(No Model.) 2 Sheets—Sheet 1.

J. H. ALKER.

MACHINE FOR BENDING CAR COUPLING LINKS.

No. 253,653. Patented Feb. 14, 1882.

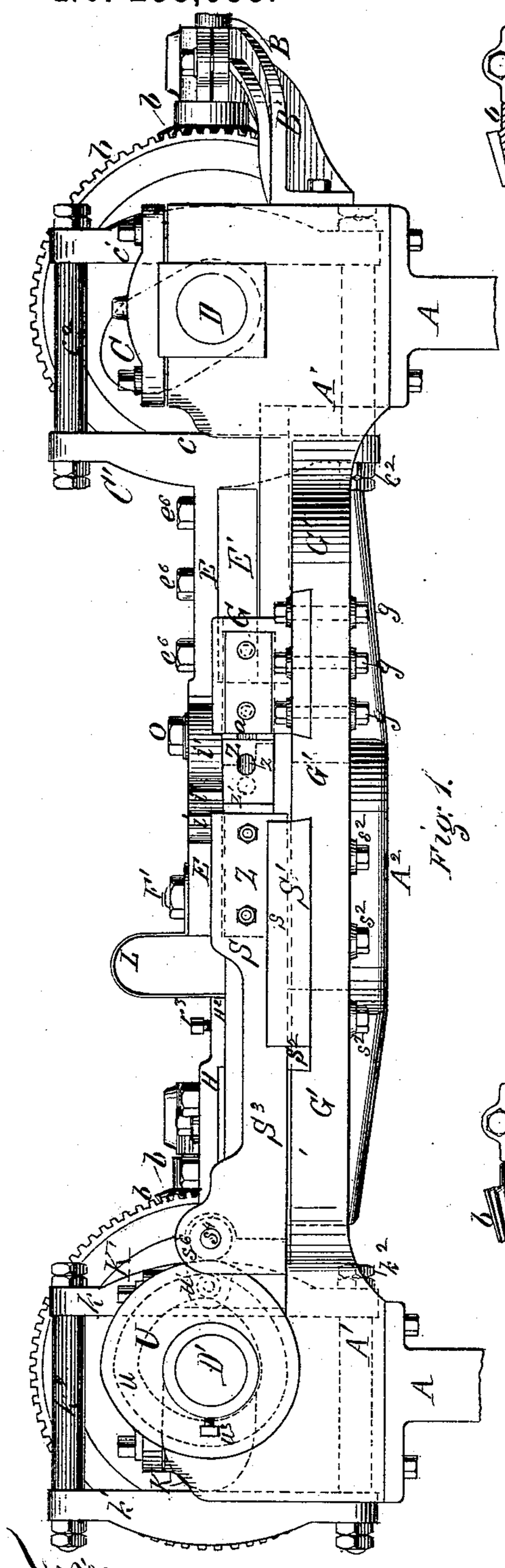

Fig. 1.

