

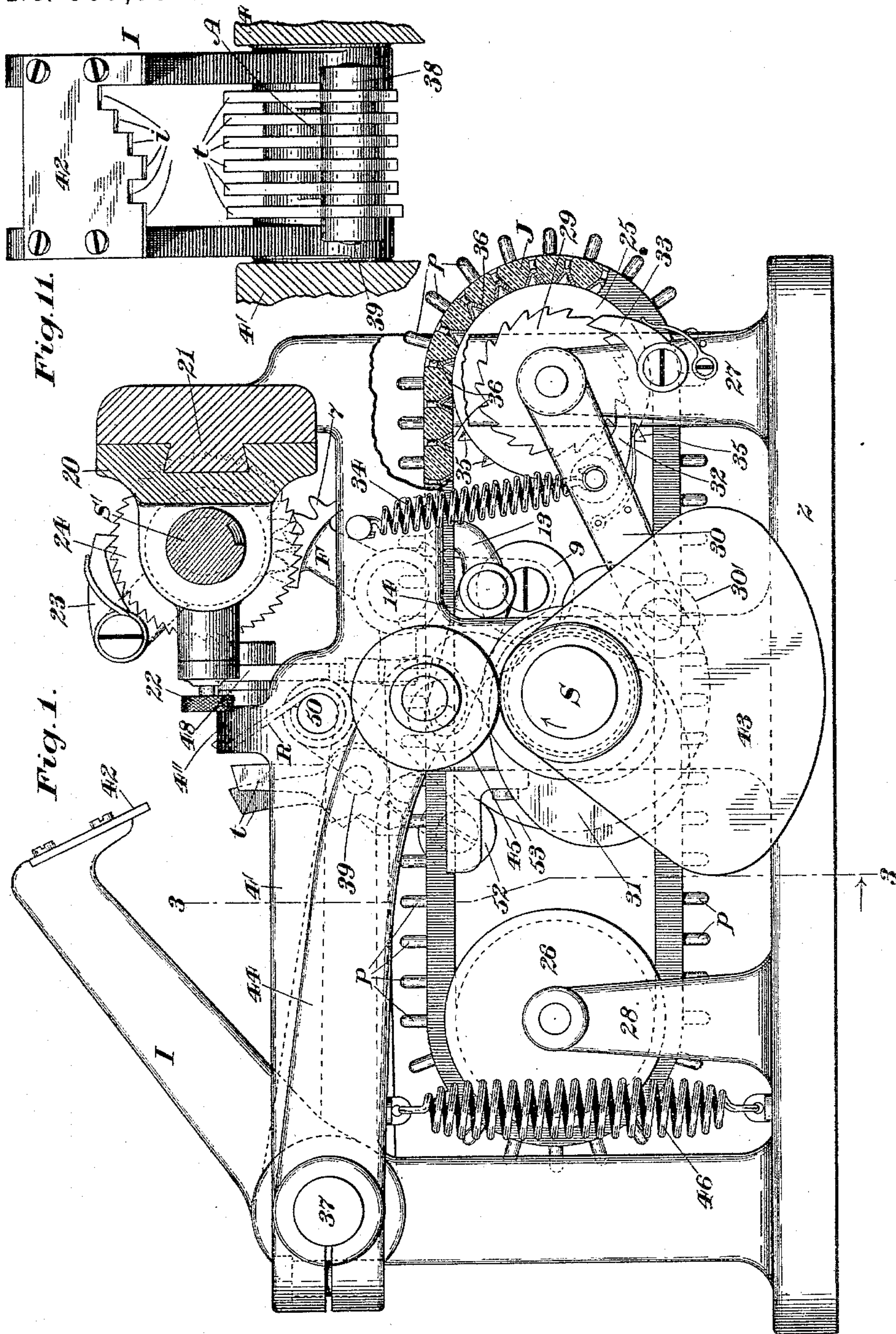
(No Model.)

6 Sheets—Sheet 1.

F. H. RICHARDS.  
FEED MECHANISM.

No. 597,566.

Patented Jan. 18, 1898.



Witnesses:  
J. L. Edwards Jr.  
Fred J. Dole.

Inventor:  
F. H. Richards.



(No Model.)

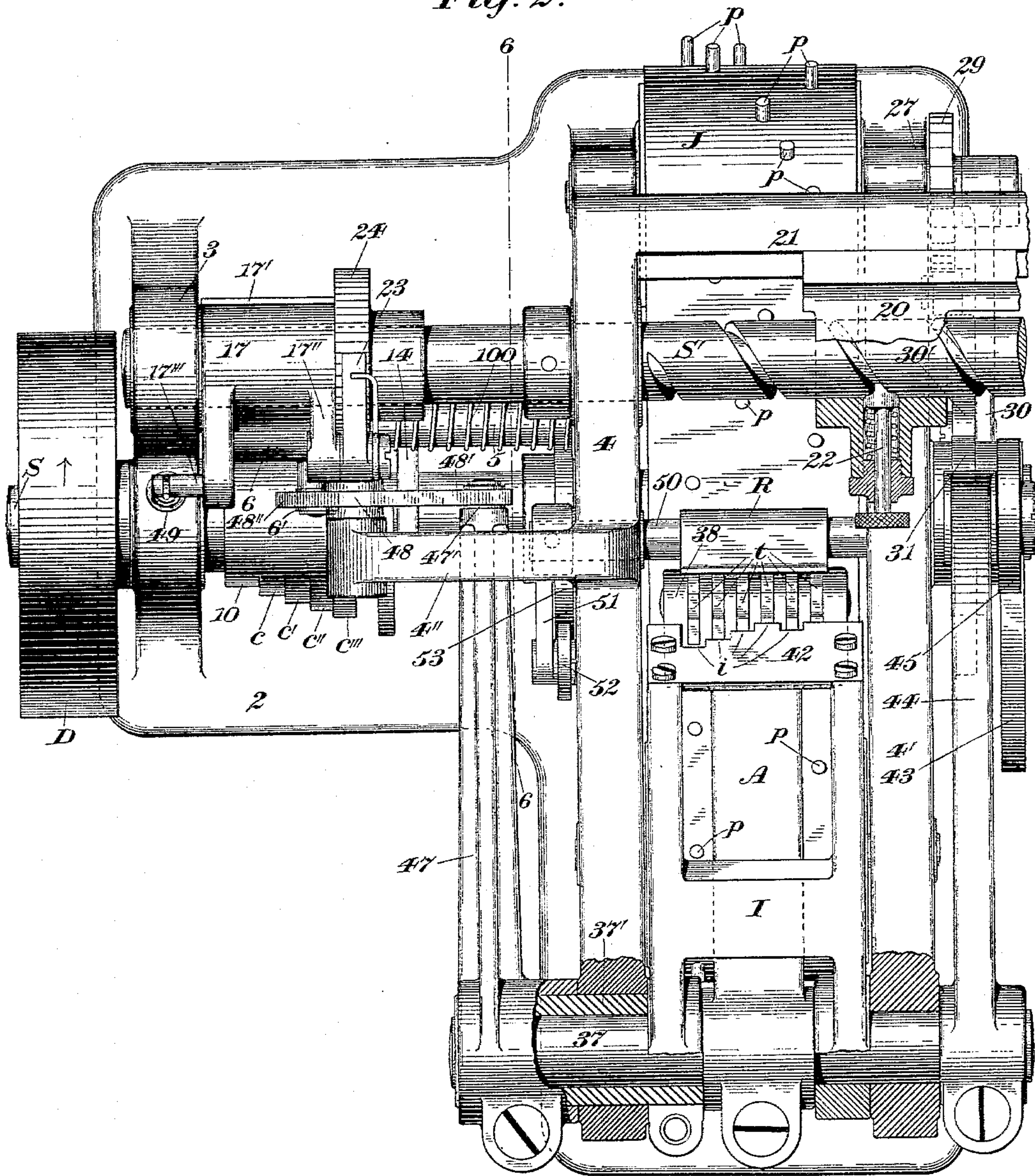
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Fig. 2.



