

No. 835,065.

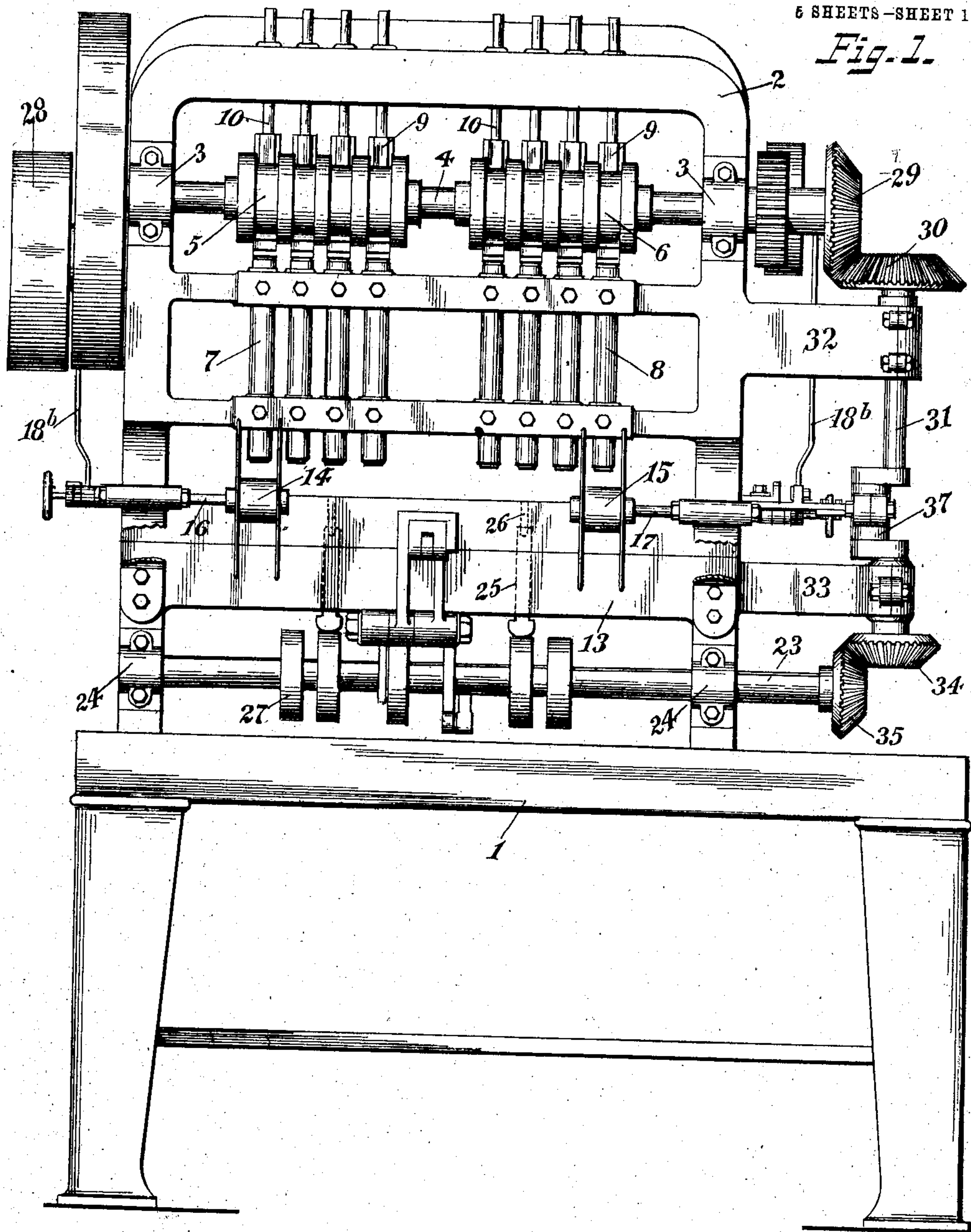
PATENTED NOV. 6, 1906.

A. H. GREENEBAUM.  
AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

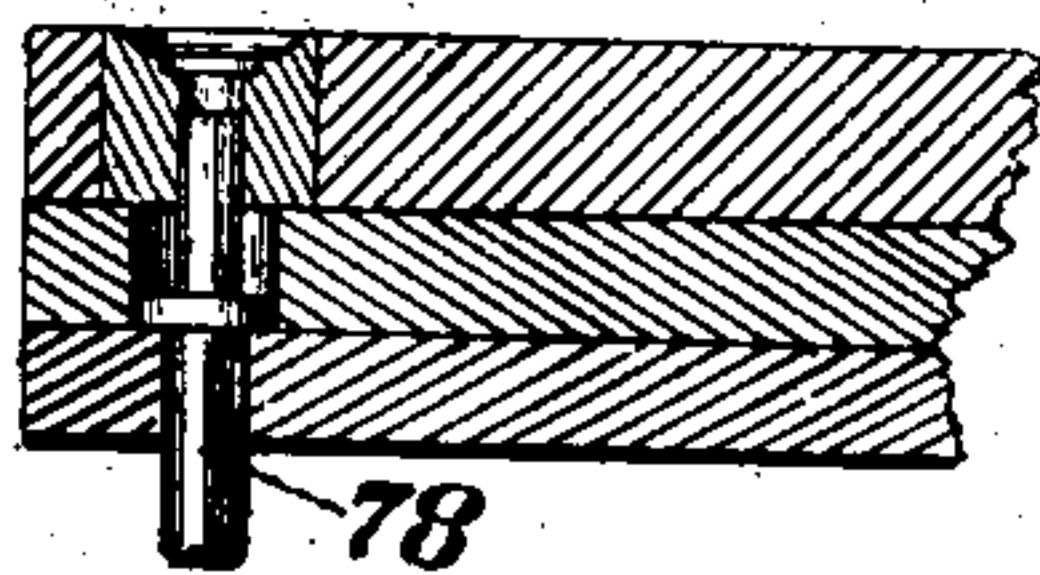
APPLICATION FILED NOV. 16, 1905.

5 SHEETS—SHEET 1

*Fig. 1.*



*Fig. 5.*



Witnesses  
John D. Schulz  
E. Walter Brewington.

Inventor  
Abraham H. Greenebaum  
By Henry S. Brewington  
his Attorney

No. 835,065.

PATENTED NOV. 6, 1906.