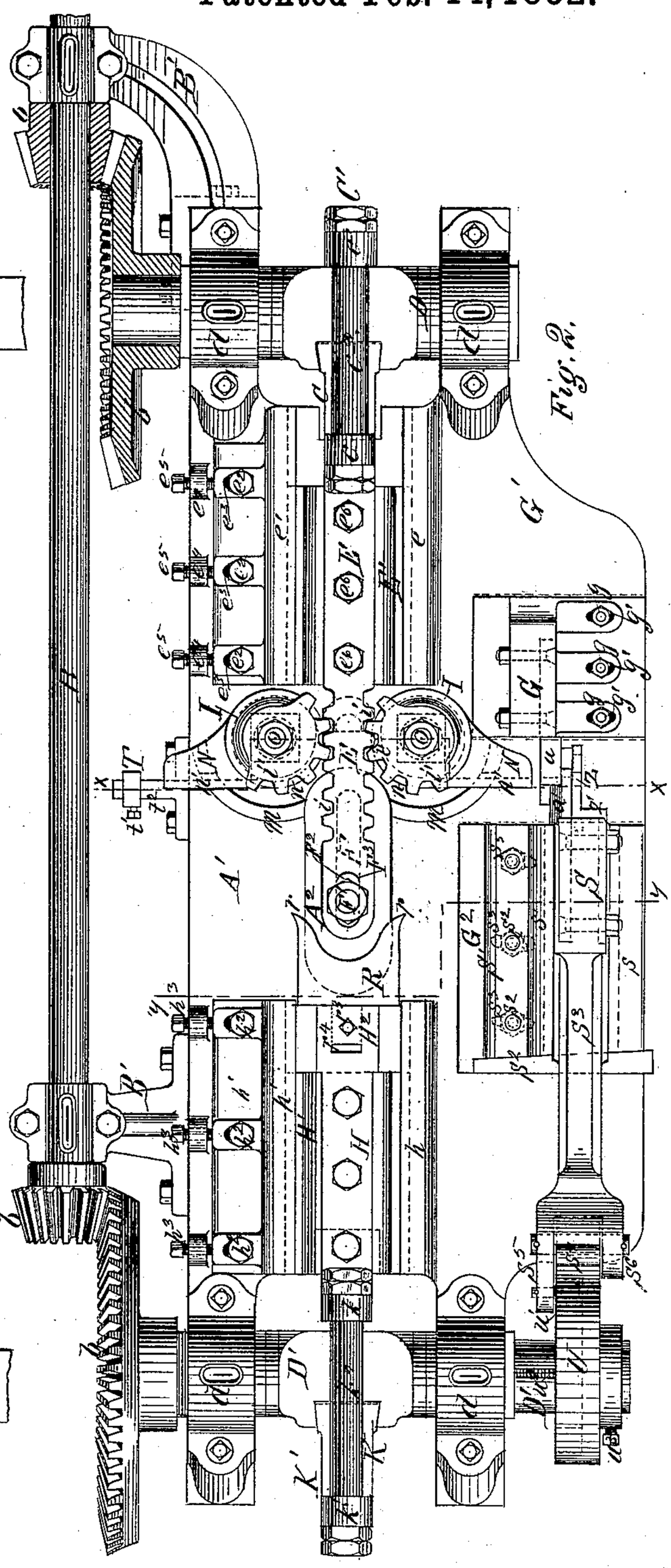

Fig. 2.

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By Attorney George H. Christy

(No Model.) 2 Sheets—Sheet 2.

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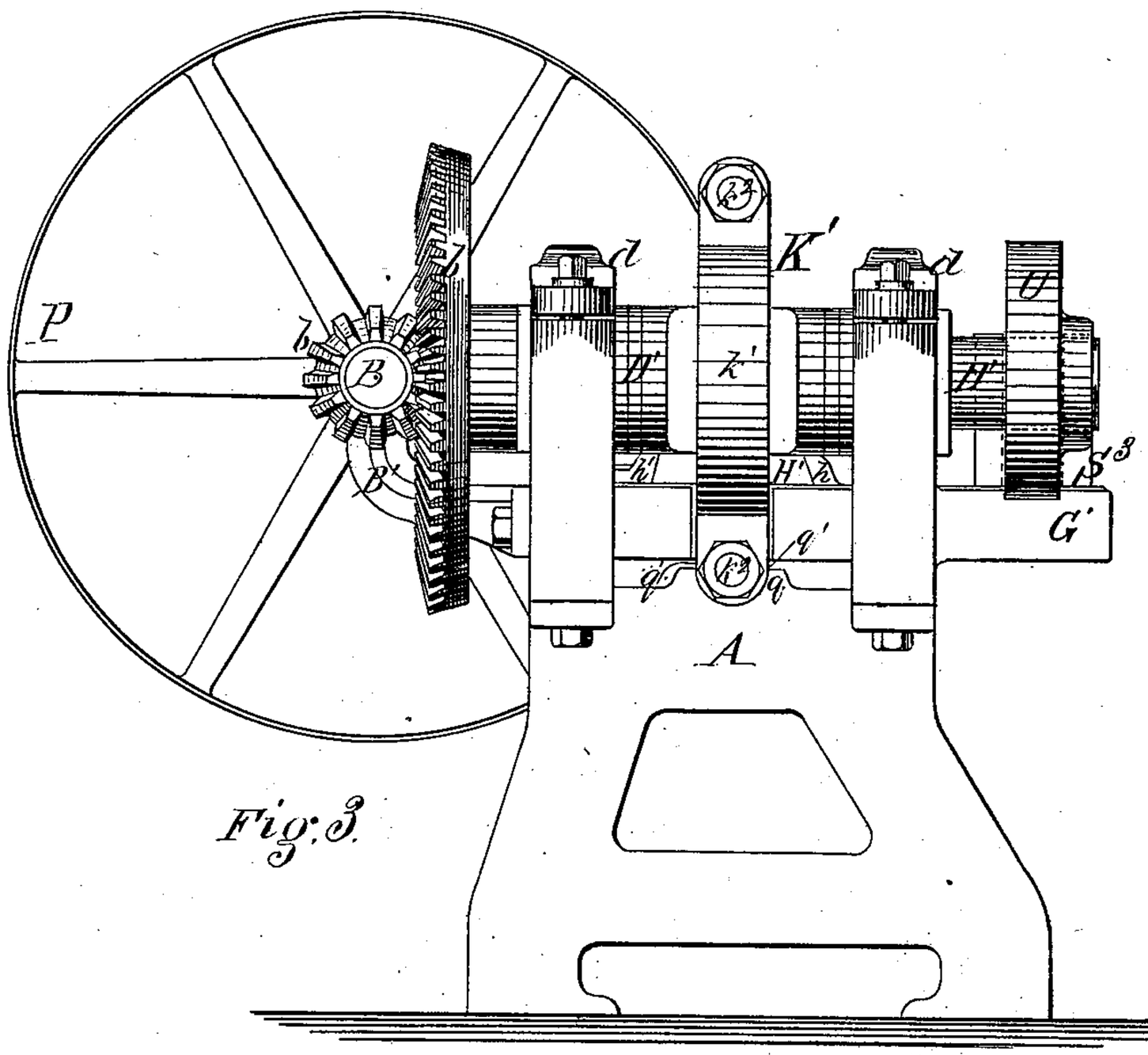

