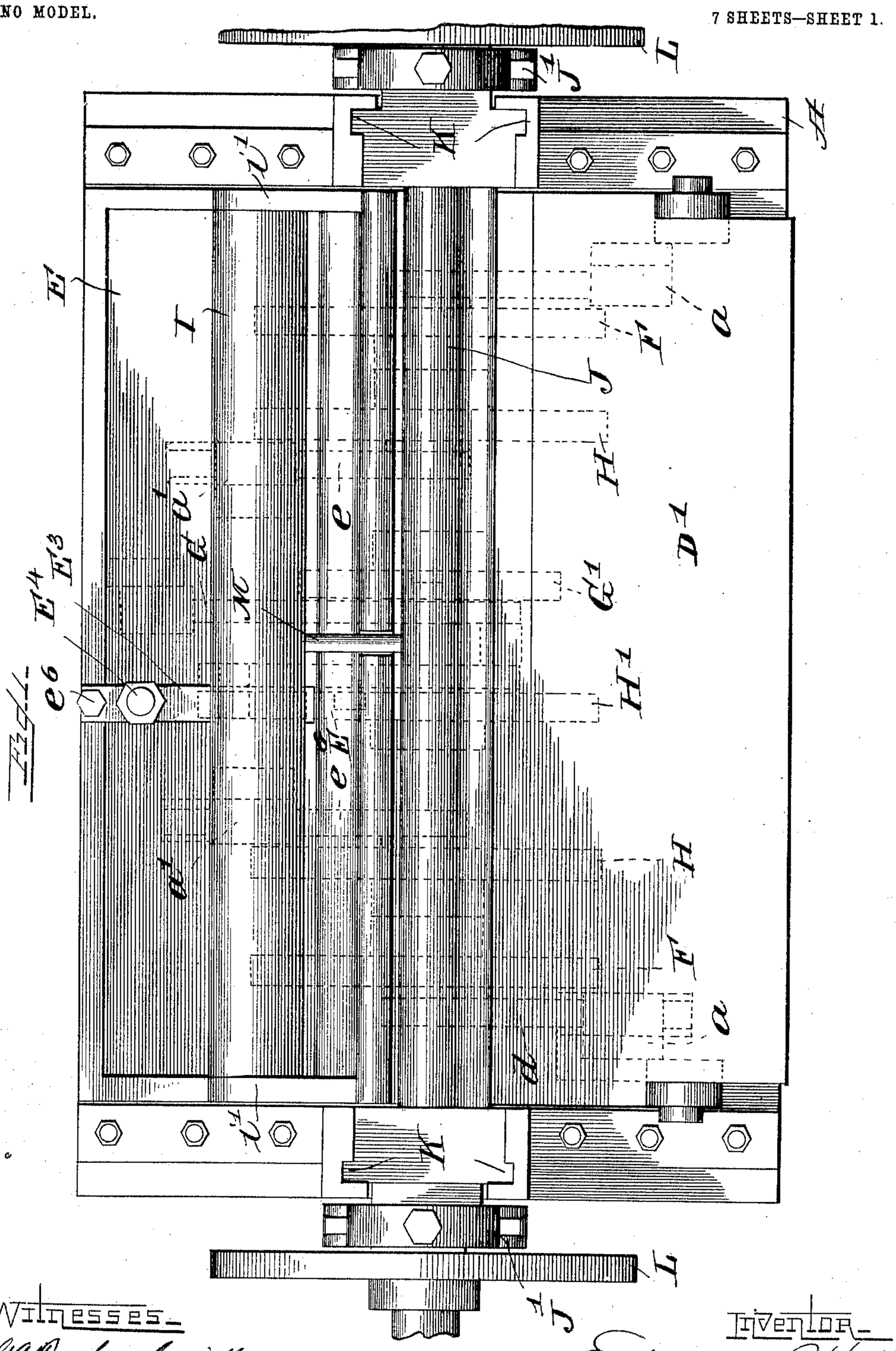
No. 759,217. PATENTED MAY 3, 1904.

E. P. HOLDEN.

METAL BENDING MACHINE.

