

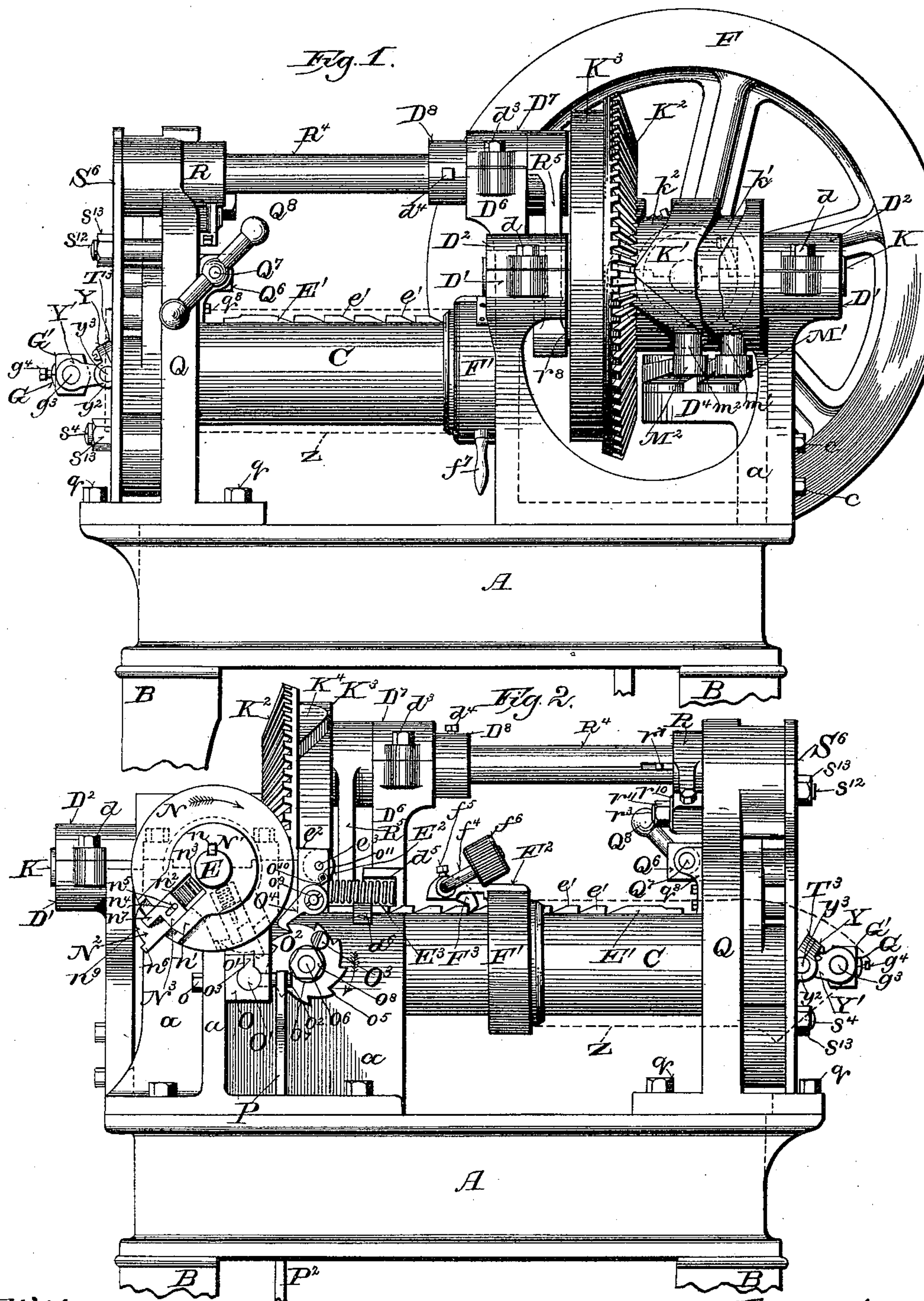
(No Model.)

6 Sheets—Sheet 1.

A. J. & A. LINDEMANN.
STOVE PIPE ELBOW MACHINE.

No. 441,426.

Patented Nov. 25, 1890.



Witnesses:

E. A. Amman
Wm. Kellogg

Inventors:

Albert J. Lindemann
August Lindemann

By H. G. Underwood
Attorney

(No Model.)

6 Sheets—Sheet 2.

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Fig. 3.

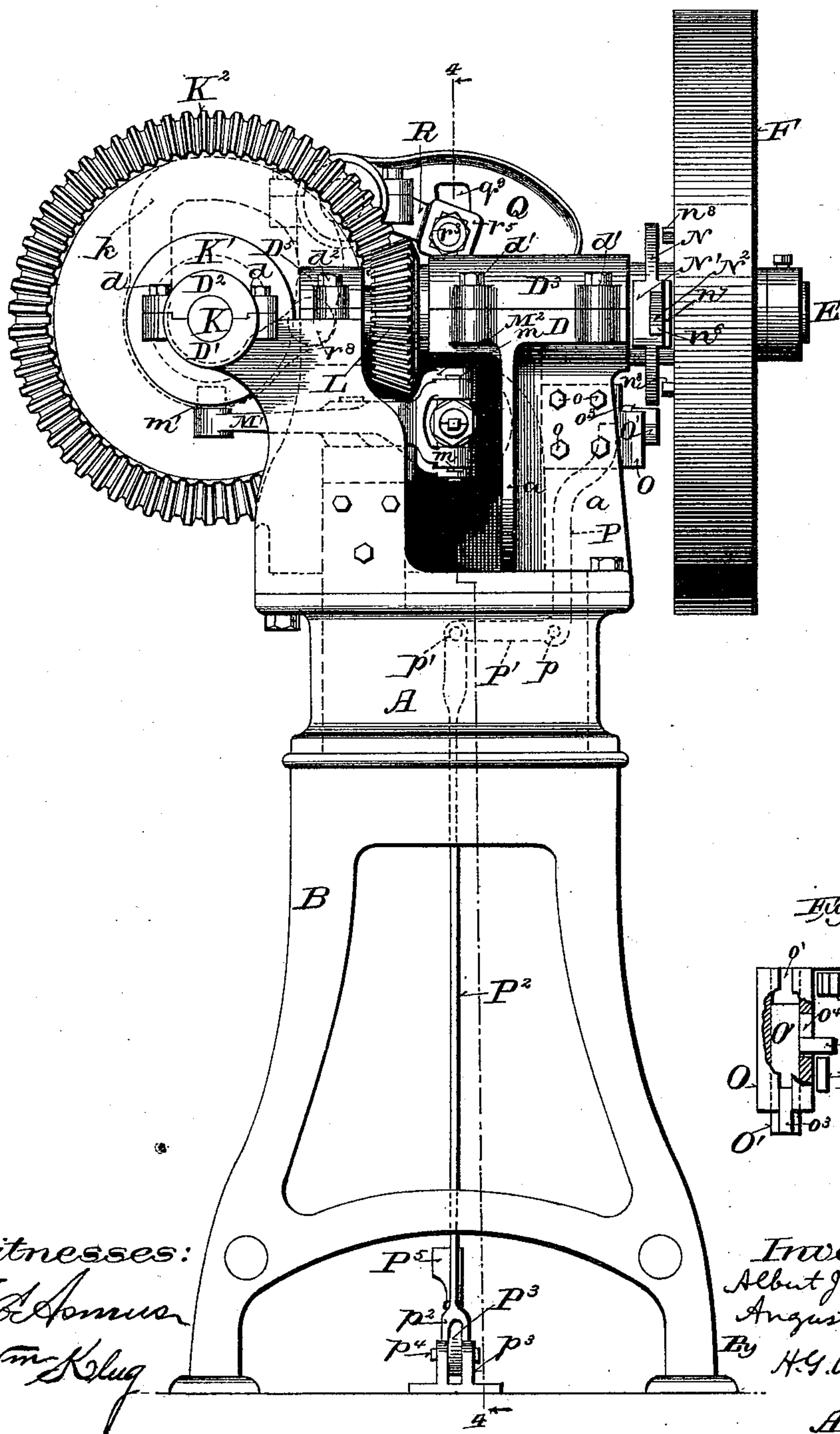
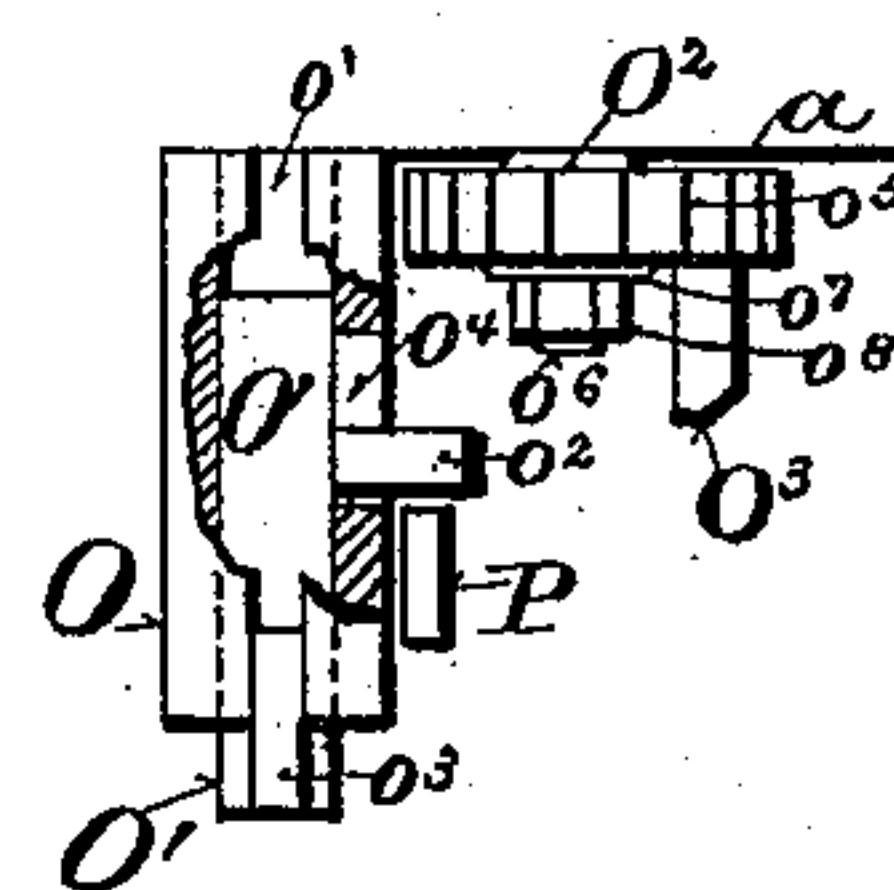