Fig: 3.

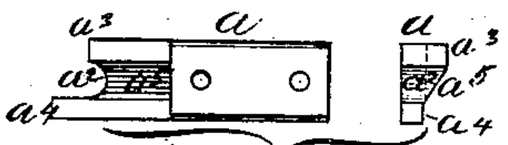

Fig: 9.

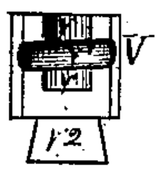

Fig: 11.

Fig: 12.

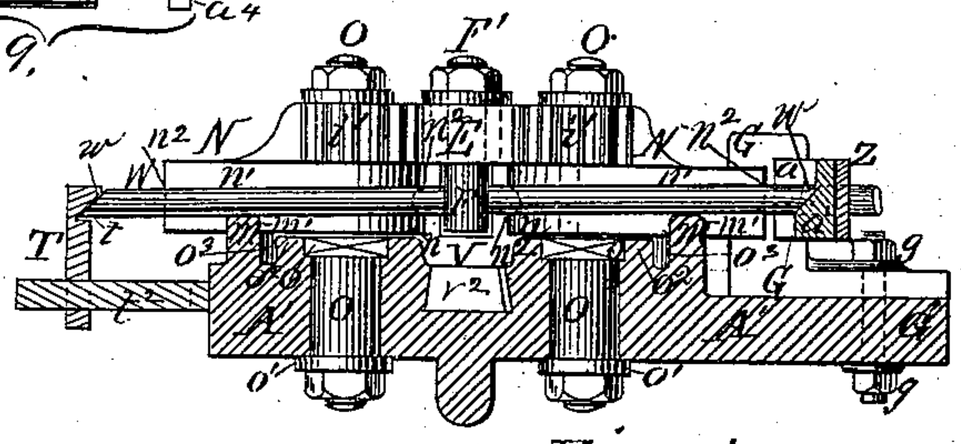

Fig: 4

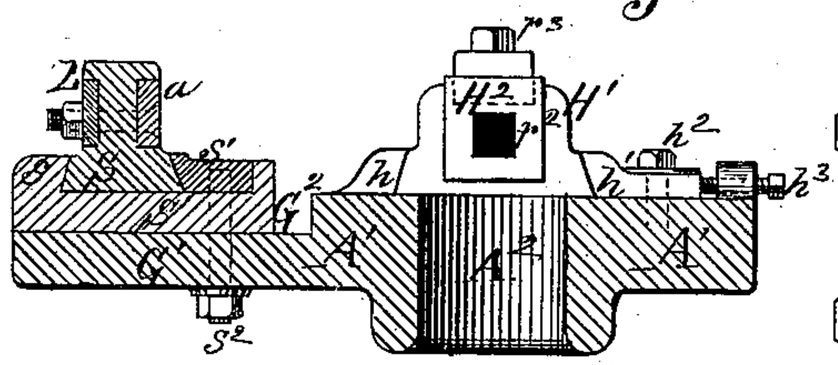

Fig: 5.

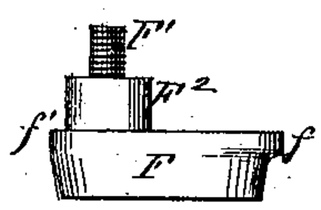

Fig: 8.

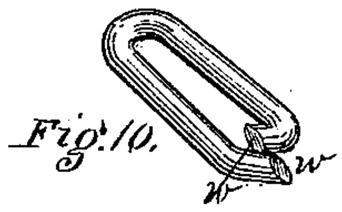

Fig: 10.