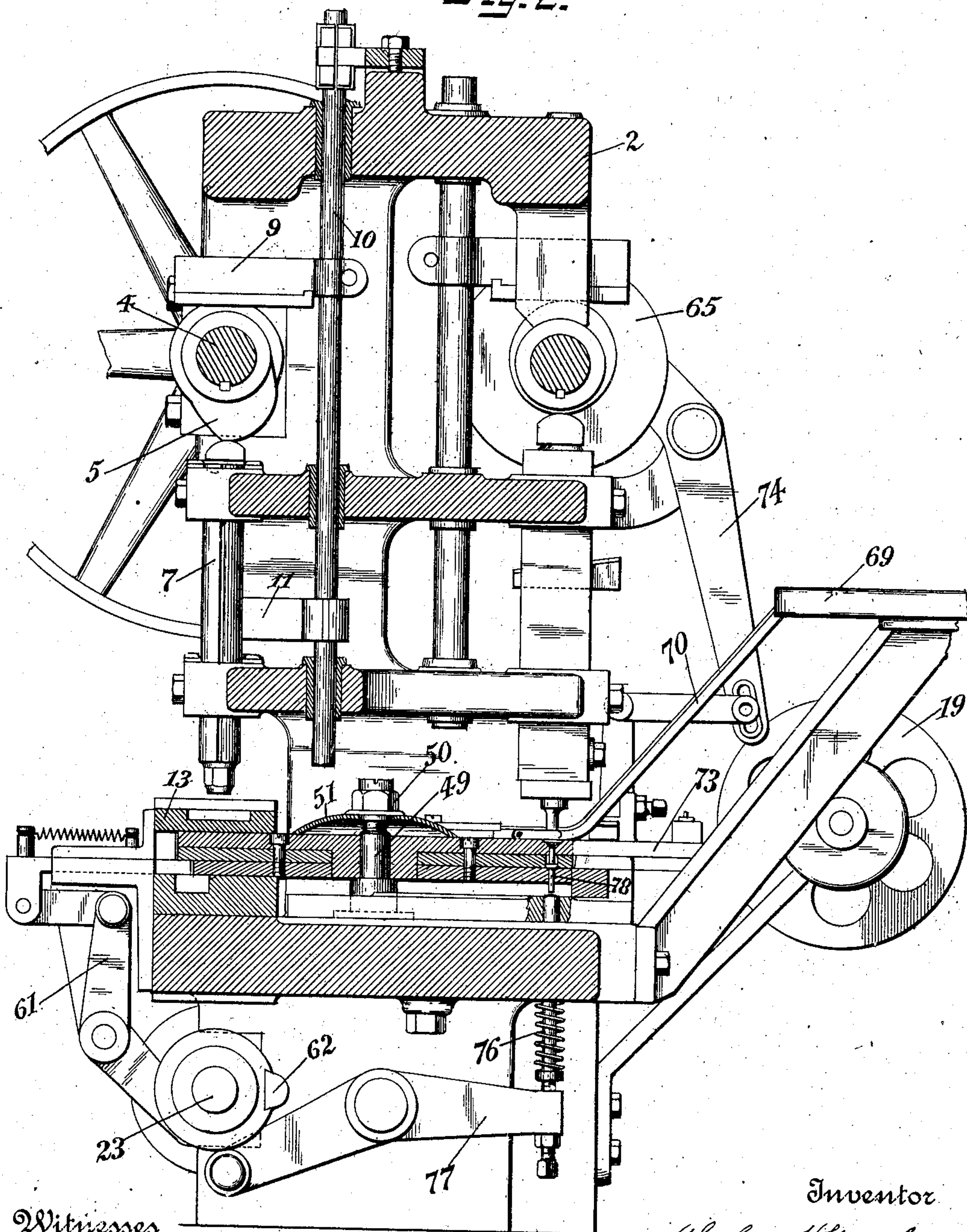
A. H. GREENEBAUM.

AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

APPLICATION FILED NOV. 16, 1905.

6 SHEETS—SHEET 2.

*Fig. 2.*



Witnesses  
John D. Schulz  
E. Walton Brewington.

Inventor  
Abraham H. Greenebaum  
By Henry S. Brewington,  
his Attorney



No. 835,065.

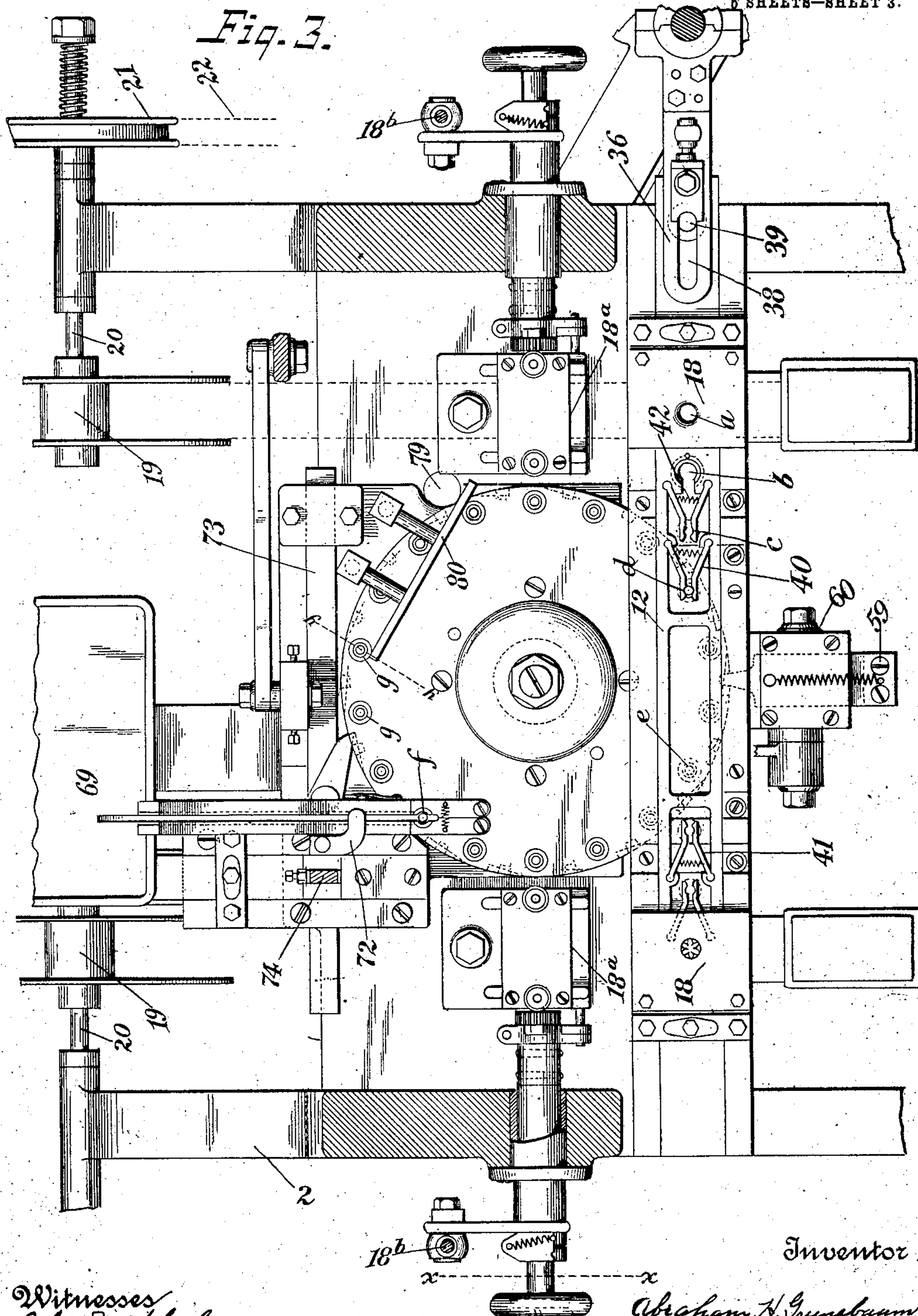
PATENTED NOV. 6, 1906.