Fig. 15.



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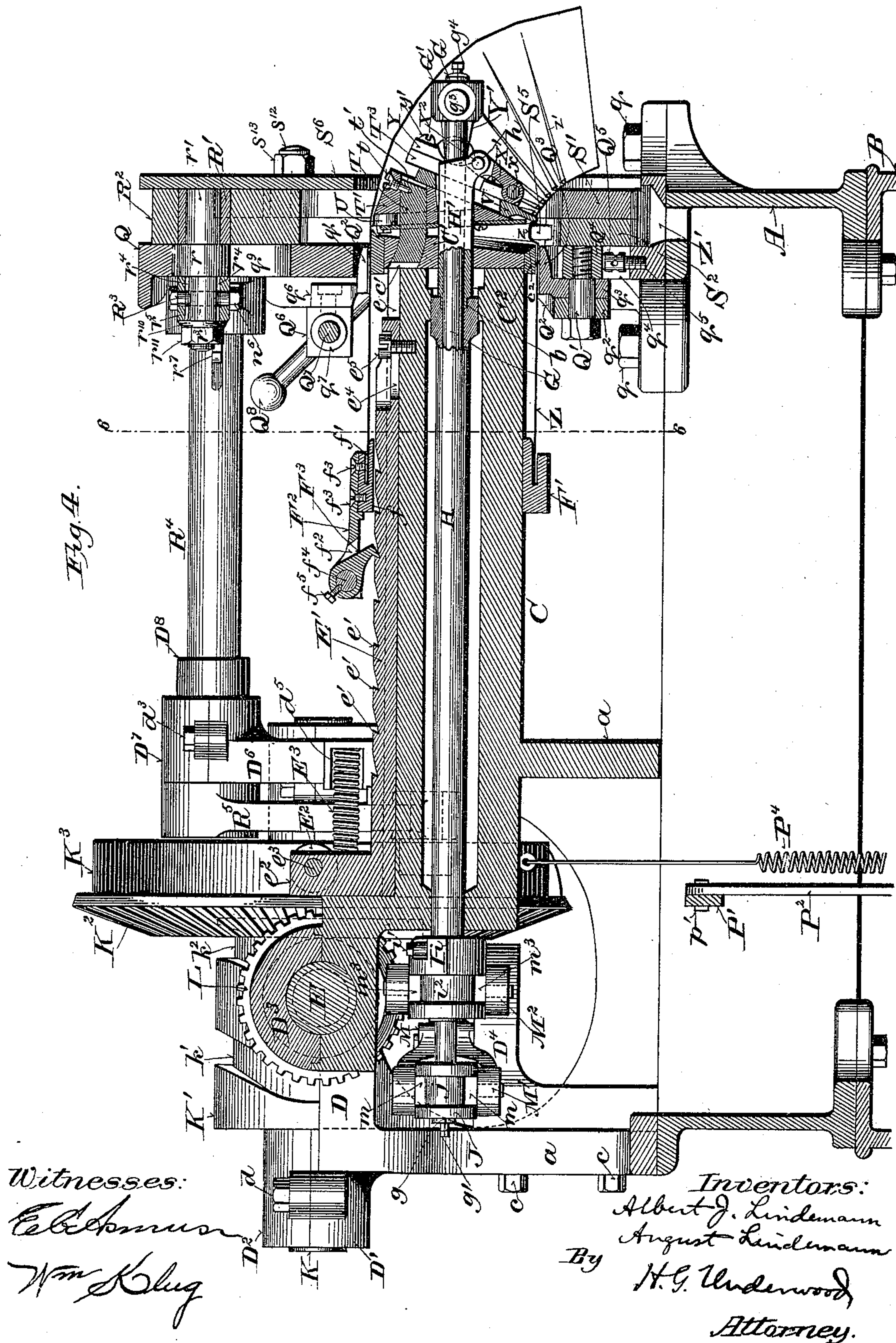
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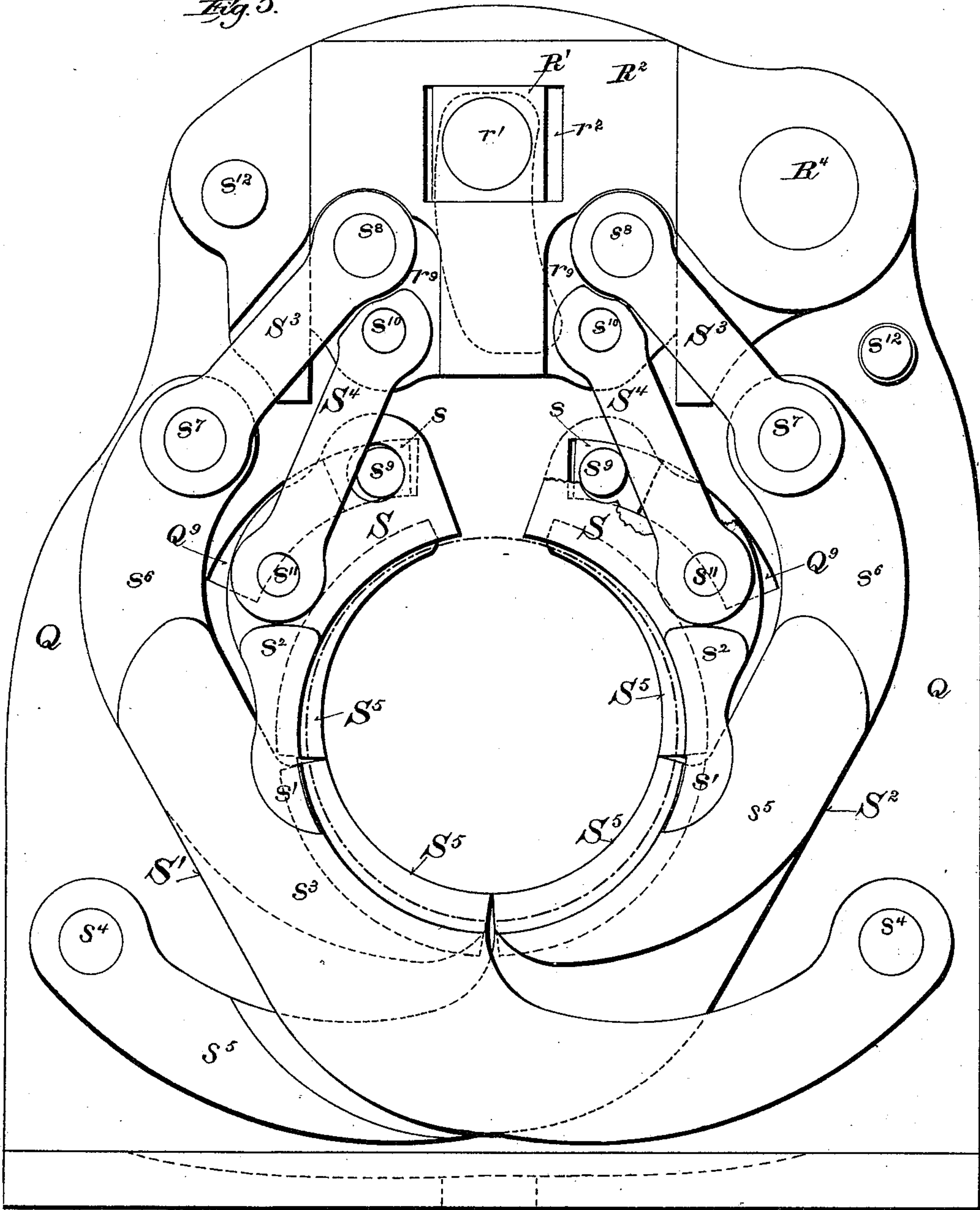
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A. J. & A. LINDEMANN.
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Fig. 5.