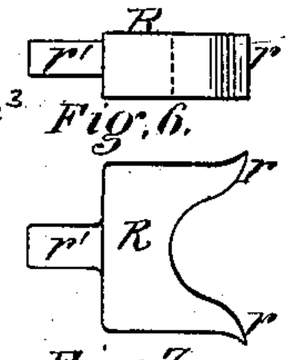

Fig: 6.

Fig: 7.

Witnesses.
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By Attorney George H. Christy

UNITED STATES PATENT OFFICE.

JOHN H. ALKER, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR BENDING CAR-COUPLING LINKS.

SPECIFICATION forming part of Letters Patent No. 253,653, dated February 14, 1882.

Application filed July 7, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. ALKER, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Machines for Bending Car-Coupling Links; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, shows a side elevation of my improved machine. Fig. 2 is a top plan view. Fig. 3, Sheet 2, shows an end elevation. Fig. 4 is a sectional view taken in a broken plane represented by the line *x x*, Fig. 2, and also showing the mandrel, rack-bar, and parts of the rotary bending-dies in elevation. Fig. 5 is a sectional view in the plane of the line *y y*, Fig. 2; and Figs. 6, 7, 8, 9, 10, 11, and 12 are detached views of parts of the apparatus, hereinafter described.

My invention relates to certain improvements in machines for bending car-coupling links; and it consists in general terms in certain combinations of devices for measuring off definite lengths or blanks from a rod or bar and severing the same at proper angles for subsequent welding, together with devices for bending such blank to the desired form, consisting of rotary dies, longitudinally-moving mandrel, an anvil or rest for supporting the mandrel and blank, and a longitudinally-moving die for completing the bending operation, with other features of improvement in the details of construction, as hereinafter described, whereby the machine is better adapted to do the work for which it is designed.

In the drawings, A represents a frame-work, of metal, on the top of which is a bed-plate, A′, adapted to carry the bending and shearing mechanism.

Along one side of the frame is a driving-shaft, B, journaled in brackets B′, which extend outward from either end of the machine. This shaft may be driven by belt and pulley P, Fig. 3, or in other desired manner.

Across the ends of the machine are journaled cam-shafts D D′ by means of suitable journal-boxes *d*, and these cam-shafts are geared with shaft B by bevel-gearing *b*, so as to take rotary motion therefrom in unison.

Upon shaft D, between its bearings *d*, is fixed a cam or wiper, C, in any convenient way, which is adapted to press against the inner and outer vertical bars, *c c′*, of the inclosing yoke C′, and thereby give it reciprocating motion. These bars *c c′* are connected above and below by stretchers c^2, and from the inner bar, *c*, a horizontal bar, E, extends inward toward or past the center of the machine. This bar E is guided and supported in its reciprocating movement by a sliding block, E′, to which the bar is bolted, as at e^6. The block E′ slides upon the bed A′, and is held in place by side strips, *e e′*, one of which, as *e′*, is made removable and adjustable by bolts and slotted openings e^2 e^3 and set-screws e^5, which work in lugs e^4, (see Fig. 2,) whereby wear may be compensated and the parts removed as occasion may require.

On the edges of bar E, toward its inner end, are made rack-teeth *i*, the purpose of which will presently appear. Also, to the under side of bar E is secured a bending-mandrel, F, (see Fig. 8,) by bolt F′ and shoulder or projection F^2. This shoulder is oblong in form, and, entering a corresponding opening, F^3, in the bar, prevents the mandrel from turning laterally. In operation the blank is bent in a horizontal plane around the mandrel, and consequently the form of the mandrel in the plane of bending corresponds to that desired in the link or coupling. (See Fig. 10.) Above this plane, at the end against which the bending operation begins, is made a shoulder, *f*, the lower part of which is hollowed or made concave to fit the rod or blank. At the opposite end the face of the mandrel above the plane of bending is made vertical, or nearly so, as at *f′*, in order to permit one end of the bent blank to be lapped over the other, as in Fig. 10, as presently described. From the plane of bending downward the mandrel is tapered to reduce its size and facilitate discharge of the bent blank.

On either side of the rack E is journaled a rotary or oscillating bending-die, I. These dies take motion in common from bar E through toothed segments *i′ i′* and rack-teeth *i*, the relationship being such that each full stroke of the rack-bar gives to each die a quarter-rotation. The working-faces of the dies consist of a short arc or circular part, *n*, and an extended tangential part, *n′*, continuous with the

curved part, such tangential face being formed on the edge of an arm, N, which projects from and in the plane of the circular hub or body of the die. These two dies are geared with the rack in such relation that when the latter is at the limit of its stroke toward the left, as in Fig. 2, the arcs *n* of the two dies are adjacent, and separated sufficiently to permit the mandrel with its link to pass between them. The two straight faces *n' n'* are in line across the machine, and the mandrel F is wholly to the left of the dies, with sufficient space between the dies and mandrel for passing the blank W. Then as the rack-bar is moved toward the right by cam C the mandrel F will be carried endwise between the dies, and at the same time the dies will be turned, bringing the straight faces *n' n'* down upon their respective sides of the mandrel, whereby an interposed blank will be bent around and against the mandrel into U form.

