(No Model.) 3 Sheets—Sheet 1.

G. B. TENNANT.

STRAIGHTENING AND BENDING MACHINE.

No. 452,960. Patented May 26, 1891.

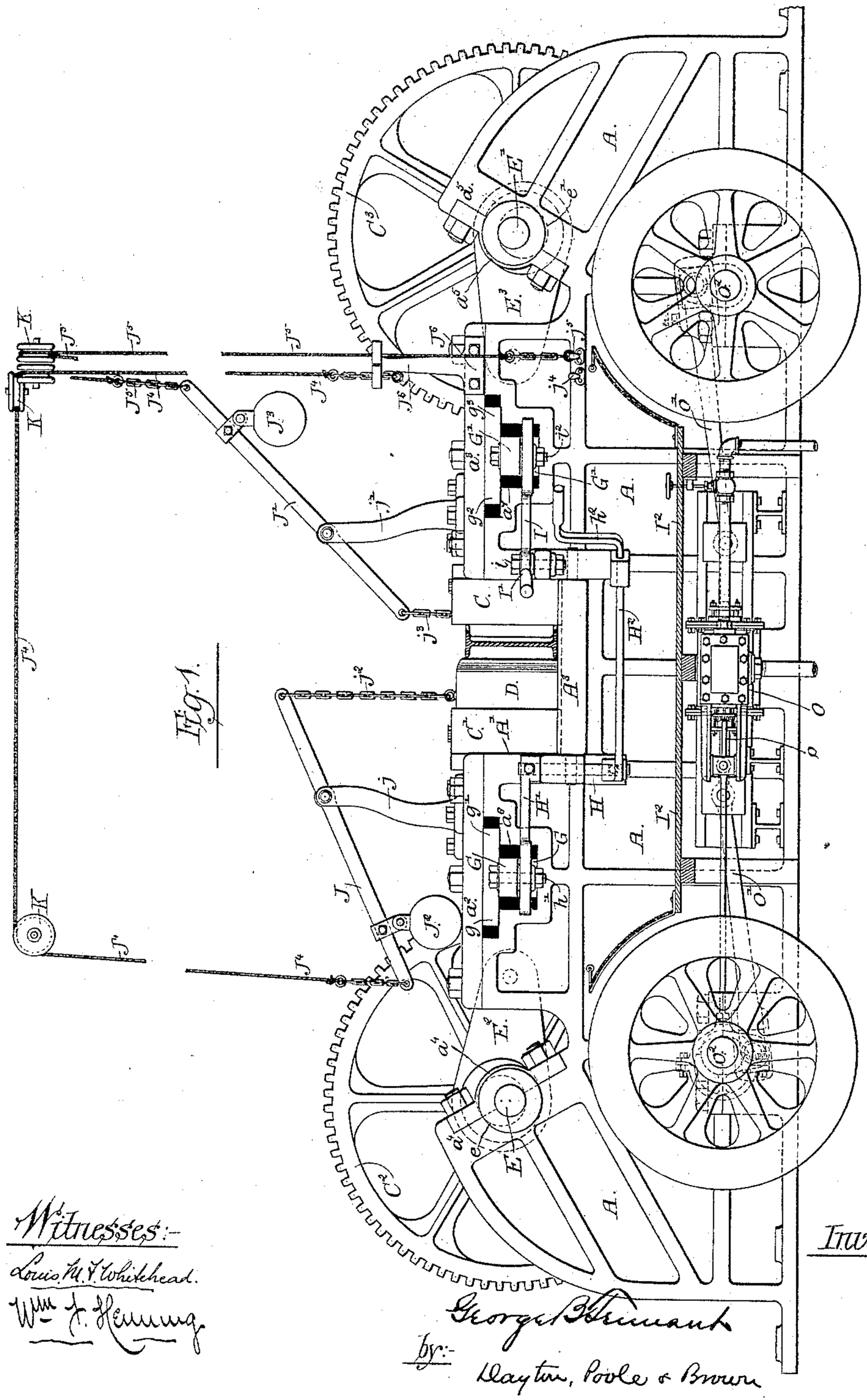