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(No Model.)

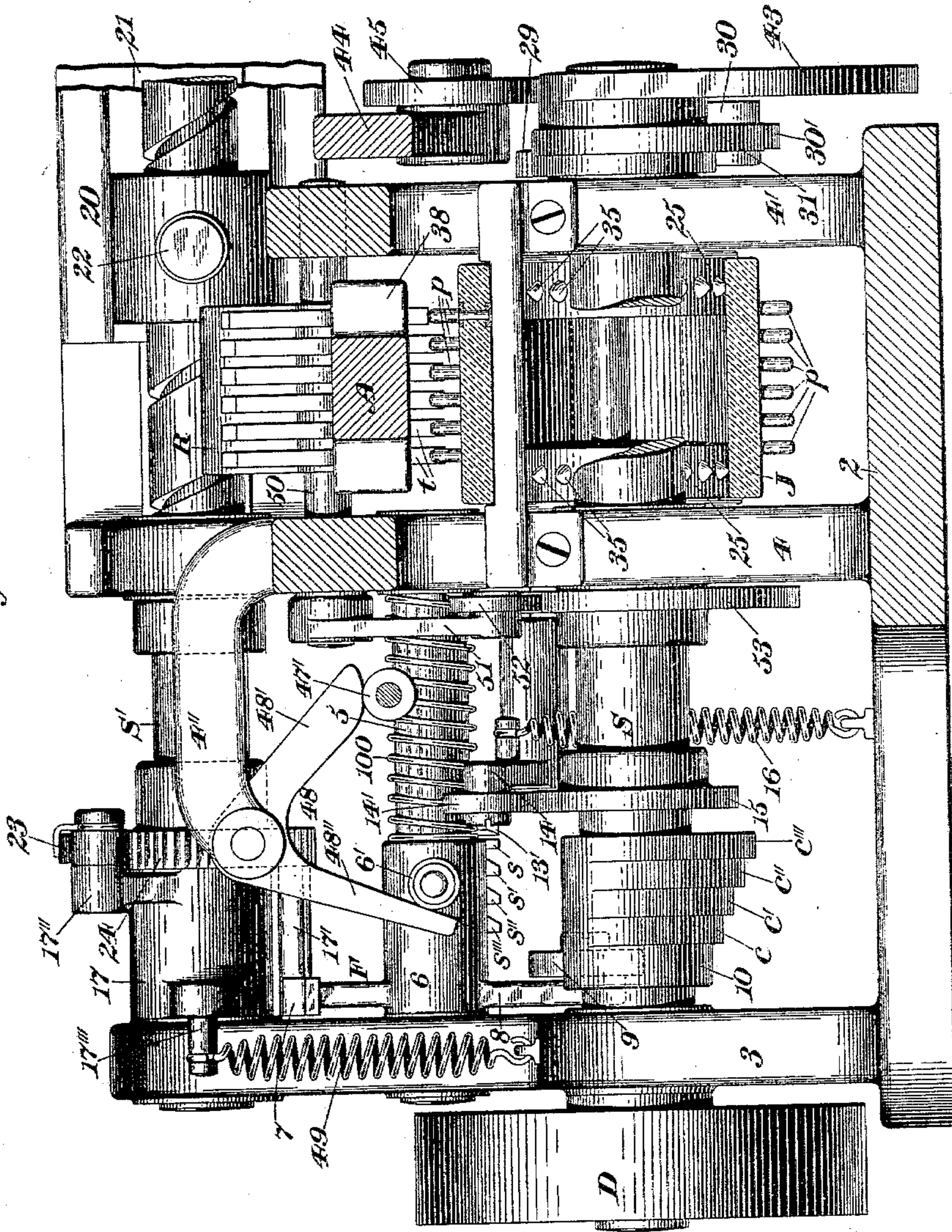
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Fig. 3.



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(No Model.)

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Fig. 5.

