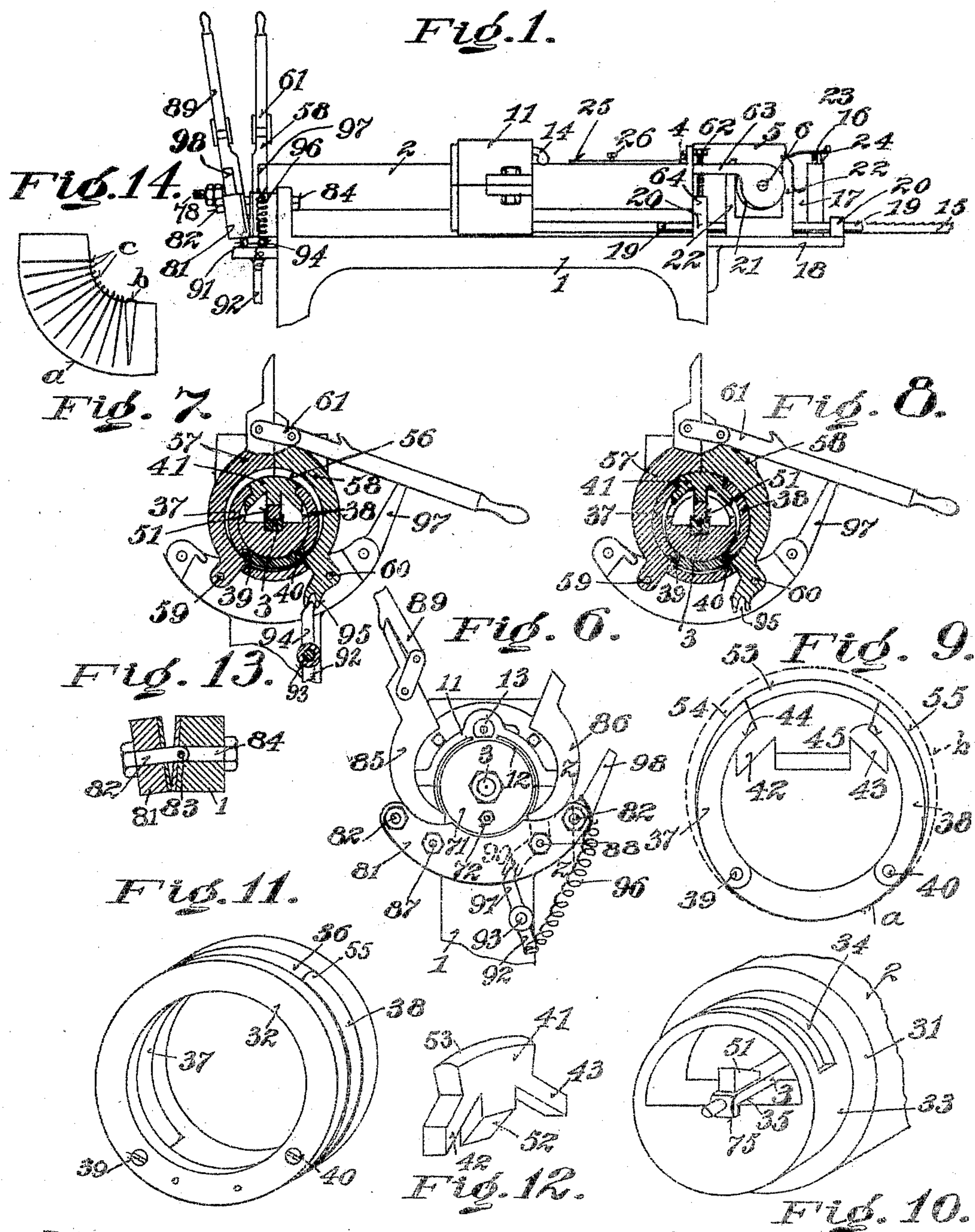


A. P. TUCKER.
ELBOW MACHINE.

APPLICATION FILED MAY 28, 1904.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses.

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Inventor.

Andrew P. Tucker,
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No. 776,038.

PATENTED NOV. 29, 1904.

A. P. TUCKER.
ELBOW MACHINE.

APPLICATION FILED MAY 26, 1904.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 2.

