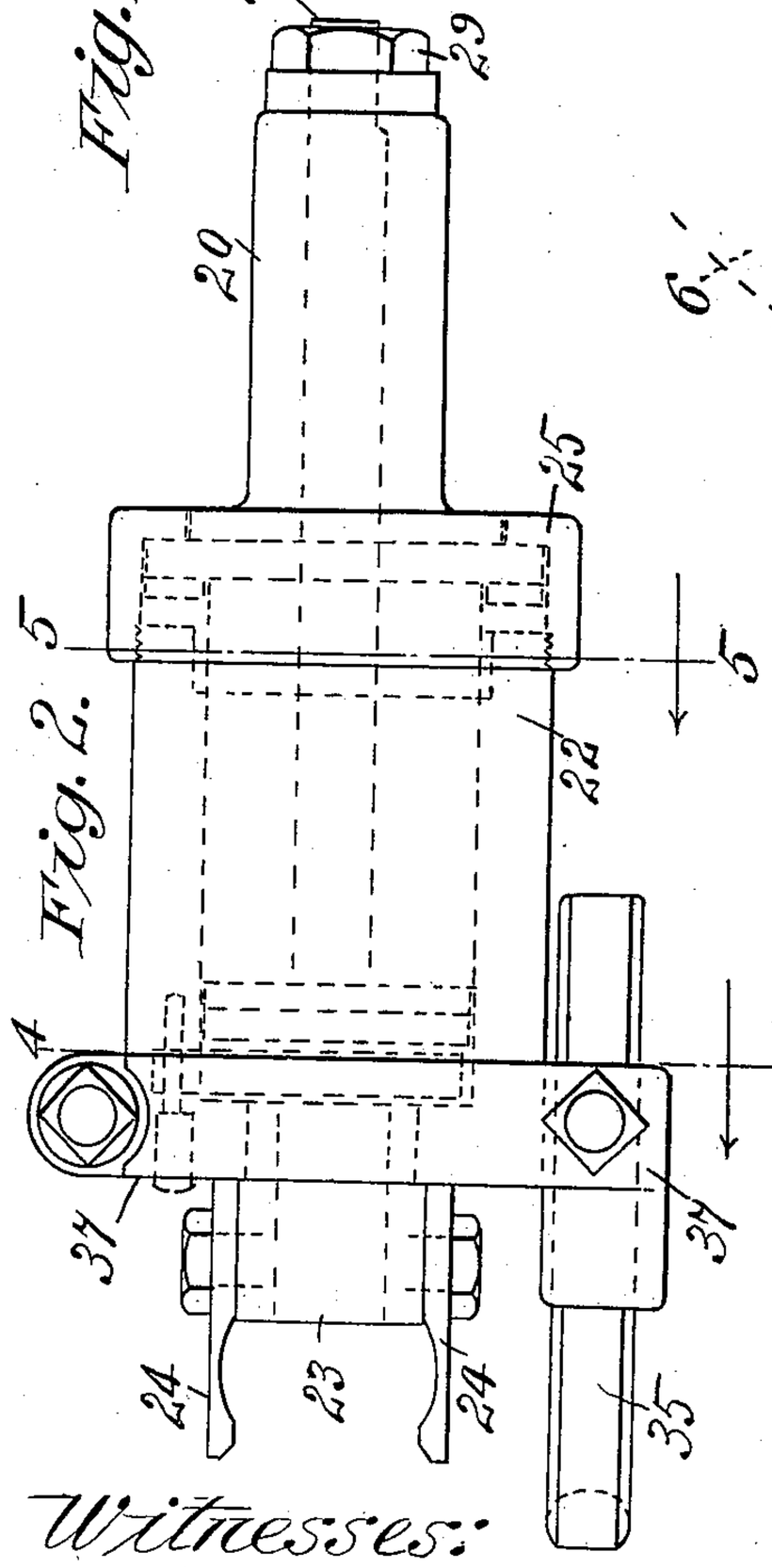

Fig. 2.

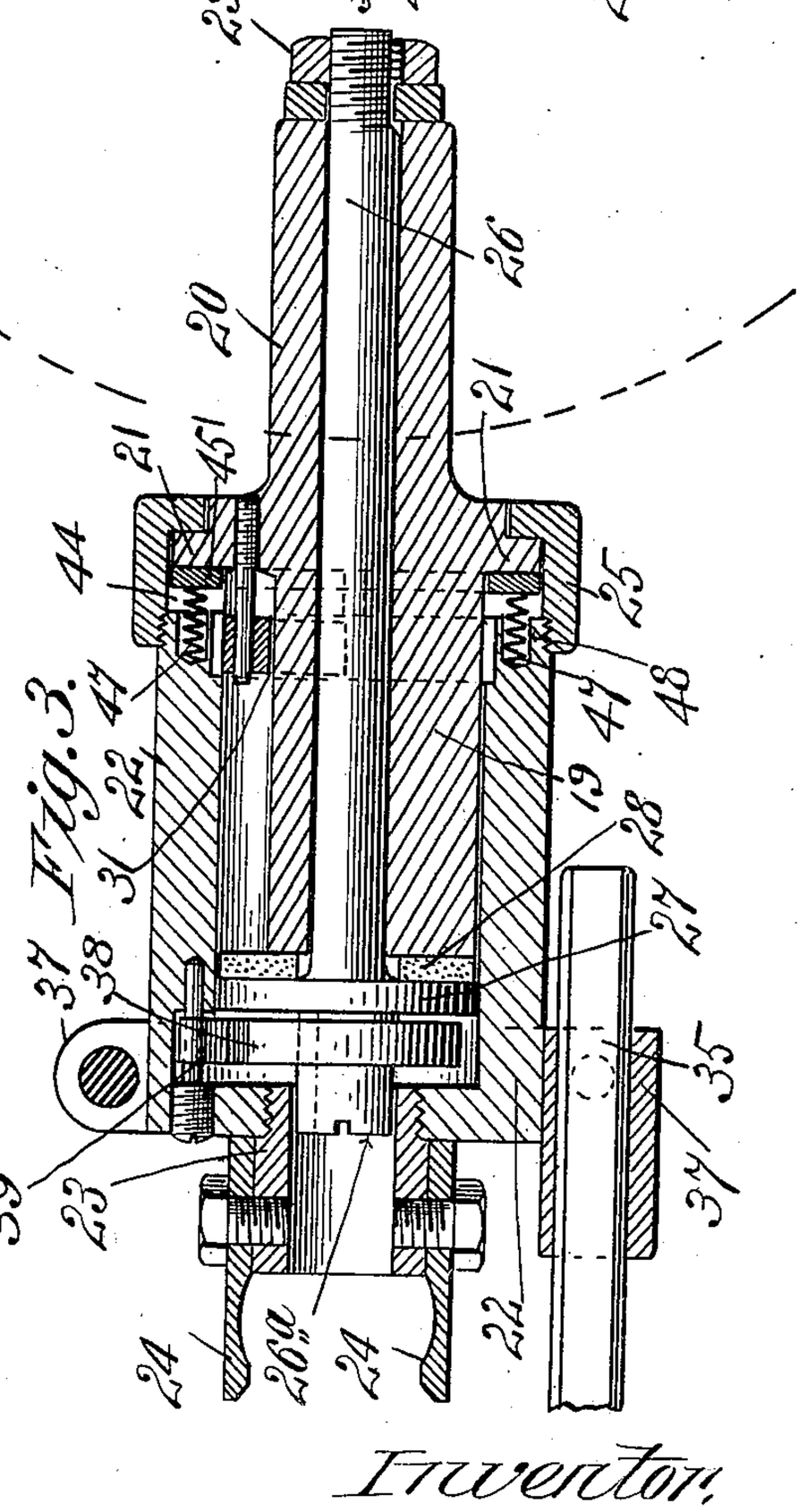

Fig. 3.