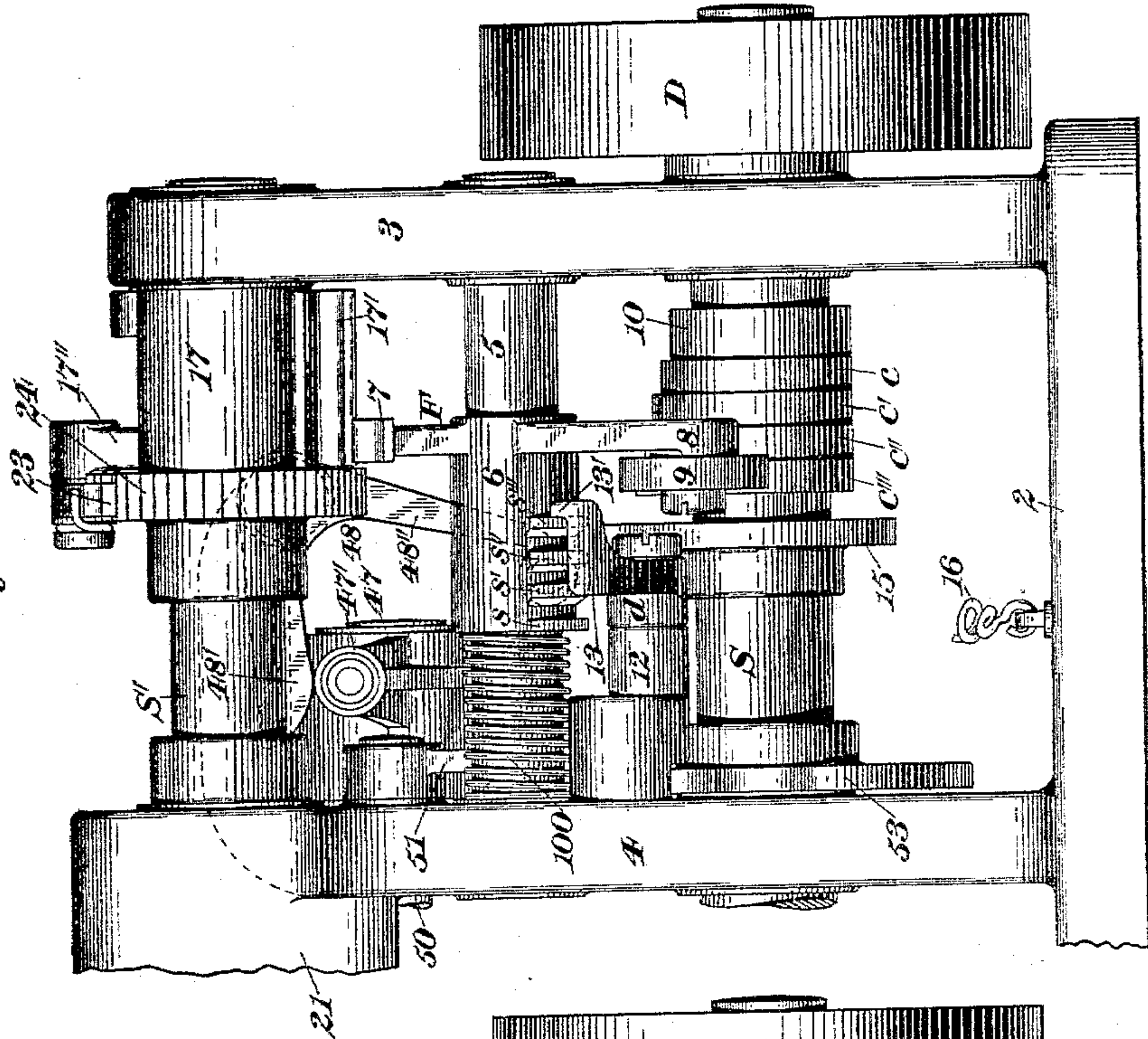
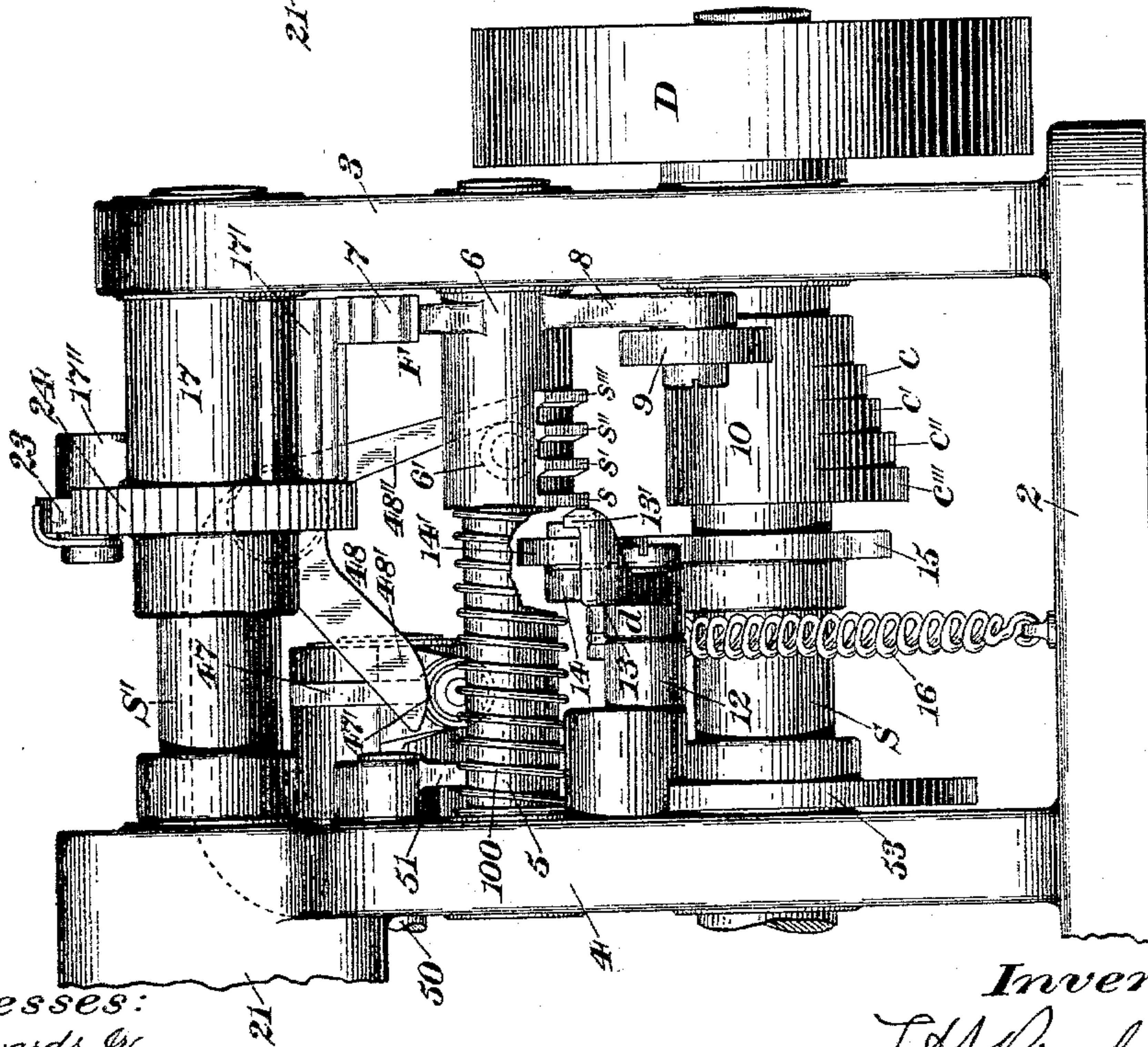


Fig. 4.



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6 Sheets—Sheet 5.