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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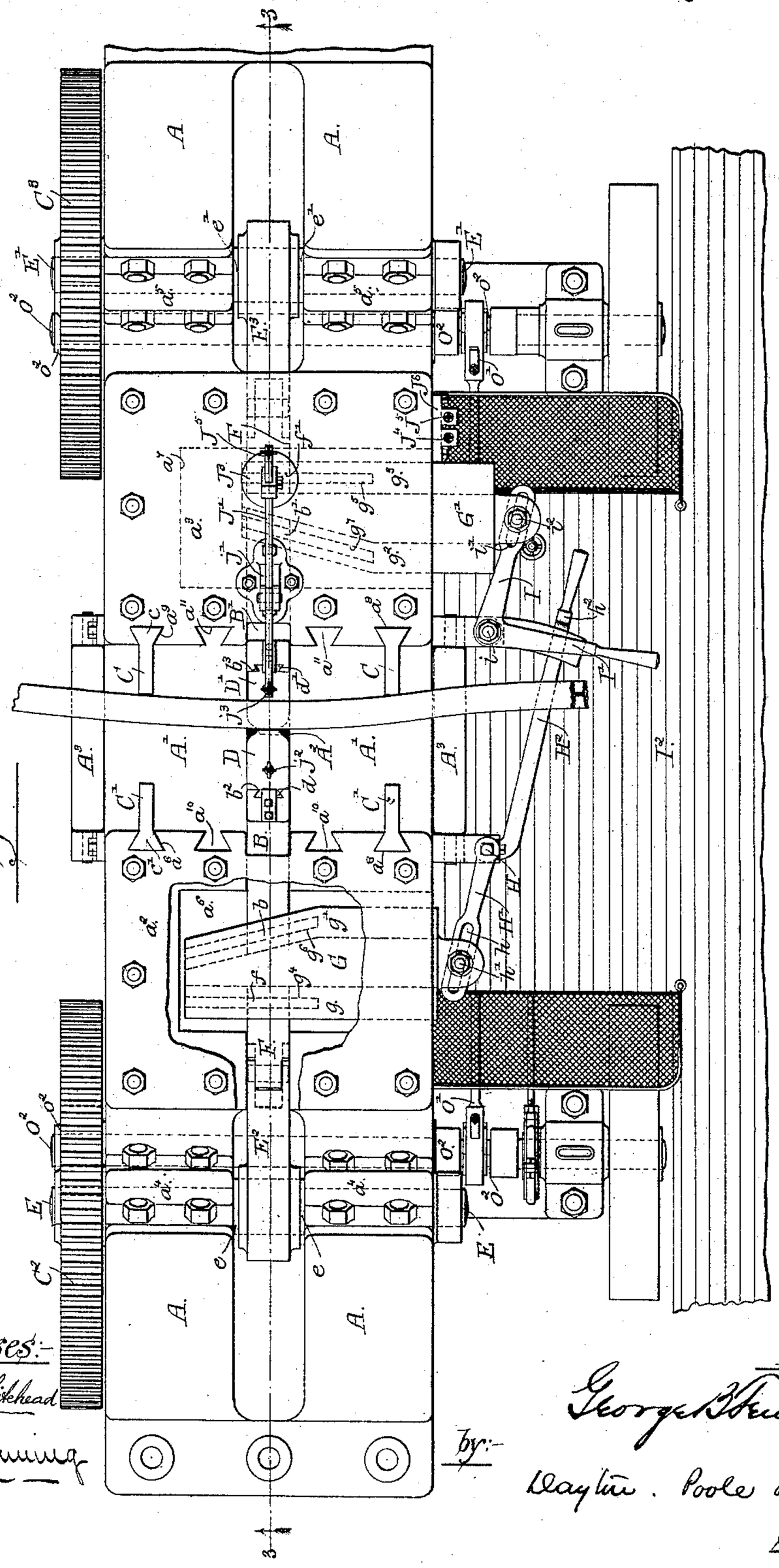