APPLICATION FILED APR. 25, 1903.

NO MODEL. 7 SHEETS—SHEET 1.



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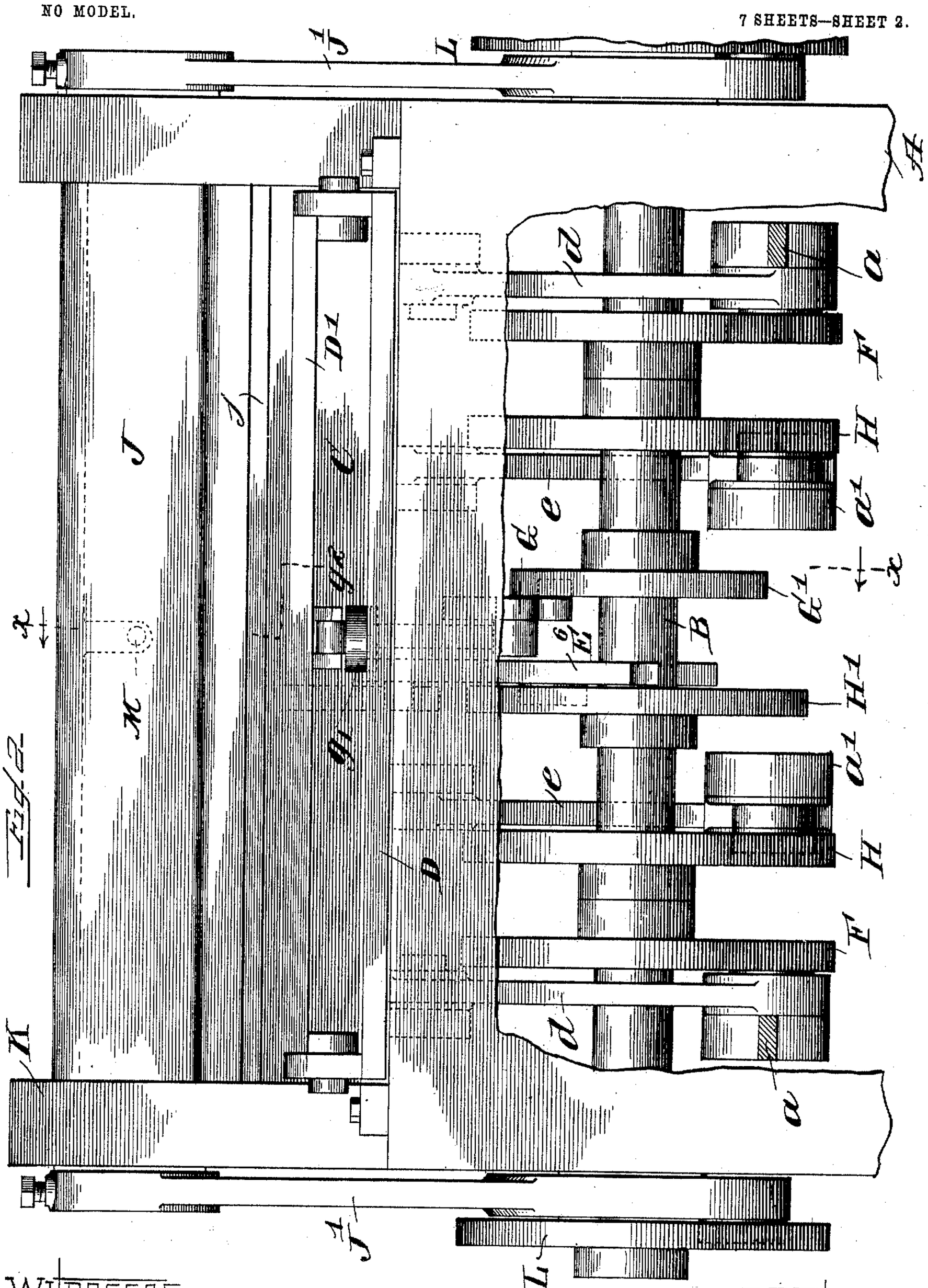
NO MODEL. 7 SHEETS—SHEET 2.



