

(No Model.)

6 Sheets—Sheet 1.

J. W. R. JOHNSON.
LINK BENDING MACHINERY.

No. 459,401.

Patented Sept. 15, 1891.

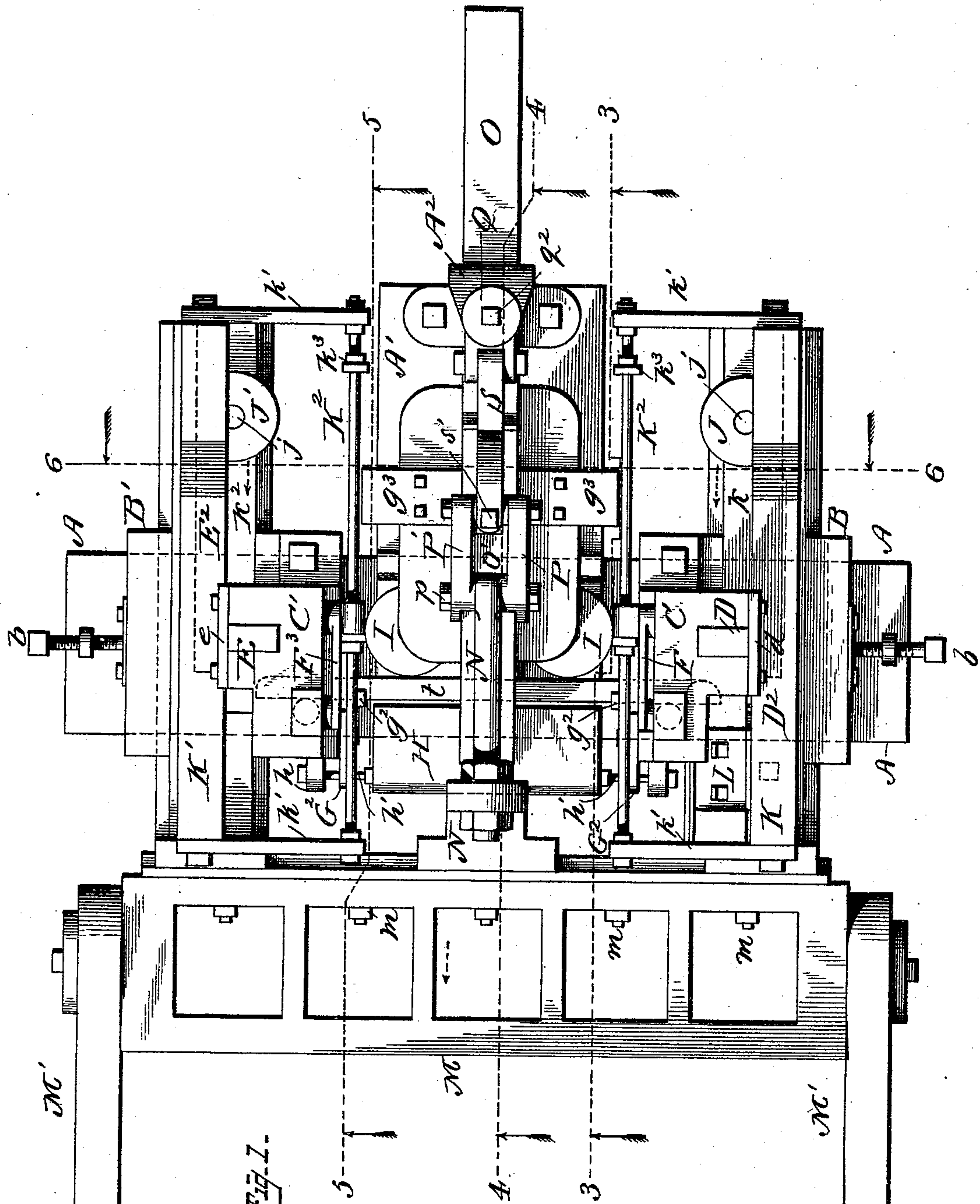


Fig. 1.

Witnesses

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By *his* Attorneys

Baldwin Davidson & Wright

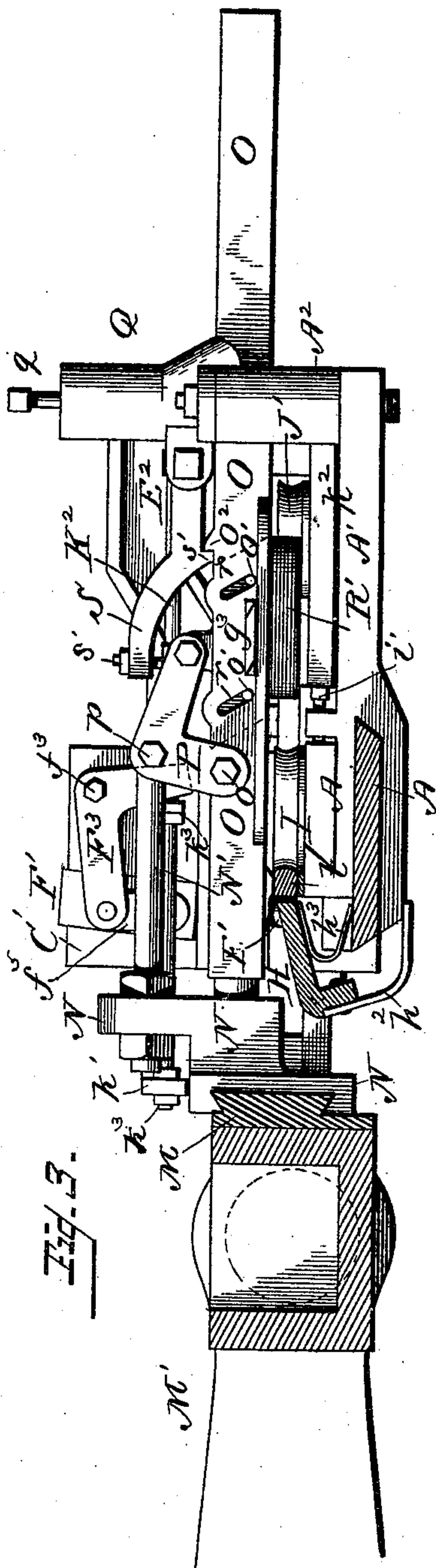
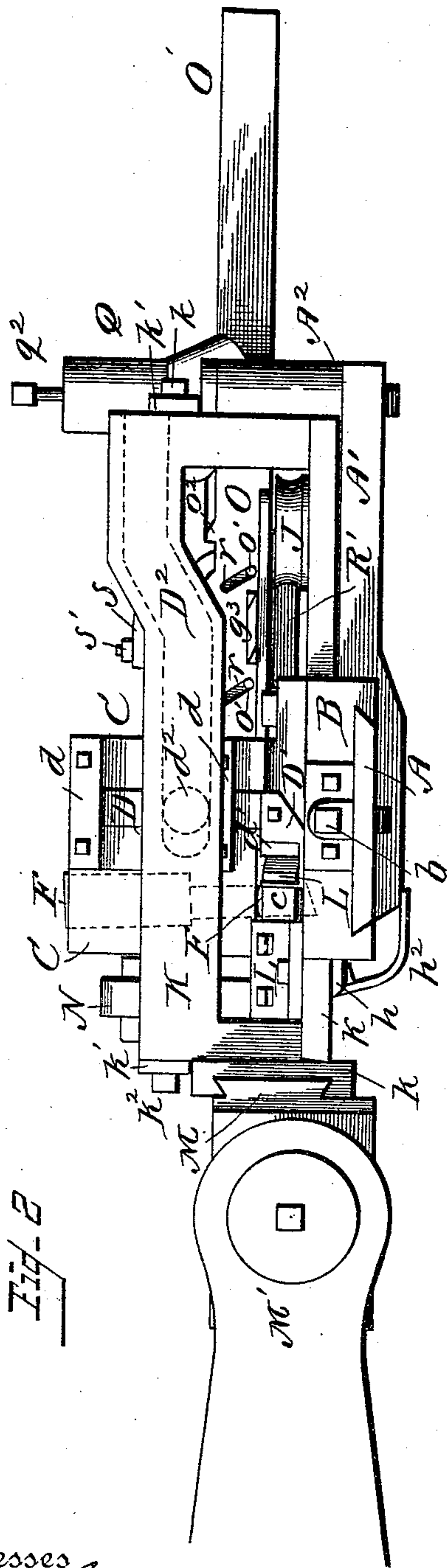
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6 Sheets—Sheet 2.