A. H. GREENEBAUM.

AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

APPLICATION FILED NOV. 16, 1905.

6 SHEETS—SHEET 3.



Witnesses  
*John J. Schulz*  
*Walter Brewington*

Inventor  
*Abraham H. Greenebaum*  
by *Henry S. Brewington*  
his Attorney

No. 835,065.

PATENTED NOV. 6, 1906.

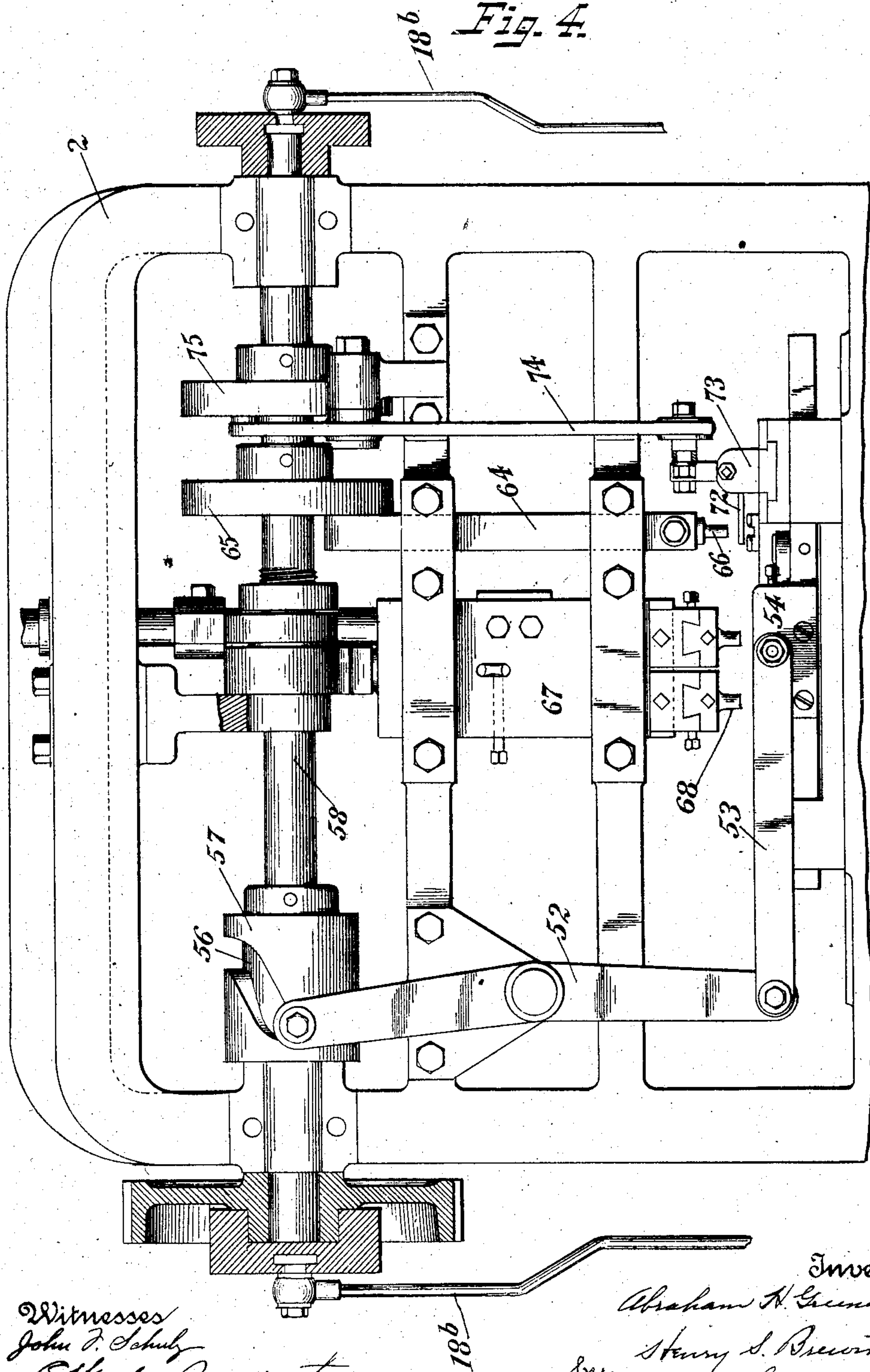
A. H. GREENEBAUM.

AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

APPLICATION FILED NOV. 16, 1905.

6 SHEETS—SHEET 4.

*Fig. 4.*



Witnesses  
John F. Schulz  
E. Walter Brevington

Inventor  
Abraham H. Greenebaum  
by Henry S. Brevington  
his Attorneys



No. 835,065.

PATENTED NOV. 6, 1906.

A. H. GREENEBAUM.

AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

APPLICATION FILED NOV. 16, 1905.