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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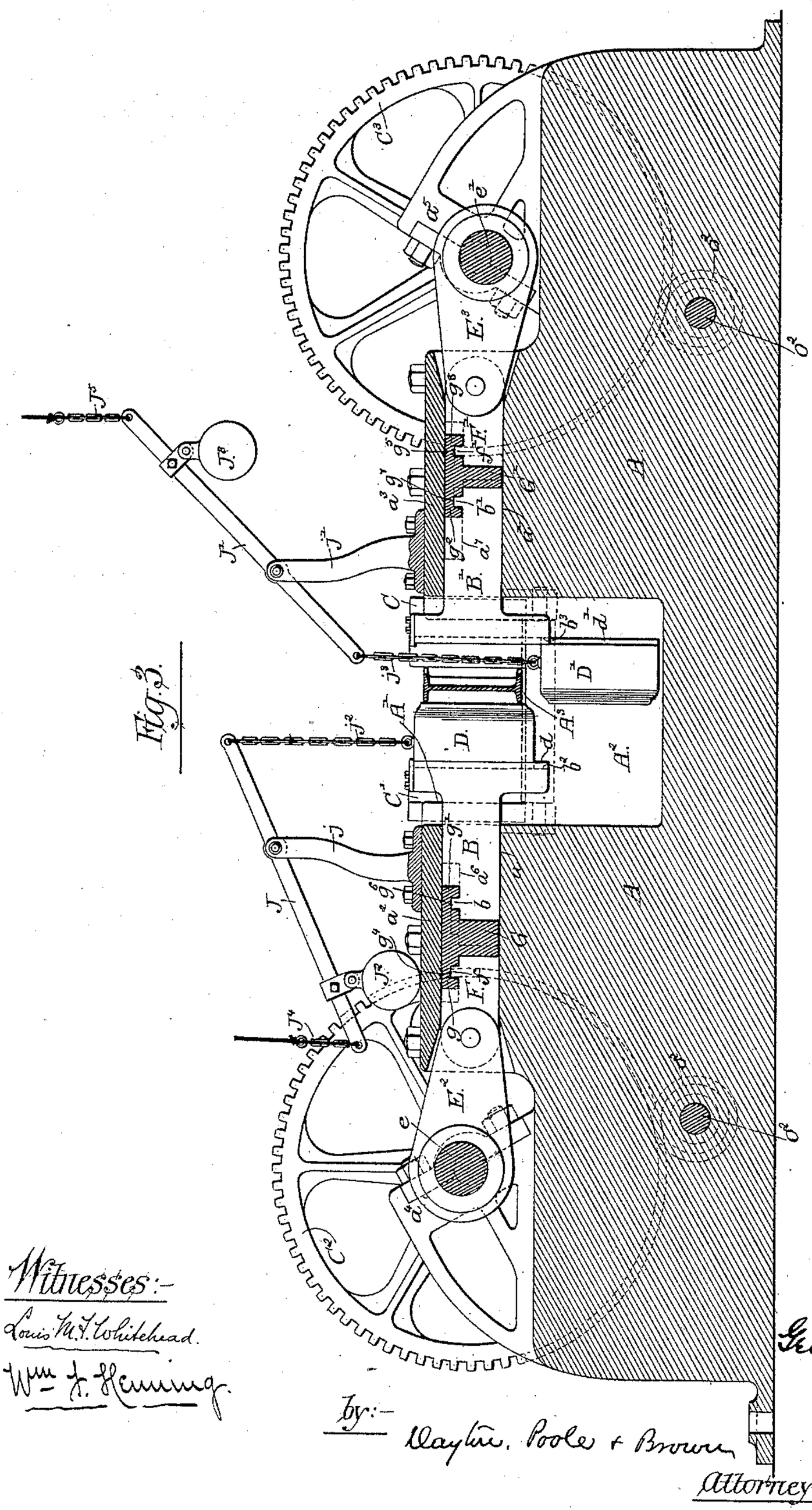

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UNITED STATES PATENT OFFICE.

GEORGE B. TENNANT, OF CHICAGO, ILLINOIS.

STRAIGHTENING AND BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 452,960, dated May 26, 1891.