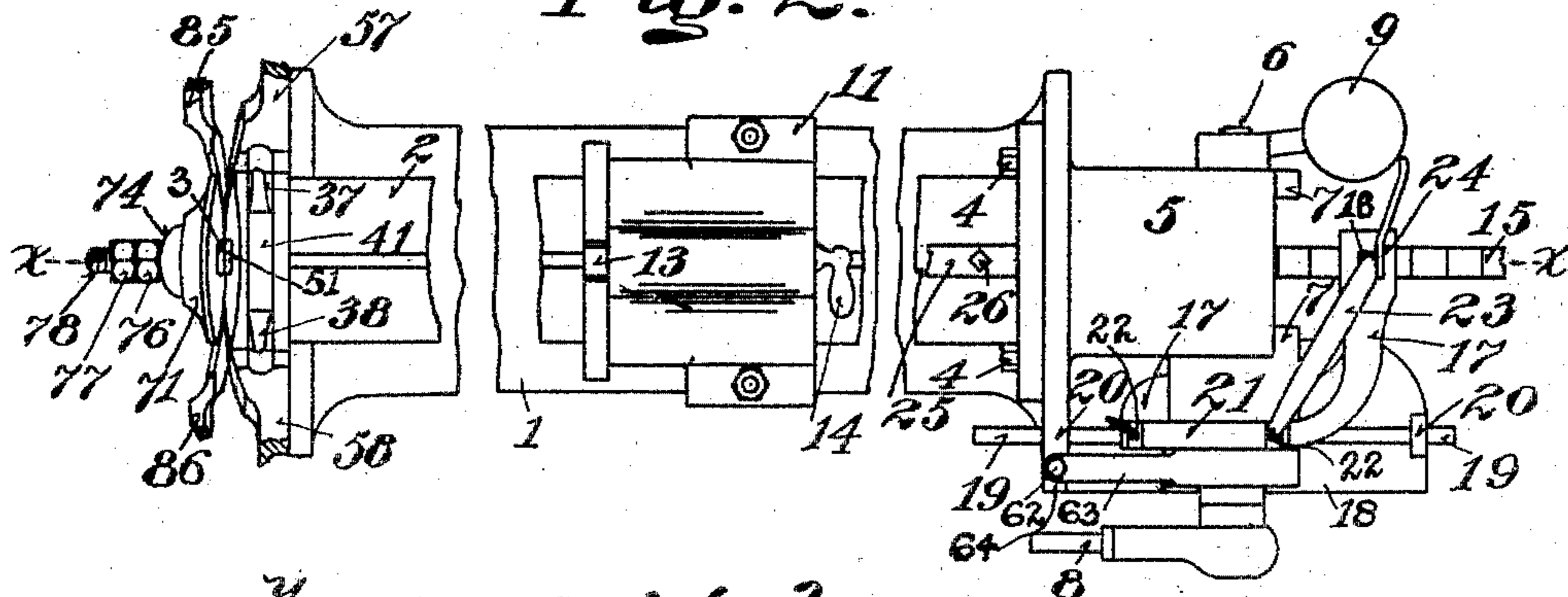


Fig. 3.