6 SHEETS—SHEET 5.

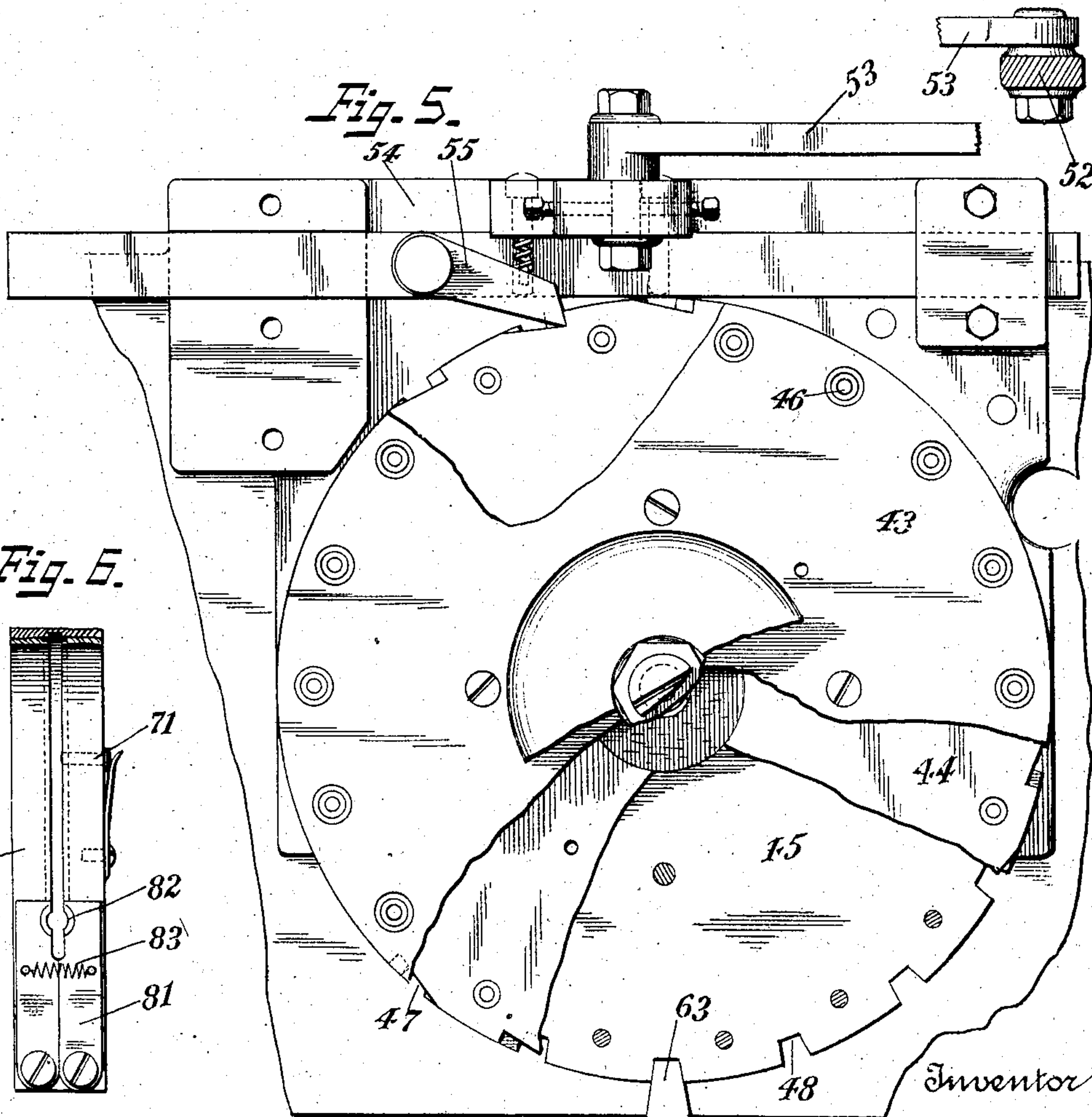
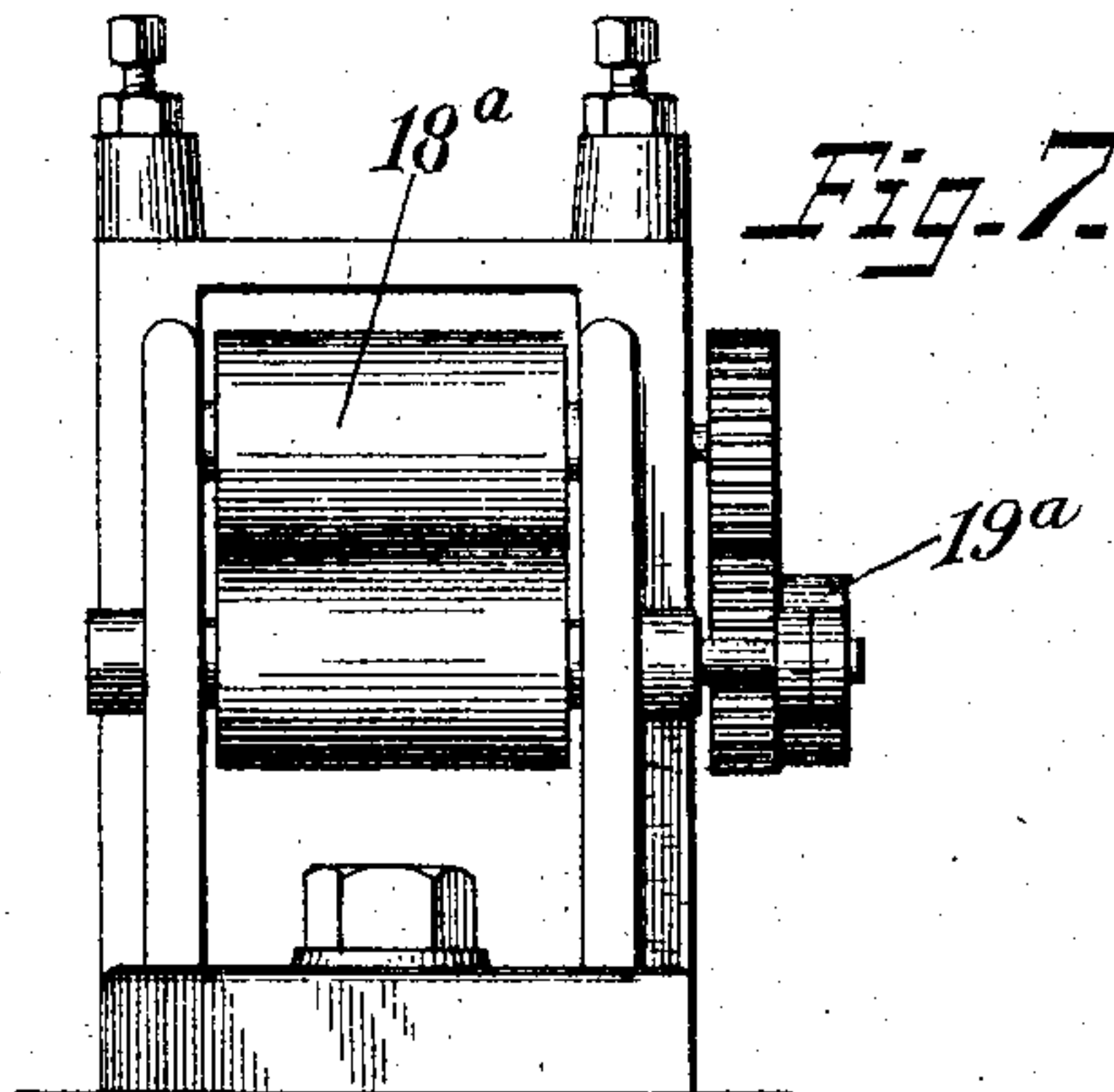