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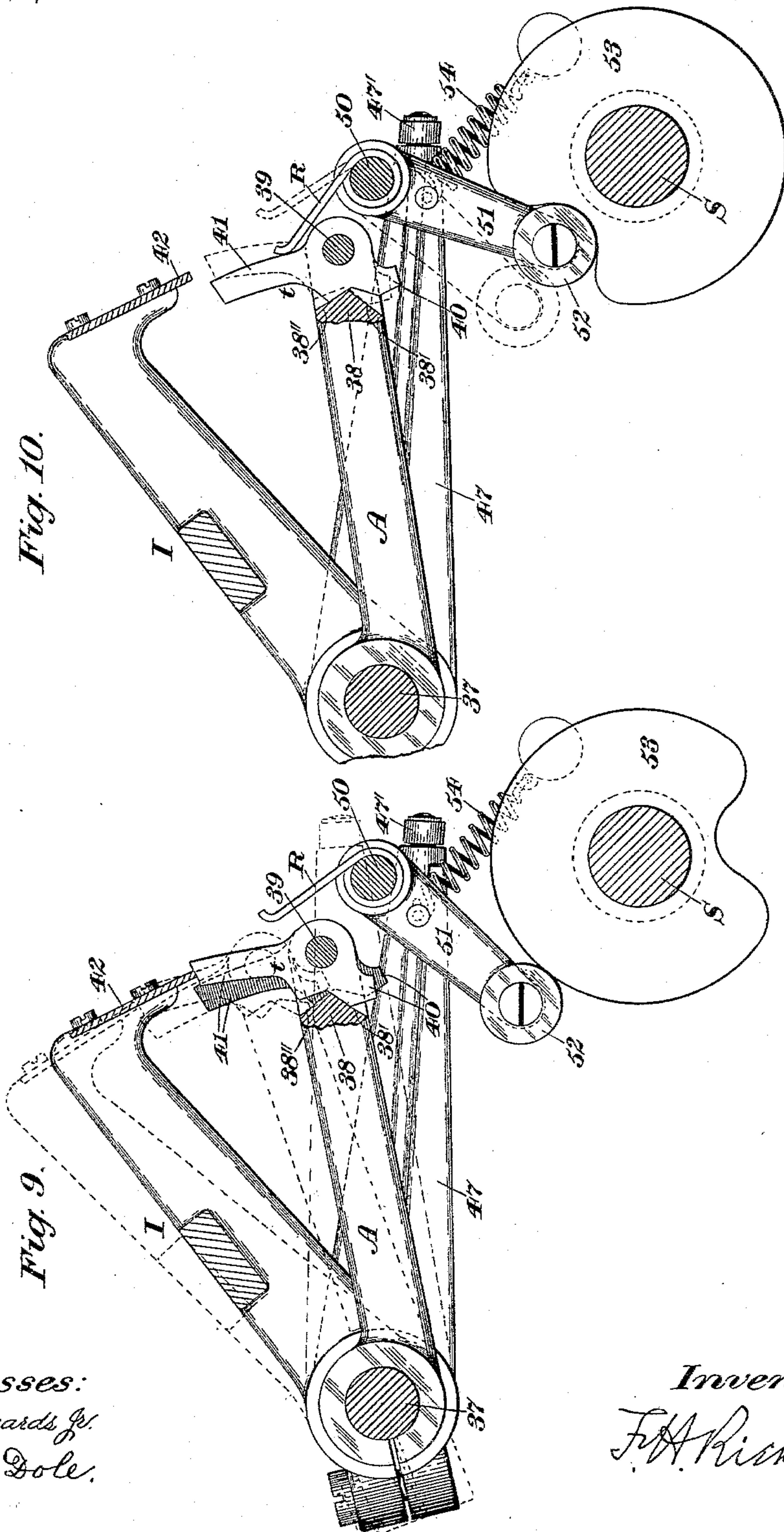
(No Model.)

6 Sheets—Sheet 6.

F. H. RICHARDS.  
FEED MECHANISM.

No. 597,566.

Patented Jan. 18, 1898.



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# UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

## FEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 597,566, dated January 18, 1898.

Application filed August 29, 1896. Serial No. 604,273. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed Mechanisms, of which the following is a specification.

This invention relates to feed mechanism generally and especially to variable-feed mechanism, which may be used in connection with type-writing, matrix, and analogous machines in which an actuated member or feed member normally in inoperative relation with suitable actuating mechanism may be intermittently brought into engagement with a feed-actuator and moved a determined distance thereby.

It is one of the main objects of my present invention to provide in connection with such a feed member a plurality of feed-actuators, each of which will be operative to impart to the feed member a feed movement independently of the operation of the other actuators of the group or series and to give to such actuators variable feed values, so that any desired one of a determined plurality of feed movements may be imparted to the feed member selectively, and any desired number of like or variable feed movements of the feed member may be effected in any desired order or in any preferred combination. It is also my purpose to impart these variable-feed movements to the feed member automatically and to effect the indication of the different feed values selectively in a predetermined order; and to the end that this may be done my invention also contemplates the control of a feed mechanism and especially of a feed mechanism such as that described in this specification by means of a jacquard or jacquard mechanism having suitable indications recorded thereon indicating, respectively, the selection of a determined succession or combination of feed movements to be imparted to the feed member successively in the order in which they appear on such jacquard.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation, looking from the right hand in Fig. 2, of a feed mechanism embodying my present invention. Fig. 2 is a sectional plan of the same. Fig. 3 is a ver-

tical transverse section of the same, the section being taken in line 3 3, Fig. 1. Fig. 4 is a rear elevation of the left-hand end of the feed mechanism, as seen in Fig. 2, and illustrates the parts in their normal or ineffective positions. Fig. 5 is a similar view showing the parts in their effective positions for imparting a feed movement to the feed member of the mechanism and to the parts controlled by such feed movement. Fig. 6 is a longitudinal vertical section of the feed mechanism, the section being taken in line 6 6, Fig. 2, looking in the direction of the arrow and illustrating the feed member and cooperative parts in their ineffective positions. Fig. 7 is a similar view illustrating the feeding operation. Fig. 8 is a detail showing the variable-feed cams carried by the main driving-shaft. Figs. 9 and 10 are detail sectional side elevations of the jacquard-controlled indicating mechanism and its cooperative devices and illustrate the parts in successive positions for imparting a feed-indicating movement to the indicating-bar hereinafter described. Fig. 11 is a detail illustrating the jacquard-controlled feed-indicating tumblers and the indicating-bar controlled thereby.

Similar characters designate like parts in all the figures of the drawings.

Any suitable framework may be employed for operatively carrying the several parts of the feed mechanism in which my present invention is embodied. That shown herein is illustrated having a base-plate 2, from the opposite sides of which rise uprights or supports 3 and 4' and an intermediate arched support 4 similar to that at 4', in which a main driving-shaft S is shown mounted for rotation and carrying at its left-hand end a main driving-wheel D, which, it should be understood, will be normally continuously operated.