J. W. R. JOHNSON,
LINK BENDING MACHINERY.

No. 459,401.

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(No Model.)

6 Sheets—Sheet 3.

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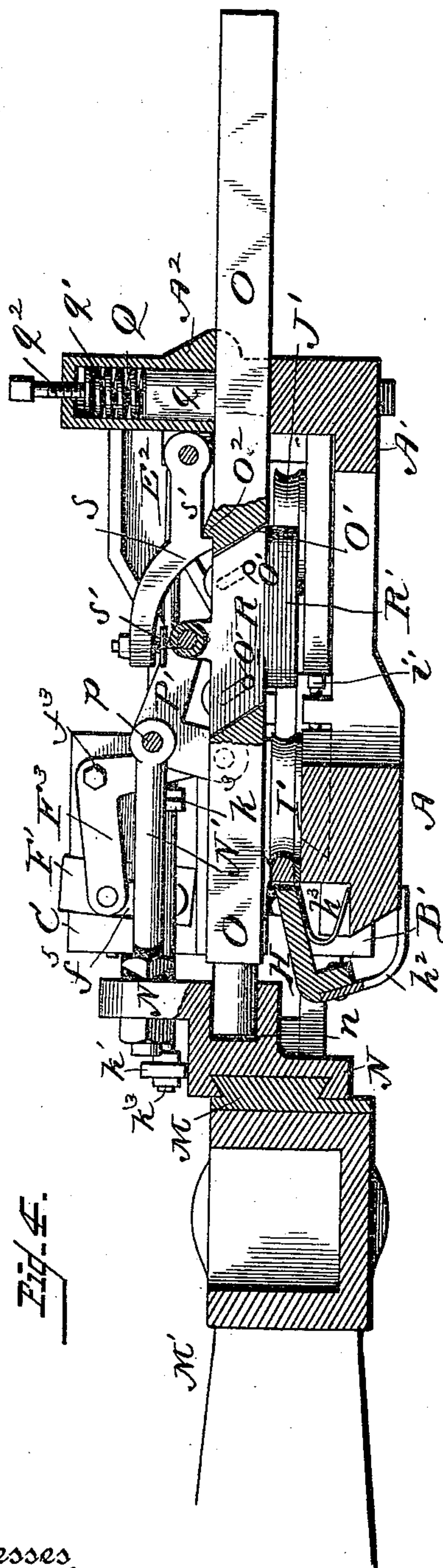


Fig. 4.

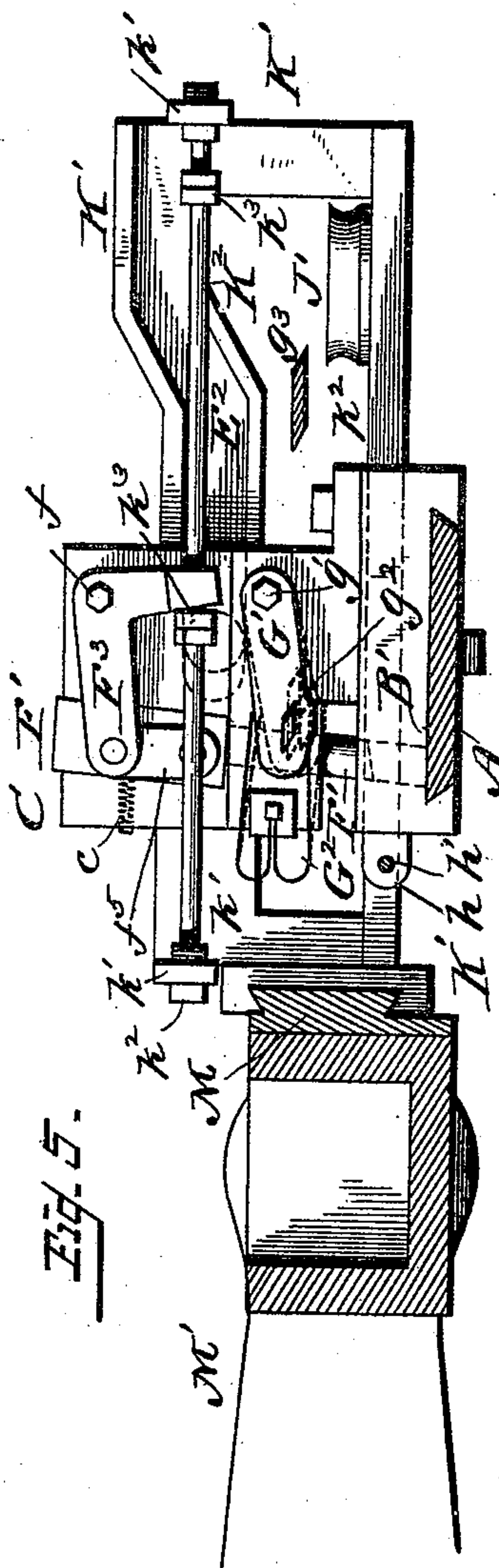


Fig. 5.