The position and direction in which the blank W is fed in are represented in Fig. 4, it being passed from right to left along the faces *n' n'* of the dies in a downwardly-inclined direction. The purpose of such inclination is to raise one end of the blank above the other, so that in the final bending operation—namely, closing together the open ends of the U—one end may lap over the other, as in Fig. 10. In order to insure this position and inclination of the blank both in the bending and feeding operations, concave channels or grooves n^2 are made lengthwise in the die-faces *n' n'* in the desired line of feed, which grooves receive and direct the blank. Also, curved guides and supports *m m* are raised above the bed on either side of the rack-bar, which extend upward, as in Fig. 4, a suitable distance to form rests for the under side of the blank while it is within the grooves n^2. By means of these curved guides *m*, grooves n^2, and the shoulder *f* the blank is securely held and directed as it is bent upon the mandrel.

It will be observed that the position of the blank upon the mandrel will be slightly helical or spiral, owing to the inclined feed above described. Consequently the plane of bending referred to in describing the form of the mandrel is not, strictly speaking, horizontal, and the hollow seat on the mandrel made by the shoulder *f* is likewise given a slightly-helical direction around the end of the mandrel. When the dies are closed upon the mandrel the upper walls of grooves n^2 are in line with or form in effect continuations of the bearing afforded by the shoulder *f*, so that the dies and mandrel together constitute a kind of griping-die, within or between which the partially-bent link is firmly held, while its open ends are bent together by a separate device, hereinafter described.

It will be observed that the rests *m m* are raised above the lower faces of the bending-dies I I. In order to provide for the proper position of the dies, these guides are made in arcs of circles, their centers corresponding with the centers of motion of the dies. Also, similarly shaped and curved grooves *m' m'* are made in the lower faces of the dies, within which the projections *m m* are received, as illustrated in Fig. 4. The projecting rims *m* thus serve both as supports for the blank and as outer or circumferential guides, to assist in keeping the dies in position as against the lateral strains.

The dies are pivoted centrally by bolts or wrists O, which are secured to the bed A' by the angular shoulders or fixed collars *o* and nuts and washers *o'*. The rims o^2, which surround shoulders *o*, afford bottom bearings for the dies; and channels o^3 between the rims *m* and o^2 are provided to facilitate fitting the several parts, and also to reduce friction and prevent choking. The rims *m* and o^2 are by preference cast with the bed A', and the surfaces on which the dies rest and turn are made true and smooth in the usual way of doing such work.

The central bolts or wrists, O, together with the rim-bearings *m*, afford secure and durable bearings for the dies, such that the extremities of the straight arms N may be brought down upon the sides of the mandrel firmly without danger of breakage.

These parts are employed, as above described, to bend the blank to U form. In this position the straight sides of the dies also co-operate with the mandrel to clamp the blank, not only holding it as against endwise thrust from the closing-in die, but they also prevent the sides of the blank from spreading or bending away from the mandrel or its open ends from separating vertically during such closing-in operation. This clamping feature, due to the straight sides of the dies, is also useful in upsetting or enlarging the link at the end first bent, as hereinafter described. In these respects the form of the dies constitutes an important feature of my invention. The open ends of the blank are bent together while the mandrel is at the limit of its stroke toward the right and while the blank is firmly griped and held between the mandrel and dies, as above described. In order, however, to obtain additional support for the blank in this position, I arrange an anvil or rest, V, on the bed A', in position to receive the right-hand or bow end of the link. This anvil is secured to the bed by a dovetail stem, V^2, and key. (See Figs. 4 and 11.) In its face adjacent to the mandrel is made a vertical seat or concave recess, *v*, adapted in form to receive the end of the mandrel, and a deeper horizontal seat or recess, *v'*, to receive the bow or bent end of the blank. As the mandrel and the partially-bent blank are carried to the right they enter and rest in their respective recesses, and in such position the blank is inclosed by the mandrel, the dies I I, and the anvil. These parts remain in this position while the cam C is passing from yoke-bar *c'* to *c*, and it is during this time that the open ends of the blank are bent together. This

is done by means of a reciprocating die, R. Figs. 2 and 7, the two horns *r r* of which diverge sufficiently to embrace the open ends of the blank, and as the die is pushed toward the mandrel in the direction of its length these horns turn or bend the ends of the blank toward each other around the end of the mandrel. The working-faces of these horns are smooth or ungrooved, thus allowing the ends of the blank to slip thereon vertically, and as the ends come together they come in contact on their beveled or scarfed edges *w w*, whereby one is bent upward and the other downward sufficiently to pass and lap over each other, as in Fig. 10, both ends being bent substantially alike or to an equal extent.