Application filed January 21, 1890. Serial No. 337,596. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. TENNANT, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Straightening and Bending Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improvement in metal bending or straightening machines of that class employed in bending or straightening metal bars or beams, and comprising a reciprocating head or ram and two stationary abutment blocks or pieces, against which the bar to be straightened or bent is placed and acted on at a point between the same by the head or ram.

My improved machine is intended for acting upon either side of a bar or beam without turning the same, so that the beam may be carried or moved endwise through the machine and one side or the other acted upon by the ram, as desired, either for straightening the same when it is oppositely curved or bent in its different parts or for bending the same in either direction, as desired.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a view in side elevation of a machine embodying the same. Fig. 2 is a plan view of said machine. Fig. 3 is a central longitudinal vertical section of the same, taken on line 3 3 of Fig. 2.

As illustrated in said drawings, A is the main frame of the machine, which consists, as herein shown, of a single massive casting, which affords bearings for the several operative parts of the machine and contains a central depression or recess A′, extending inwardly or downwardly from the top thereof and through the sides of the same to receive the bar or beam to be operated upon.

B B′ are two reciprocating rams arranged longitudinally of the machine-frame and at the center line thereof adjacent to the recess or openings A′ and mounted to slide in guide-grooves $a\ a'$, arranged in alignment with each other, the rams being covered by the cap-plates $a^2\ a^3$, which hold the same in place within the guide-grooves.

C C are two abutment-blocks, which are secured in or upon one of the side walls or faces of the recess A′, and which operate, in connection with the ram or plunger B, to bend or straighten the beams. C′ C′ are similar abutment-blocks located opposite the blocks C C and secured in the wall of the recess A′, said abutment-blocks acting, in connection with the ram B′, to bend or straighten the beams. The ends of said rams B B′ do not act directly upon the beam; but said rams are provided with movable blocks D D′, commonly called "gags," the outer ends of which are adapted to directly engage the bar or beam to be bent. Said blocks or gags D D′ may be made movable, so that either one may be removed from its position opposite the beam at the time the opposite ram is acting, so that the presence of the gag on the inactive ram will not interfere with the work of the ram which is in operation. The particular means herein shown for supporting and moving said gags will be hereinafter shown and described.

The rams B B′ may be actuated by any known or suitable device for giving reciprocatory motion to the same. The devices herein employed for this purpose are of a well-known construction and are made as follows: E E′ are horizontal shafts arranged at opposite ends of the machine-frame at right angles to the said rams, said shafts being mounted in bearings $a^4\ a^5$ in said frame. Said shafts E E′ are provided at points opposite the rams with eccentrics or crank-pins $e\ e'$, one of which is engaged by a pitman E^2, connected with and giving motion to the ram B, and the other with a pitman E^3, connected with and operating the ram B′. Said pitmen are preferably not connected directly with the rams, but are pivoted to sliding blocks F F′, located within the guide-grooves $a\ a'$ behind the said rams B B′, said blocks being conveniently made of the same cross-sectional form as the rams, so as to fit and slide within said grooves. Said blocks F F′ are made separate from the rams in order that the latter may be adjusted with reference to the crank-shaft and their forward or advance

ends thereby shifted relatively to the abutment-blocks C C′, in accordance with the thickness of the bar or beam operated upon or other circumstances, as required in the act of straightening or bending.