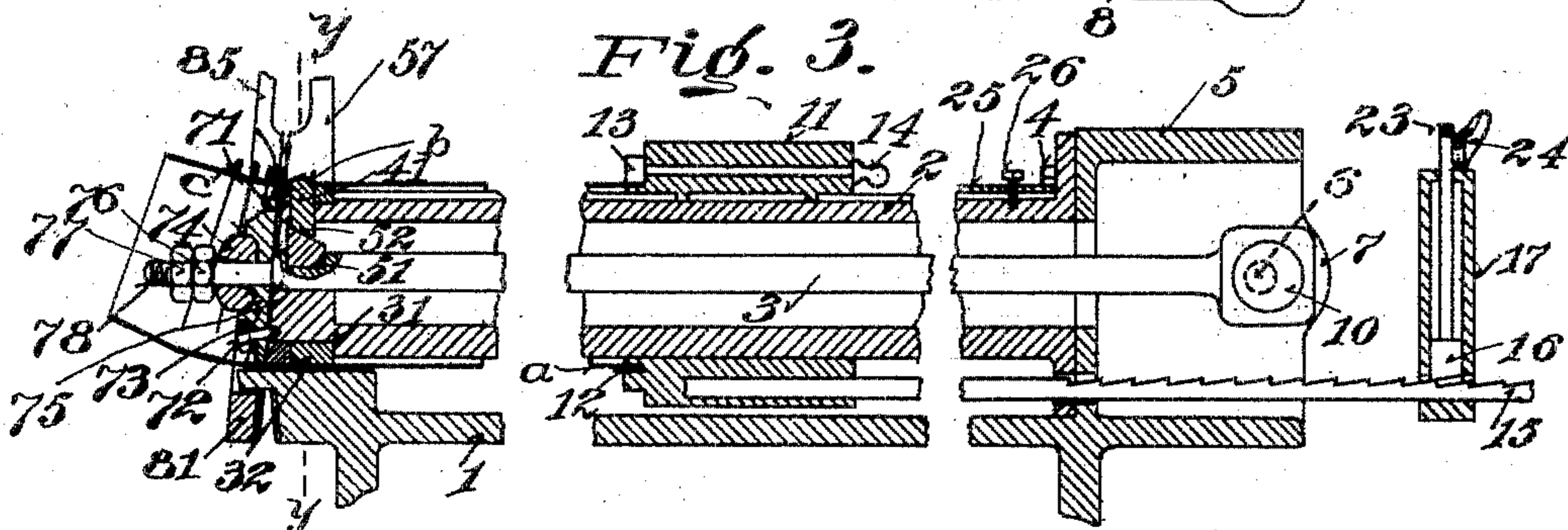


Fig. 4.