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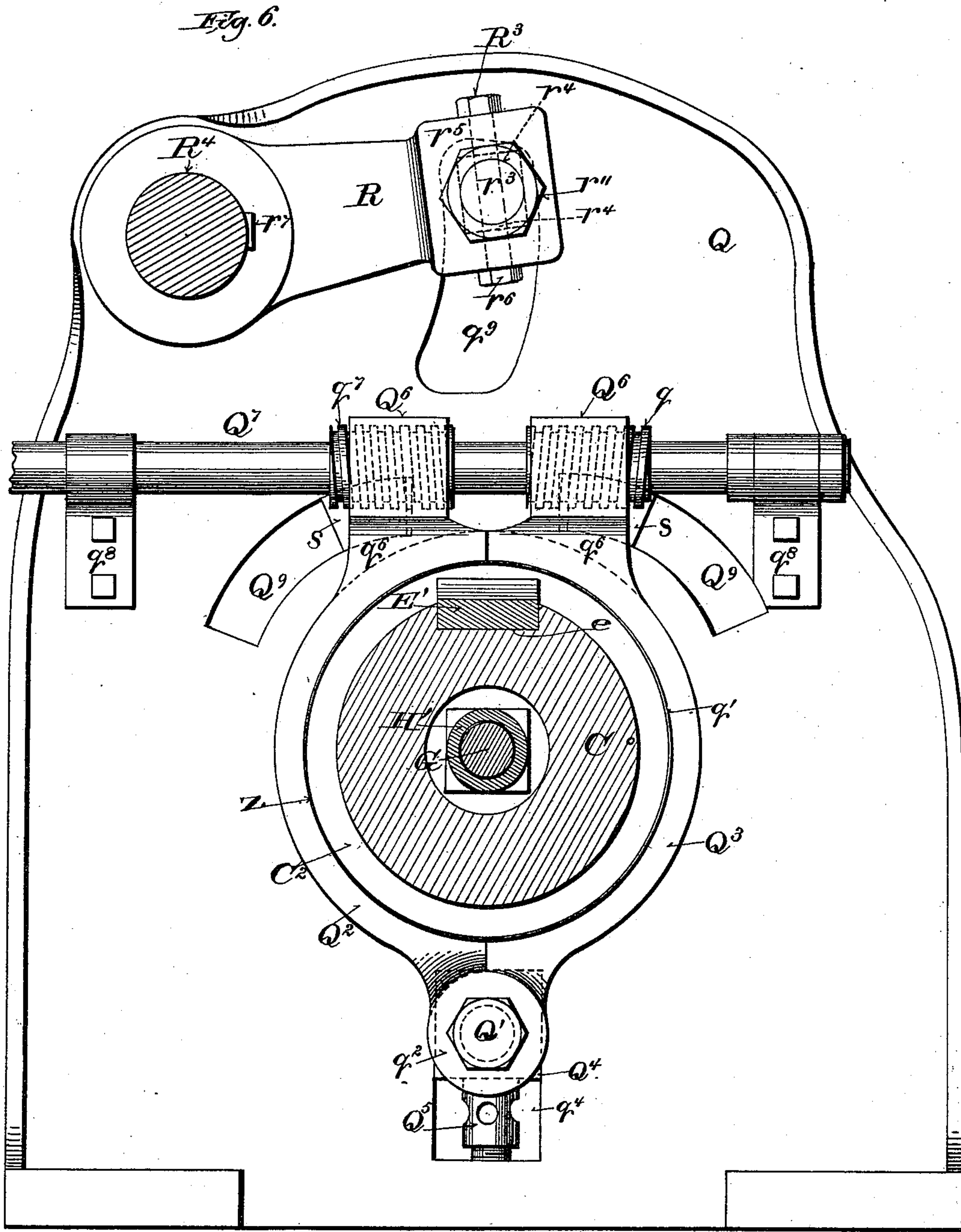
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6 Sheets—Sheet 5.

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STOVE PIPE ELBOW MACHINE.

No. 441,426.