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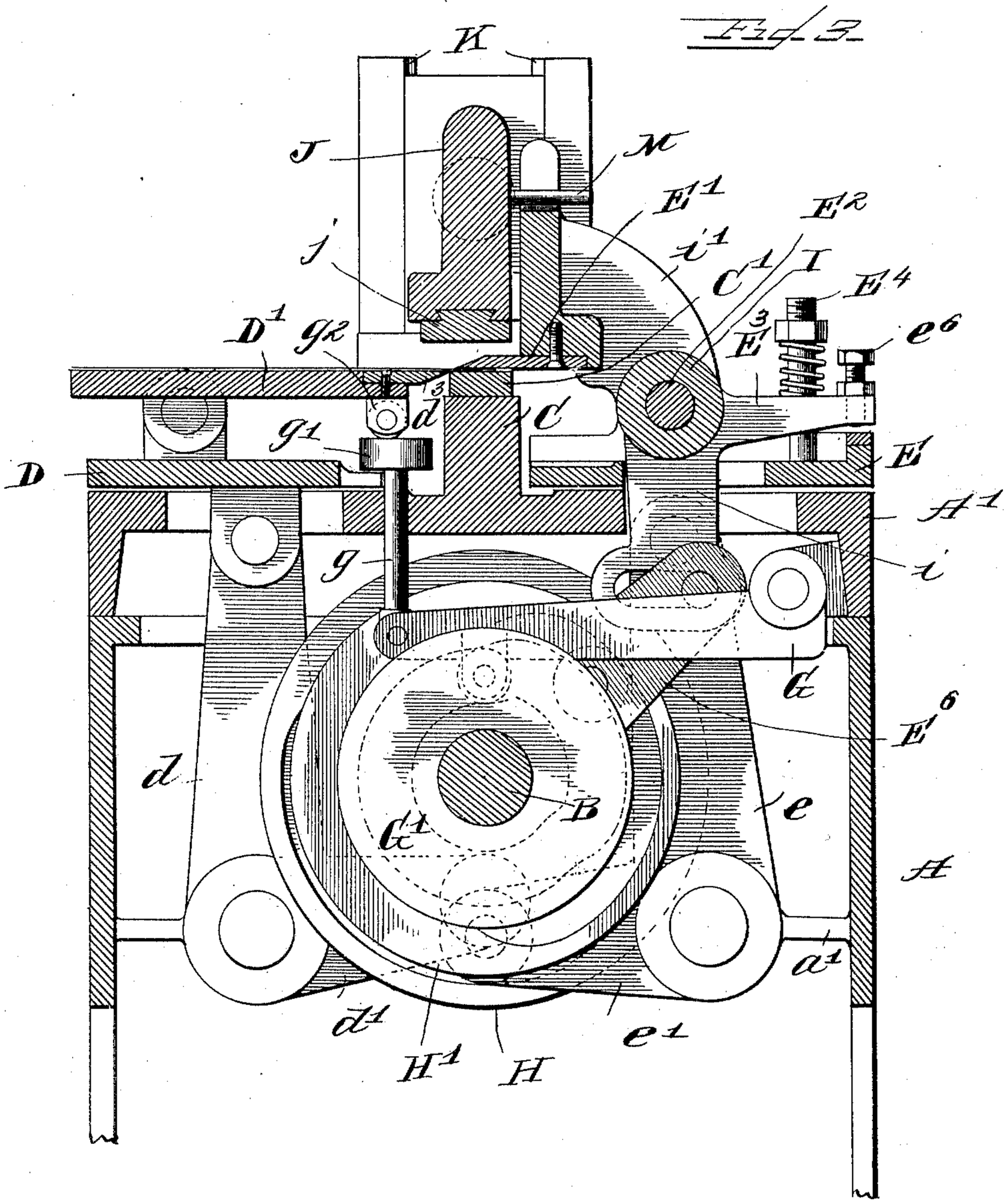
NO MODEL. 7 SHEETS—SHEET 3.

Fig 3



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No. 759,217. PATENTED MAY 3, 1904.

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METAL BENDING MACHINE.