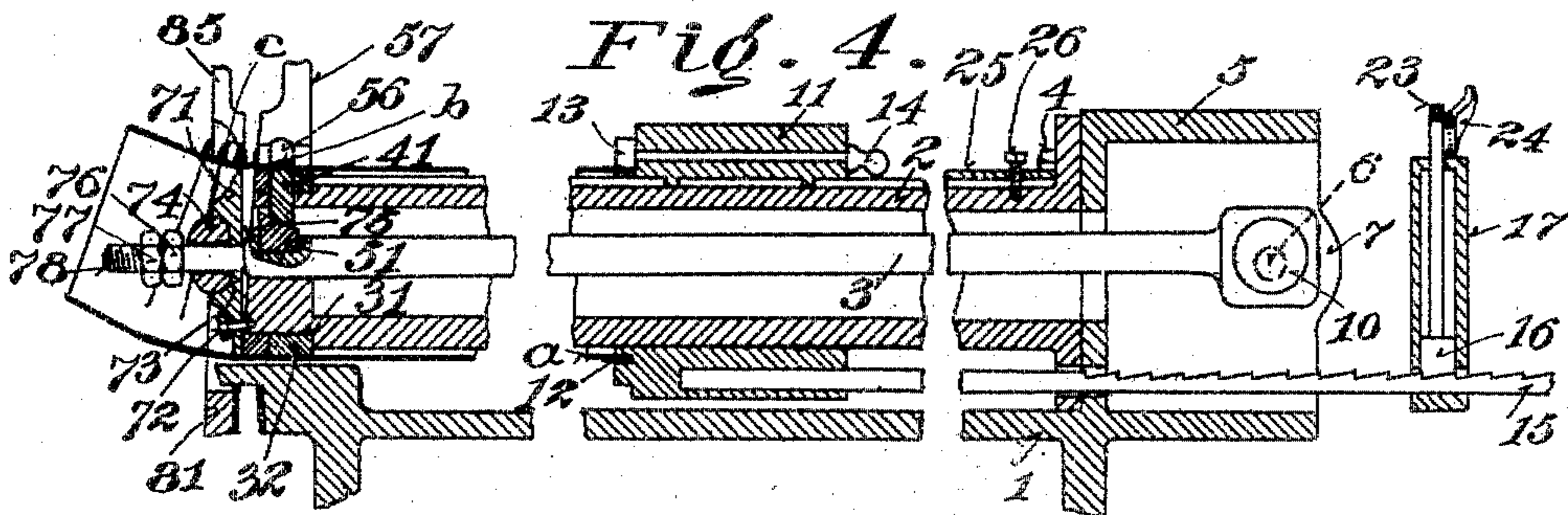
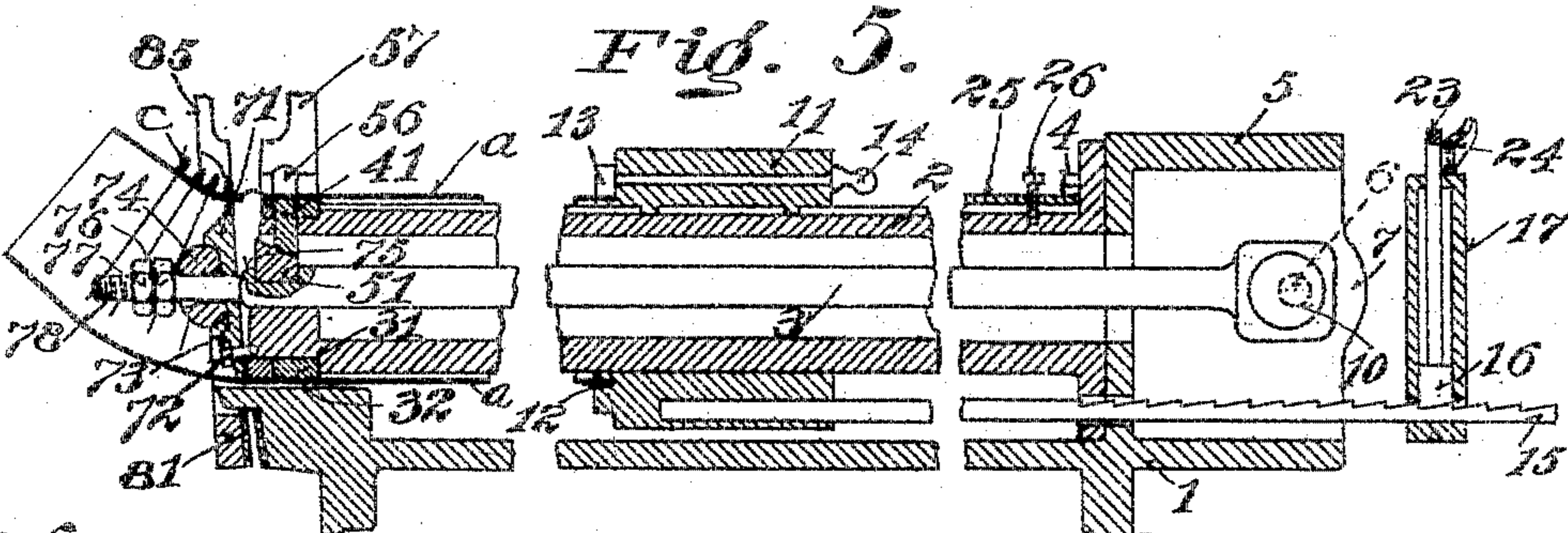


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELBOW-MACHINE.

SPECIFICATION forming part of Letters Patent No. 776,038, dated November 29, 1904.

Application filed May 26, 1904. Serial No. 209,960. (No model.)

To all whom it may concern:

Be it known that I, ANDREW P. TUCKER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Elbow-Machines, of which the following is a specification.

My invention relates to elbow-machines employed in bending or crimping pipe for forming an elbow therein, and has for its object the providing of improvements in a machine of this character whereby the operation is expedited and an improved article produced, and the invention will be readily understood from the following description and claims and from the drawings, in which latter—

Figure 1 is a side elevation of my improved device. Fig. 2 is a plan view of the same partly broken away. Figs. 3, 4, and 5 are longitudinal vertical sections of the same on the line *xx* of Fig. 2, partly broken away, showing the parts in relatively different positions assumed during operation. Fig. 6 is an end elevation of my improved device partly broken away. Fig. 7 is a cross-section on the line *yy* of Fig. 3, showing the inner bulge-forming dies in collapsed relation. Fig. 8 is a similar view showing the inner bulge-forming dies in expanded relation. Fig. 9 is a diagram view showing the inner bulge-forming dies and their relation to the bulge formed thereby. Fig. 10 is a perspective view of the mandrel end, broken away, showing the seat for the inner bulge-forming die-head. Fig. 11 is a perspective view of the inner bulge-forming die-head. Fig. 12 is a perspective view of the bulge-forming and die-expanding die. Fig. 13 is a sectional detail of the pivotal connection of the swinging jaw-frame, taken on the line *zz* of Fig. 6; and Fig. 14 is a side elevation of an elbow, showing the crimps and a bulge therein.