The particular devices herein shown as employed for adjustably connecting the said rams with the blocks F F′ are of familiar form and are constructed as follows: G G′ are two wedge plates or blocks located within recesses a^6 a^7 in the top of the frame A beneath the plates a^2 a^3, hereinbefore mentioned. The wedge-plate G is engaged with the adjacent ends of the block F and the ram B, while the wedge-plate G′ engages the ends of the block F′ and the ram B′. The main or body parts of the wedge-plates are of wedge form, as shown in the plan view, and enter between the adjacent end faces of said parts in the operation of the machine. Said wedge-plates are provided at their upper parts, however, with overhanging lateral flanges g g' g^2 g^3, which extend over the adjacent outer surfaces of the said blocks F F′ and rams B B′, the said blocks F F′ being provided with lugs or projections f f', which enter grooves g^4 g^5 in the flanges g g^3, while the rams are provided with similar lugs or projections b b', which enter grooves g^6 g^7, formed in said flanges g' g^2. The projections on the rams and blocks being arranged to interlock with the flanges of the wedge-plates in the manner described, the rams are obviously held in engagement with the blocks F F′, so that said rams are drawn backwardly as well as thrust forward during the reciprocatory movement of the said blocks. It will of course be understood that said wedge-plates thus engaged with the blocks and rams are moved or reciprocated with the same during the operation of the machine, the recesses a^6 a^7, formed in the top of the frame-casting adjacent to the guide-grooves a a', being made of sufficient width to allow such bodily movement of the wedge-plates. Said wedge-plates are moved or shifted by hand, and preferably levers are connected therewith, by which the said plates may be easily and quickly shifted by the operator during the operation of the machine, it being obvious that the degree with which the bar or beam is bent is determined by the shifting of the wedge-plate which controls the ram, so that during the operation of straightening a beam the operator may be obliged to constantly shift or move the wedge-plate in accordance with a degree of bending of flexure which is necessary to straighten the bar or beam or to bend a straight beam to a desired curvature.

An advantageous arrangement of levers for actuating the plates, by which both of the same may be controlled by a person standing in one spot, is provided as follows: H is a vertical rock-shaft located at one side of the machine and out of line with the recess A′, said rock-shaft being provided with a lever-arm H′, having a slot h engaging a pin h' on the outer end of the wedge-plate G. The rock-shaft H extends downwardly to a point below the said recess A′, and there has attached to it a hand-lever H^2, extending to the opposite side of the said recess A′, where its end is bent upwardly, as indicated at h^2, Fig. 1, so as to bring its end which is grasped by the hand in position convenient for the operator. The rock-shaft H is employed for the purpose of bringing the hand-lever H^2 below the recess A′ and out of the way of the bars or beams being operated upon. I is a lever-arm pivoted at i to the machine-frame and provided at its outer end with a slot i', which is engaged with a pin i^2 upon the end of the wedge-plate G′. Attached to said lever I is a hand-lever I′, which extends outwardly in position adjacent to the end of the hand-lever H^2, so that the hand-levers controlling both wedge-plates are brought together and a man standing near them may control both of the rams with ease and convenience. The machine shown is a large one, and a platform I^2 is provided upon which the operator may stand in position convenient for observation of the work. The abutment-blocks C C′ may be secured to the machine-frame in any convenient manner. As herein shown, said blocks are held in place by being provided at their sides or edges adjacent to the vertical face of the frame-recess A′ with parts c c', of dovetailed shape, fitting in vertical dovetailed recesses a^8 a^9 in the walls of said recess. This construction enables the abutment-blocks to be easily taken out or removed and replaced by the others, which are wider or narrower, in cases where the differences in thickness of the beams operated upon are so great as to require wider or narrower abutment-plates. It will of course be understood that some considerable variation in the thickness of the bars or beams operated upon may be compensated for by adjustment of the rams through the medium of the wedge-plates; but in case the adjustment thus afforded is not sufficient then abutment-blocks of greater or less width may be inserted in the machine. The employment of removable abutment-blocks is not, however, essential, inasmuch as said blocks may be made bodily adjustable inwardly or outwardly upon the machine-frame with practically the same result. The said abutment-blocks C C′ are shown as located near the outer margins of the frame-casting, which latter is made of considerable width in order that said abutments may be located a considerable distance apart and at points remote from the rams. A provision is made for placing the said abutment-blocks nearer to the rams or to the center line of the machine by means of additional recesses a^{10} a^{11}, located inside of the recesses a^8 a^9, as shown in Fig. 2. The abutment-blocks may need to be placed closer to the ram in bending a bar to a short or abrupt curvature, for instance.