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(No Model.) 5 Sheets—Sheet 3.

Fig. 6.

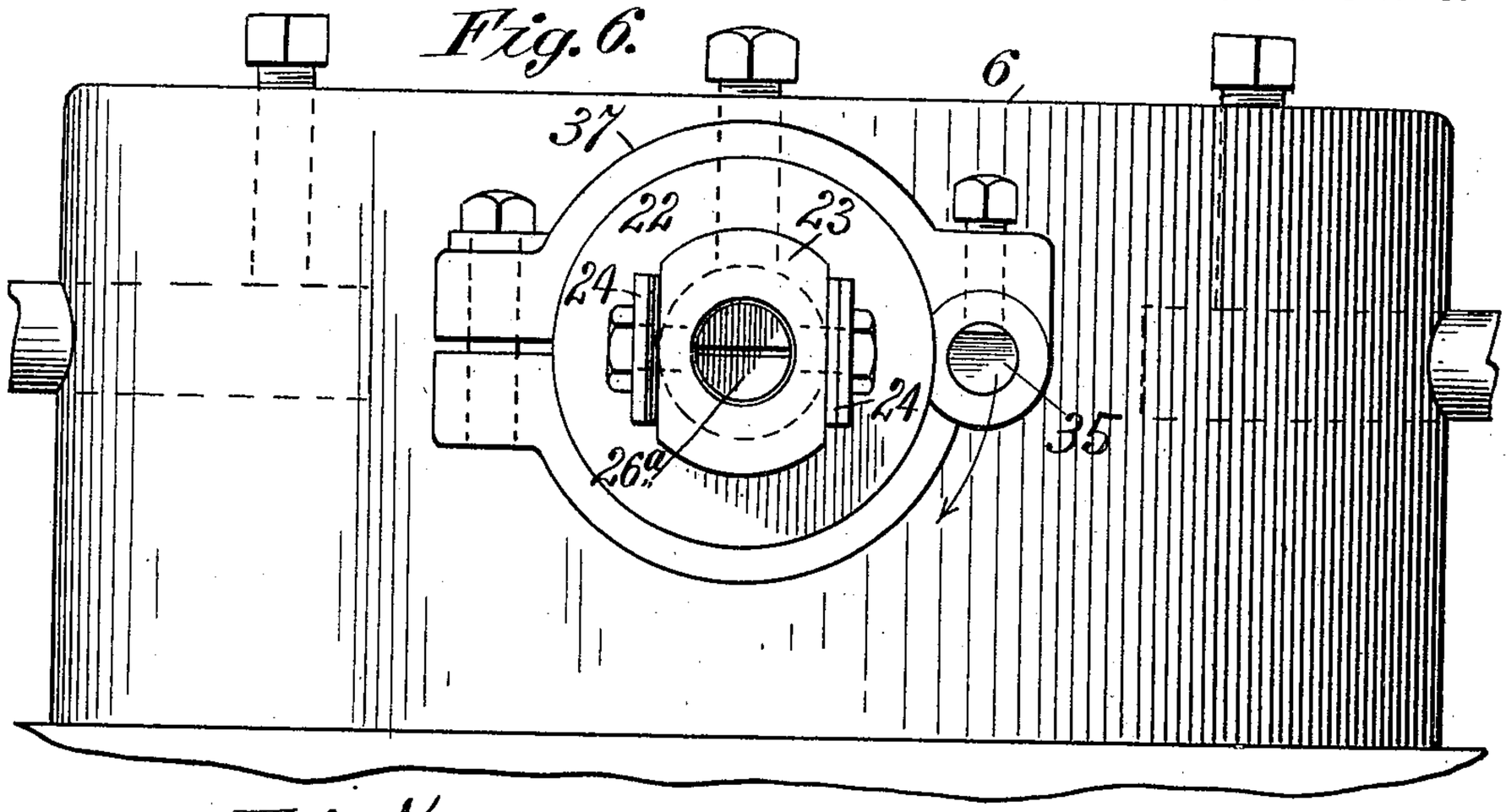
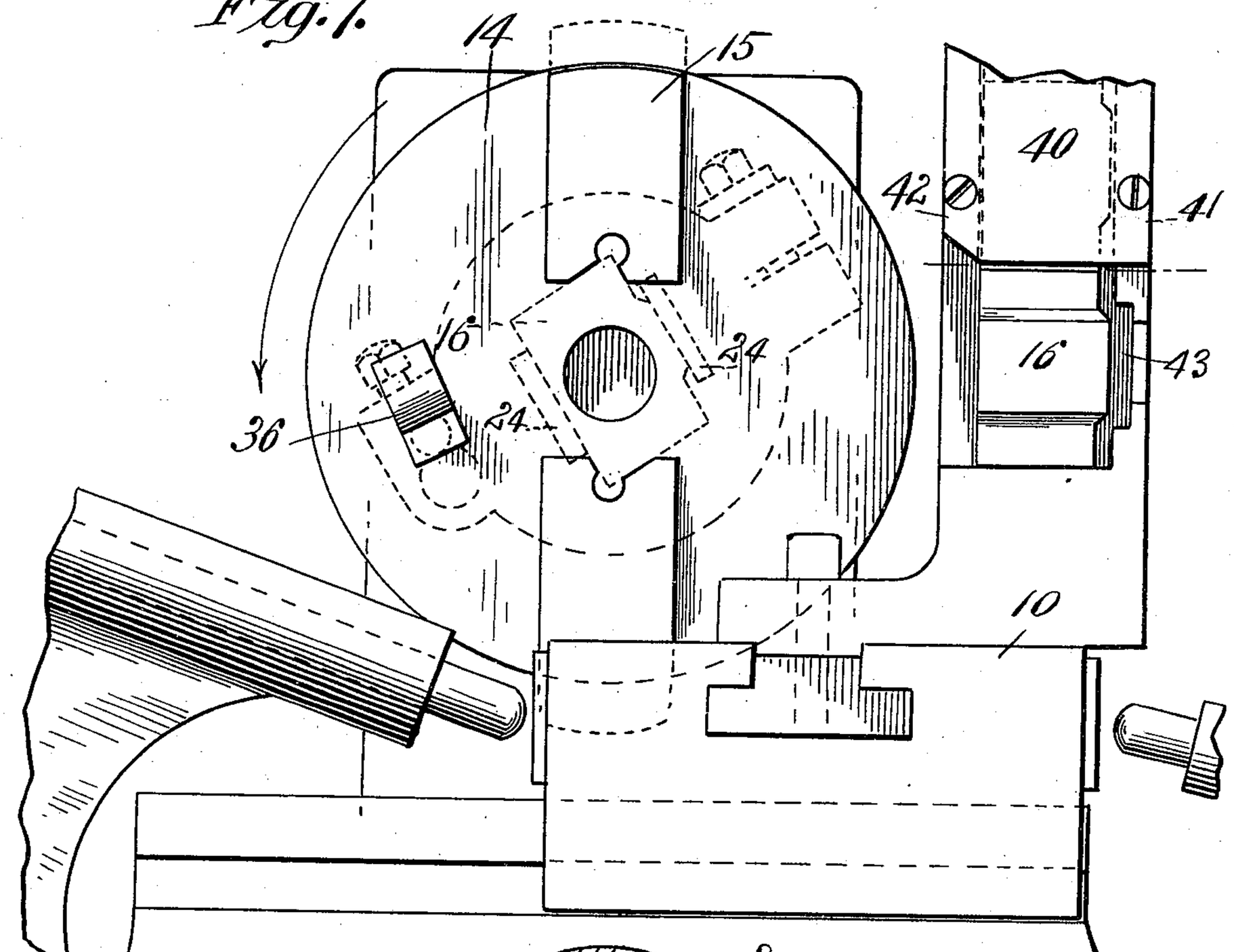