The frame 1 stationarily supports a hollow mandrel 2, in which there is a longitudinally-movable rod 3. The hollow mandrel is preferably connected at one end to the frame, as by bolts 4 taking into the housing 5 on the frame. A rock-shaft 6 is journaled in bearings 7 7 in the housing and has an operating

device, as a lever 8 and counterbalance-weight 9, attached thereto. The rock-shaft has a crank 10, about the journal of which one end of the rod 3 is journaled. A feed-collar 11 takes about and slides longitudinally of the mandrel. It has an annular slot 12 in its end for receiving one end of the pipe-blank *a*, which it is intended to form into an elbow, the pipe-blank being clamped to the collar by a clamp 13, shown as a cam-clamp operated by a handle 14. The collar is given a step-by-step movement by having a rack-bar 15 secured thereto. The teeth of the rack-bar are engaged by a pawl 16, mounted in a reciprocating frame 17, supported on a bracket 18 and having rods 19 sliding in bearing 20. The rock-shaft 6 has an eccentric 21 engaging walls 22 22 on the frame 17 for reciprocating the same. A spring 23 depresses the pawl into engagement with the rack-bar, and a trip 24 releases this engagement for permitting the collar to be retracted, the collar when retracted striking a stop 25, secured on the mandrel by a bolt 26. Various sizes of stops may be used for accommodating different lengths of pipe.

The mandrel is provided at its free end with an annular rabbet 31, forming a seat for an expanding die-head 32. The reduced part 33 on the mandrel has a slot 34 and a bearing 35, in which the rod 3 slides. The head 32 has a slot 36, in which side bulge-forming dies 37 38 are pivoted on pivots 39 40. Intermediate bulge-forming die 41 takes into the slots 34 36, thereby locking the head on the mandrel. It also takes between the side dies 37 38. The dies 37 38 are pivoted, as stated, respectively, at 39 40, the radii of the mandrel bisecting the pivots being approximately at an angle of ninety degrees relatively to each other. The die 41 is movable transversely of the mandrel between the dies 37 38 and has lateral wings 42 43, forming shoulders at the respective sides thereof, contacting engaging faces 44 45, respectively, on the dies 37 38, thereby forming a bulge-forming and die-expanding die. These shoulders and engaging faces are preferably inclined with relation to each other.

The rod 3 has a wedge 51 fixed thereon en-

gaging the correspondingly-inclined inner end face 52 of die 41. When the rod 3 is moved longitudinally for causing the wedge 51 to move under the face 52, the die 41 is caused to move outwardly, the shoulders thereon engaging the contact-faces on the dies 37 38, causing those dies to swing outwardly on their pivots. The dies 41 37 38 are respectively provided with outer bulge-forming rounded faces 53 54 55, forming ribs which press the metal of the pipe into the grooves 56 of outer arms 57 58, pivoted, respectively, at 59 60 to the frame and connected at their free ends by a toggle-lever 61 for forming an outer die or bulge-forming matrix for the bulge *b*. In forming the elbow the bulge is formed only part way around the periphery of the pipe, preferably all but approximately ninety degrees being thus bulged, the bulge beginning almost imperceptibly and increasing in width and depth from its ends toward its middle. In order that this increase may be gradual and for forming the best-shaped pipe, I have pivoted the side dies 37 38 closely adjacent the outer periphery of the head and at approximately the point of beginning of the outward bulge and move the swinging ends of the side dies outwardly by the middle die 41, thereby insuring regularity in increase of the bulge toward its middle irrespective of the final depth given the bulge. This construction causes the circle formed by the bulge (see *b*, Fig. 9) to be substantially coincident with the circle of the pipe proper (see *a*, Fig. 9) at and between said pivotal points. The length of endwise movement given the rod 3 is regulated by the set-bolt 62 in an arm 63, secured to the rock-shaft, the bolt striking a lug 64 on the frame. This construction selectively regulates the protrusion of the die 41, which in turn affects the outward swinging movement of the dies 37 38 for always causing regularity in increase of the bulge toward its middle irrespective of the depth of the bulge. The bulge is next formed into a crimp *c*. An inner plate 71 is loosely pivoted with relation to the mandrel on a bolt 72. At its front face the inner plate has a rounded seat 73, a collar 74, having corresponding seat, taking against the seat 73. The rod 3 has a rounded shoulder 75, against which the rear face of the inner plate 71 takes. Nuts 76 77 take over the threaded end 78 of the rod. The plate 71 is loosely held between the shoulder 75 and the collar 74. A swinging frame 81 is pivoted to the main frame on bolts 82, each of which latter is pivoted at 83 to a bolt 84, secured to the main frame. Clamping-arms 85 86 are pivoted to the swinging frame on bolts 87 88, the free ends thereof being connected by a toggle-lever 89. These clamping-arms clamp the pipe between them and the plate 71. The pivotal axis of the swinging frame 81 coincides substantially in horizontal plane with the pivotal axis of the