The feed-actuators controlling the movements of the feed member are represented in the present case fixed on a sleeve or rotary cylindrical carrier 10, secured to the shaft S for rotation therewith, and these actuators are illustrated herein as a plurality of feed-cams preferably axially aligned and having different axial positions, said cams being shown as four in number and being designated, respectively, by  $c$ ,  $c'$ ,  $c''$ , and  $c'''$ . Each cam in the present case is also represented



having the termini of its periphery merged in the periphery of the rotary carrier 10, so that the feed member when actuated by such cam may start from its normal position and return thereto by a gradual movement, the cams thus serving positively to control the movement of the feed member from the beginning to the end of its operation and to prevent jarring and uneven movement, which might tend to impair the accuracy of the feed. The feed member which these cams are designed to actuate is represented mounted on a carrier 5, supported in the supports 3 and 4 and parallel with the shaft S, this feed member being designated in a general way by F and being shown having a tubular portion or sleeve 6, having secured thereto at one side thereof a feed-segment 7 and at the opposite side thereof a feed-controlling arm 8, carrying an antifriction-roll 9, normally in contact with the periphery of the sleeve 10 and adapted when shifted axially thereof to be brought opposite one of the feed-cams. This feed member is illustrated automatically retrogressive or reactive to its normal position (seen in Fig. 3) with the left-hand end of the sleeve 6 contiguous to the upright 3, a strong spiral spring being represented at 100, surrounding the carrier 5 between the inner end of said sleeve and the partition or upright 4. The sleeve 6 is also shown having integral therewith at the rear side thereof (see Figs. 4 and 5) an axial series of stops, one for each cam, designated, respectively, by  $s$ ,  $s'$ ,  $s''$ , and  $s'''$ , each of these stops being adapted to cooperate with a suitable locking device or detent, so that the feed member may be locked in its working position when its antifriction-roll is brought into line with any selected cam. This feed-member detent is designated in a general way by  $d$  and is shown as an oscillatory member mounted on a stud 12, secured to the upright 4 and having at the outer end of its short arm 13 a locking-finger 13', which constitutes the detent proper, and at the outer end of its long arm, which is designated by 14, an antifriction-roll 14', adapted to travel on the periphery of a cam 15, secured to the main driving-shaft S. (See Fig. 6.) For the purpose of normally holding the antifriction-roll in contact with the cam a strong helical spring is represented at 16 secured at one end to the arm 14 and at its opposite end to the base of the apparatus. The movement of the feed-segment 7 may be utilized to operate a driven device or mechanism of any suitable construction or organization. In the present case I have represented this feed-segment as meshing with a corresponding segment 17', which is illustrated as a wide-faced segment forming part of a sleeve 17, loosely mounted upon a driving-shaft, which is represented at S' as carried for rotation in suitable bearings in the uprights 3 and 4, this driven shaft being also shown as a feed-screw, the outer end of which is illustrated passed through and supported

in a traveler 20, suitably guided for movement along a transverse frame member 21 at the rear of the apparatus. (See Figs. 1 and 3.) The feed-screw S' is represented, having the usual spiral groove, with the walls of which the inner end of a spring-pressed detent or locking-bolt 22 is represented engaging in the usual manner for causing the advance of the traveler 20 and for permitting the return of the same to its initial position on the withdrawal of the detent from engagement with the walls of said groove. It should be understood that this movement of the traveler and feed-screw may be utilized in any suitable manner, and for this reason only so much of said feed-screw and its cooperative parts is shown as is deemed necessary for a clear understanding of the operation. The sleeve 17 is also represented having a pawl-carrying arm 17'', supporting a pawl 23, normally held in the usual manner by means of a light spring in engagement with the teeth of a ratchet-wheel 24, fixed on the shaft S'. For the purpose of returning the sleeve 17 and its segment to their normal positions after a feed movement has been imparted thereto by the feed member 7 a strong spring is shown at 49 secured at one of its ends to a pin or stud 17''', fixed on the sleeve, and at its other end to the upright 3. (See Figs. 3, 6, and 7.)

As has been hereinbefore stated, I propose to control the several feed movements of the variable-feed mechanism from a jacquard, and a jacquard mechanism suitable for this purpose is illustrated at the forward right-hand side of the apparatus.

The jacquard which I have illustrated herein as an endless belt or traveler has on the outer side thereof a plurality or circuit of jacquard-pins or indicating-actuators, such as  $p$ , disposed, preferably, in transversely-separated longitudinal series, as shown in Fig. 2, and spaced equidistantly longitudinally of the jacquard, as will be evident by reference to Fig. 1. This endless jacquard may be mounted in any suitable manner, it being shown in the present case as supported on a pair of rotary cylinders 25 and 26, carried for rotation in the bearings of suitable uprights 27 and 28, rising from the base-plate 2. The cylinder 25 is also illustrated, carrying for movement in unison therewith a driving ratchet-wheel 29, which is represented deriving its movement from the main shaft S, the driving connections for this purpose being shown as a link 30, loosely mounted at one end on the shaft of the cylinder 25 and having at its opposite end an antifriction-roll 30', a cam 31, secured to the shaft S and cooperating with said antifriction-roll to oscillate the link 30, and a spring-pressed pawl 32, carried by said link and oscillatory therewith for rotating the ratchet-wheel 29 the space of one tooth on each rotation of the shaft S.

A stop-pawl is shown at 33 for preventing



return movement of the ratchet-wheel, and a strong spring is also illustrated at 34, secured at one end to the link 30 and at its opposite end to the support 4' for retaining the

antifriction-roll 30' in contact with the cam 31. The jacquard J is represented driven in the present case by sprocket-teeth 35, engaging the walls of corresponding drive openings or sockets 36 in the inner side of the belt, and

it will be evident that at each rotation of the shaft S this jacquard will be advanced a step by the ratchet-wheel 29, the interval being equal to the distance between any pair of adjacent jacquard-pins. The indications shown on the jacquard may be taken off by any suitable device. In the present case the jacquard-pins are illustrated as operative for shifting from a normal unset position a plurality of indicator actuators or tumblers, such as *t*, which are represented in the drawings carried for oscillation on a frame A, secured to an oscillatory carrier-shaft 37, carried in bearings in the forward ends of the supports 4 and 4'. This frame is shown supporting at its rear end a tumbler-carrier bar 38, having parallel kerfs forming aligned tumbler-separating members, which have also registering apertures for the reception of a tumbler-carrier, such as 39, on which the tumblers *t* are illustrated supported. (See Fig. 9.) At the ends of the kerfs in the tumbler-carrier bar diverging stop-walls are shown at 38' and 38'' for limiting the movements of the tumblers. Said tumblers are disposed in such positions that they will be in the paths, respectively, of the respective longitudinal series of jacquard-pins, and each of these tumblers is represented having a depending finger 40 inclined toward the jacquard when in its normal position, so that when it is engaged by one of the pins *p* the tumbler will be in the position shown in full lines at the right in Fig. 9. It should be understood that the tumbler-separating walls are contiguous to the sides of the tumblers and exert sufficient resistance to prevent movement of the tumblers until said tumblers are positively actuated from one position to the other.