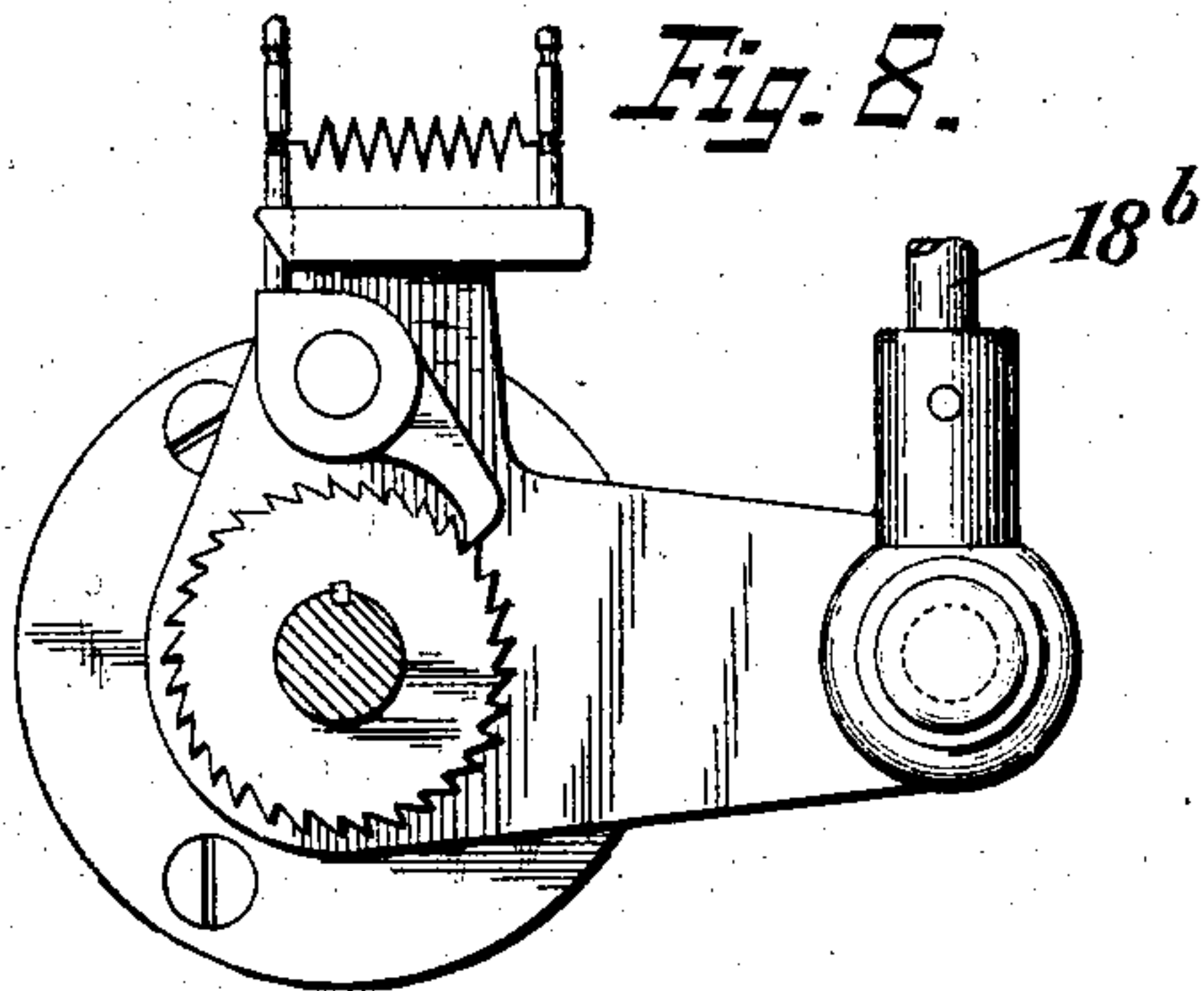
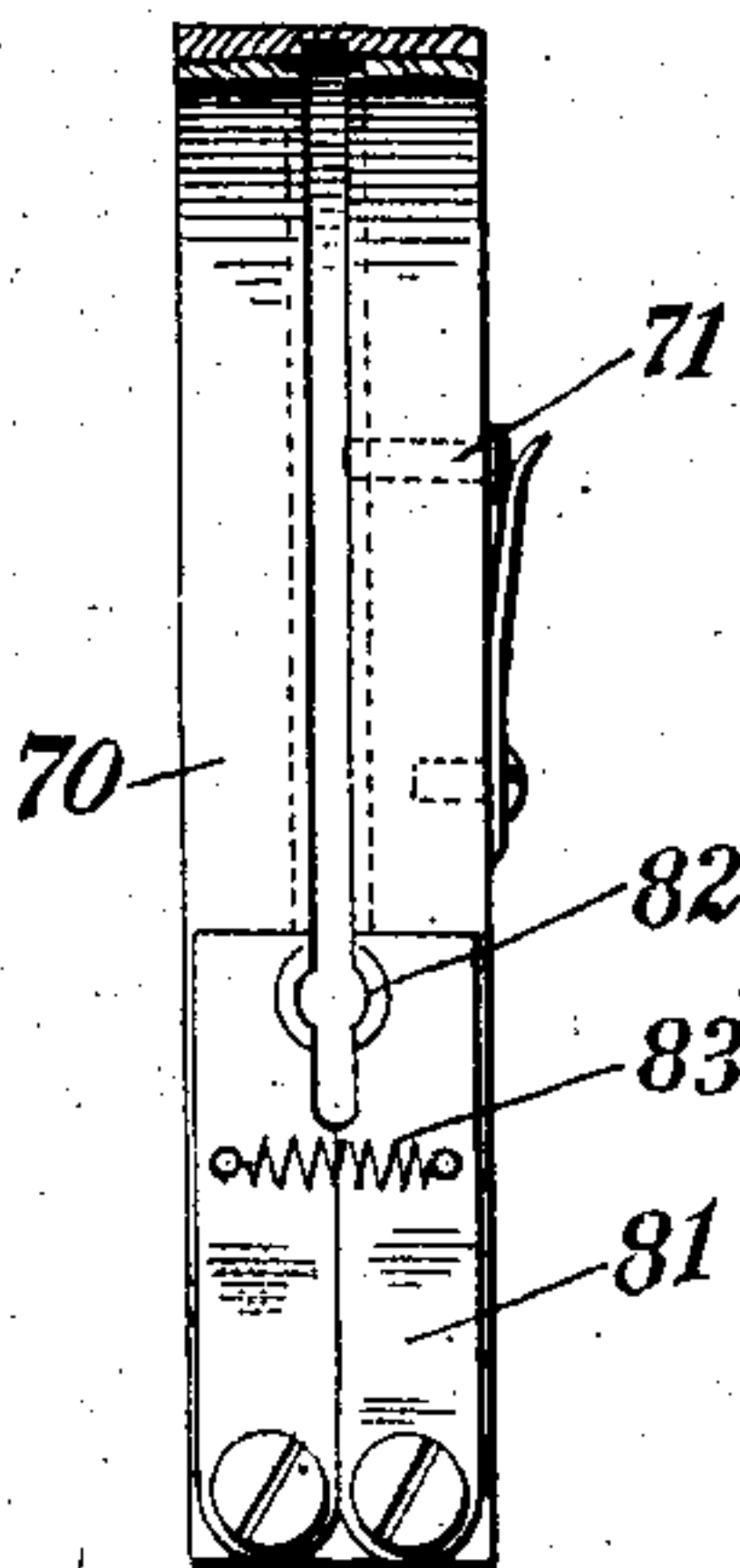