The gags D D′ are removably secured upon the forward faces of the rams, and means are

herein provided for moving said gags vertically, so that one or the other of the same may be thrown out of the way of the work, as follows: The outer faces of the said rams B B′ are provided with vertical dovetailed recesses b^2 b^3, Fig. 2, and the blocks or gags D are provided with dovetailed ribs or tongues d d', fitting in said dovetailed grooves. J J′ are two levers mounted upon standards j j' over the top of the machine. Each of said levers is connected at one end with the top of one of the gags by means of a chain j^2 j^3 and at its opposite end is provided with a counterbalance-weight J^2 J^3, the gravity of said weights being sufficient to overbalance the weight of the said gags. J^4 J^5 are chains attached to the weighted ends of the levers J J′, passing over guide rollers or pulleys K K K, and having their ends terminating at a point convenient to the operator standing near the hand-levers H^2 J′. In the particular construction illustrated the ropes J^4 J^5 pass through a guide J^6 on the machine-frame and are adapted to engage hooks j^4 j^5, by which the weighted end of either of the levers may be held in its elevated position and the gag attached thereto thereby allowed to remain in its lowermost position below the level of the beam operated upon when the ram to which said gag belongs is inactive. The bottom of the recess A′ is preferably arranged near the level of the lower parts of the rams B B′, and to provide room for the gags D D′ when the latter are lowered a central depression or recess A^2 is formed beneath the ends or heads of the rams in the manner illustrated. The said ends or heads of the rams in which are formed the guides b^2 b^3 for the gags are preferably extended downwardly into the said recess A^2, below the bottom of the main recess A′, in order that the gags may remain in engagement with the rams when said gags are in their lowermost position. A^3 A^3 are rollers located at the opposite sides of the recess A′, upon which the beams or bars rest while being bent or straightened, and which serve to facilitate the handling of the bars when being operated upon by the machine.

Any suitable actuating device may be used for driving the two shafts E E′. As shown, a steam-engine cylinder O is placed at one side of the machine-frame and is provided with a single piston-rod o, passing through both ends of the cylinder and connected by pitmen O′ O′ with crank-shafts O^2 O^2, which latter are provided with pinions o^2 o^2, which engage with spur-wheels C^2 C^3 upon said shafts E E′. The engine-cylinder O is conveniently placed beneath the platform I^2.

One feature of special advantage in the machine shown is that by which the gags or blocks on the ends of the rams have sliding connection with the latter, and another is that by which said gags or blocks are adapted to drop below the work, the advantage of this latter construction being that the operator is thereby enabled to obtain a full view of the beam throughout its entire length during the bending or straightening operation, which he could not do in case the gag were lifted above the beam.

Another important feature of construction is that whereby the shifting of the gags belonging to both rams may be accomplished from one point, so that a single operator can easily manipulate or control all parts of the machine.

I claim as my invention—

1. A machine for the purpose set forth, comprising two oppositely-acting reciprocating rams and two sets of abutment-blocks, said rams being provided with removable blocks or gags having sliding connection with the ends of the rams, substantially as described.

2. A machine for the purpose set forth, comprising two oppositely-acting reciprocating rams and two sets of abutment-blocks, said rams being provided each with a vertically-movable block or gag adapted to drop below the level of the beam or bar to be operated upon, substantially as described.

3. A machine for the purpose set forth, comprising two oppositely-acting reciprocating rams and two sets of abutment-blocks, said rams being provided with movable blocks or gags, and means connected with the gags for moving the latter, constructed for operation from a single place or point, substantially as described.

4. A machine for the purpose set forth, comprising two oppositely-acting reciprocating rams, two sets of abutment-blocks, shifting wedges for controlling the position of the rams, and hand-levers for operating both wedges, said hand-levers having their ends located near each other, whereby both rams may be controlled from a single point, substantially as described.

5. A machine for the purpose set forth, comprising two oppositely-acting reciprocating rams, said rams being provided with movable blocks or gags, two sets of abutment-blocks, shifting wedges for controlling the position of the rams, means connected with the gags for moving the latter, adapted for operation from a single point, and hand-levers for operating the shifting wedges, located near each other and near the devices for actuating the gags, whereby all parts of the machine may be controlled from one point by a single operator.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE B. TENNANT.

Witnesses:

C. CLARENCE POOLE,

GEORGE W. HIGGINS, Jr.