Fig. 7.



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DEVICE FOR AUTOMATICALLY FEEDING ARTICLES TO SCREW MACHINE CHUCKS.

(Application filed June 23, 1898.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 8.

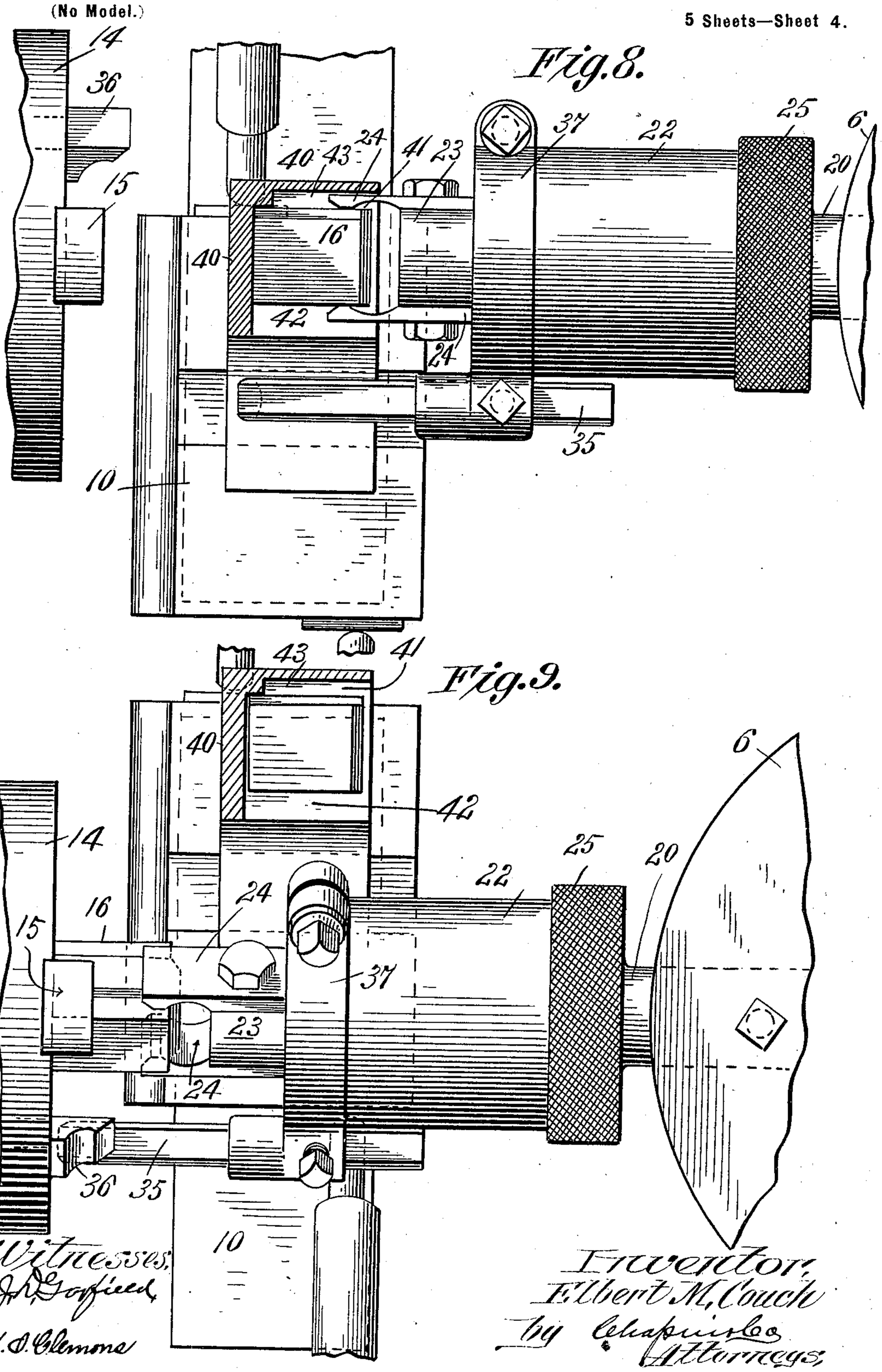

Fig. 9.

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DEVICE FOR AUTOMATICALLY FEEDING ARTICLES TO SCREW MACHINE CHUCKS.

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(No Model.) 5 Sheets—Sheet 5.

Fig. 10.