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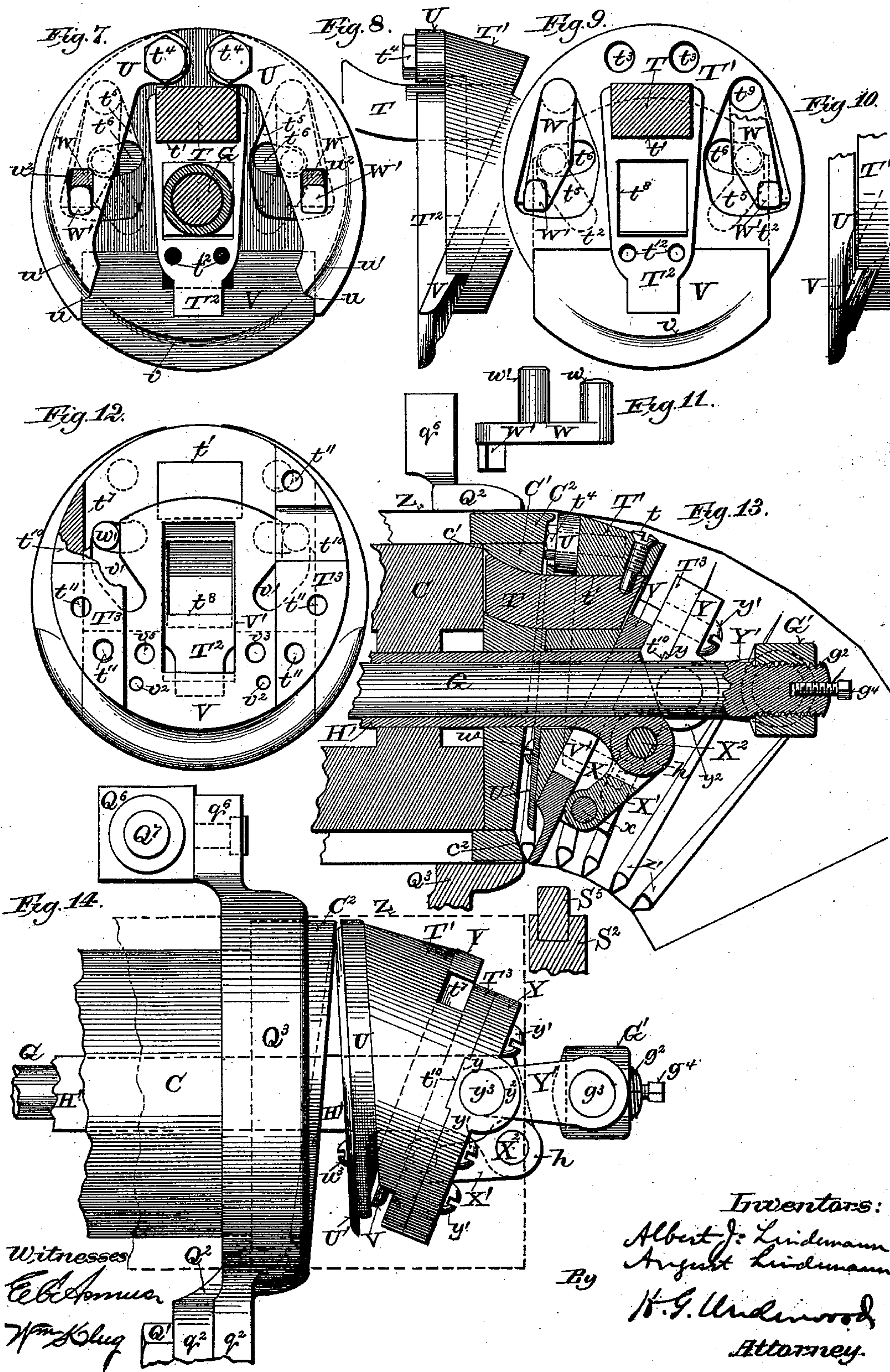
(No Model.)

6 Sheets—Sheet 6.

A. J. & A. LINDEMANN.
STOVE PIPE ELBOW MACHINE.

No. 441,426.

Patented Nov. 25, 1890.



UNITED STATES PATENT OFFICE.

ALBERT J. LINDEMANN AND AUGUST LINDEMANN, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO J. P. LINDEMANN & SONS, OF SAME PLACE.

STOVE-PIPE-ELBOW MACHINE.

SPECIFICATION forming part of Letters Patent No. 441,426, dated November 25, 1890.

Application filed March 26, 1890. Serial No. 345,349. (No model.)

To all whom it may concern:

Be it known that we, ALBERT J. LINDEMANN and AUGUST LINDEMANN, of Milwaukee, in the county of Milwaukee and in the State of Wisconsin, have invented certain new and useful Improvements in Machines for Making Stove-Pipe Elbows; and we do hereby declare that the following is a full, clear, and exact description thereof.

Our invention relates to machines for making stove-pipe elbows; and it consists in certain peculiarities of construction, as will be fully set forth hereinafter and subsequently claimed.

In the drawings, Figure 1 is a side elevation of our machine; Fig. 2, a like elevation of the opposite side of our machine with the fly-wheel removed. Fig. 3 is a rear elevation. Fig. 4 is a vertical longitudinal section of our machine in the position shown in Fig. 2, taken on the line 4 4 of Fig. 3. Fig. 5 is an enlarged detail view of portions of the crimping mechanism. Fig. 6 is a partly-sectional enlarged detail view, showing portions of the blank-holding mechanism from the rear, the section being taken on line 6 6 of Fig. 4. Figs. 7 to 14, inclusive, are detail views illustrating peculiarities in the construction of the dies and adjacent mechanism; and Fig. 15 is a detail top view of portions of the seaming-clutch mechanism partly broken away.

A represents the bed of our machine supported on and bolted to suitable legs B B. Resting on said bed is the main casting comprising a tubular portion C, with an elevated rear bridge portion D, which forms the bearings for the transverse shaft E of the fly-wheel F, (which is also a band-wheel, and loose on its shaft,) there being suitable legs, ribs, and strengthening-flanges, as *a a a*, depending from said casting and resting on said bed to form a steady and sufficient support.

G represents the inner rod, which serves to move the collapsible die, as hereinafter explained, and this rod G extends through the tubular casting C, and entirely through the machine at each end, passing also through the sleeve-rod H, which is likewise within said tubular casting C, and which passes out (around rod G) at the rear, as best shown in

Fig. 4. At the front there is an exteriorly square continuation H' of the sleeve-rod inclosing the rod G, and screw-joined (as at *b*) to the sleeve-rod proper H. The other end of the sleeve-rod H terminates beneath the bridge portion D of the casting and there receives a grooved guide-sleeve I, one end of which is split, as shown at *i*, and clamped to the sleeve-rod H by means of a screw *i'*, passing through the divided portions of this sleeve I at this point, said sleeve I having a circumferential groove *i*², as shown. The adjacent and protruding end of the rod G likewise carries a sleeve J, having a similar circumferential groove *j*, to serve as a guide, as hereinafter explained, the extreme end of the rod G being preferably split, as shown at *g*, and expanded by a screw *g'* to clamp the sleeve J and rod G together.

D' D' are two laterally-projecting portions of the described casting, which serve as bearings for the shaft K, which carries the cam-drum K' and bevel gear-wheel K², having upon its opposite face the cam-disk K³, the outline of the cam-groove *k* in said disk K³ being shown in dotted lines in Fig. 3. The bearings D' have suitable caps D² and securing-screws *d d*, and the bearing D is similarly provided with a cap D³, secured in place by screws *d'*. The cam-drum K' is provided with two peripheral cam-grooves *k' k*², which receive, respectively, pins *m'* and *m*² on the long or lever arms of the spanners M' and M², whose bifurcated ends carry headed pins *m m* and *m*³ *m*³, moving, respectively, in the grooves *j* and *i*² of the guide-sleeves J and I, said lever-arms of the spanners M' M² being pivoted, as shown at M, to the horizontal arm of an angular bracket D⁴, whose vertical arm is bolted to a leg of the main casting, as shown at *c c*. The shaft E carries near its end farthest from the fly-wheel F a bevel-pinion L, which meshes with the large bevel gear-wheel K², and beyond this point the inner end of said shaft E has its bearing in the main casting, and is covered by a cap D⁵, secured by screws *d*².

N is a clutch-disk keyed, as shown at *n*, to the fly-wheel shaft E, and this clutch has a hub N', which on one side has an extension

n' , having a groove n^2 therein which receives a spring n^3 and a two-part dog, the inner layer N^2 of which normally extends out farther beyond the periphery of the clutch-disk N than does the outer layer N^3 , said dog being provided with a slot, as n^4 , to receive a pin n^5 , projecting therethrough from the said disk N to limit the outward throw of said dog against the force of the spring n^3 . The layer N^2 has a curved end n^6 and a lip n^6 , and the layer N^3 a lip n^7 , the latter for engagement at the proper time with a series of pins n^8 , (four, less or more, in number,) projecting from the inner side of the fly-wheel F .