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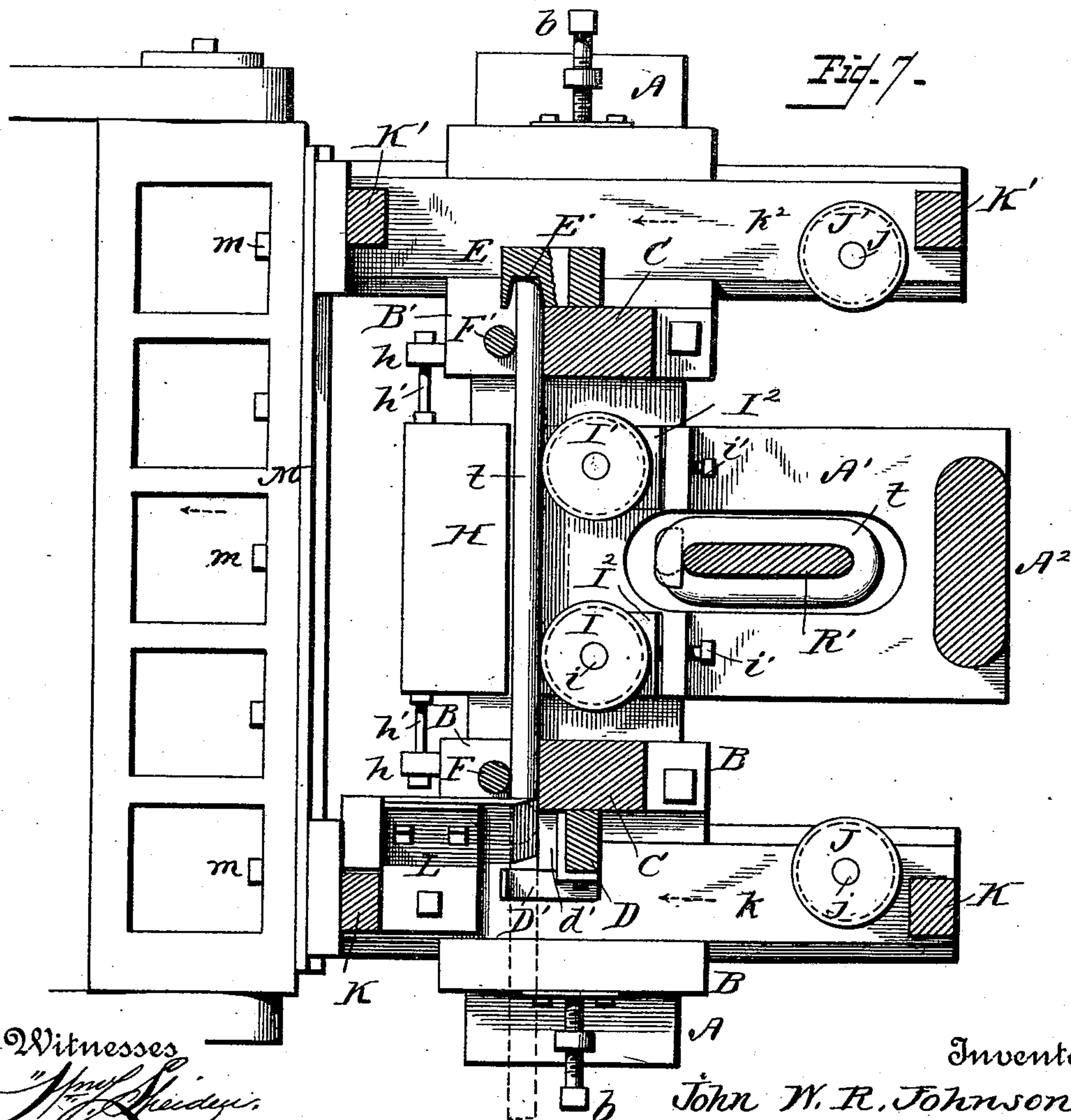
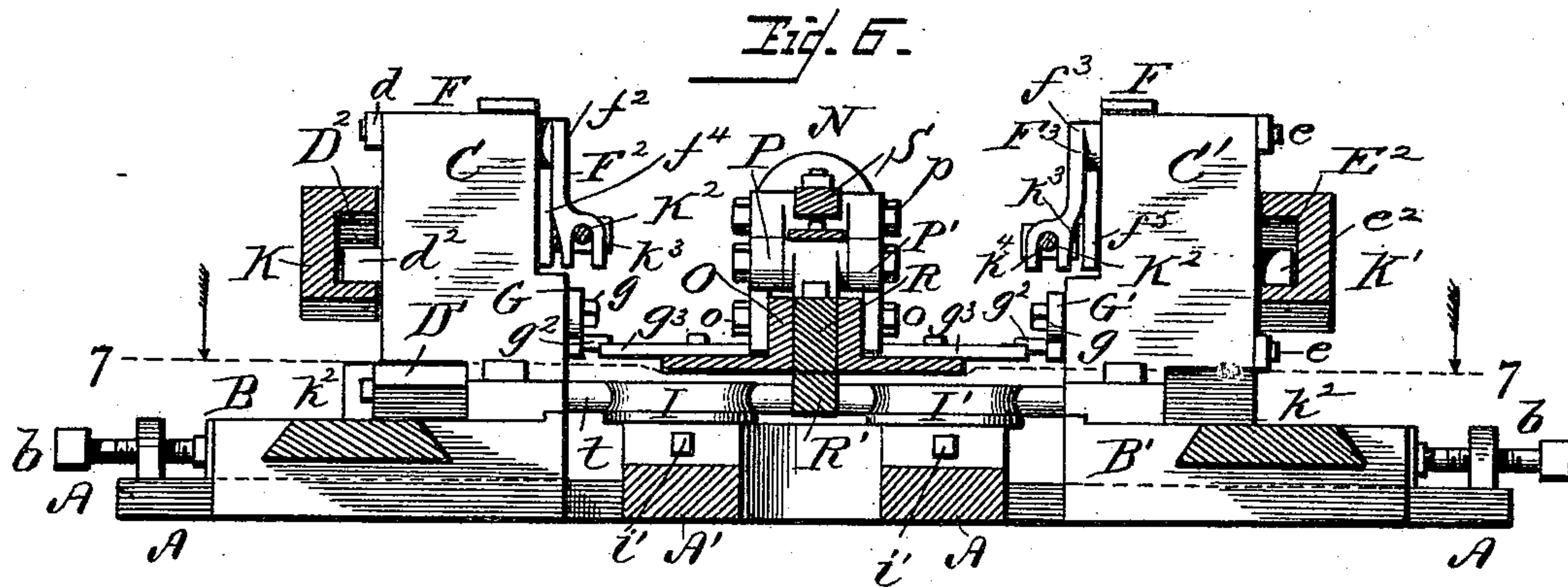
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6 Sheets—Sheet 4.

J. W. R. JOHNSON.
LINK BENDING MACHINERY.

No. 459,401.

Patented Sept. 15, 1891.