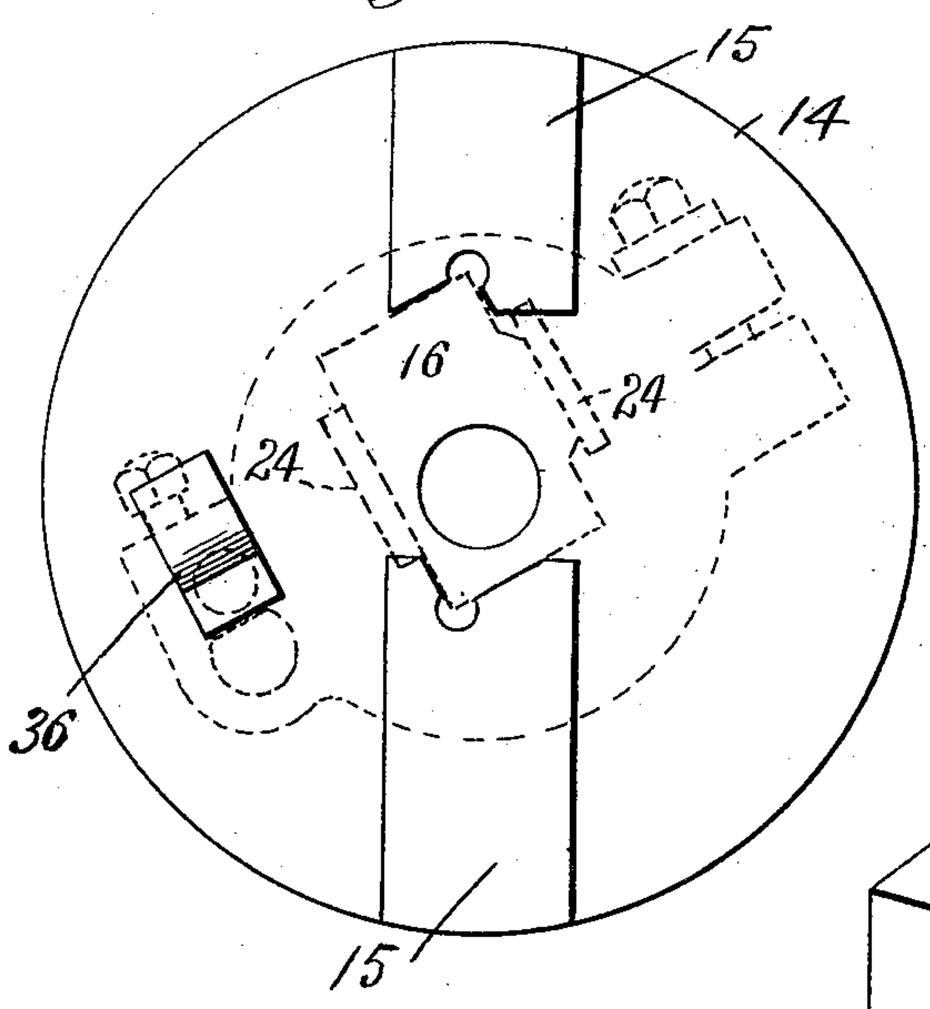
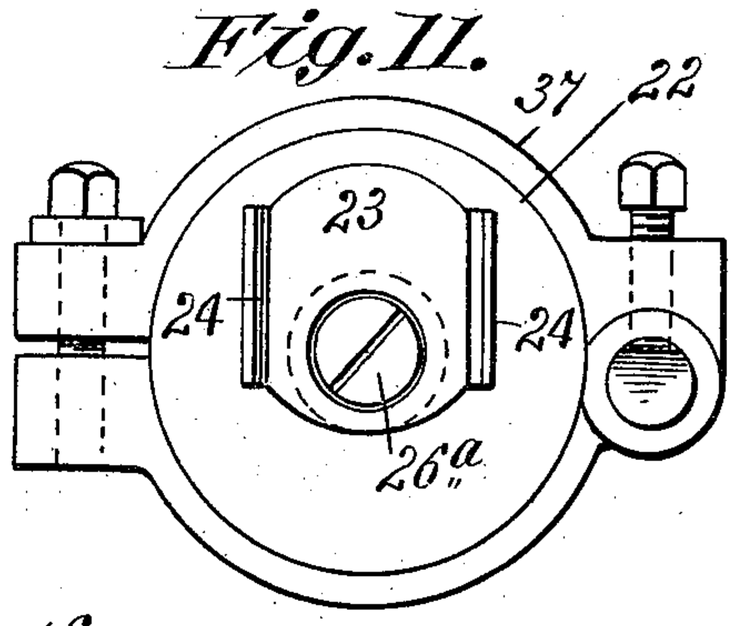


Fig. 11.



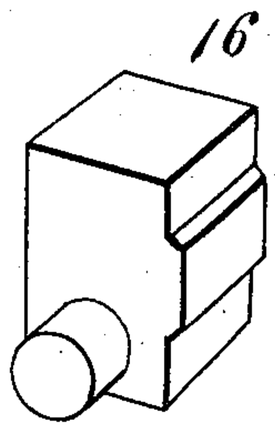
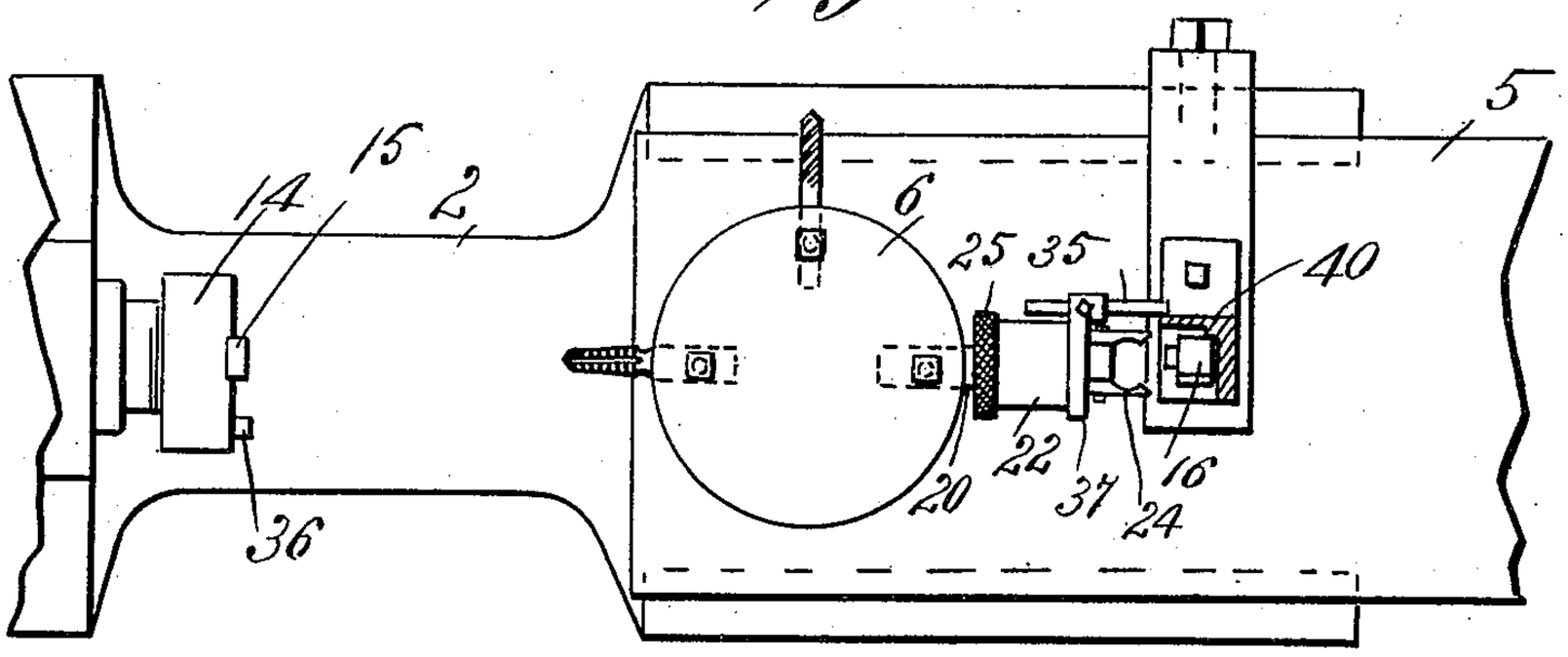