By inclining the blank sufficiently as it is fed to the machine, and thereby giving it more of spiral bend around the mandrel than above described, the ends of the blank may be lapped over and under without additional bending at the ends; but in practice I prefer to bend the blank around the mandrel but slightly out of a true plane—say about half the diameter of the rod—and thereby to separate the ends vertically, simply enough to insure proper contact of the ends upon their beveled cuts *w*, the balance or greater part of the over and under bend being made at the ends in the operation of closing them together. In this way I avoid injurious twisting of the bent link and bring the lapping points in contact in suitable and convenient relationship for subsequent welding.

The requisite movements of die R toward and from the mandrel are imparted by the following means: A cam, K, is secured on shaft D′, and is adapted to operate at intervals upon the inner vertical bar, *k*, of the yoke K′. This yoke is made substantially like yoke C′, having vertical bars *k k′* and stretchers k^2. From the inner bar, *k*, a horizontal bar, H, is extended inward toward the center of the machine, and is directed and supported by connection with a sliding block, H′, which is mounted on the bed-plate between side guides, *h h′*, one of which, as *h′*, is made removable and adjustable by slots and bolts h^2 and set-screws h^3, substantially as provided for slide E′, before described.

On the inner end of bar H is made a head, H^2, (see Fig. 5,) having a socket, r^2, made lengthwise therein and opening on the face or end toward the mandrel. This socket is adapted to receive and hold the shank or pin r' of die R, the shank being bound by set-screw r^3. A top opening, r^4, at the inner end of the socket (see Fig. 2) is provided, through which wedges or liners may be introduced back of the shank, for adjusting the die in the direction of its motion. By unscrewing the binding-screw r^3 the die may be removed when desired.

The cams C and K are set in such relation to each other and to their respective yokes that the yoke C′ has a period of rest at the end of each stroke, and that the die R remains stationary at the left-hand limit of its movement while the mandrel F is moving toward the right and the blank is being bent into U form, as above described; but as the mandrel reaches or approaches the limit of its movement toward the right the die R is advanced quickly in the same direction by the cam K closing in the ends of the blank, as above described, while the mandrel is at rest. This being done, the backward movement toward the left is given by cam C while cam K is passing between the bars *k k′*, the die R being pushed by the mandrel by means of a spring device, presently described. In this backward movement the rotary dies I I are turned outward, thereby releasing the bent blank, allowing it to fall through the opening A^2 in the bed plate. This discharge, owing to the tapering form of the mandrel, will ordinarily occur as stated, notwithstanding the pressure against die R which would be caused by pushing it back by the mandrel; but as such pressure might at times be an objection or hinderance to proper discharge, I introduce a bow-spring, L, Fig. 1, between the bar E and die R, the pressure of which is sufficient to open a space between the die and link when cam K is off the bar *k*, and so relieve pressure upon that end of the link and allow it to fall without hinderance.

Instead of placing the spring between the die and bar, it may be placed at the end of the frame, one end of the spring being secured rigidly to the frame and the other to the yoke, as in ordinary bolt-machines; or the yoke K′ may be given such form that the cam K may operate to move die R in both directions in proper relation to the movements of the mandrel to effect the objects stated. At the limit of this movement toward the left both the mandrel and the dies have a period of rest, during which the feeding and shearing operations take place, as presently described.

The pressure of cam K upon the bar *k* is forward and downward. In order to support such downward pressure, a rib, *q*, Fig. 3, is raised on the end of frame A, and a concave groove, *q′*, is made lengthwise therein, adapted to form a support or bearing, in which the understretcher, k^2, slides. Like provision may be made at the other end of the machine for supporting the yoke C′.