Witnesses

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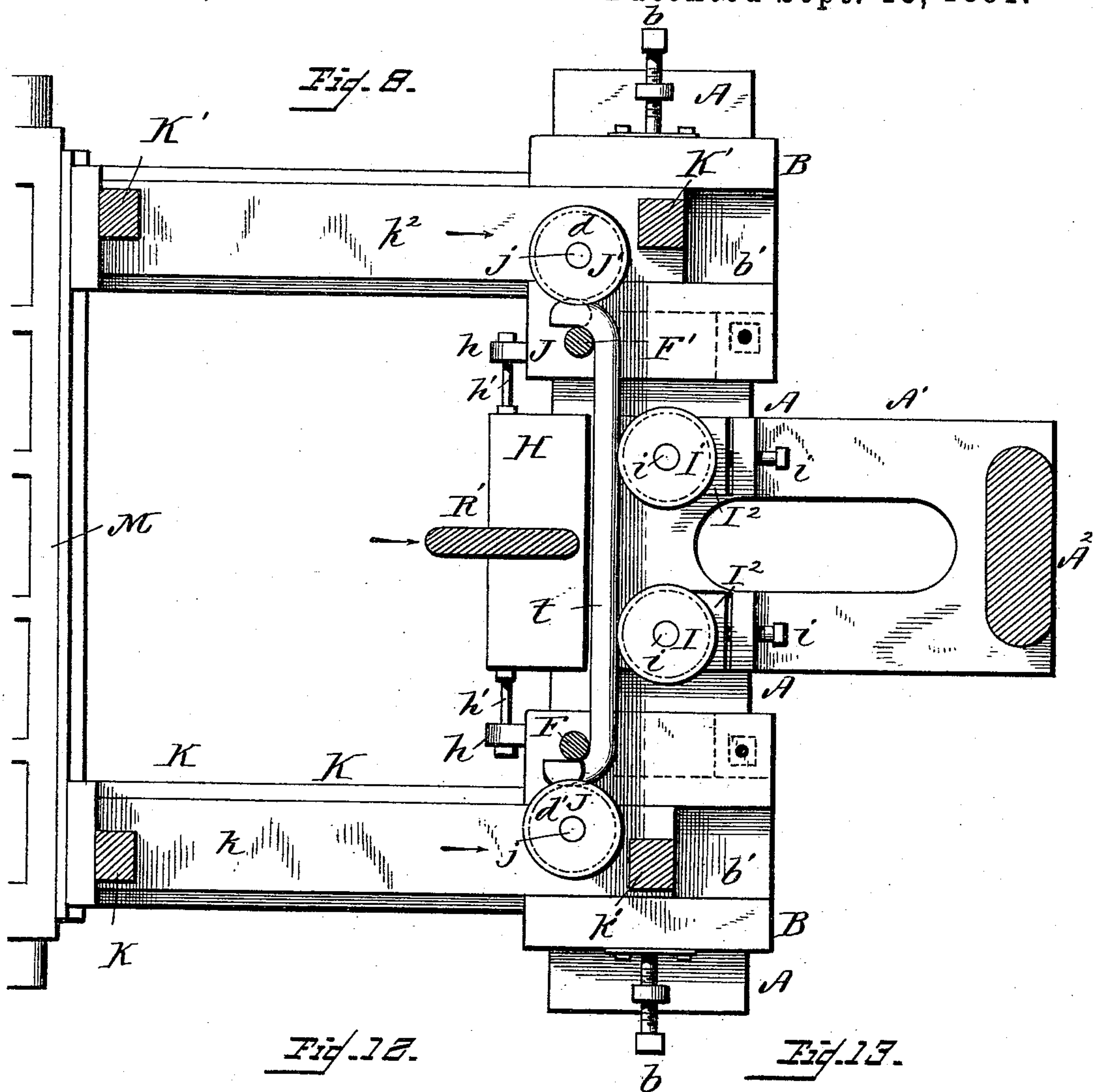
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J. W. R. JOHNSON.
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No. 459,401.

Patented Sept. 15, 1891.