plate 71, so that the frame and plate may swing together.

The arm 86 is provided with a mouth 90, into which a finger 91 on a foot-lever 92 takes loosely. The foot-lever rocks on a bolt 93, secured to the frame. The foot-lever also has a finger 94 thereon which takes into a mouth 95 on the arm 58. When the outer dies are to be closed, the foot-lever is rocked, which swings the arms 86 58 inwardly into position for receiving the toggle-levers 89 61, respectively, a spring 96 taking between the frame and foot-lever for normally holding those arms outwardly. When the levers 61 and 89 are thrown to connect the arms 57 58 and 85 86, respectively, they respectively strike stops 97 98, respectively, on the main frame and swinging frame 81.

In operation, the outer clamping-jaws having been closed, the rearward longitudinal movement of the rod 3 causes the die 41 to move outwardly, which in turn swings the dies 37 38 for forming the bulge and simultaneously causes the swinging frame 81 to move toward the bulge-forming dies, thereby crimping a previously - formed bulge, the parts being then in the relative positions shown in Fig. 3, the pawl being on the rear end of the rack-teeth, the crank-journal of crank 10 being also thrown rearwardly, and the inner bulge-forming dies expanded. The outer clamping-jaws are then relieved, the crank-shaft rocked, advancing the pawl 16 into contact with the tooth at the front thereof, throwing the crank-journal upwardly and the wedge 51 forwardly, permitting partial retraction of the inner bulge-forming dies away from the bulge formed in the pipe, the parts assuming the positions shown in Fig. 4. The rocking of the shaft being continued, the wedge moves still farther forward, permitting complete retraction of the inner bulge-forming dies. The pawl moving forwardly in contact with the tooth of the rack moves the feed-collar forwardly, thereby feeding the pipe blank forwardly into position for receiving its next bulge and having its bulge just formed creased into a crimp, the crank-journal being thrown into forward position, as seen in Fig. 5. The die 41 readily falls inwardly into the head, or the contact-faces between the die 41 and the dies 37 38 readily permit retraction of the dies by the contact of the pipe therewith, the retraction of the dies removing obstruction to the free feeding of the pipe.

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

1. In an elbow-machine, the combination of outer bulge-forming dies having grooves forming a matrix, inner bulge-forming pivoted dies, an intermediate inner bulge-forming die between said pivoted dies, said inner dies having ribs for said grooves, said inter-

mediate inner die having shoulders and said inner pivoted dies having contact-faces contacted by the latter, said grooves, ribs, shoulders and contact-faces located in the same transverse plane, and constructed and arranged substantially as described.

2. In an elbow-machine, the combination of outer bulge-forming dies having grooves forming a matrix, inner bulge-forming pivoted dies, an intermediate inner bulge-forming die between said pivoted dies, said inner bulge-forming dies having ribs located in the transverse plane of said grooves, said inner pivoted dies having contact-faces and said intermediate inner die having shoulders for the latter located inside of and in the same transverse plane with said contact-faces, and means moving said intermediate inner die outwardly, and constructed and operating substantially as described for pressing material of the pipe outwardly into the grooves of said outer bulge-forming dies.