O is a block bolted, as shown at o , to one of the legs a of the main casting, and this block has a key-hole slot o' to receive a movable lug O' , similarly shaped (by means of a rib o^3) at its outer end, and which lug O' has a laterally-projecting pin o^2 , which has movement within a slot o^4 in the side of the said block O .

O^2 is a ratchet-wheel having (in this instance) nine teeth o^5 , which wheel is journaled on an arbor o^6 , projecting from a leg a of the main casting and secured in place by means of a washer o^7 and nut o^8 , as shown, said wheel O^2 , having a pin O^3 , (having a beveled or cam-shaped end,) projecting from the face of said wheel O^2 adjacent to one of its teeth, which latter are adapted for successive engagement with the end of a pawl O^4 , which is pivoted on a pin or arbor o^9 , projecting from the upright rear arm e^2 of the rack-bar E' , said pawl being held down against the ratchet-wheel O^2 by means of a spring o^{10} , one end of which is secured to said arm e^2 , as shown at o^{11} , and the other end of which (not shown) rests on the hub or other part of the said pawl O^4 .

P designates the long arm of an irregular bell-crank lever whose top is on a plane with the just-described pin o^2 and intended to move said pin back in its slot o^4 at the proper time, and said lever is fulcrumed, as shown at p , to the bed A , the short arm P' of said lever being pivoted, as shown at p' , to the upper end of a connecting-rod P^2 , whose lower end is preferably bifurcated, as shown at p^2 , and there connected to a treadle-arm P^3 , whose end beyond this point is secured in any suitable manner, as between the uprights of a forked bearing p^3 , by a journal or pivot p^4 , and on the other side of the point of attachment of said connecting-rod P^2 the treadle-arm P^3 is connected to one end of a spring P^4 , whose upper end is connected to any suitable portion of the main casting or bed as found most convenient, its function being to hold the free end of the treadle-arm P^3 up in an inclined position, and said arm terminates in a suitable foot-piece P^5 for use when the same is to be depressed against the action of said spring.

Q is the front casting or standard of the machine resting on and secured to the bed A , as shown at q , and said standard has a

circular opening q' therethrough, below which is a square-edged slot q^4 , receiving a square nut Q^4 ; and hubs q^2 q^3 , on the ends of the separable halves or segments Q^2 Q^3 , forming the clamping-ring, are held against this nut Q^4 by a screw-bolt Q' , the side walls of the slot q^4 being slightly tapered, converging from front to rear, and the nut being similarly shaped on its side edges and the bore of the nut being screw-threaded to receive the reduced and screw-threaded end of the bolt Q' . Below this nut Q^4 and within said slot q^4 there is located a turn-screw Q^5 , whose head is provided with holes or other means for turning it and bears up against the bottom face of said nut and whose screw-threaded shank engages with a similarly-threaded bore q^5 in the lower part of the standard Q . Each of the clamping-ring segments Q^2 Q^3 is provided with a wing q^6 , to which is bolted a nut Q^6 , the nuts Q^6 Q^6 being, respectively, right and left threaded to receive the right and left threads q^7 q^7 of the shaft Q^7 , said shaft having its bearings in brackets q^8 q^8 bolted to the standard Q and being provided with a handle Q^8 , or other convenient means, for operating it when required. The upper part of the standard Q is provided with an arc-shaped slot q^9 , which receives the enlarged hub r of a rod or bolt projecting both ways from said hub, one arm r' carrying a block R' , which fits within a somewhat wider slot r^2 in a larger block R^2 , while the other arm r^3 is preferably squared off on top and bottom so that the bore of the end r^5 of the crank-arm R , which receives it, may be larger above and below said bolt-arm r^3 , as shown at r^4 r^4 , (in dotted line, Fig. 6,) and said bolt-arm r^3 and crank-arm end r^5 are vertically perforated, the perforation in the arm r^3 being screw-threaded, and a bolt R^3 , screw-threaded at its central part, passes down through said perforations, and by turning this bolt R^3 either way the relative height of the arm r^3 within the enlarged bore of the crank-arm end r^5 may be varied as desired, there being a clamping-nut r^6 on the bottom of this bolt, and the outer end of the arm r^3 being preferably reduced and screw-threaded to receive a washer r^{10} and a clamping-nut r^{11} . The other end of the crank-arm R is keyed, as shown at r^7 , to a longitudinal shaft R^4 , whose other end finds its bearing in an upward extension D^6 of the aforementioned main casting, having a cap D^7 , secured thereto by screws d^8 , there being preferably a collar D^8 next said bearing, held in place by a screw d^4 , as shown, and the extreme end of said shaft R^4 beyond said bearing D^6 has keyed or otherwise secured to it a lever R^5 , from whose free end there projects a pin r^8 , which engages with the cam-groove k in the described cam-disk K^3 .

The standard Q is provided above its described circular opening q' with two arc-slots Q^9 Q^9 segmentally arranged, each of which receives an arc-shaped guide-lug s , which are

pivoted, as shown at s^9 , on one side of each of the upper crimping-blocks S, the lower portions of which are re-enforced on their opposite sides to form bearing-plates s^2 , the lower part s' of each of which projects down below the lower end of the block S proper, being received in the similarly-shaped recesses in the adjacent face or re-enforced portions $s^3 s^5$ of the adjacent lower crimping-blocks S' S². The said lower blocks S' S² are of an irregular-curved shape, crossing each other at their lower portions, and each pivoted, as shown at s^4 , to the standard Q, the face of the block S² being cut away to provide for the crossing and movement of the block S' thereon, as shown in Fig. 5, the opposite side of the block S' being, of course, similarly cut away, while above the said faces $s^3 s^5$ of said blocks S' S² these blocks are reduced (on that side) in thickness, as shown at $s^6 s^6$, and at their upper ends are pivoted, as shown at $s^7 s^7$, to the adjacent ends of links S³ S³, (which ends rest on the said reduced face of the blocks S' S², so the outer faces of the said links will be on the same vertical plane with that of the faces $s^3 s^5$;) the other ends of said links S³ S³ being pivoted, as shown at $s^8 s^8$, to the block R², said ends resting on the reduced face of the lower corners of said block, as shown at r^9 , to keep the exterior faces of all these parts in the same vertical plane as before named, and the adjacent ends of the lower links S⁴ S⁴ are likewise pivoted on said reduced faces r^9 of said block R², as shown at $s^{10} s^{10}$, the other ends of said links S⁴ S⁴ being similarly pivoted, as shown at $s^{11} s^{11}$, to the upper crimping-blocks S S. These crimping-blocks are preferably grooved on their circular inner faces to receive the crimping-blades S⁵ S⁵, which taper in projection from the crimping-blocks, as shown, from their base ends to their upper ends, and the operative faces of which similarly decrease in width from their lower toward their upper ends. All of the described links and crimping-blocks are protected by a front casing-plate S⁶, held against the standard Q by the described lower pivot-bolts $s^4 s^4$ and upper bolts $s^{12} s^{12}$ and suitable nuts s^{13} .