The tumblers just described constitute a plurality of independently-effective jacquard-controlled actuators, each of which is operative selectively for actuating a feed-indicator, preferably in the form of a variable-feed indicator, having variable movements corresponding, respectively, to the respective variable feeds controlled by the feed-cams *c*, *c'*, *c''*, and *c'''*. This indicator is designated in a general way by I, and is preferably in the form of a frame loosely mounted for oscillation about the shaft 37, one side of said frame being shown in Fig. 2 mounted directly on the shaft, while the other is represented clamped to a sleeve 37', surrounding said shaft, this frame being illustrated carrying at its free end a transverse indicating-bar 42, (see Fig. 11,) having a plurality of indicating members or indicators, such as *i*, aligned, re-

spectively, with the respective tumblers *t* and controlled, respectively, thereby. It will be noted by reference to Fig. 9 that these indicators *i* are out of the paths of movement of the respective tumblers when said tumblers are in their normal positions, but that when any one of the tumblers is moved to its set position the operating-finger thereof (shown at 41) will lie in the path of its respective indicating member and engaging the same will actuate the indicator I and will oscillate the indicator a distance proportionate to the feed which it is desired to indicate.

It will be obvious that the maximum and minimum feed movements will be controlled by the indicating members shown, respectively, at the left and right in Fig. 11.

It should also be stated here that the tumblers constitute indicator-actuators for the indicating members or indicators and hence for the frame I, the tumbler-carrying frame being normally continuously operated by the main driving-shaft S from a settable to a working position, the shaft S being represented having thereon a cam 43 for this purpose. (See Fig. 1.) The shaft 37 is also illustrated having a rock-arm 44 secured thereto and carrying at its free end an antifriction-roll 45 in contact with the periphery of the cam 43, (see Figs. 1 and 2,) so that when said cam is rotated the rock-arm 44 and the tumbler-carrying frame will be intermittently oscillated from the position shown in Fig. 1 to that illustrated in dotted lines in Fig. 9, a strong retracting-spring being shown at 46 connecting said rock-arm and the base of the machine to thereby maintain the antifriction-roll in its proper working position.

At the end of the shaft 37 opposite that at which the rock-arm 44 is carried I have illustrated at 47 a second rock-arm clamped to the sleeve 37', so as to move in unison with the indicators, and by means of this rock-arm the movements of the indicators *i* are transmitted to the feed member for shifting the same longitudinally of the carrier on which said feed member is mounted.

I have shown in the drawings (see Figs. 2 and 3) an overhang 4'', forming part of the support 4 and having pivotally mounted thereon a feed-member shifter in the form of an angle-lever 48, which is represented disposed transversely to the rock-arm 47 and having one of its arms 48' shaped to form a cam-surface coöperative with an antifriction-roll 47', carried at the free end of the rock-arm 47. The other arm 48'' of the angle-lever is shown engaging an antifriction-roll 6', carried by the sleeve 6 of the feed member F.

After the operation of the indicator I by one of the indicator actuators or tumblers *t* it is necessary to return said tumbler to its normal unset position in order that the tumbler which is to be selected by the next succeeding pin on the jacquard may operate without interference from the tumbler already actuated. Hence I have illustrated at



R resetting means suitable for restoring each of the indicating actuators or tumblers to its normal unset position after operation, this resetting means being shown as a sheet-metal strip secured to a shaft 50, (see Figs. 2 and 9,) carried for oscillation in the supports 4 and 4' and having at its left-hand end a rock-arm 51, carrying an antifriction-roll 52, adapted to travel on the periphery of a cam, such as 53, (see Fig. 10,) secured to the main shaft S, the antifriction-roll being held to its working position as by means of a spring 54, secured to the rock-arm 51 and to the support 4.

The operation of a feed mechanism constructed in accordance with my present invention as herein set forth is as follows: It being assumed that the main driving-wheel D is continuously rotated in the direction indicated by the arrow in Fig. 2, it will be seen (see Fig. 1) that the cam 31 will first actuate the link 30 to advance the jacquard the interval between two adjacent pins, whereupon the tumbler-carrying frame will descend, and by the striking of the depending finger 40 of the tumbler corresponding to such pin upon a jacquard-pin said tumbler will be oscillated from its normal unset position to its set position. (See Fig. 1.) The operation of the cam 43 will then cause the tumbler-carrier to rise, and the set tumbler will operate the indicating member *i* corresponding to said tumbler, the indicator being oscillated a distance sufficient to shift the roll 9 into the path of movement of that feed-cam which corresponds to the indicator engaged by the tumbler, the movement of the indicator I being transmitted to the angle-lever or feed-member shifter 48 by the rock-arm 47 of the shifter-actuating indicator and from said angle-lever to the feed member, which will be shifted thereby along the carrier 5 to the desired position, the spring 10 being put under tension by the movement of the sleeve 6. Immediately on the shifting of the feed member the feed-member detent *d* is carried to the position shown in Fig. 7 by the operation of the spring 16, which carries the roll 14' down the cam-face of the cam 15, and the feed member is thus locked in its working position during its feed movement. The roll 9, which up to this time has been in contact with a surface concentric with the axis of the shaft S, will now ride off from such concentric periphery and up the cam-surface of that one of the feed-cams into the plane of which it has been shifted by the angle lever or shifter 48, and hence the feed-segment 7 will be actuated—as, for instance, from the position shown in Fig. 6 to that illustrated in Fig. 7—the movement of the roll from one terminus of the cam-face to the top of the cam and from the top of said cam to the opposite terminus thereof being a gradual and even one, so that the feed-segments may be oscillated to any desired position without causing any shock or strain upon the moving parts. It will be obvious that the turning of these feed-seg-

ments will cause a corresponding partial rotation of the feed-screw S', it being understood that each tooth of the ratchet-wheel 24 corresponds to a single unit of feed and that the several feed values indicated by the feed-cams differ from one another by units, it being assumed herein that the cams *c*, *c'*, *c''*, and *c'''* correspond to feed values of one, two, three, and four units, respectively. The traveler 20 will of course be advanced along the feed-screw at each partial rotation thereof a distance proportionate to such feed movement, and hence proportionate to the movement of the feed-screw-actuating feed member or feed-segment 7. On the descent of the tumbler-carrier and before it reaches the limit of its descending movement the roll 52 is carried by the spring 54 to the position shown in Fig. 10, and said tumbler is restored by the resetting-blade R to its normal unset position. As soon as the roll 9 arrives at the end of the face of the cam by which it has been actuated the roll 14' rides up the cam 15, as shown in Fig. 6, and releases the detent *d* from engagement with that stop on the feed member which it engaged at the beginning of the feed movement, and the feed member is then shifted to its normal position by the force of the spring 100, as shown in Figs. 3 and 4. At the same time the feed-member shifter 48 is restored to its normal position by the roll 6', and the combined action of said shifter and the spring 46 also causes a corresponding return movement of the indicator I to its normal position. (Shown in full lines in Figs. 1 and 9.)