Fig. 5.



Witnesses  
John D. Schulz  
E. Walton Brewington.

Inventor  
Abraham H. Greenbaum  
by Harry S. Brewington,  
Attorney



# UNITED STATES PATENT OFFICE.

ABRAHAM H. GREENEBAUM, OF BALTIMORE, MARYLAND, ASSIGNOR TO  
ALMA MANUFACTURING COMPANY, A CORPORATION OF MARYLAND.

## AUTOMATIC CUTTING, FORMING, AND ASSEMBLING MACHINE.

No. 835,065.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed November 16, 1905. Serial No. 287,735.

*To all whom it may concern:*

Be it known that I, ABRAHAM H. GREENEBAUM, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Automatic Cutting, Forming, and Assembling Machines, of which the following is a specification.

My invention relates to machines for forming and assembling the parts of fastening devices of the class commonly employed as glove and garment fasteners and for analogous uses.

Heretofore machines have been constructed for forming or stamping fastening devices of the character indicated, said machines comprising a plurality of vertically-arranged cam-operated plungers carrying dies, in combination with means for automatically feeding a strip of metal to the first plunger and means for automatically transferring the blank cut by the initial plunger successively to the remaining plungers and discharging the blank after it has been operated upon by the last of the plunger-dies.

The primary object of the present invention is to greatly increase the capacity of machines of this type by utilizing both strokes of the reciprocating slide, which carries the blank-transferring means; and a further important object of the invention is to combine with the plungers and blank-transferring means mechanism for automatically assembling the parts of the fastener, whereby a complete fastener consisting of a plurality of separate elements may be produced on a single machine.

The machine illustrated in the accompanying drawings is designed for the manufacture of fasteners each consisting of three separate parts, two of which parts are formed by the machine, while the third part or element is fed to the assembling mechanism, where it is automatically assembled with the other two elements, all of said elements being then permanently compressed together to form the completed product. It will, however, be understood that the invention is not restricted to the production of this particular species of fasteners, but is of such scope as to embrace and include the production of all such fasteners as the construction of the machine adapts it for producing, and the three-part fastener above referred to is here de-

scribed and shown for convenience of description, and so illustrating one of the specific functions of the improved machine.

Generally stated, the machine comprises a plurality of plungers supported in vertical guides at the front of the machine, a horizontally-reciprocating slide arranged below the plungers, two series of oppositely-disposed spring-fingers for grasping the blank and transferring it to the next adjacent plunger, means for feeding a strip of metal to the initial plunger of each series, and assembling mechanism consisting of a horizontally-supported circular table provided with seats or pockets to receive the blanks as they are delivered from the plungers, means for imparting the required rotary motion to the assembling-table, and means for permitting the feed to the assembling mechanism of the third part or element of the fastener.

In the drawings, Figure 1 is a front elevation of a machine embodying the invention, parts being omitted and broken away for the sake of clearness of illustration. Fig. 2 is a view, partly in elevation and partly in vertical section, the assembling-table being shown in central vertical section. Fig. 3 is a top plan of the machine, parts being shown in horizontal section and the plungers being omitted to afford a clear view of the bed-plate slide and parts associated therewith. Fig. 4 is a rear elevation, partly in section, showing the mechanism for operating the assembling-table. Fig. 5 is a plan view of the assembling-table, partly broken away. Fig. 6 is a detail plan, partly in section, of the feed device of the assembling mechanism. Fig. 7 is an elevation of a pair of rollers for feeding the metal strip to the plungers. Fig. 8 is a section on the line *xx* of Fig. 3, and Fig. 9 is a section on the line *yy* of Fig. 3.

The reference-numeral 1 designates a stand or bench upon which the machine is supported, and 2 a casting secured to the table 1 and serving as the supporting-frame for the mechanism. The frame 2 is provided with bearings 3, within which is mounted a shaft 4. At either side of the longitudinal center of the shaft 4 within the frame is fixed a series of cams (designated, respectively, by the numerals 5 and 6,) each series comprising four independent cams. These cams are in vertical alinement with two series of plungers 7 and 8, supported in bearings in the frame 2 and



adapted to be struck by the cams at each revolution of the shaft 4. This contact of the cams with the upper ends of the plungers effects the downward movement of the plungers, and the reverse or upward movement of said plungers is effected by the contact of the cams 5 and 6 with arms 9, projecting forward from a series of guide-rods 10, supported in suitable bearings of the frame 2. (See Fig. 2.) Each of the guide-rods 10 is connected to one of the plungers by an arm 11.

To the lower end of each of the plungers is attached a suitable die, said dies being adapted to act upon blanks carried by a reciprocating slide 12, supported upon a horizontal die-bed 13 below the plunger.

14 and 15 designate reels supported at the front of the machine upon shafts 16 and 17. Upon each of these reels is wound a strip of sheet metal, (dotted lines, Fig. 3,) the free end of each strip being carried rearward under a perforated guide-plate 18 and between feed-rollers 18<sup>a</sup> to a winding-reel 19, located at the rear of the machine, as shown in Fig. 7. The feed-rolls 18<sup>a</sup> are arranged in pairs within a suitable frame and are geared together. Upon the shaft of the lower roller is any suitable brake device 19<sup>a</sup> to prevent backlash. The shafts of the lower rollers 18<sup>a</sup> are operated by rod connection 18<sup>b</sup> with the shaft 58 through any suitable connections, such as pawl-and-ratchet mechanism. (Shown in Fig. 8.) These guide-plates 18 are so located with relation to the plungers that the outermost plunger of each series is in exact alinement with the perforation in the adjacent plate to adapt it to pass therethrough and punch out a blank from the metal strip. The receiving or winding reels 19 are mounted upon shafts 20, each driven by a pulley 21, connected by a belt 22 with a shaft 23, supported in bearings 24 of the frame below the die-bed 13.

The die-bed 13 is formed with a series of openings 25, serving as female dies and corresponding in number to the plungers. Within each of the openings 25 is arranged an ejecting-pin 26, adapted to be operated by a series of cams 27 on the shaft 23, as best seen in Fig. 1 of the drawings.