The tubular portion C of the main casting, hereinbefore referred to, is provided with an upper exterior longitudinal groove e , extending the whole length thereof back to the upper rear elevated portion of said casting, and this is fitted with a movable rack-bar E', having on its upper face a series (as eight) of teeth $e' e'$, and at the rear end an upright arm e^2 , to which is journaled, as shown at e^3 , an anti-friction roller E², between the inner face of said arm e^2 and the adjacent periphery of the cam-disk K³, which latter is provided with a peripheral cam K⁴, said arm e^2 further serving as a bearing for one end of a stiff spring E³, whose other end is received in a recess d^5 in the described extension D⁶ of the afore-named casting, adjacent to which is a holding-down strap d^6 , secured to said casting and projecting over the rear end of the said rack-

bar E'. The forward end of this rack-bar is provided with a slot e^4 , to receive a screw e^5 , which projects down into the top of the said tubular portion C of the casting to retain the rack in place and limit its movement, the upper portion of said slot being longer and wider than the lower portion thereof, to accommodate the head of said screw e^5 , whereby the front end of said rack-bar is prevented from rising.

F' is a ring (which we term the "feed-ring") surrounding the tubular casting C and rack-bar E', said ring being slotted, as shown at f , to receive the latter, which forms thereby a guide for said feed-ring, the latter having an annular groove f' on one side to receive a joint of stove-pipe, as hereinafter described. On top of this ring is a rearwardly-extending arm F², having a bifurcated end or central end slot f^2 , said arm being secured to the ring F', as by screws $f^3 f^3$, and the bifurcated end of the said arm is transversely perforated to receive one arm of an L-shaped rod f^4 , which carries (within the slot f^2) one end of a dog F³, whose point or free end engages with the described teeth e' on the said rack-bar E', said dog and arm being rigidly connected together by a screw f^5 and the bent end of said rod f^4 , carrying a weight f^6 .

The ring F' may have a handle f^7 , as shown, for convenience in operation.

The front end of the heretofore-named inner rod G is reduced and screw-threaded, as shown at g^2 , to receive a nut G', having trunnions g^3 , and said end of the rod is further split, so that when said nut has been screwed thereon the split ends may be expanded by a screw g^4 to clamp said nut tightly in place. The front end of the tubular casting C is covered with a steel face-piece C', held to place by a steel ring C², and this face-piece C' is perforated for the passage therethrough of the inner rod G and externally-squared sleeve-rod extension H', which latter has at its forward end on the under side a lip or projection h , and said face-plate C' is further provided with a transverse curved slot c' , which receives the curved hinge-piece T, whose other end is received in a similar curved slot t' in the body T' of the collapsible die, where it is secured by a screw t . On its rear side the die-body T' (which is wedge-shaped from top to bottom) has a central tongue T², on each side of which the rear face is recessed or cut away, as shown at $t^2 t^2$, and above the tongue T² are bolt-holes $t^3 t^3$ to receive the screw-bolts $t^4 t^4$, which secure the wings U U, whose inner edges conform in shape to that of the side edges of the tongue T² and have notched ends $u u$ projecting below the lower line of said tongue, said wings U U being further provided with arc grooves $u' u'$ and oblique slots $u^2 u^2$. The recessed sides $t^2 t^2$ of the rear face of the die-body T' are provided with irregular (approximately triangular) slots $t^5 t^5$, which extend only partially through the die-body and are intersected by other and trans-

verse kidney-shaped slots t^6 t^6 , which latter extend through to the front face of the die-body proper, said front face having integral stationary side wings T^3 T^3 , which project over
 5 the front face proper from each side, so as to leave vertical walled grooves t^7 beneath or back of the inner projecting edges of said wings T^3 T^3 , and this front face receives a slide V, whose lower edge is rounded and
 10 shaped to complete the circle at this point with the described wings U U when the latter are spread, and whose lower rear face is provided with a groove v , coinciding with the grooves u' in said wings, (in this position of
 15 the latter,) all as shown in Fig. 7. Said slide V is further provided with a vertical oblong central slot V' , whose height is about equal to the combined height of the slot t' (in the die-body T') and the slot t^8 (through
 20 the tongue T^2) on the adjacent front face of the die-body. Said slide is further provided with two upper angular open-topped slots $v'v'$, one on each side of the said central slot V' . These slots $v'v'$ receive long round pins $w'w'$,
 25 projecting from above the centers of the lever-bars W, which lever-bars have projecting from the same side, at one end, other and shorter round pins w , which form pivot-pins, and are socketed in holes t^9 , extending through
 30 the die-body from the apexes of the slots t^5 , the long pins w' , just named, extending first through the transverse kidney-shaped slots t^6 and thence into the angular slots v' , in the slide V, as already stated. At the other end
 35 of the lever-bars W and projecting from the opposite side of the same are the oblong pins W' , which latter work in the oblique slots u^2 in the movable wings U. The slide V is provided with series of screw-threaded holes v^2
 40 v^3 , to receive the screws which secure to said slide the lugs X, which are transversely perforated for the reception of the ends of the journal or trunnions x of the hinge-piece X' , whose free end is bifurcated and transversely
 45 perforated to receive or straddle the lip or projection h on the end of the sleeve-rod extension H' , secured thereto by bolt or pivot X^2 .
 The side wings T^3 T^3 on the front face of the die-body are provided with transverse grooves
 50 t^{10} , which receive corresponding transverse projections y on the rear of the outer plates Y, (which are of the same outlines as that of the said side wings T^3), which plates Y are secured to the said side wings by screws y' ,
 55 passing through perforations in said plates and into screw-threaded perforations t^{11} in said side wings, and these plates Y have perforated peripheral lugs y^2 , which receive the projecting round lugs or pins y^3 on the ends
 60 of links Y' , whose other ends are provided with round perforations to receive the described trunnions g^3 on the nut G' on the extreme front end of the described inner rod G. The rear face of the collapsible die and its
 65 wings U U are protected by a case-plate U' , slotted to admit the passage therethrough of the hinge-piece T and sleeve-rod extension H' ,

and below the latter slot said plate U' is perforated to receive the screws u^3 , which pass into screw-threaded holes t^{12} in the tongue T^2 . 70

The operation of our machine will be understood from the foregoing description of its construction, taken in connection with the accompanying drawings. A joint of plain stove-pipe Z, of the proper length and loosely
 75 rolled, is inserted at the front end of the machine, with the rear end of said joint inserted in the annular groove f' of the feed-ring F' , which ring at this stage is pushed back as far as the first leg a of the main casting will allow, as shown in Fig. 1. The front end of
 80 said joint Z is clamped against the outer periphery of the steel ring C^2 (with a certain degree of tightness, enough to hold by frictional contact, but not to prevent movement of the joint at the proper time) by the
 85 clamping-ring segments Q^2 Q^3 , operated through the thread in their nuts Q^6 Q^6 , actuated by the shaft Q^7 . The dies are now in the position shown in Fig. 4. The operator now
 90 steps on the foot-piece P^5 , which through the action of the treadle-arm P^3 , connecting arm P^2 and connected bell-crank lever $P'P$, forces back the pin o^2 on the lug O' in its slot o^4 , which releases the two-part dog N^2 N^3 on the
 95 clutch-disk N from the position shown in dotted lines in Fig. 2, and the force of the spring n^3 forces said dog out into the position shown in full lines in said figure, with the lip n^7 of the layer N^3 of said dog in the path of travel
 100 of the pin n^8 on the inner face of the fly-wheel F, and as the latter (which, as stated, is loose on its shaft E) is revolved by its band or belt (not shown) the adjacent pin n^8 comes against said lip n^7 and temporarily clutches
 105 the fly-wheel F to its shaft E, and as said fly-wheel thus clutched continues its revolution the bevel-pinion L, fast on said shaft E, which is in mesh with the larger bevel gear-wheel K^2 , revolves the latter and the cam-disk K^3 ,
 110 fast with said wheel K^2 , thereby causing the pin r^8 on the free end of the lever R^5 to travel in the cam-groove k in said cam-disk K^3 , and thereby to vibrate said lever R^5 , keyed on shaft R^4 , and thereby reciprocating the crank-arm R, keyed on the other end of said shaft
 115 R^4 , and the bolt projecting from the head r^5 of said crank-arm within the slot q^9 of the standard Q, and thus, through the blocks $R' R^2$ and the links connected to the latter and
 120 their connections, actuating the crimping-blocks $S S' S^2$, and as the blocks $R' R^2$ rise contracting the crimping-blades S^5 around the joint of pipe Z, forming the crimp z , which as first made is a square crimp, as shown in
 125 Fig. 4. As the cam-disk K^3 further revolves, the pin r^8 , in continuing its travel in the cam-groove k , causes the crank-arm head r^5 and the connected blocks $R' R^2$ to descend, and thereby expand the crimping-blocks $S S' S^2$
 130 and withdraw the crimping-blades S^5 from the joint Z, and meanwhile the cam-drum K' on the shaft K of the crank-disk K^3 has been so moved that its peripheral cam-grooves k'