From the foregoing description it will be apparent that the operation of the indicator is absolutely dependent upon the setting of the tumblers by the pins of the jacquard, and hence if any of the jacquard-pins were missing the tumbler-carrier would oscillate ineffectively and the indicator, the feed-member shifter, the feed member, and the parts controlled thereby would operate intermittently. It will be seen, therefore, that the apparatus illustrated herein comprises two separate mechanisms, one of which may be ineffective while the other is continuously operating.

As the feed-cams constitute the means for controlling the advance of the traveler 20, it will be evident that my invention comprises, in combination with a feed-indicator and a feed-movement controller, a feed member normally in inoperative relation with said controller and shiftable by the indicator into operative relation with such controller, the feed member being automatically retrogressive or reactive to such normal position, a plurality of these feed-movement controllers being shown for the purpose of imparting variable feed movements to said traveler, and the feed member being shiftable by the feed-indicator into operative relation with any selected controller. These feed-controllers or feed-actuators are also rotatable in unison and preferably, as before described, about a common



axis. As the feed member is shiftable axially to its working position and is oscillatory about its axis, I also consider the employment of a feed member having its feed movement transverse to its shifting movement a feature of importance. Moreover, I prefer to provide a feed member automatically retrogressive toward the axis of its feed-cam or feed-movement controller, as well as to its normal or non-working position.

As before stated, the movement of the feed member depends upon the setting of a tumbler by the jacquard, and hence when my improved feed mechanism is employed in connection with a jacquard said mechanism embodies two portions, one of which is controlled by such jacquard and constitutes an actuator for the other, while one of said portions also forms a feed-indicator, the feed-indicator being illustrated herein controlled by a feed-indicator actuator.

Having described my invention, I claim—

1. The combination, with a feed-indicator, of a feed-movement controller; and a feed member normally in inoperative relation with said controller and shiftable by said indicator into operative relation with said controller and automatically retrogressive to said normal position.

2. The combination, with a feed-indicator, of a feed-actuator; and a feed member normally in inoperative relation with said actuator and shiftable by said indicator into operative relation with said actuator and automatically retrogressive to said normal position.

3. The combination, with a feed-indicator, of a plurality of feed-movement controllers; and a feed member normally in inoperative relation with said controllers and shiftable by said indicator into operative relation with any selected controller and automatically retrogressive to said normal position.

4. The combination, with a feed-indicator, of a feed-actuator; and a feed member normally in inoperative relation with said actuator and shiftable by said indicator into operative relation with said actuator and reactive to said normal position.

5. The combination, with a variable-movement feed-indicator, of a plurality of feed-actuators; and a feed member normally in inoperative relation with said actuators and shiftable by said indicator into operative relation with any selected actuator and reactive to said normal position.

6. The combination, with a feed-indicator, of a plurality of rotary feed-actuators; and a feed member normally in inoperative relation with said actuators and shiftable by said indicator into operative relation with any selected actuator and reactive to said normal position.

7. The combination, with a feed-indicator, of a plurality of feed-actuators rotative in unison; and a feed member normally in inoperative relation with said actuators and

shiftable by said indicator into operative relation with any selected actuator and reactive to said normal position.

8. The combination, with a feed-indicator, of a plurality of feed-actuators rotative about a common axis; and a feed member normally in inoperative relation with said actuators and shiftable by said indicator into operative relation with any selected actuator and reactive to said normal position.

9. The combination, with a feed-indicator, of a feed-actuator; and a feed member normally in inoperative relation with said actuator and shiftable by said indicator into operative relation with said actuator and having its feed movement transverse to said shifting movement and also automatically retrogressive to said normal position.

10. The combination, with a feed-indicator, of a plurality of feed-actuators; and a feed member normally in inoperative relation with said actuators and shiftable axially by said indicator into operative relation with any selected actuator and having its feed movement about its axis and also automatically retrogressive to said normal position.

11. The combination, with a feed-indicator, of a plurality of feed-cams rotative about a common axis and having different axial positions; and a feed member normally in inoperative relation with said cams and shiftable by said indicator into operative relation with any selected cam and reactive to said normal position.

12. The combination, with a feed-indicator, of a rotary cylindrical carrier; a plurality of feed-cams secured to said carrier and having the termini of their peripheries merged in the periphery of the carrier; and a feed member normally in inoperative relation with said cams and in contact with said carrier and shiftable by said indicator into operative relation with any selected cam and reactive to said normal position.

13. The combination, with a feed-indicator, of a rotary cylindrical carrier; a plurality of variable-feed cams secured to said carrier and having the termini of their peripheries merged in the periphery of the carrier; and a feed member normally in inoperative relation with said cams and in contact with said carrier and shiftable by said indicator into operative relation with any selected cam and reactive to said normal position.

14. The combination, with a feed-indicator, of a rotary cylindrical carrier; a plurality of axially-alined feed-cams secured to said carrier and having the termini of their peripheries merged in the periphery of their carrier; and a feed member normally in inoperative relation with said cams and in contact with said carrier and shiftable by said indicator into operative relation with any selected cam and reactive to said normal position.

15. The combination, with a feed-indicator, of a rotary cylindrical carrier; a plurality of axially-alined stepped feed-cams secured to



said carrier and having the termini of their peripheries merged in the periphery of the carrier; and a feed member normally in inoperative relation with said cams and in contact with said carrier and shiftable by said indicator into operative relation with any selected cam and reactive to said normal position.

16. The combination, with a feed-indicator, of a rotary feed-movement controller; and a feed member normally in inoperative relation with said controller and shiftable by said indicator into operative relation with said controller and automatically retrogressive toward the axis of the controller and to said normal position.

17. The combination, with a feed-indicator, of a rotary cylindrical carrier; a feed-cam secured to said carrier and having the termini of its periphery merged in the periphery of the carrier; and a feed member normally in inoperative relation with said cam and in contact with said carrier and shiftable by said indicator into operative relation with said cam and automatically retrogressive toward the axis of the carrier and to said normal position.

18. The combination, with a feed-indicator, of a feed-actuator; a feed member normally in inoperative relation with said actuator and shiftable by said indicator into operative relation with said actuator and having its feed movement transverse to said shifting movement and also automatically retrogressive to said normal position; and a feed-member detent operative for holding said feed member in its operative position during the feed movement thereof.

19. The combination, with a feed-indicator, of a rotary cylindrical carrier; a feed-cam secured to said carrier; an oscillatory feed member normally in inoperative relation with said cam and in contact with said carrier and shiftable axially by said indicator into operative relation with said cam and also reactive to said normal position; and an oscillatory feed-member detent operative for holding said feed member in its operative position during the feed movement thereof.

20. The combination, with a variable-feed indicator, of a rotary cylindrical carrier; a plurality of axially-aligned variable-feed cams secured to said carrier; an oscillatory feed member normally in inoperative relation with said cams and in contact with said carrier and shiftable axially by said indicator into operative relation with any selected cam and also reactive to said normal position and having an axial series of stops, one for each cam; and a feed-member detent operative for engaging said stops, selectively, during the feed movement of the feed member, to thereby hold the feed member in its operative position during said period.