Fig. 12.

Fig. 13.



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UNITED STATES PATENT OFFICE.

ELBERT M. COUCH, OF NORTHAMPTON, MASSACHUSETTS, ASSIGNOR TO THE PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT.

DEVICE FOR AUTOMATICALLY FEEDING ARTICLES TO SCREW-MACHINE CHUCKS.

SPECIFICATION forming part of Letters Patent No. 629,714, dated July 25, 1899.

Application filed June 23, 1898. Serial No. 684,277. (No model.)

To all whom it may concern:

Be it known that I, ELBERT M. COUCH, a citizen of the United States of America, residing at Northampton, in the county of Hampshire and State of Massachusetts, have invented new and useful Improvements in Devices for Automatically Feeding Articles to Screw-Machine Chucks, of which the following is a specification.

This invention relates to automatic screw-machines; and the object thereof is the construction of mechanism whereby pieces of an irregular or other than practically cylindrical contour to be operated upon by said machine may be successively moved into position to be grasped by the jaws of the spindle-chuck of said machine and means for insuring the successive presentation of such pieces of work to said spindle-chuck always in the same position relative to the jaws thereof, whereby said pieces will be inserted between the open jaws of the chuck in predetermined positions and during the rotation thereof whether the center of the piece of work inserted between the jaws of the chuck be concentric with the axis of said chuck or eccentric thereto.

In the drawings forming part of this specification, Figure 1 is a side elevation of a screw-machine having this invention applied thereto. Fig. 2 is a plan view of a transfer chuck or device for grasping a piece of work and moving it into position to be taken therefrom by the chuck of the machine. Fig. 3 is a longitudinal section of the same. Fig. 4 is a cross-section of Fig. 2 on line 4 4, looking to the left. Fig. 5 is a similar section on line 5 5, looking to the left. Fig. 6 is an end elevation of said transfer-chuck in position in the turret of a screw-machine. Fig. 7 is an end view of a spindle-chuck of the screw-machine, showing the cross-slide thereof and a work-holding magazine on said slide. This view is taken substantially on section-line 7 7, Fig. 1, looking to the left and enlarged. Fig. 8 is a plan view of the transfer-chuck, cross-slide, with magazine thereon, and part of the spindle-chuck, showing the position of the parts at the moment of engagement of the transfer-chuck with a piece in the magazine. Fig. 9 is a view of the parts shown in Fig. 8, the magazine having retired and the transfer-chuck having moved toward the spindle-chuck and presented the piece of work taken from the magazine to the jaws of said chuck. Fig. 10 is an end view of a spindle-chuck, showing a piece of work therein in dotted lines, the center of which is eccentric to the axis of said chuck. Fig. 11 is an end view of a transfer-chuck, showing its jaws offset from the axis thereof. Fig. 12 is a perspective view of a piece of work, showing a cylindrical boss near one end thereof and one side of the center of said piece. Fig. 13 is a plan view of the top of a screw-machine, showing an alternative position of the work-holding magazine.

Screw-machines have been heretofore made which have had magazines for holding pieces to be operated on mounted on the cross-slides of such machines, which magazines have been operated so as to bring a piece of work in the magazine into axial alinement with the spindle-chuck and which piece of work has then been pushed by a tool on the turret into position between the jaws of said chuck, the latter being automatically operated to grasp said piece of work at the proper time. This device, however, is adapted only to feed automatically pieces which are substantially cylindrical in cross-section and which can therefore be grasped by said spindle-chuck in any position in which said piece may be presented thereto, the only essential condition being that the axis of the piece presented and that of the spindle-chuck should be in substantial coincidence. The construction herein presented has, however, not only all of the capabilities of that above referred to, but possesses the further capacity of transferring to a spindle-chuck during the rotary movements thereof pieces whose contour is most irregular, and, furthermore, can, if desired, be adjusted to transfer them to said chuck in such a position as will locate the centers of said pieces eccentric to the axis of said chuck. For instance, a rectangular block may be transferred to and inserted between the open jaws of a spindle-chuck during the rotation of the latter in such position that the center of rotation of said block may be located at any desired point thereon, either at or outside of the center thereof, and the device is so constructed that each jaw of the

spindle-chuck will engage the same portion of one piece that it engaged on the preceding pieces of work—that is, certain parts of the piece are presented to certain jaws of the chuck.

Referring now to the drawings, Fig. 1 represents a well-known type of an automatic screw-machine, in which 2 represents the frame thereof, and 3 the cam-wheel shaft, having thereon the cam-wheel 4 for operating the turret-slide 5, provided with the usual turret 6 and the cam-wheel 7 for moving the chuck-operating block 8. The cam-wheel 9, which operates the cross-slide 10, is also supported on this shaft, and the latter is driven by the usual worm and gear connections, (shown on the right-hand end of said Fig. 1,) whereby the various speeds of rotation of said shaft 3 are imparted thereto through the operation of the belt-shifting devices common to machines of this class, whereby the speed of the worm-shaft 12 is controlled, all of which are shown in Fig. 1 and are too well known to require detailed description and are illustrated in this application only for the purpose of showing means for effecting the various movements of the parts of the screw-machine which are necessary to a clear understanding of this invention, but which form no part thereof and for which other means performing the same functions may be substituted, if desired.

The spindle 13 of the machine is provided with a suitable automatically-operated chuck, which may be of any pattern suited to take the piece operated on by the machine.

The chuck 14 shown herein is provided with two radially-moving jaws 15, this form being best adapted to receive and hold the rectangular piece of work 16, which has been chosen as illustrative of the operation of the mechanism which forms the subject of this invention. This chuck is operated by the longitudinally-moving cone 17 on the spindle 13 operating the right-angled levers 18, which engage a chuck-actuating member located axially in said spindle, all of which is common to machines of this class.