k^2 , which receive the pins $m' m^2$ on the lever-arms of the spanners $M' M^2$, begin to move said pins laterally, (said pins having till now been idle in the straight portions of the said cam-grooves $m' m^2$;) and this lateral movement of the said pins actuates the inner rod G and sleeve-rod H, the rod G serving to draw the die inward against the lower operative edge of the steel ring C^2 , (which has an outward bevel c^2 at this point,) while the continuation H' of the sleeve-rod H and its connections serve to hold the slide V in the proper lowered position, (shown in Figs. 4 and 13,) and the continued rear draw of the rods G and H H' , by the action of the cam-drum, changes the square crimp z into a triangular-shaped crimp z' , as best shown in Fig. 13, this resulting from the form of the grooves $u' v$ in the parts U U V of the die, in connection with the described beveled edge c^2 of the steel ring C^2 . The crimp first made is next the outer end of the joint, and in order that the joint may be moved outward past the crimp z' already finished, the die must be collapsible and the slide must rise and the wings move in against the tongue to leave space around the die for the passage of the said just-completed crimp, as follows: The groove k' remains straight, (as the cam-drum K' continues its revolutions,) and hence the pin m' and the rod G, connected by spanner M' therewith, remain stationary for the present; but the groove k^2 runs at an angle, and hence moves the pin m^2 laterally, forcing the sleeve-rod H H' forward, which through lip h and hinge-piece X' draws on the slide V and raises it above the line of the crimp just made, and simultaneously, by reason of the consequent action of the hereinbefore named slots and pins in the die, the side wings U U are drawn in against the tongue T^2 , leaving a clearance all around the completed crimp z' . Both cams $k' k^2$ in the periphery of the cam-drum K' are now straight for a certain distance, and hence both rods G and H H' are now stationary; but the said rotation of the cam-disk K^3 has now brought its peripheral cam K^4 against the anti-friction pulley E^2 , journaled in the upright arm e^2 of the rack-bar E' , the said cam forcing the said rack-bar forward the distance of one tooth e' thereon, which, by reason of the dog F^3 , carries the feed-ring F' and joint Z a like distance forward, the spring E^3 serving to retract the rack-bar to its original position the moment the cam K^4 has passed the wheel E^2 , and the just-named forward movement of the said rack-bar serving, through the pawl O^4 , pivoted to its upright arm e^2 , to draw on the ratchet-wheel O^2 and revolve it the space of one of its teeth o^5 . The cam-grooves $k' k^2$ now again deviate for a straight line, and both become active, causing the rod G to move forward and the sleeve-rod H H' slightly back, which again spreads the wings U U and lowers the slide V of the die to the position shown in Fig. 4, when the operation al-

ready described is repeated and a new crimp z' formed, and this is continued until (in the arrangement shown in the drawings) nine crimps have been formed, which brings the pin O^3 on the face of the ratchet-wheel O^2 a trifle above the horizontal line of the pin o^2 on the lug O' , pushing said pin o^2 outward (to the position shown in Fig. 15) as it passes, and then, as the clutch-disk N is revolved to this point, the curved end n^9 on the layer N^2 of the two-part dog on said clutch-disk engages with the rib o^3 on the lug O' and gradually forces said dog back against the force of its spring n^3 , until said rib o^3 comes in direct contact with the lip n^6 on said dog, as shown in dotted lines in Fig. 2, which stops the machine, as thereby the lip n^7 on said dog is withdrawn from the path of the pins n^8 on the fly-wheel F, and the latter (being thus unclutched) is free to revolve loosely on its shaft E. The successive crimping of the joint Z being heaviest on the under side thereof gradually bends the same into the completed shape shown in Fig. 4, and it now only remains to remove the finished article from the machine.

An important feature of our machine lies in the fact that it is self-cleaning, as all scale that falls from the joint being operated upon drops down through the hole Z' and does not fall upon any delicate or important part of the mechanism. In the collapsible die the slide supports the wings when in operative position, and thereby the device is strong and durable, and the machine is entirely automatic, and hence not liable to injury as where the motions of the parts have to be timed by the judgment of the operator.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a machine for making stove-pipe elbows, the combination of a tubular casting with a collapsible die, a die-moving rod passing through said tubular casting, a sleeve-rod also passing therethrough and surrounding said first-named rod, links connecting said die with said rods, and mechanism for reciprocating said rods independently, substantially as set forth.

2. In a machine for making stove-pipe elbows, the combination, with a casting having a face-plate and surrounding beveled ring, of a collapsible die, a rod linked to said die at one end and carrying a circumferentially-grooved collar at its other end, a sleeve-rod surrounding the first-named rod and also linked to said die at one end and carrying a circumferentially-grooved collar at its other end, a revolving cam-drum having differently-directed cam-grooves in the periphery thereof, spanners having lever-arms pivoted to said casting, pins on said lever-arms in engagement with said cam-grooves, and headed pins on the forked ends of said spanners engaging with the said grooves in the collars on the ends of the said rods, substantially as set forth.

3. In a machine for making stove-pipe elbows, the combination, with a suitable frame and shaft journaled therein, of a fly-wheel loose on said shaft, a clutch-disk keyed to the same shaft and having a movable spring-pressed two-part dog secured thereto consisting of two layers, each having a projecting end lip, one of said layers extending farther from the center of said disk than the other, a slotted block secured to said frame, a lug sliding in said block and having a rib for temporary engagement with the lip on one layer of the two-part dog, and a series of pins projecting from the inner side of the fly-wheel for temporary engagement with the lip on the other layer of the said two-part dog, substantially as set forth.

4. In a machine for making stove-pipe elbows, the combination, with a suitable frame and shaft journaled therein, of a fly-wheel loose on said shaft and carrying a series of inwardly-projecting pins, a clutch-disk keyed to the same shaft, and having a movable spring-pressed two-part dog secured thereto consisting of two layers each having a projecting end lip, one of said layers extending farther from the center of said disk than the other, a slotted block secured to said frame, a lug sliding in said block and carrying a rib for temporary engagement with the lip of one layer of the two-part dog, and a laterally-projecting pin, a ratchet-wheel on said frame having a bevel-ended pin projecting from its face for engagement with said lateral pin, and a reciprocating rack-bar carrying a pawl for engagement with said ratchet-wheel, substantially as set forth.

5. In a machine for making stove-pipe elbows, the combination, with a suitable frame and shaft journaled therein, of a fly-wheel loose on said shaft and carrying a series of inwardly-projecting pins, a clutch disk keyed to the same shaft and having a movable spring-pressed two-part dog secured thereto consisting of two layers, each having a projecting end lip, one of said layers extending farther from the center of said disk than the other, a slotted block secured to said frame, a lug sliding in said block and carrying a rib for temporary engagement with the lip of one layer of the two-part dog, and a laterally-projecting pin, a bell-crank lever whose top is on a plane with said pin, a connecting-rod pivoted to said lever, and a treadle-arm connected to said connecting-rod, and by a spring to said frame, substantially as set forth.