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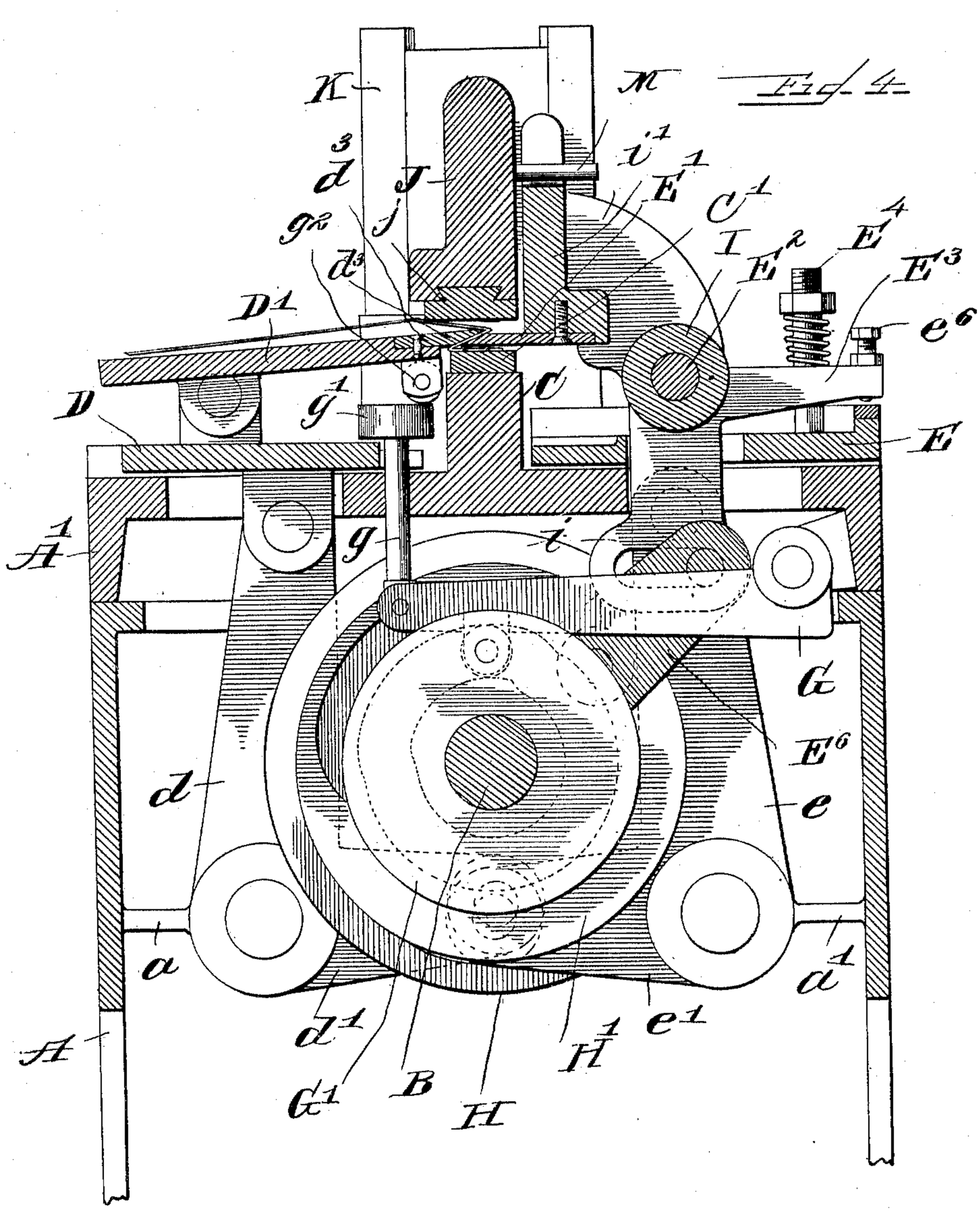
NO MODEL. 7 SHEETS—SHEET 4.

Fig. 4.



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METAL BENDING MACHINE.