The device by which the transfer of pieces of work automatically to the spindle-chuck 14 is accomplished is illustrated in Figs. 2, 3, 4, and 5, and the manner of its coaction with the spindle-chuck to transfer to the latter a piece of work is particularly illustrated in Figs. 8 and 9 of the drawings. This transfer device, "or chuck," as it will be hereinafter termed, is supported in any convenient way in the side of the turret 6 of the machine in the same plane as the other turret-tools which operate on the piece of work held in the spindle-chuck and is constructed as follows:

The barrel 19 of the chuck (cylindrical in cross-section) is provided at one end with the concentric stem 20, which enters a tool-socket of the turret and is secured therein. On the end of said barrel 19 from which the stem 20 projects is a flange 21. The cylindrical shell 22 of the chuck has a free fit on said barrel 19, and the forward end of said shell is closed save for the central screw-threaded aperture therein, into which is screwed the head 23, to which the spring-jaws 24 are secured. These spring-jaws may be made of such shape as the form of the piece of work to be held by them may require, and the form of the head 23 may be altered to adapt it to the reception of the work-grasping jaws 24. On the end of the shell 22 adjacent to the flange 21 of the barrel 19 is screwed a cap 25, the center of said cap being turned out to receive said annular flange 21, as shown in Fig. 3, whereby said cap is given a bearing on said flange and is prevented from moving toward the barrel, but is permitted to move in the opposite direction for purposes to be described farther on. Said barrel 19 and stem 20 are bored out axially to receive the friction-stem 26. This stem is provided with an annular head 27, which has a somewhat smaller diameter than the shell 22, and a compressible washer 28 is interposed between the said head 27 and the end of the barrel 19. By turning up the nut 29 on the end of said stem which projects beyond the end of the stem 20 said washer may be compressed to such an extent as may be required to cause a certain amount of frictional resistance to be applied to the said stem to prevent the too-easy rotation thereof in its support. Said friction-stem 26 is provided with a hub-like projection 26^a, which extends forward toward the spring-jaws 24 into a central perforation in the head 23. The purpose of this hub-like projection and the frictional resistance to the stem 26 will be referred to farther on. The construction thus far described consists of the shell 22, carrying the spring-jaws 24 for grasping a piece of work, said shell being revolubly supported on said barrel 19, and the cap on the opposite end of the shell bearing on the flange 21 on the barrel. It is requisite to the proper operation of the transfer-chuck, however, that the shell 22 should be freely revoluble only in a direction coinciding with the revolution of the spindle-chuck 14 and revoluble to a limited degree in a contrary direction, and to that end a cut 30 is made in the surface of the barrel 19 transversely to its axis, near said flange 21, (see Fig. 5,) and a pawl 31 is pivotally supported therein, under which is a spring 32 to hold the end of said pawl against the inner wall of the shell 22. A step 34 is formed on the interior wall of the shell contiguous to said pawl, with which the latter may engage only when the shell is rotated in a direction contrary to the direction of revolution of the spindle-chuck. The normal position of the shell relative to the barrel is with the pawl 31 in engagement with said step 34 in the wall of the shell, and in this position the spring-jaws 24 will be in position to receive a piece of work to be transferred to the spindle-chuck, and the sole function of the said pawl engagement between the shell 22 and the barrel 19 is to determine the position of

said jaws relative to the pieces to be received by them. In this case the pieces of work 16 shown in position between the spring-jaws 24 in dotted lines in Fig. 7 and which are moved into position to be automatically grasped by them by means to be described must be turned before they are presented to the spindle-chuck from the position shown in Fig. 8 to that shown in Fig. 9 in plan and in end elevation in dotted lines in above-referred-to Fig. 7, as it is much easier to hold said pieces firmly by their corners than by their opposite parallel sides. After said pieces have been transferred and grasped by the spindle-chuck the transfer-chuck must be returned again to its normal position (shown in Fig. 8) for engagement with the next piece of work, and these opposite rotary movements are accomplished as follows:

It is obvious that if an irregularly-shaped piece of work like that shown is to be inserted between the open jaws of a spindle-chuck while the latter is rotating and that if said piece can only be inserted therein when presented to said jaws in a certain position means must be provided for presenting said piece to said chuck-jaws in the position in which it can be inserted therein and that the transfer-chuck must then be rotated in coincidence with said jaws while the piece still in the transfer-chuck is moved toward and into said jaws and the latter are closed thereon, and to effect this coincident rotation of the spindle-chuck and transfer-chuck a bar 35 is supported on said shell 22 in a position parallel with the axis of said shell and projecting far enough beyond the end of the transfer-chuck to be engaged by a lug 36 on the face of the spindle-chuck when the transfer-chuck is moved up toward the spindle-chuck, said engagement taking place before the piece of work in the transfer-chuck has approached the spindle-chuck near enough to enter the piece of work between the jaws of the latter. Said bar 35 is adjustably supported on said shell 22 on a collar 37, and therefore may be so placed relative to the normal work-receiving position of the jaws of the transfer-chuck that when said bar 35 engages said lug 36 said shell may be given such a degree of rotation on the barrel 19 that said piece of work may be brought into any position desired relative to the jaws of the spindle-chuck and will then continue to rotate with said spindle-chuck while maintaining said relative position, and the movement of said transfer-chuck toward said spindle-chuck will then cause said piece of work to enter between the jaws of the latter in the position necessary to permit it to be grasped by the latter when they are automatically operated for that purpose by the movements of the machine, as described. The return of the jaws to normal work-receiving position after the transfer-chuck has delivered its piece of work, as stated, is effected by the spiral spring 38, one end of which is secured to the shell 22 at 39 and the opposite end of which is secured to the hub-like projection 26^a of the stem 26, sufficient space between the end of the shell 22 and the head 27 on said stem for the reception of said spring being provided. It is seen from this construction that as soon as the bar 35 encounters the lug 36 the shell 22 will be rotated against the tension of said spring until the latter has been wound around the hub 26^a, and that the spring will then cause the stem 26 to rotate in its support, and that the rotation of said stem will be under a certain frictional resistance applied thereto by the compressible washer 28 between the head 27 and the end of the barrel. Hence as soon as the transfer-chuck backs off away from the spindle-chuck and the bar 35 is withdrawn from engagement with the lug 36 the rotation of the stem 26 will cease and the tension of said coiled spring will cause the shell 22 to rotate back to a normal position in a direction contrary to the rotation of the spindle-chuck, and its movement is arrested when it arrives at that normal position by the engagement of the step 34 with the pawl 31, as described, said step during the rotation of the shell 22 in the opposite direction—that is, in coincidence with the spindle-chuck—passing under said pawl at each revolution, the pawl, being hung on the barrel 19, remaining stationary. It is therefore obvious that by means of this invention a piece of any shape may be made to register with the jaws of a spindle-chuck adapted to receive it and that pieces of work may therefore now be fed into the spindle-chuck of a screw-machine while said chuck is rotating, which heretofore it has been necessary to insert by hand in the chuck while the latter is at rest.