6. In a machine for making stove-pipe elbows, the combination, with a slotted standard and a series of movable crimping-blocks, actuating mechanism, and connecting-links, of crimping-blades projecting from the curved inner faces of said crimping-blocks, and which taper or decrease in projection from said crimping-blocks from their base ends to their upper ends, and the operative faces of which similarly decrease in width from their lower

toward their upper ends, substantially as set forth.

7. In a machine for making stove-pipe elbows, the combination, with a standard provided with a central circular opening and arc slots above the same, of upper crimping-blocks pivoted to arc-shaped guide-lugs moving in said arc slots, independent upward-extending lower crimping-blocks pivoted to the lower part of said standard and crossing each other, and crimping-blades secured to and projecting from the inner curved edges of the said several crimping-blocks, substantially as set forth.

8. In a machine for making stove-pipe elbows, the combination, with a standard having a central opening, of a series of crimping-blocks and actuating mechanism, and crimping-blades secured to and projecting from the inner curved faces of said blocks, said blades having their greatest width and projection at the base, and thence tapering and decreasing toward the top, substantially as set forth.

9. In a machine for making stove-pipe elbows, the combination, with a suitable frame and a transverse shaft journaled therein, of a band-wheel clutched to one end of said shaft and a pinion on the other end thereof, a longitudinal shaft supported on raised bearings at each end of the machine, a gear-wheel on said shaft in mesh with said pinion, a cam-grooved disk rigid with said gear-wheel, a lever on the rear portion of said shaft having a pin on its free end in engagement with the cam-groove in said disk, a standard at the front of the machine having an upper longitudinally-arranged arc slot and a central opening, a crank-arm on the front portion of said longitudinal shaft, a bolt projecting from the free end of said crank-arm through the said upper arc slot and carrying a block at its extreme end, a sliding block moving in vertical ways in the upper part of the said standard and provided with a slot for the reception of the last-named block, and a series of crimping-blocks pivotally attached to said standard and linked to said sliding block and carrying projecting crimping-blades surrounding said circular opening, substantially as set forth.

10. In a machine for making stove-pipe elbows, the combination, with a suitable frame having a standard at its front end provided with an upper longitudinal arc slot, a central opening, and vertical guideways, of a longitudinal shaft journaled in said standard, and in suitable rear bearings, a crank-arm on said shaft having a transverse perforation through its free end, a bolt having an enlarged hub fitting in said arc slot and projecting both ways therefrom, one arm of said bolt carrying a block and the other arm passing through the bore in said crank-arm end and being squared off on its upper and lower surface and secured to said crank-arm end by a clamping-nut, a vertical adjusting-bolt centrally screw-threaded passing through perforations

in said crank-arm end and through a screw-threaded perforation in said squared bolt-arm, a sliding block moving in the said vertical guideways of the standard and slotted for the reception of the said other block, and a series of crimping-blocks pivotally attached to said standard and linked to said sliding block and carrying crimping-blades, substantially as set forth.

11. In a machine for making stove-pipe elbows, the combination of a tubular casting, a collapsible die, and operating-rods attached to the latter and passing through said casting, of a face-plate and surrounding ring attached to said casting, a standard having a circular opening coinciding with the front end of said casting and arc slots and bearing-brackets above and a tapering-edged slot below said circular opening, a tapering-edged nut and an adjusting-screw in said lower slot, separable clamping-ring segments secured to said nut and surrounding said circular opening, right-and-left-threaded nuts bolted to projections on said segments, and a shaft supported in said bearing-brackets and having right-and-left-screw-threads formed thereon for engagement with said correspondingly-threaded nuts, substantially as set forth.

12. In a machine for making stove-pipe elbows, the combination of a tubular casting, a collapsible die, and operating-rods attached to the latter and passing through said casting, of a face-plate and surrounding ring attached to said casting, a standard having a circular opening coinciding with the front end of said casting, an upper longitudinal arc slot, and intermediate arc slots above and a tapering-edged slot below said circular opening, and vertical guideways on the upper part of the other side of said standard, a slotted sliding block moving in said ways, crimping-blocks pivotally attached to said standard and linked to said sliding block and having projecting crimping-blades surrounding said circular opening, a tapering-edged nut in said lower slot, separable clamping-ring segments secured to said nut and surrounding said circular opening, and carrying screw-threaded nuts, a screw-rod in engagement with the said nuts on the segments, a power-shaft having a crank-arm at one end, and a bolt projecting from the free end of said crank-arm, projecting through said upper arc-slot and carrying a block moving in the slot in said sliding block, substantially as set forth.

13. In a machine for making stove-pipe elbows, the combination, with a tubular casting, a die-operating sleeve-rod passing there-through and terminating at its forward end in a downward projection or lip, and another die-operating rod passing through said sleeve-rod and projecting beyond the forward end of the latter, of a face-plate on the end of said casting, provided with an opening for the passage therethrough of said sleeve-rod, and having a curved slot above said opening, a ring surrounding the front end of said cast-

ing and said face-plate, a nut secured to the extreme front end of said inner rod and provided with trunnions, a collapsible die provided with an opening for the reception of the said sleeve-rod, and a slot above said opening coinciding with the curved slot in the said face-plate, a curved hinge-piece located in the said coinciding slots, a slide in said die hinged to the said projection of the sleeve-rod, and links connecting the trunnions of the nut on the said inner rod with the said collapsible die, substantially as set forth.

14. In a machine for making stove-pipe elbows, the combination, with a tubular casting having a slotted face-plate on its end surrounded by a beveled-edged ring, and a die-operating sleeve-rod, and inner projecting rod passing through said casting and face-plate, of a collapsible die hinged to said face-plate and linked to said inner rod and carrying a slide with a grooved lower inner edge hinged to said sleeve-rod, substantially as set forth.

15. In a machine for making stove-pipe elbows, the combination, with a suitable casting and face-plate, and an inner die-operating rod and surrounding sleeve-rod passing there-through, and rod-actuating mechanism, of a slotted die-body hinged to said face-plate, movable wings pivoted to said die-body, a slide hinged to said sleeve-rod, lever-bars having operative pins located in and projecting through slots in said die-body, and links connecting said die-body with the outer end of said inner die-operating rod, substantially as set forth.

16. In a machine for making stove-pipe elbows, a collapsible die consisting of a wedge-shaped die-body having its rear side recessed or cut away to leave a central tongue, movable wings pivoted to the upper part of said rear face and having inner edges conforming to the shape of the side edges of the said tongue, and notched lower ends projecting below the bottom line of the latter, said wings having arc grooves and oblique slots formed therein, the said recessed sides of the said rear face having irregular approximately-triangular slots extending partially through the die-body and intersected by transverse slots extending through to the front face of the die-body proper, said front face having integral stationary side wings projecting over it from each side, leaving vertical walled grooves beneath or back of the inner projecting edges of said wings, a slide on said front face whose lower edge is rounded and shaped to complete the circle at this point when the said movable wings are spread and whose lower rear face is provided with a rounded groove coinciding with the grooves in said movable wings, the said slide having upper angular open-topped slots, one on each side, and there being central slots through said die-body and slide, lever-bars located in the approximately-triangular slots and having on

one side long pins projecting through said transverse slots and said open-topped slots, and shorter pivot-pins at one end on the same side socketed in said die-body, and at the
5 other end and side oblong pins working in said oblique slots in the movable wings, and front and rear face-plates, in combination with a tubular casting, face-plate, and beveled edge surrounding-ring, and inner and
10 sleeve rods passing through said casting, rod-actuating mechanism, and links connecting said inner rod with the front face-plate of the

die, and a hinge-piece connecting said sleeve-rod with said slide, substantially as set forth.

In testimony that we claim the foregoing 15
we have hereunto set our hands at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of witnesses.

ALBERT J. LINDEMANN.

AUGUST LINDEMANN.

Witnesses:

H. G. UNDERWOOD,

H. C. HOVERSON,

WM. KLUG.