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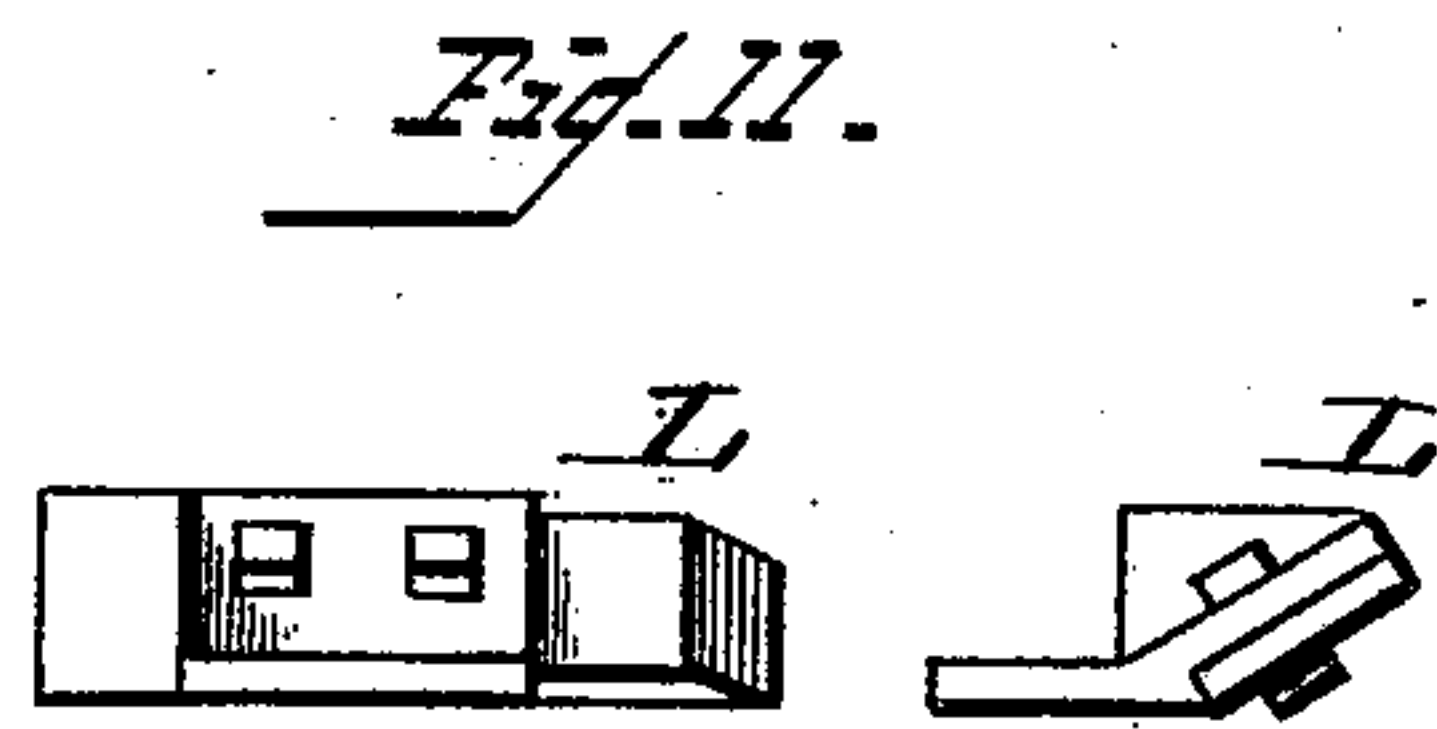
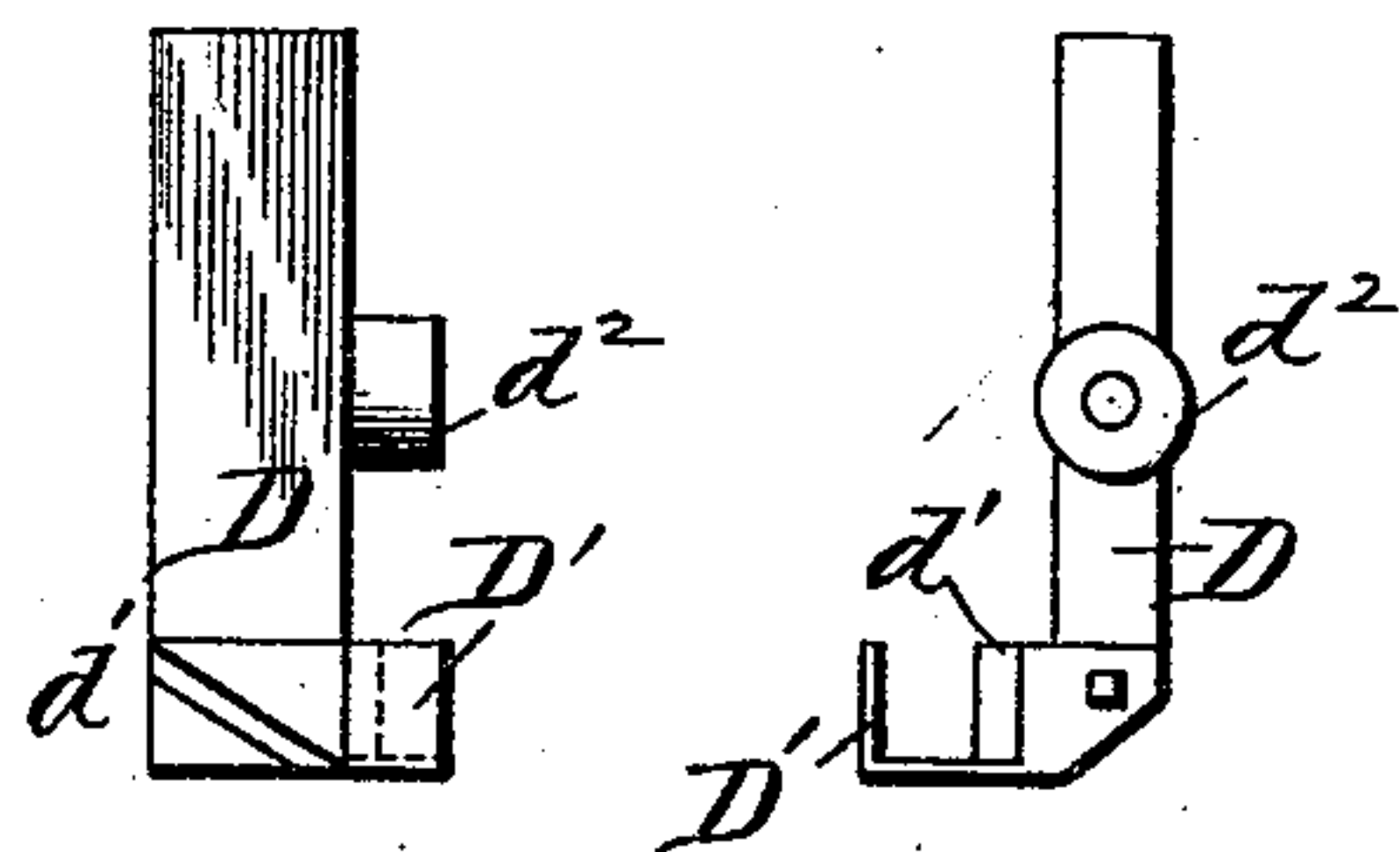
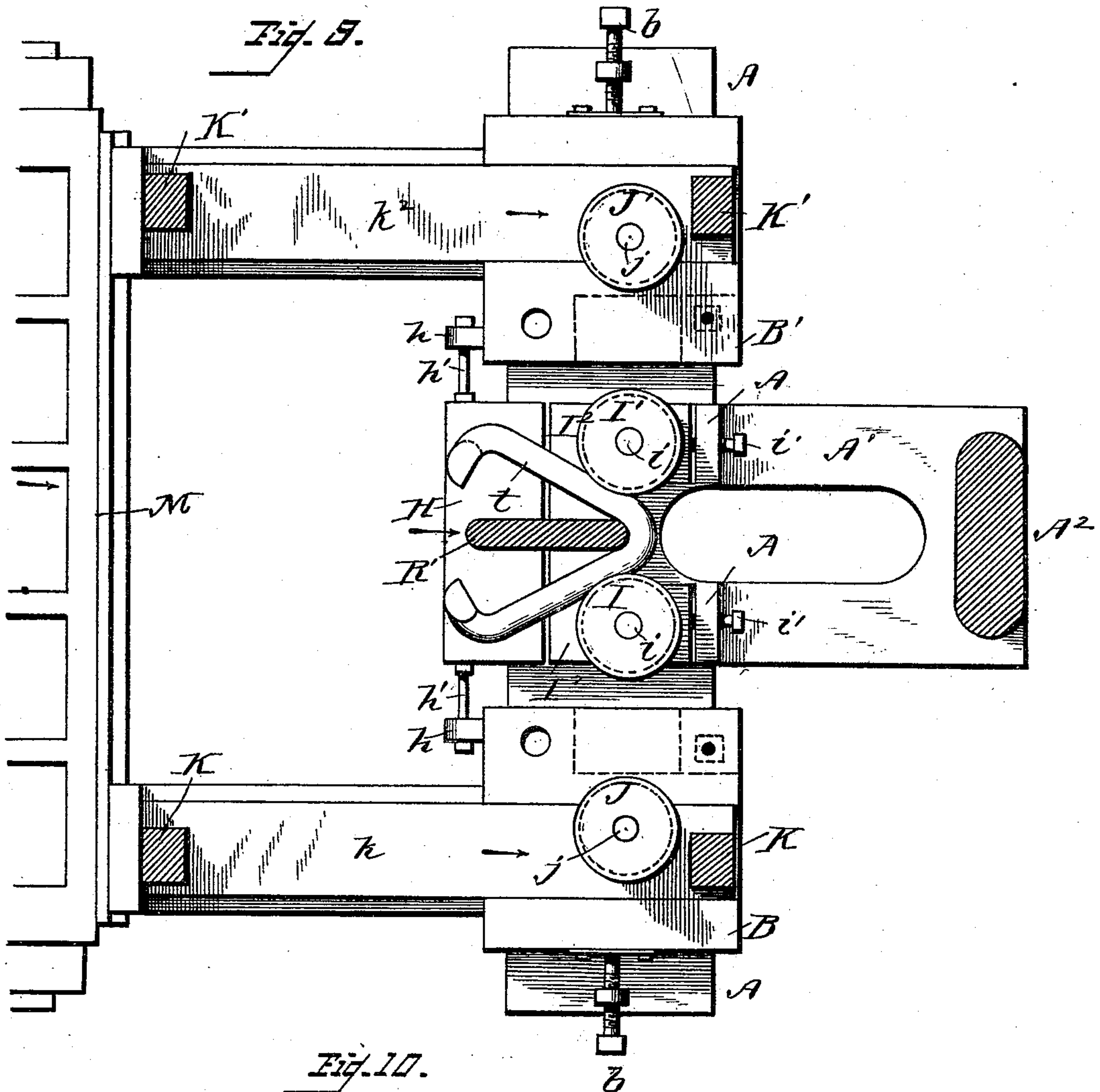
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6 Sheets—Sheet 6.

J. W. R. JOHNSON.
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No. 459,401.

Patented Sept. 15, 1891.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN W. R. JOHNSON, OF RICHMOND, VIRGINIA, ASSIGNOR TO THE
TREDEGAR COMPANY, OF SAME PLACE.

LINK-BENDING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 459,401, dated September 15, 1891.

Application filed April 20, 1891. Serial No. 389,668. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. R. JOHNSON, a citizen of the United States, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Link-Bending Machinery, of which the following is a specification.