Upon one end of the shaft 4 is mounted a clutch-pulley 28, adapted to be connected by a driving-belt with any source of power. Upon the opposite end of the shaft 4 is mounted a bevel-gear 29, meshing with a corresponding gear 30, fixed to the upper end of a crank-shaft 31, supported in bearings formed in projecting parallel arms 32 and 33 of the frame. Upon the lower end of the crank-shaft 31 is mounted a bevel-gear 34, meshing with a bevel-gear 35 on the end of the shaft 23, and thus serving to drive said shaft from the shaft 4.

The reciprocation of the slide 12 upon the die-bed 13 is effected by means of a pitman 36, connecting the outer end of the slide with

the crank 37 of the crank-shaft 31, the inner end of said pitman having an elongated slot 38 to receive a pin 39, projecting from the slide, and thus provide a loose connection between the slide and the pitman.

Upon the slide 12 are arranged two series of spring-fingers 40 and 41, said fingers being arranged in pairs and pivotally secured at one end, a spring 42 being interposed behind the fingers of each pair. The function of these spring-fingers is to grasp the blank and hold it in position to be operated upon by the next plunger-die as the blank is carried along by the movement of the slide.

It will be noted that the two series of pairs of spring-fingers are oppositely disposed, the result of such arrangement being that each series of fingers carries the blanks toward the center of the machine in position to be delivered to the assembling-table, and this peculiar arrangement of the fingers insures a delivery of blanks to the assembling-table at each stroke or movement of the reciprocating slide. In other words, upon the inward movement of the slide the pairs of fingers 40 will deliver blanks to the assembling-table, while upon the outward movement of the slide the fingers 41 will deliver blanks.

Referring now to the mechanism for assembling the different parts of the fastener, I employ a revoluble table consisting, as clearly shown in Fig. 5, of three concentric disks 43, 44, and 45. The upper disk 43 is formed near its periphery with equidistant openings or pockets 46. The intermediate disk 44 is formed with peripheral ratchet-teeth 47, and the under disk 45 is provided with equidistant peripheral notches 48. The table is centrally mounted upon a stud 49 and revolubly secured thereon by a nut 50 and washer-plate 51. The revolution of the table is effected by means of a lever 52, fulcrumed at the rear of the frame 2, a link 53, pivotally secured to the lower end of the lever 52, and a slide 54, moving in a guideway of the frame, and a pawl 55, projecting from the slide 54. The upper end of the lever 52 is provided with a pin which projects into the slot 56 of a barrel-cam 57, mounted upon a shaft 58, supported in bearings of the frame. The pawl 55 engages successively the ratchet-teeth of the central disk 44 of the table, and thus the required intermittent rotary movement of the table is insured. A locking device is provided at the front of the machine to lock the assembling-table while the latter is at rest. This device comprises a slide 59, supported in a guide-block 60, and a lever 61, connected to the slide 59 and adapted to be struck by a cam 62 on the shaft 23. The rear end of the slide 59 is reduced to form a tooth 63, adapted to engage the notches in the lower disk 45 of the table and lock the table against movement until the slide is withdrawn. Referring now particularly to



Fig. 4 of the drawings, 64 designates a vertically-movable slide supported in bearings of the frame and adapted to be operated by a cam 65 on the shaft 58. The lower end of the slide 64 carries a tool 66 for uniting the parts of the fastener. A slide 67, also supported in bearings of the frame, carries tools 68, which perform the finishing step in the assembling of the parts of the fastener.

69 designates a hopper or feed-box, within which the third part or element of the fastener is fed through a slotted tube 70 to the assembling-table. This tube is inclined, as shown, so that the eyelet (or other part of the fastener) is fed by gravity through the tube until its movement is arrested by a spring-pressed pin 71, Fig. 6. The eyelet is released by a finger 72, secured to a stud on a slide 73, operated by a lever 74, actuated by a cam 75 on the shaft 58.

76 designates a spring-encircled stud supported in a guideway below the point where the final step in the joining of the parts of the fastener occurs. This stud is actuated by a lever 77, operated by a cam on the shaft 23 to elevate the die-pin 78 and effect the required upsetting operation. The completed fastener is then pushed up to the surface of the upper disk of the table by a raiser and scraped off into a discharge-opening 79 by means of a stationary stripper-plate 80.

At the lower end of the tube 70 are two coöperating pivoted fingers 81, formed with seats 82 to embrace the eyelet and connected by a spring 83.

The general operation of the mechanism has been disclosed in the foregoing description of its construction; but the detail operation may be briefly explained, as follows:

Two strips of sheet metal are fed to the machine simultaneously, passing from the front reels 14 and 15 under the perforated guide-plates 18 and thence between the feed-rolls 18<sup>a</sup> to the rear winding-reels 19. The first plunger 8 punches a blank from one of the strips, and this blank is then carried by the first pair of fingers 40 to the next plunger 8, and so on until each of the four plungers 8 has acted on it. The function of the last plunger is to force the blank into an adjacent pocket in the assembling-table, which extends below the bed-plate slide. On the reverse or right-hand movement of the slide the plungers 7 operate upon the other metal strip. Referring to Fig. 3 of the drawings, one blank is first punched at the point *a*. It is next operated upon at the point *b* and again at the point *c*. At the point *d* it is forced into one of the pockets of the assembling-table. It should be here explained that while the punches 8 are operating upon the strip of metal to form one part of the fastener the punches 7 are at rest, the cams being so disposed as to insure this result, and when the plungers 8 are raised the plungers 7

operate upon their metal strip to form another part of the fastener, which part when formed is delivered at the point *e* on the table. The movement of the table then continues until the point *f* is reached, where the third part of the fastener is forced down upon the other two by the tool 66. The continued movement of the table brings the united parts under the tools 68 at the points *g*. The arrangement and timing of the cams are such that the bed-plate slide moves to the left for a time corresponding to ninety degrees of the circle described by the table, and then is at rest for a corresponding time. It then moves to the right for a similar time and again rests. The table moves while the slide travels to the left and then rests until the right-hand stroke of the slide is completed.

I would have it understood that the invention is not restricted to the details of construction here shown and described, but comprehends and includes all such variations and modifications in the form and relative arrangement of the detail elements as may be included within the scope and terms of the appended claims, it being my especial purpose to cover, broadly, the association and combination in a single organized machine of means for forming the parts of a composite fastener and means for assembling such parts into a finished product.

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

1. A machine for manufacturing fasteners comprising a series of plungers for forming one part of the fastener, a second series of plungers for forming another part of the fastener, a slide adapted to reciprocate below the plungers and to deliver blanks to one series of plungers at one stroke, and to the other series of plungers at the reverse stroke.

2. In a machine for manufacturing fasteners two independent series of plungers carrying dies, in combination with a reciprocating slide arranged below the plungers, and two oppositely-disposed series of spring-fingers carried by said slide.