21. The combination, with a variable-feed indicator, of a plurality of feed-movement controllers controlling variable feeds; a feed-

screw-actuating variable-movement feed member normally in inoperative relation with said controllers and shiftable by said indicator into operative relation with any selected controller and automatically retrogressive to said normal position; and a feed-screw operative by said feed member proportionally to the feed movements of said feed member.

22. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of feed mechanism controlled by said indications of the jacquard.

23. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism controlled by said indications of the jacquard.

24. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of feed mechanism embodying two portions, one controlled by said indications of the jacquard and constituting an actuator for the other, and one of said portions also forming a feed-indicator.

25. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of feed mechanism embodying a feed-indicator and a feed-indicator actuator controlled by said indications of the jacquard.

26. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying two portions, one controlled by said indications of the jacquard and constituting an actuator for the other, and one of said portions also forming a variable-feed indicator.

27. The combination, with a jacquard, of a feed-indicator; a jacquard-set feed-indicator actuator movable from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said feed-indicator; and a feed member controlled by the feed-indicator.

28. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a feed-indicator; a jacquard-set indicator-actuator movable from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said feed-indicator; and a feed member controlled by the feed-indicator.

29. The combination, with a jacquard, of a variable-movement feed-indicator; jacquard-set indicator-actuators movable, respectively, from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said feed-indicator; and a variable-movement feed member controlled by the feed-indicator.

30. The combination, with a jacquard, of variable-feed mechanism embodying two portions, one operative for actuating the other and comprising a plurality of independently-



effective jacquard-controlled actuators, and one of said portions also comprising a plurality of independently-effective variable-feed indicators, one for each respective actuator.

31. The combination, with a jacquard and with a plurality of transversely-separated longitudinal series of indicating-actuators carried thereby, of variable-feed mechanism embodying two portions, one operative for actuating the other and comprising a plurality of independently-effective indicator-actuators controlled, respectively, by said respective series of indicating-actuators, and one of said portions also comprising a plurality of independently-effective variable-feed indicators, one for each respective indicator-actuator.

32. The combination, with a jacquard, of variable-feed mechanism embodying a plurality of independently-effective jacquard-set indicator-actuators reciprocatory between a settable and a working position, and a plurality of variable-feed indicators operative, respectively, by said respective indicator-actuators.

33. The combination, with a jacquard and with a plurality of transversely-separated longitudinal series of indicating-actuators carried thereby; of variable-feed mechanism embodying a plurality of independently-effective normally unset indicator-actuators, one for each respective series of indicating-actuators and settable by said indicating-actuators and movable from a settable to a working position, and vice versa, and a plurality of variable-feed indicators operative, respectively, by said respective indicator-actuators.

34. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying a variable-feed indicator controlled by said indications of the jacquard.

35. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying a plurality of independently-effective variable-feed indicators controlled by said indications of the jacquard.

36. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying a plurality of independently-effective reciprocatory variable-feed indicators controlled by said indications of the jacquard.

37. The combination, with a jacquard having a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying a plurality of independently-effective oscillatory variable-feed indicators controlled by said indications of the jacquard.

38. The combination, with a jacquard hav-

ing a series of indications successively effective in the order of their occurrence, of variable-feed mechanism embodying a plurality of independently-effective variable-feed indicators controlled by said indications of the jacquard and movable in unison.

39. The combination, with a jacquard, of variable-feed mechanism embodying an indicating-bar having a plurality of independently-effective variable-feed indicators controlled by the jacquard.

40. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; and a jacquard-controlled feed-member shifter for carrying said feed member into operative relation with said feed-actuator.

41. The combination, with a jacquard, of a continuously-operative feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; and a jacquard-controlled feed-member shifter for carrying said feed member into operative relation with said feed-actuator.

42. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; and a jacquard-actuated feed-member shifter controlled by said indicating-actuators and operative for carrying said feed member into operative relation with said feed-actuator.

43. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a plurality of feed-actuators; a feed member normally in inoperative relation with said feed-actuators and operative by said feed-actuators; and a jacquard-actuated variable-movement feed-member shifter controlled by said indicating-actuators and operative for carrying said feed member into operative relation with any selected feed-actuator.

44. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a plurality of feed-cams; a feed member normally in inoperative relation with said feed-cams and operative by said cams; and a jacquard-actuated variable-movement feed-member shifter controlled by said indicating-actuators and operative for carrying said feed member into operative relation with any selected cam.

45. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a plurality of rotary feed-cams; a feed member normally in inoperative relation with said feed-cams and operative by said cams; and a jacquard-actuated variable-movement feed-member shifter controlled by said indicating-actuators and operative for carrying said feed member into operative relation with any selected cam.



46. The combination, with a jacquard and with a plurality of indicating-actuators carried thereby, of a plurality of feed-cams rotative about a common axis; a feed member normally in inoperative relation with said feed-cams and operative by said cams; and a jacquard-actuated variable-movement feed-member shifter controlled by said indicating-actuators and operative for carrying said feed member into operative relation with any selected cam.

47. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; a jacquard-controlled shifter-actuating indicator; and a feed-member shifter operative by said indicator for carrying said feed member into operative relation with said feed-actuator.

48. The combination, with a jacquard, of a plurality of feed-actuators; a feed member normally in inoperative relation with said feed-actuators and operative by said feed-actuators; a jacquard-controlled shifter-actuating variable-movement indicator; and a variable-movement feed-member shifter operative by said indicator for carrying said feed member into operative relation with any selected feed-actuator.

49. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; a shifter-actuating indicator; a feed-member shifter operative by said indicator for carrying said feed member into operative relation with said feed-actuator; and a jacquard-set indicator-actuator movable from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said indicator.

50. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; a shifter-actuating indicator; a feed-member shifter operative by said indicator for carrying said feed member into operative relation with said feed-actuator; and a continuously-operative jacquard-set indicator-actuator movable from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said indicator.

51. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; a shifter-actuating indicator; a feed-member shifter operative by said indicator for carrying said feed member into operative relation with said feed-actuator; and a jacquard-set indicator-actuator oscillatory between its settable and working positions and normally unset and in inoperative relation with said indicator.

52. The combination, with a jacquard, of a feed-actuator; a feed member normally in inoperative relation with said feed-actuator and operative by said feed-actuator; a shifter-actuating indicator; a feed-member shifter operative by said indicator for carrying said feed member into operative relation with said feed-actuator; a jacquard-set indicator-actuator movable from a settable to a working position, and vice versa, and normally unset and in inoperative relation with said indicator; and resetting means for restoring said indicator-actuator to its normal, unset position after operation.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,  
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