Another very important feature of this invention is illustrated in Figs. 10 and 11 and shows the adaptability of this device in effecting the presentation of pieces of work to be grasped by the spindle-chuck in a position eccentric to the axis thereof and during the rotation of said chuck. To accomplish this, it is obvious that the piece of work must be grasped by the transfer-chuck in such a manner that when said transfer-chuck is caused to rotate in coincidence with said spindle-chuck the piece to be grasped by the jaws of the latter must be in position to enter said jaws when moved forward by the transfer-chuck, as described. Ordinarily it is necessary to offset the jaws of the transfer-chuck from their center of rotation, as in Fig. 11; but it sometimes happens that said jaws may remain in their concentric position while the jaws of the spindle-chuck only are offset—as, for instance, in transferring to the spindle-chuck pieces having the form of a double eccentric. To conduce to a clear understanding of this feature of the invention, the piece of work shown illustrating this feature of the invention in Figs. 10 and 12 is similar to the piece shown in the other figures of the drawings, except that a cylindrical boss is shown

on said piece, near the lower extremity thereof, and to grasp this piece of work so that the center of said boss shall register with the center of rotation of said spindle-chuck the jaws of the latter must be adapted to receive said piece and the jaws of the transfer-chuck be offset from the center, so as to grasp said piece in such position that the center of that part of the piece of work to be operated on by the turret-tools will coincide with the center of rotation of the transfer-chuck.

To adjust the transfer-chuck relative to the spindle-chuck, so as to insure the presentation of successive pieces of work to the latter always in a position to be engaged by said spindle-chuck, assuming, of course, that said pieces can be grasped by the spindle-chuck only when they are presented in a certain way, the transfer-chuck is loosened in its socket in the turret and the collar 37 is loosened from the shell 22. The shell is then rotated to such a degree as to locate the spring-jaws 24 in a proper engaging position relative to the piece to be grasped by them, and the barrel of the chuck is then turned on its axis, the shell being held stationary until the pawl 31 engages the step 34 in said shell and the spring 38 is put under a certain tension. The barrel is now secured in its socket in the turret and the shell may be released, said spring holding the latter firmly in engagement with the pawl on said barrel. The jaws of the transfer-chuck are now in their normal work-receiving position, and the transfer-chuck, having a piece of work between its said jaws, is now moved up to the spindle-chuck and the shell rotated on the barrel to the position required to make the piece of work register with the jaws of said spindle-chuck, and this position having been attained the collar 37 is moved around on the barrel until the bar 35 engages with the lug 36 on said chuck, and the collar 37 is then secured to said shell in this position. When the bar 35 is withdrawn from engagement with the lug 36, the spring 38 will cause said shell to rotate back to normal position again, and whenever said lug 36 engages the bar 35 the piece of work in the transfer-chuck will be presented to the spindle-chuck in the same position relative to the jaws thereof that the parts occupied when adjusted and set, as above described.

The form of the work-grasping fingers or jaws of the transfer-chuck may be varied infinitely, as well as their position relative to the center of said chuck, to adapt the latter to automatically feed pieces of work of a great variety of forms to the spindle-chuck of a machine of the class herein shown, and all while the chuck is rotating, thus greatly increasing the efficiency of the machine.

The particular manner of feeding the pieces of work into the jaws of the transfer-chuck will of course vary with varying classes of work. For pieces of work such as are shown in connection with the drawings forming part of this application a convenient manner of doing it is to provide a tubular magazine 40, partly shown in side elevation in Fig. 1, front elevation in Fig. 7, and in sectional plan in Figs. 8 and 9. Two sides 41 42 at the bottom of said magazine are left open for a space somewhat higher than the height of one of said pieces 16, and a cut 43 is made in the side wall of said magazine to permit the entrance of one of the spring-jaws 24, which grasp this piece. That part of the magazine opposite the open side toward which the transfer-chuck advances is rigid, and said pieces abut thereagainst as the advancing transfer-chuck presses the ends of said jaws against said piece, which jaws by said movement of the chuck are sprung open and seize the piece. In Figs. 1, 7, 8, and 9 said magazine is shown mounted on the cross-slide 10 of the machine, and said slide is operated at the proper time to move the magazine transversely of the machine to the position it occupies in Fig. 8, which will bring the lower piece of work in said magazine in proper position to be engaged by the spring-jaws 24 of the transfer-chuck as the turret moves it forward toward the spindle-chuck. This forward movement of the transfer-chuck is in two steps, the first advancing it far enough to bring the face of the head 23 up against the end surface of the piece of work in the magazine with the jaws 24 grasping opposite sides thereof, at which point said transfer-chuck comes to a stop. Fig. 8 shows this chuck approaching this position. As soon as said first movement of the chuck ceases the cross-slide 10 is operated to move the magazine back again to the position shown in Fig. 9, leaving the transfer-chuck free to move again toward the spindle-chuck. As this transverse movement of the magazine takes place the piece of work engaged by the transfer-chuck emerges therefrom through the opening 42 in the side of the magazine, and those pieces in the magazine above said lower piece then descend by gravity, bringing another piece into position to be subsequently engaged by the transfer-chuck. As soon as the magazine has moved out of the path of the transfer-chuck the second forward movement of the latter takes place and the chuck again moves forward, and the bar 35 thereon engages with the lug 36 on the spindle-chuck to bring the piece of work in said transfer-chuck into registering position with the open jaws of the spindle-chuck, the said jaws having been opened at the proper time by the operation of the block 8, as described. This second movement of the transfer-chuck continues until the piece of work is in position to be grasped by the spindle-chuck, and this being accomplished (by another movement of the block 8) the transfer-chuck retires. Fig. 9 shows the position of the parts at the beginning of this retrograde movement of the transfer-chuck. Having reached the end of its rearward movement, the turret 6 is rotated to bring its tools into line for operating on the piece in

the spindle-chuck, and these operations take place in the manner common to machines of this class, successive partial rotations of the turret eventually bringing the transfer-chuck again into position to grasp a new piece of work in the magazine, which has again moved forward into the line of movement of the transfer-chuck, and deliver it to the spindle-chuck when the finished piece therein has been ejected therefrom. In Fig. 13 the magazine is shown in a different position—viz., supported in a fixed position on the frame of the machine and extending over the turret-slide in such position that the transfer-chuck will engage with one of said pieces of work 16 at the proper time upon the rearward movement of the turret. It is to be understood that neither this particular magazine nor any magazine forms an essential part of this invention, which lies, primarily, in the means shown, or their equivalents, for successively presenting pieces of work to the chuck of a machine to be grasped thereby and during the rotation thereof always in the same position relative to a particular point on said chuck, whereby said piece of work will always be grasped at predetermined points thereon.