3. In an elbow-machine, the combination of outer bulge-forming dies having grooves forming a matrix, inner bulge-forming pivoted dies, an intermediate inner bulge-forming die between said pivoted dies, said inner bulge-forming dies having ribs located in the same transverse plane with said grooves, said intermediate inner die having shoulders moving with said intermediate inner die and said inner pivoted dies having contact-faces for said shoulders moving with said inner pivoted dies, said shoulders and contact-faces located in the same transverse plane, and means moving said intermediate inner die outwardly whereby the shoulders thereon press against the contact-faces of the inner pivoted dies and press the latter outwardly, pressing the material of the pipe outwardly into the grooves of said outer bulge-forming dies, substantially as described.

4. In an elbow-machine, the combination of outer bulge-forming dies having grooves therein forming matrices, inner bulge-forming pivoted dies, an intermediate inner bulge-forming die between said pivoted dies, said intermediate die having shoulders rigid thereon and said pivoted dies having contacting faces rigid thereon contacted by said shoulders, said shoulders and contacting faces being in the same transverse plane, and means moving said intermediate die outwardly whereby said pivoted dies are swung by said shoulders and the material of the pipe is pressed outwardly into said grooves.

5. In an elbow-machine, the combination of outer bulge-forming dies having grooves therein forming matrices, inner bulge-forming pivoted dies, an intermediate inner bulge-forming die between said pivoted dies, said intermediate die having shoulders rigid thereon and said pivoted dies having contacting faces rigid thereon contacted by said shoulders

and located in the same transverse plane with said shoulders, means moving said intermediate die outwardly whereby said pivoted dies are swung by said shoulders and the material of the pipe is pressed outwardly into said grooves, and means adjustably limiting said outward movement.

6. In an elbow-machine, the combination with the mandrel, pipe-feeding collar, pivoted crimping-frame, and outer bulge-forming matrix, of a longitudinally-movable rod in said mandrel provided with a wedge, inner expandible bulge-forming dies operated by said wedge and comprising inner pivoted dies and an inner intermediate die therebetween, said latter die having shoulders and said inner pivoted dies having contact-faces therefor in the same transverse plane with said shoulders, a rack-and-pawl feeding device, a rock-shaft, an eccentric connection between said rock-shaft and said rack-and-pawl feeding device feeding said collar, said pawl having alternate non-feeding and feeding connection with the teeth of said rack in the advance movements of said pawl, an eccentric connection between said rock-shaft and rod, and constructed and arranged for retracting said expandible dies and feeding said collar in the order named at a single rocking in one direction of said rock-shaft.

7. The combination, in an elbow-machine, of a hollow mandrel, a longitudinally-movable rod therein, a pipe-feeding collar taking about said mandrel, a rock-shaft, an eccentric driving connection between said rock-shaft and rod, a rack and pawl having connection with said collar, an eccentric feeding connection between said rock-shaft and rack and pawl, a pivoted crimping-frame having connection with said rod, a bulge-matrix, pivoted bulge-forming dies pivoted with relation to said mandrel, the radii of said mandrel bisecting said pivots being substantially at an angle of ninety degrees with relation to each other, a middle die, said rod having a wedge-face pressing said middle die outwardly, said middle die having shoulders and said pivoted side dies having engaging faces therefor for swinging said side dies outwardly upon their pivots, and means adjusting the length of longitudinal movement of said rod, and constructed, arranged and operating substantially as and for the purpose specified.

8. In an elbow-machine, the combination with a mandrel having a reduced end, outer bulge-forming dies having grooves forming a matrix, an inner die-head taking over said reduced end and having a slot therein, inner pivoted dies pivoted in said slot, the said reduced end having a slot coinciding in position with the slot in said head, an intermediate inner bulge-forming die between said inner pivoted dies taking through said slots and having shoulders taking against said pivoted in-

ner dies for expanding the same, a longitudi-
nally-movable rod having a wedge thereon
pressingsaid intermediate inner die outwardly
for pressing material of the elbow being
5 formed outwardly into said grooves, substan-
tially as described.

In testimony whereof I have signed my name

hereto in the presence of two subscribing wit-
nesses.

ANDREW P. TUCKER.

Witnesses:

AUGUST F. HERBSLEB,
HERBERT F. HARDEN.