As before stated, the line of feed is across the machine from right to left in front of dies I I. (See Figs. 2 and 4.) On the left-hand side of the frame, in this line of feed, is secured by screw *t′* a stop or gage, T, in an extended pin, rod, or bracket, t^2. This gage may be adjusted in or out on the pin to lengthen or shorten the feed, and to prevent upsetting or blunting the extreme point of the blank by forcing it while heated against the gage I make a recess or notch, *t*, in the inner side face of the gage, of such form that the blank may strike on its beveled edge or cut *w*, as illus-

trated in Fig. 4. On the opposite or right-hand side of the frame is a shear device for severing blanks from a bar. This device consists of a stationary and movable shear-blade, which blades are held and operated as follows:

A stationary shear-head, G, is secured by bolts *g* to a lateral extension, G′, of the bed-plate A′. The bolts *g* are passed through slots *g′* in the foot or base of the shear-head, whereby the head is made adjustable on its seat G^2 laterally toward and from the central line of the machine. To the outer surface of this shear-head is bolted the stationary shear-blade *a*. A movable shear-head, S, is also mounted on extension G′, and it is arranged to slide in a dovetail way formed by the plate S′ and two side or guide strips, *s s′*, one of which, as *s′*, is removable, and is held in place by bolts s^2 and by a wedge, S^2, which locks plate S′ in the depressed seat G^2. In order to make the plate S′ adjustable laterally in this seat, and with it the shear-head, the bolts s^2 are passed through slots s^3, (shown by dotted lines, Fig. 2,) which slots are made in the plate G′. By loosening the wedge S^2 and bolts s^2 the shear-head S may be moved toward or from the central line of the machine.

From the head S a bar, S^3, is extended toward the shaft D′, which bar is forked or has two ears, s^5 and s^6, formed thereon, between which is journaled an anti-friction roller, s^4. A cam-wheel, U, is secured by feather and groove u^2 and binding-screw u^3 on the extended end of shaft D′, the periphery of which is adjusted to bear against the roller s^4 and push the head S forward toward the stationary head G. A cam-groove, *u*, (indicated by dotted lines, Fig. 1,) is made in the inner side face of cam-wheel U, and a roller or wrist, *u′*, pivoted on the inner fork, s^5, of bar S^3, extends into this groove, and on the rotation of the cam draws the head S away from G. In order to support the bar S^3 firmly against the downward thrust of cam U, the plate G′ is carried back under the bar, as illustrated in Figs. 1 and 2, making thereby a long slide or bottom bearing.

On the inner side face of shear-head S is bolted the movable shear-blade *a′*. The two heads S and G are adjusted to bring the two blades *a a′* in contact face to face at the same distance from the mandrel as the gage T. The two shear-blades are substantially similar in form or are counterparts, the stationary one being shown detached in Fig. 9. The cutting-edges a^2 are curved in form, with a short lip or projection, a^3, above and a longer lip or projection, a^4, below the cutting-edge proper. This form is given in part to facilitate feeding the rod between the shear-blades.

In order to give a beveled or oblique cut, *w*, to the rod in severing the blanks, the adjacent cutting-faces of the blades at and in rear of the cutting-edges a^2 are sloped, beveled, or inclined vertically, as at a^5, Figs. 4, 9, and 12, thereby making the upper and lower edges of each shear-blade of unequal or different thickness. In cutting the rod the shear-blade *a′* carries the end which rests in it forward toward the head G, out of the line of feed. In order to bring this end back with the retreating shear-blade, and also to guide and support the rod as it is fed to the machine, I make use of a guide-bar, Z, which is fastened to the outer face of shear-head S, as in Figs. 1 and 2, by the same bolts which secure shear-blade *a′*. This bar Z is bent or turned, as at *z′*, against the outer face of blade *a′*, and a slightly elongated hole, *z*, is made through it in proper position to register with the opening between the shears when in position for feeding, as represented in Fig. 12. The blade *a′* and guide-bar Z move in unison, the hole *z* being continually in front of or in line with the feed-opening between the shear-lips a^3 and a^4 of this blade. Consequently as the blade is drawn back the end of the rod which passes through the guide-bar and rests on the blade will also be carried back in proper position to be again fed between the shear-blades.

The slight elongation or enlargement of hole *z* prevents binding the rod. Instead of attaching the bar Z to head S, it may be made substantially tubular in form and attached directly to the face of the shear-blade; but such construction would weaken the blade and increase expense of manufacture, and for these reasons I prefer the construction and arrangement shown.

As car-coupling links are usually bent, the blank is stretched and reduced in area at the points where bending takes place. This is objectionable, as it weakens the link at the point where in use it is most liable to break. In the machine above described, however, the rotary dies I I, co-operating with the mandrel F and anvil V in their action upon the blank, work or press the heated metal toward the bending-points, thereby actually upsetting it and increasing the size or area in cross-section at the bend. This I consider an important result, and it is secured by the construction and combination of anvil, mandrel, and rotary dies above described.