My invention relates to machines of the class in which the link-blank is cut from a heated rod inserted into the machine, its ends scarfed and bent by being pressed around a form or mandrel by rollers into a form which only requires the uniting of its overlapping ends to complete the link.

The object of my invention is to perform these operations in a simple and efficient manner, which end I attain by certain novel organizations of instrumentalities, hereinafter specified, by which the work is done by the simple traverse of parts of the mechanism in two intersecting paths.

The accompanying drawings represent so much only of a machine embodying my improvements in the best way now known to me as is necessary to illustrate the subject-matter claimed. Some parts may, however, be used without the others and in machines differing somewhat in their details of construction from those herein shown.

Unless otherwise indicated the parts are of well-known approved construction and operation.

Figure 1 is a plan with the parts in their normal or forward position, ready for the insertion of a blank, and Fig. 2 an elevation of the right-hand side of the machine. Figs. 3, 4, and 5 are respectively vertical longitudinal sections on the lines 3 3, 4 4, and 5 5; Fig. 6, a vertical transverse section on the line 6 6; Fig. 7, a horizontal transverse section on the line 7 7. All the above views show the parts in the same relation as in Fig. 1. Fig. 8 shows a section similar to Fig. 7, but with the parts retracted into the relation assumed at the moment of bending the ends of the blank. Fig. 9 is a similar view illustrating the operation of bending the center of the blank. Fig. 10 shows front and side views of the rod guide and shear; Fig. 11, a perspective and edge

view of the scarfing-knife; Fig. 12, front and side views of the blank-gage; and Fig. 13 shows the bending-pins with their opposite inclines for bending the ends of the blank into different horizontal planes, so that they may overlap when joined.

The feed end of the machine I term the "front," the discharge end the "rear." That side on the right of a person at and facing the feed end I term the "right," the opposite the "left" side. The feathered arrows indicate the direction of view of the sections, the short solid darts the forward or down stroke of the moving parts, and the dotted arrows their backward or up stroke.

The apparatus may be used separately or as an attachment to other machines.

The drawings show the mechanism as mounted on a fixed frame or bed-plate A A'. Slide-plates B B' on opposite sides of this bed-plate are made movable toward and from the central line of the machine or the line of traverse of the mandrel, and are held in their adjusted position by set-screws b. The machine is thus rendered capable of making links of different lengths, as hereinafter explained. Stands C C' are mounted on these slide-plates.

A shear-bar D moves vertically in guides in the right-hand stand C, being held therein by straps d. This bar carries on its lower end a rod-guide D', Fig. 10, through which the blank is inserted endwise, and a shear d', which aids in cutting it, and is reciprocated endwise vertically into and out of the line of feed of the blank by a lifting-roller d², traversing the guide-groove D², hereinafter described.

A corresponding stop or gage bar E moves vertically in guides in the opposite or left-hand stand C', being held therein by straps e, and carries on its lower end a stop-gage E', Fig. 12, into which the blank is inserted and against which its end abuts. This gage-bar is also reciprocated endwise in and out of the line of the blank by a lifting-roller e², traversing a guide-groove E², hereinafter described. Bending-pins F F' also move endwise in guides slightly inclined from the vertical in the stands C C', respectively. The

lower ends of these pins, when in this normal or lowest position, rest in sockets in the slide-bars B B' to enable them to resist the lateral strain to which they are subjected when bending the blank. They are inclined in opposite directions and serve to bend the opposite ends of the blank above and below its plane to enable them to overlap when joined. These pins are also reciprocated endwise in and out of the plane of the blank by means of bell-cranks F² F³, rocking vertically parallel with the inner faces of the stands C C' on pivots f^2 f^3 thereon. These bell-cranks are connected with the bending-pins by pivoted links or straps f^4 f^5 , to accommodate their movement in different paths.

Grippers G G' rock vertically on pivots g g' , parallel with the inner faces of the stands C C', to hold the blank down firmly while its ends are being bent. They are held down at the proper time by cam-lugs g^2 thereon, acted upon by grip-plates g^3 on the central slide-bar, hereinafter described. When released from these plates, the grippers are normally lifted up out of contact with the blank by springs G².

A guide-apron H is hung at its forward end on a rod h' , mounted in lugs h on the front of the slide-plates B B'. This rod being longer than the width of the apron and being capable of sliding freely endwise through its lugs accommodates itself to the adjustment of the slide-plates to different lengths of blanks. This guide-apron is pivoted slightly below the plane in which the blank lies in the machine; but its rear edge is forced up to that plane, so as normally to rest against the blank by spring h^3 . It is depressed at the proper time as the mandrel passes over it to bend the center of the blank, as hereinafter explained.

Two center bending-rolls I I' turn loosely on pivots i on blocks I², adjustable laterally in the bed-plate A and capable of being held in any desired position by clamp-screws i' to suit different widths of links.

Slide-frames K K' move freely endwise in guides b' in the slide-plates B B', which, as before remarked, are laterally adjustable to accommodate links of different lengths. The outer bending-rollers J J' turn on vertical pivots j near the outer end of the lower bars of these slide-frames.

A knife L, Fig. 11, is mounted on the inner front side of the slide-frame K and co-operates with the shear d' in severing and scarfing the blank, being set at the proper angle for that purpose, as clearly shown in the drawings. Brackets k' , projecting inwardly from each of the slide-frames, carry rods K², provided with knockers k^3 adjustable thereon. These rods slide endwise through the lower forked ends of the bell-crank levers F² F³, and the abutting of the knockers against these levers lifts them at the proper time, and with them the bending-pins. These pins, by the way, are preferably made to slide some-

what loosely in their guides, and are kept in proper position by suitable springs (not shown) acting in opposition to the thrust of the bell-cranks.

The slide-frames K K' above mentioned are arranged to slide laterally at their forward ends upon a cross-head M, with which they are connected by bolts m , thus accommodating the lateral adjustment of the slide-frames K K' and slide-plates B B' to accommodate different lengths of links. The cross-head is reciprocated from any suitable prime mover by pitmen M', respectively connected with each end thereof, so as to insure a perfectly parallel movement of the slide-frames and other moving parts. A center head N, mounted on this cross-head, carries a socket n , in which the front end of a center bar O fits loosely, so as to be capable of slight endwise play therein. The rear end of this bar slides through a bearing in an upright A², mounted on an extension A' of the bed-plate. An adjustable connecting-rod N' projects from center head backward a short distance over the center bar. Parallel elbow-levers P P' rock vertically on a central pivot p on this overhanging arm. The forward arm of these levers is connected by a pivot o to the center bar O, while their rear arms are pin-jointed to a mandrel-block R, carrying a mandrel R' on its lower side. This block is adapted to move vertically in a vertical slot O' in the center bar, the front and rear walls of which slot are sloped upward and backward. Correspondingly-inclined slots r in the center bar are traversed by pins o' in the mandrel-block, thus compensating the differential movements of the center head and center bar.

A friction-cup Q in the upright A² carries a friction-block q , pressed down upon the center bar O by a spring q' , the tension of which is adjustable by a set-screw q^2 to prevent the bar from sliding farther than it is positively pushed by the center head and to hold it while mandrel descends.