As it sometimes happens that pieces of work will vary in thickness, means are provided to permit a slight yielding movement of the shell 22 lengthwise on the barrel 19 should a piece of work thicker than usual be engaged by the jaws of the transfer-chuck and come to a bearing against the head 23 of the transfer-chuck before the latter has finished the first stage of its movement to engage said piece in the magazine. It is also obvious that if said piece of work is of such thickness as to bottom on the end of the said head of the transfer-chuck its opposite end will also come into contact with the face of the spindle-chuck as the transfer-chuck carries said piece forward between the jaws of said spindle-chuck before the transfer-chuck has finished the second part of its movements. Said endwise yielding movement of the shell 22, to which the jaws 24 are secured, is provided for as follows: A space 44 is left between the end of said shell and the flange 21 on the barrel 19, and a ring 45, secured to pins 46, (which have a free sliding movement in holes provided therefor in the end of said shell,) bears on said flange 21 and is held thereagainst by springs 47, located in sockets 48 in the end of said shell. The resistance of these springs 47 is sufficient to prevent any compression thereof by any endwise pressure the shell may be subjected to while the spring-jaws 24 are being forced into engagement with the piece of work held in the magazine; but should the head 23 of the transfer-chuck come in contact, as stated, with said piece of work before said chuck has finished its forward movement during the first of the two movements of said chuck, or should said piece of work encounter the face of the spindle-chuck before the transfer-chuck has finished the second movement, said shell will yield endwise, and thus any possible injury to the parts be avoided. As soon as the excessive pressure on said shell is relieved the springs 47 will return it to its normal position again relative to the barrel—viz., to the position shown in Fig. 3.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine of the class described, a continuously-rotating member which receives and holds a piece of work to be operated upon, a second member normally non-rotative which receives and delivers said piece to said first-named member, and means for effecting, temporarily, the coincident rotation of said two members on a common axis, by the interengagement thereof in advance of the contact of the work with the member which holds it to be operated upon, substantially as described.

2. In a machine of the class described, a rotatable member which receives and holds a piece of work to be operated upon, a second rotatable member which receives and delivers said piece to said first-named member, means for effecting independent of the piece of work held by said second member, the coincident rotation of said two members and for moving one of them toward the other during said coincident rotation, substantially as described.

3. In a machine of the class described, comprising a rotatable chuck, a rotatable member which receives and delivers a piece of work to said chuck, means for moving one of said rotatable members toward and into engagement with the other in advance of the entrance of said piece of work into said chuck, whereby said work-delivering member is rotated in one direction, and means for rotating said delivering member in the opposite direction back to its normal position upon the disengagement of said member and said chuck, substantially as described.

4. In a machine of the class described, a member receiving and holding a piece of work to be operated upon, a second member which receives and delivers said piece to said first-named member, means for moving said delivering member toward and from said holding member and rotating the latter, and for effecting, temporarily, independent of the piece of work, the coincident rotation of said two members on a common axis, substantially as described.

5. In a machine of the class described, a rotatable member which receives and holds a piece of work to be operated upon, a second rotatable member which receives and delivers a piece of work to said first-named member, and means independent of the work for

effecting the temporary coincident rotation of said two members, and for bringing a given point on each of said members into a plane passing through the axis of said members, substantially as described.

6. In a machine of the class described, a continuously-rotating member receiving and holding a piece of work to be operated upon, a second member which receives and delivers said piece to said first-named member and is rotatable continuously in one direction, and to a limited degree in the opposite direction, means for moving said delivering member toward and from said holding member and for effecting, temporarily, the engagement of said second member with said continuously-rotating work-holding member, independent of the work, whereby said two members may rotate in unison before the work is grasped by said holding member, substantially as described.

7. In a machine of the class described comprising a chuck for receiving and holding a piece of work to be operated upon, a member which receives and delivers a piece of work to said chuck, which delivering member consists of a fixed part, a part supported and continuously rotatable on said fixed part in one direction; means of engagement between said fixed and rotatable parts for limiting the rotation of said movable part in the other direction and determining the normal position of one of said parts relative to the other, a work-grasping device on said rotatable part and means of engagement between said chuck and the rotatable part of said delivering device, substantially as described.

8. In a machine of the class described, the combination of a member which receives and delivers a piece of work to said chuck, which member consists of a fixed barrel, a shell thereon rotatable continuously in one direction, a part in said barrel rotatable thereon under an adjustable resistance, a yielding connection between said shell and said frictional part, a stop between said shell and said barrel whereby the normal relative position of said parts is determined, devices on said shell for grasping a piece of work, and means for moving said work-delivering member toward and from said chuck and into engagement therewith, whereby said member may temporarily rotate in coincidence with said chuck, substantially as described.

9. In a machine of the class described, the combination with a chuck having a plurality of jaws, the common center of whose work-engaging ends is located one side of the center of rotation of said chuck, of a rotatable work receiving and delivering member adapted to hold a piece of work eccentric to its center of rotation, and means independent of the work for coincidently rotating said chuck and said work-delivering member and for bringing said eccentrically-held piece of work into registering position with said chuck-jaws, and means for operating the latter, substantially as described.

10. In a machine of the class described, a rotatable member which receives and holds a piece of work to be operated upon, a second rotatable member which receives and delivers said piece to said first-named member, means independent of the work for effecting the coincident rotation of said two members and for moving one of them toward the other during said coincident rotation, combined with a container for said pieces of work which are withdrawn therefrom by said second member, substantially as described.

11. The combination with a continuously-rotating receiving-chuck, the common center of whose jaws is eccentric to its axis of rotation, which receives and holds pieces of work to be operated upon, of a member movable toward and from said chuck, which receives and delivers said pieces to said chuck, means for effecting the interengagement of said chuck and said member, whereby their coincident rotation as one piece will begin in advance of the contact of the work with said chuck, a container for said pieces, means for intermittently moving said container into a position intercepting the line of movement of said delivering member, and work-grasping jaws on said member whereby a piece of work is withdrawn from said container, substantially as described.

12. In a machine of the class described, the combination with a chuck having a plurality of jaws, the common center of whose work-engaging ends is located one side of the center of rotation of said jaws, means for rotating said chuck, and means for automatically placing a piece of work between the jaws of said chuck during its rotation, and suitable devices for opening and closing said jaws, substantially as described.

13. In a machine of the class described, comprising a rotating chuck having work-engaging jaws, a rotatable member which receives and delivers a piece of work to said chuck, suitable mechanism for moving said rotatable piece-delivering member toward said chuck and into engagement therewith in advance of the contact with the jaws of said chuck, of a piece of work held by said delivering member, substantially as described.

14. The combination with a work-receiving chuck, of a device for delivering a piece of work thereto, and means of engagement between said chuck and said device, whereby they are caused to rotate in unison, and permitted to move one toward the other during said rotative engagement, substantially as described.

ELBERT M. COUCH.

Witnesses:
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H. A. CHAPIN.