I am aware that rotary dies have been used with reciprocating mandrels for closing in the open ends of a U-shaped blank, one such form of combination being described and shown in patent granted to me February 26, 1878, No. 200,595. In my present invention, however, the rotary dies co-operate with the mandrel to give the blank U form, and also with the anvil to clamp and hold the U-blank while the open ends of the latter are bent together by a separate bending device. The operation of these several parts and the advantages secured by the features of construction embodied therein have been described above.

I claim herein as my invention—

1. In a machine for bending car-coupling links, a bending-mandrel, F, arranged to move longitudinally with reciprocating motion, in combination with rotary moving dies I, arranged

on either side of the path of motion of the mandrel, such dies having their working-faces formed of a curved part, *n*, and a staight tangential part, *n'*, substantially as and for the purposes set forth.

2. In a machine for bending car-coupling links, the combination of a reciprocating mandrel, rotary moving bending-dies arranged on either side of the path of motion of the mandrel and adapted with the mandrel to bend the blank into U form around and clamp it upon the mandrel, and a reciprocating die arranged to press upon and bend the ends of the U-shaped blank together around the end of the mandrel, substantially as set forth.

3. The combination of reciprocating rack-bar E, rotary moving bending dies I I, geared with the rack, mandrel F, secured to the rack-bar, and reciprocating die R, substantially as set forth.

4. In a machine for bending car-coupling links, the combination of a reciprocating mandrel, rotary moving dies arranged on either side of the mandrel and adapted therewith to bend the blank into U form, a reciprocating die for bending together the ends of such blank, and an anvil or rest adapted to support the blank as against the pressure of the latter die, substantially as set forth.

5. The combination of rack-bar E, rotary moving dies I I, geared with the rack-bar, reciprocating mandrel F, reciprocating die R, and anvil or rest V, substantially as set forth.

6. The combination of reciprocating mandrel F, rotary moving dies I I, arranged on either side of the path of motion of the mandrel, such dies having arc faces *n* and straight faces *n'*, and end-supporting anvil or rest V, having mandrel-recess *v* and link-recess *v'*, substantially as set forth.

7. The reciprocating bending-mandrel F, having a concave seat or shoulder, *f*, extending part way around the same above the plane or line of bending, in combination with rotary bending-dies I I, having straight bending-faces *n' n'*, with grooves n^2 therein, such grooves being adapted to register with the blank-seat on the mandrel formed by shoulder *f*, substantially as and for the purposes set forth.

8. The combination of reciprocating rack E, dies I I, geared with the rack, such dies having straight bending-faces *n'*, with grooves n^2 therein, which incline downward, as described, feed-supports *m m*, reciprocating mandrel F, and reciprocating die R, having divergent horns *r r*, substantially as and for the purposes set forth.

9. The combination of rack-bar E, mandrel F, yoke C', and cam C, adapted to give reciprocating motion to the mandrel, with a period of rest after each stroke, dies I I, geared with the rack, anvil V, reciprocating die R, arranged to bend together the ends of the blank while the mandrel is at one position of rest, and a shear device for severing blanks from a rod while the mandrel is at its other position of rest, substantially as set forth.

10. The combination of reciprocating mandrel F, rotary moving bending-dies I I, reciprocating die R, and means for separating die R and the mandrel on their back stroke to facilitate discharge of the bent blank, substantially as set forth.

11. The rotary moving bending-dies I I, having central pivots, O, and circular grooves *m' m'* in their under side faces, in combination with curved projections *m m*, adapted to enter the grooves and afford lateral support for the dies, mandrel F, and rack-bar E, the latter being geared with the dies and carrying the mandrel, substantially as set forth.

12. In combination with the bending mechanism of a machine for bending car-coupling links, the shear-head G and shear-blade *a*, reciprocating shear-head S and blade *a'*, such shear heads and blades being adjustable in the direction of the line of feed, and gage or stop T, also adjustable in position in the line of feed, substantially as set forth.

13. In a machine for bending car-coupling links, the combination of fixed shear-head G and blade *a*, reciprocating shear-head S and blade *a'*, such shear-blades having inclined cutting-faces a^5 for giving an oblique cut to the blank, and reciprocating shear-guide Z, substantially as described.

14. The combination of table G', shear-head G, and blade *a*, such head having a slot-and-bolt connection, *g g'*, with the table, reciprocating shear-head S and blade *a'*, plate S', wedge S^2, removable guide-strip *s'*, and bolts s^2, substantially as and for the purposes set forth.

15. The combination of shaft D', yoke K', and cam K, the latter being arranged to give the yoke motion in a horizontal direction, rest *q'* for the under side of the yoke, bar H, slide-block H', and die R, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN H. ALKER.

Witnesses:
R. H. WHITTLESEY,
C. L. PARKER.