3. In a machine for producing fasteners, the combination with two series of vertically-disposed plungers, and means for feeding strips of metal thereto, of a reciprocating slide, spring-fingers supported on said slide, and means for operating said plungers so that one series thereof operates upon a blank at one movement of the slide, and the other series operates upon a blank on the reverse movement of the slide.

4. In a machine for manufacturing fasteners, the combination with two series of vertical punches adapted to operate alternately, of a horizontal slide and means carried thereby for transferring a blank from one punch to another.



5. In a machine for manufacturing fasteners, the combination with two series of vertical punches, of a horizontal slide, spring-fingers on said slide, said fingers being arranged  
5 in two oppositely-disposed series, one series being adapted to operate on the inward movement of the slide, and the other series on the outward movement thereof.

6. In a machine for manufacturing fasteners, the combination with two series of vertical punches of an upper cam-shaft for raising and lowering said punches, a lower cam-shaft, an assembling-table, means for uniting  
10 the parts of the fastener in said table, and means operated by said lower cam-shaft for raising the completed fastener to the surface of said table.

7. In a machine for manufacturing fasteners, the combination with an assembling-table, of a cam-shaft, and means operated  
20 thereby for revolving said table.

8. In a machine for manufacturing fasteners, the combination with an assembling-table, of a cam-shaft, and means operated  
25 thereby for revolving said table comprising a slide-block and pawl, and a lever operated by said cam-shaft and having a link connection with said slide-block.

9. In a machine for manufacturing fasteners, the combination of two series of vertical punches adapted to operate alternately, of a horizontal slide and means carried thereby for transferring a blank from one punch to another and means for operating said series  
30 of punches alternately, of a horizontal slide and a crank-shaft for imparting a reciprocating movement thereto, substantially as described.

10. In a machine for manufacturing fasteners the combination with two series of vertical punches of a horizontal slide, spring-fingers on said slide, said fingers being arranged in two oppositely-disposed series, one series being adapted to operate on the inward  
45 movement of the slide and the other series on the outward movement thereof, of cams for operating said series of punches alternately, of a horizontal slide and perforated guide-plates for said slide, substantially as described.  
50

11. In a machine for manufacturing fasteners, comprising a series of plungers for forming one part of the fasteners, a second series of plungers for forming another part of the fastener, a slide adapted to reciprocate below the plungers and deliver the blanks to one series of plungers at one stroke and to the other series of plungers at the reverse stroke in combination with an assembling-table  
55 comprising three eccentric disks, means for revolving the said table and mechanism for locking the table against movement, substantially as described.

12. In a machine for manufacturing fasteners two independent series of plungers

carrying dies, in combination with a reciprocating slide arranged below the plungers and two oppositely-disposed series of spring-fingers carried by said slide with means for forming parts of the fastener, of a revoluble  
70 assembling-table formed with pockets to receive said parts, a feed-tube for supplying other parts to the table a punching-tool for uniting all the parts, a finishing-tool for compressing the parts together and means for  
75 discharging the completed fastener from the table, substantially as described.

13. In a machine for manufacturing fasteners two independent series of plungers carrying dies in combination with a reciprocating slide arranged below the plungers and two oppositely-disposed series of spring-fingers carried by the said slide-rollers for feeding the strips to the plungers, reels at the front of the machine carrying strips, and  
80 winding-reels at the rear of the machine, substantially as described.

14. In a machine for manufacturing fasteners two independent series of plungers carrying dies in combination with a reciprocating slide arranged below the plungers and two disposed series of spring-fingers carried by the slide, a revoluble assembling-table comprising three concentric disks, one of which is provided with equidistant pockets, another with peripheral ratchet-teeth, and the third with peripheral notches of an actuating-pawl and a locking device and means for forcing parts of the fastener into said pockets and means for forcing the complete  
95 fastener out of said pockets substantially as described.

15. In a machine for manufacturing fasteners, the combination of two series of vertical punches adapted to operate alternately of a horizontal slide and means for transferring a blank from one punch to another of an assembling-table, a feed-tube for supplying another part to the table and means for removing said other part from the feed-tube, comprising spring-fingers and a vertically-movable tool substantially as described.  
100

16. In a machine for manufacturing fasteners the combination of two series of vertical punches adapted to operate alternately of a horizontal slide and means carried thereby for transferring a blank from one punch to another of an assembling-table provided with pockets to receive said parts, means for revolving said table, a locking device for securing the table against movement, comprising an automatic slide to engage notches in the periphery of the table substantially as described.  
110

17. In a machine for manufacturing fasteners, the combination with two series of vertical punches adapted to operate alternately of a horizontal slide and means carried thereby for transferring a blank from one punch to another, of cams for operating said series of  
125



punches alternately, of a horizontal reciprocating slide and perforated guide-plates for said slides substantially as described.

5 18. In a machine for manufacturing fasteners, the combination with two series of vertical punches adapted to operate alternately of a horizontal slide, and means carried thereby for transferring a blank from one punch to another, cams for operating the said series of  
10 punches of a series of guide-rods arranged in rear of the punches, connections between said punches and rods, a series of cams for raising and lowering the punches and guide-rods, substantially as described.

15 19. In a machine for manufacturing fasteners the combination with two series of vertical punches adapted to operate alternately, of a horizontal slide means for forming parts of the fastener, of an assembling-table provided with pockets to receive said parts, a  
20 tube for feeding another part of the fastener to the table, said table being provided with a spring-pressed pin to arrest the feed substantially as described.

25 20. In a machine for manufacturing fasteners, the combination with two series of vertical punches, of an upper cam-shaft for raising and lowering said punches, a lower cam-shaft, an assembling-table, means for uniting  
30 the parts of the fasteners in said table and means operated by said lower cam-shaft for raising the complete fastener to the surface

of said table a slotted feed-tube for supplying part of the fastener thereto, of a finger extending over the slot in the tube substantially as  
35 described.

21. In a machine for manufacturing fasteners the combination with two series of vertical punches of an upper cam-shaft for raising and lowering said punches, a lower cam-shaft  
40 an assembling-table, means for uniting the part of the fastener in said table and means operated by said lower cam-shaft for raising the completed fastener to the surface of said  
45 table of a cam-shaft and vertically-reciprocating tools operated by said cam-shaft for uniting the parts of the fastener on said table substantially as described.

22. In a machine for manufacturing fasteners, the combination with an assembling-  
50 table, of a cam-shaft, and means operated thereby for revolving said table comprising a slide-block and pawl, and a lever operated by said cam-shaft and having a link connection  
55 for raising the completed fastener to the surface of the table and a scraper for discharging the fasteners from the table, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ABRAHAM H. GREENEBAUM.

Witnesses:

E. WALTON BREWINGTON,

MARY M. MAGRAW.