A weighted lever S is pivoted at its rear end to this friction-cup, so as to rock vertically over the center bar, and a catch s' on the under side of this lever when it is depressed engages with a corresponding lug o^2 on the center bar. The forward end of this lever curves upward and carries an adjustable stop S', which is struck upward at the proper moment by the mandrel-block R as it rises to release the lever-catch from the center bar.

The operation is as follows: The work is done by a series of reciprocations or backward and forward strokes of the moving parts of the apparatus. While the knife L is retracted a heated rod or blank is inserted endwise through the rod-guide D² a short distance. On the next forward stroke the knife severs and scarfs this end of the rod. The crop end of the bar is swept out on the next back stroke. The hot rod is then pushed endwise across

the machine until its inner end rests in the stop-gage E'. The knife then advances and cuts off the other end of the blank, this operation taking place at the end of the forward stroke, when the parts occupy the position shown in the first seven figures of the drawings. These figures show the rod as lying between the bending-pins F F' and guide-apron H on one side and the stands C C' and the center bending-rolls I I' on the other side. The rod also rests near each end on the slide-plates B B', with its ends projecting slightly beyond the stands. (See Fig. 7.) In this position the bending-pins are inserted in their sockets, the rod-guide and stop-gage are in their lowest position in line with the rod, and the grippers G G' rest upon the rod near each end. The rod-guide, the stop-gage, the bending-pins, the guide-apron, and the center bending-rolls, being mounted on the slide-plates, all remain stationary. The center bar has a slight endwise play in its bearings, while the slide-frames K K' move freely endwise, but always in the same horizontal plane with the cross-head and center head. As a consequence of this organization on the next back stroke the grip-plates g^3 ride over the cam-lugs g^2 on the grippers to hold the rod securely in place. Simultaneously with this movement the lifting-rollers d^2 e^2 traverse the upwardly and backwardly inclined parts of the guide-grooves D² E² in the sliding frame and lift the rod-guide or shear-bar D and the gage-bar E above the line of travel of the outer bending-rollers J J', which then come into action, passing backward into the position shown in Fig. 8, under the shear-bar and gage-bar, and bend the ends of the blank around the bending-pins F F', they being firmly supported laterally against the strain to which they are subjected at this moment by their lower ends being inserted in sockets in the slide-plates. The center bar O, having, as before remarked, slight end-play in its bearings, does not partake of the first backward movement of the slide-frame; but the elbow-levers P P', pivoted thereto, do partake of this movement, being connected with the cross-head by the center head N. The center bar is, in fact, held positively against backward movement by its lug o^3 engaging with the catch s' of the weighted lever S. The center bar being thus held while the backward movement of the center head continues, the mandrel R' is raised up through the vertical slot in the center bar above the plane of the link-blank and the bending-rollers by the action of the elbow-levers P P', which in their upward movement release the catch-lever S and allow the center bar and mandrel to move backward with the slide-frame into the position shown in Fig. 8, where it lies in front of the blank t and over the guide-apron. Simultaneously with this backward movement of the mandrel the grippers are released from pressing on the blank and thrown up by their

springs out of the way. Toward the termination of the back stroke the knockers strike the bell-cranks of the bending-pins and lift them also out of their sockets and out of the way, they being retained in this upward position by suitable friction-springs c , Fig. 5. At the beginning of the next forward stroke the friction-block f holds the center bar temporarily while the center head advances. This depresses the mandrel into the plane of the link-blank, during which movement it rides over and depresses the guide-apron out of the way. In its continued forward movement the mandrel passes between the center bending-rolls and bends the link. Fig. 9 shows this bending as partly completed, while Fig. 7 shows the finished link at the completion of the forward stroke. From this figure it will be seen that a new blank is inserted as the formation of the preceding one is completed. The completion of this forward movement restores all the parts to their normal position shown in the first seven figures of the drawings. The completed link is stripped from the mandrel as it rises through the center bar on the back stroke and drops out of the machine.

Among the advantages incident to my improved organization may be enumerated the following: A rigid compact bed-plate having slide-plates adjustable laterally thereon relatively to the central line or axis of the machine carrying the rod-guide, gage-bar, bending-pins, grippers, guide-apron, all except the latter moving transversely to the plane traversed by the blank as it is formed, so as to get them out of the way of the parts moving in the same horizontal plane with the blank, such as the slide-frames, knife, outer bending-rollers, and center bar, which always move in the same horizontal plane, and the mandrel, which moves both parallel with and transversely to the blank in order first to ride over and then to bend it. The blank, it will be observed, is formed mainly by the co-operation of the mandrel and four bending-rollers with the bending-pins, the ends of the link being bent on the back stroke of the machine and its formation completed on the succeeding forward stroke, thus requiring less power than if the whole operation was performed during a single stroke of the machine. The organization, it will also be observed, is such that any of the parts can readily be removed or replaced in case of breakage, and the motions are simple and direct.

Having thus fully described the construction, organization, and operation of my improved link-bending machine, what I claim therein as new and as of my own invention is—

1. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, stands on these slide-plates, a rod-guide carried by one of these stands, and a stop-gage carried by the

other, both movable transversely to the line of feed of the blank to guide, gage, and release the blank.

2. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, stands on these slide-plates, and bending-pins carried by the stands and movable transversely to the line of feed of the blank which passes between the stands and bending-pins as it is fed into the machine.

3. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, and bending-pins, all movable transversely to the line of feed of the blank.

4. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, stands on these slide-plates, a rod-guide, a stop-gage, and bending-pins, all carried by the stands and movable transversely to the line of feed of the blank.

5. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, a rod adapted to slide endwise in bearings on the slide-plates, a guide-apron pivoted on this rod, and springs which normally hold the apron in the line of feed of the blank to help retain it in place when first inserted in the machine.

6. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates laterally adjustable thereon, a rod-guide, a stop-gage, and a guide-apron, all movable transversely to the line of feed of the blank and co-operating to hold it in position.

7. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, and a guide-apron, all movable transversely to the line of feed of the blank, first to hold and then to release it.

8. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, a rod-guide and stop-gage carried by the adjustable slides, and the center bending-rolls, against which the blank is held by the stop and guide when first inserted into the machine.

9. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, and a guide-apron, all movable transversely to the line of feed of the blank, with center bending-rolls, between which and the apron the rod is inserted endwise into the rod-guide and stop-gage.

10. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, bending-pins, and a guide-apron with center bending-rolls, between which and the other members the rod is held.

11. The combination, substantially as hereinbefore set forth, of a bed-plate, slide-plates adjustable laterally thereon, stands on these slide-plates, a rod-guide carried by one of these stands, a stop-gage carried by the other, a slide-frame movable in the slide-plates

transversely to the line of feed of the blank, and a scarfing-knife carried by the slide-frame.

12. The combination, substantially as hereinbefore set forth, of a rod-guide through which the blank is fed endwise adapted to move transversely to the line of feed of the rod, a shear carried by this guide, a slide movable transversely to the line of feed, and a scarfing-knife mounted on the slide and co-operating with the shear to sever the blank.

13. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, and interposed yielding grippers which press the blank upon its bed as it is fed into the machine.

14. The combination, substantially as hereinbefore set forth, of bending-pins against which the ends of the blank rest when inserted into the machine, and interposed yielding grippers which hold the blank in this position.

15. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, bending-pins, and yielding grippers, all co-operating to hold the rod in position.

16. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, bending-pins, yielding grippers, and a guide-apron, all co-operating to retain the blank in position.

17. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, yielding grippers, and center bending-rolls, all co-operating to hold the blank in position.

18. The combination, substantially as hereinbefore set forth, of bending-pins, yielding grippers, and center bending-rolls, all co-operating in holding the blank.

19. The combination, substantially as hereinbefore set forth, of bending-pins, yielding grippers, a guide-apron, and center bending-rolls, all co-operating to hold the blank.

20. The combination, substantially as hereinbefore set forth, of a rod-guide, a stop-gage, bending-pins, yielding grippers, a guide-apron, and central bending-rolls, all co-operating to hold the blank.

21. The combination, substantially as hereinbefore set forth, of a slide-plate, a stand carried thereby, a shear-bar or rod-guide mounted in guides therein through which the rod or blank is fed endwise, a roller on the rod-guide, a frame sliding in the slide-plate, and a guide-groove therein traversing the roller to move the rod-guide transversely to the line of feed of the rod or blank.

22. The combination, substantially as hereinbefore set forth, of a slide-plate, a stand thereon, a gage-bar or stop-gage movable in guides therein, into which gage the end of the rod is inserted, a lifting-roller on the stop-gage, a frame sliding in the bed-plate, and a guide-groove therein traversing the roller to move the stop-gage transversely to the line of feed of the rod or blank.

23. The combination, substantially as here-
inbefore set forth, of a slide-plate, stands car-
ried thereby, bending-pins movable in guides
therein, frames sliding in the bed-plate,
5 knockers carried thereby, and bell-cranks
actuated by the knockers to traverse the bend-
ing-pins in and out of the path of the blank.

24. The combination, substantially as here-
inbefore set forth, of a slide-plate, stands car-
ried thereby, yielding grippers pivoted there-
on, cam-lugs on the grippers, a frame sliding
in the slide-plate, and grip-plates actuated
thereby to press the grippers upon the blank.

25. The combination, substantially as here-
inbefore set forth, of a bed-plate, bending-
pins around which the ends of the blank are
bent, grippers which hold the blank during
this operation, and mechanism which simul-
taneously releases the bending-pins and grip-
pers from contact with the blank.

26. The combination, substantially as here-
inbefore set forth, of bending-pins, mechan-
ism traversing them in and out of the line of
the blank, outer bending-rolls, and mechan-
ism which traverses them in the plane of the
blank, between which and the bending-pins
the ends of the blank are bent.

27. The combination, substantially as here-
inbefore set forth, of a bed-plate, a recip-
rocating center head, a center bar sliding end-
wise through a stand on the bed-plate and
having slight end-play in a socket in the cen-
ter head, a mandrel carried by the center bar,
and link connections between the mandrel,
35 center bar, and center head, by which the
mandrel is traversed both transversely to and
parallel with the path of the blank, first to
pass over and then to abut against it.

28. The combination, substantially as here-
inbefore set forth, of a bed-plate, a center
head reciprocating relatively thereto, a cen-
ter bar sliding endwise through a stand on
the bed-plate and having slight end-play in
a socket in the center head, a catch-lever
45 holding the bar against movement in one di-
rection, a mandrel carried by the center bar,
and link connections between the center
head, center bar, and mandrel, these mem-
bers co-operating to hold the bar and man-
drel until the latter is moved out of the path
of the link, and then released to allow the
mandrel to be traversed by the head and bar
to carry it over and in front of the blank pre-
paratory to bending it.

29. The combination, substantially as here-
inbefore set forth, of a bed-plate, center bend-
ing-rolls fixed thereon, a slide-frame recip-
rocating on the bed-plate, a mandrel carried
thereby, and mechanism which lifts the man-
drel out of the path of the blank, carries it
over and in front of the blank, descends and
advances it between the rolls to bend the cen-
ter of the blank.

30. The combination, substantially as here-
inbefore set forth, of bending-rolls, a recip-
rocating center head or frame, a center bar re-

ciprocating with said frame, a mandrel car-
ried by said bar, and mechanism which trav-
erses the mandrel with and transversely
across the center bar, first to carry it over the
blank and then to act upon the blank to bend
it on its return movement.

31. The combination, substantially as here-
inbefore set forth, of a reciprocating center
head, a center bar reciprocating therewith
and having slight end-play therein, a friction
device acting on the center bar, a mandrel
carried by and movable transversely rela-
tively to the bar, and an elbow-lever connec-
tion between the center head and mandrel to
actuate both the center bar and mandrel by
the reciprocation of the center head.

32. The combination, substantially as here-
inbefore set forth, of center bending-rolls
against which the blank lies, a reciprocating
center head, a center bar reciprocating there-
with and having a slight endwise movement
relatively thereto in a plane parallel with the
bending-rolls, a friction device which retards
the movement of the center bar, a mandrel
carried by the lever and movable transversely
thereto, an elbow-lever connection between
the center head, center bar, and mandrel, a
catch-lever which locks the center bar tem-
porarily when moving in one direction, and
a stop actuated by the movement of the man-
drel to release the catch-lever and allow the
center bar and mandrel to move backward to
carry the latter over and into position to act
upon the blank.

33. The combination, substantially as here-
inbefore set forth, of a bed-plate, laterally-ad-
justable slide-plates thereon, sliding frames
mounted in these slide-plates, a cross-head,
and mechanism for adjusting the sliding
frames thereon coincidently with the adjust-
ment of the slide-plates on the bed-plate to
adapt the mechanism to the manufacture of
links of different lengths.

34. The combination, substantially as here-
inbefore set forth, of bending-pins inclined
in opposite directions relatively to a vertical
plane passing longitudinally through the
blank, and bending-rolls traversing in the
plane of the blank to bend its ends so that
they shall lie in different horizontal planes,
so as to overlap when the link is finished.

35. The combination, substantially as here-
inbefore set forth, of a rod-guide through
which the blank is fed endwise, a gage-stop
into which it is similarly fed, and bending-
pins against which its ends rest when ready
for operation, mechanism which removes
these devices from the path of the blank at
the proper time, center bending-rolls secured
by the bed-plate, a knife or shear to sever the
blank, outer bending-rolls reciprocating in
the plane of the blank to bend its ends, and
a mandrel reciprocating both vertically and
transversely relatively to the blank, first to
pass over it and then to bend it.

36. The combination, substantially as here-

inbefore set forth, of a bed-plate, slide-plates
laterally adjustable thereon, stands carried
by the slide-plates, a rod-guide, a gage-bar,
bending pins and grippers mounted on these
5 stands, laterally - adjustable center rolls
mounted on the bed-plate, slide-frames mov-
able in guides in the slide-plate, a knife, and
outer bending-rolls carried thereby, a cross-
head adjustably connected with the slide-
10 frame, a center head, a center bar, a mandrel
carried by and reciprocating transversely

relatively to said bar, and a catch-lever which
holds the bar until released by the mandrel
as it rises out of the way of the blank to pass
over it to begin a new movement. 15

In testimony whereof I have hereunto sub-
scribed my name.

J. W. R. JOHNSON.

Witnesses:

J. R. J. ANDERSON,

E. W. COOPER.