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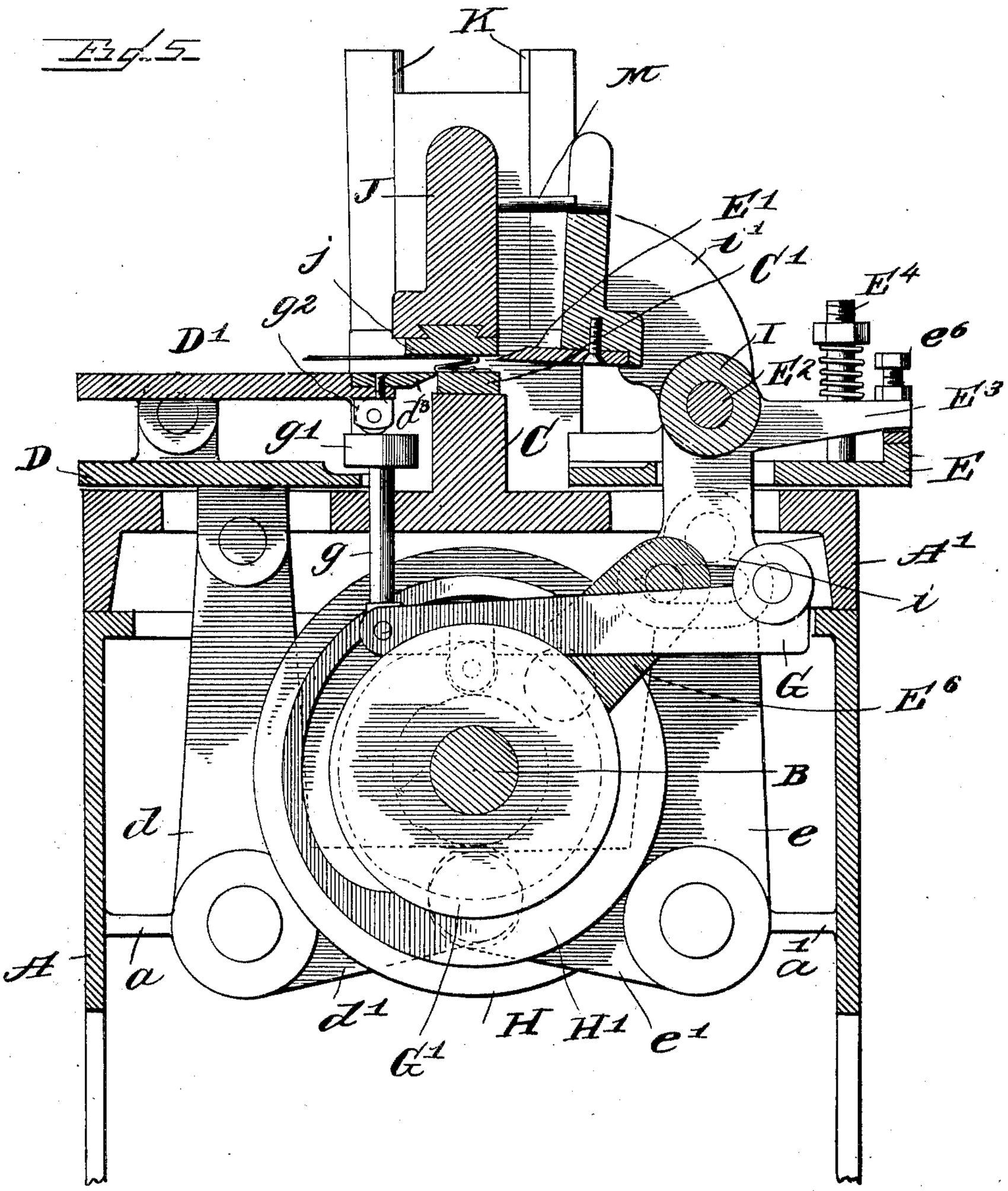
NO MODEL. 7 SHEETS—SHEET 5.

Fig. 5.



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No. 759,217. PATENTED MAY 3, 1904.

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METAL BENDING MACHINE.

APPLICATION FILED APR. 25, 1903.

NO MODEL. 7 SHEETS—SHEET 6.

Fig. 6.

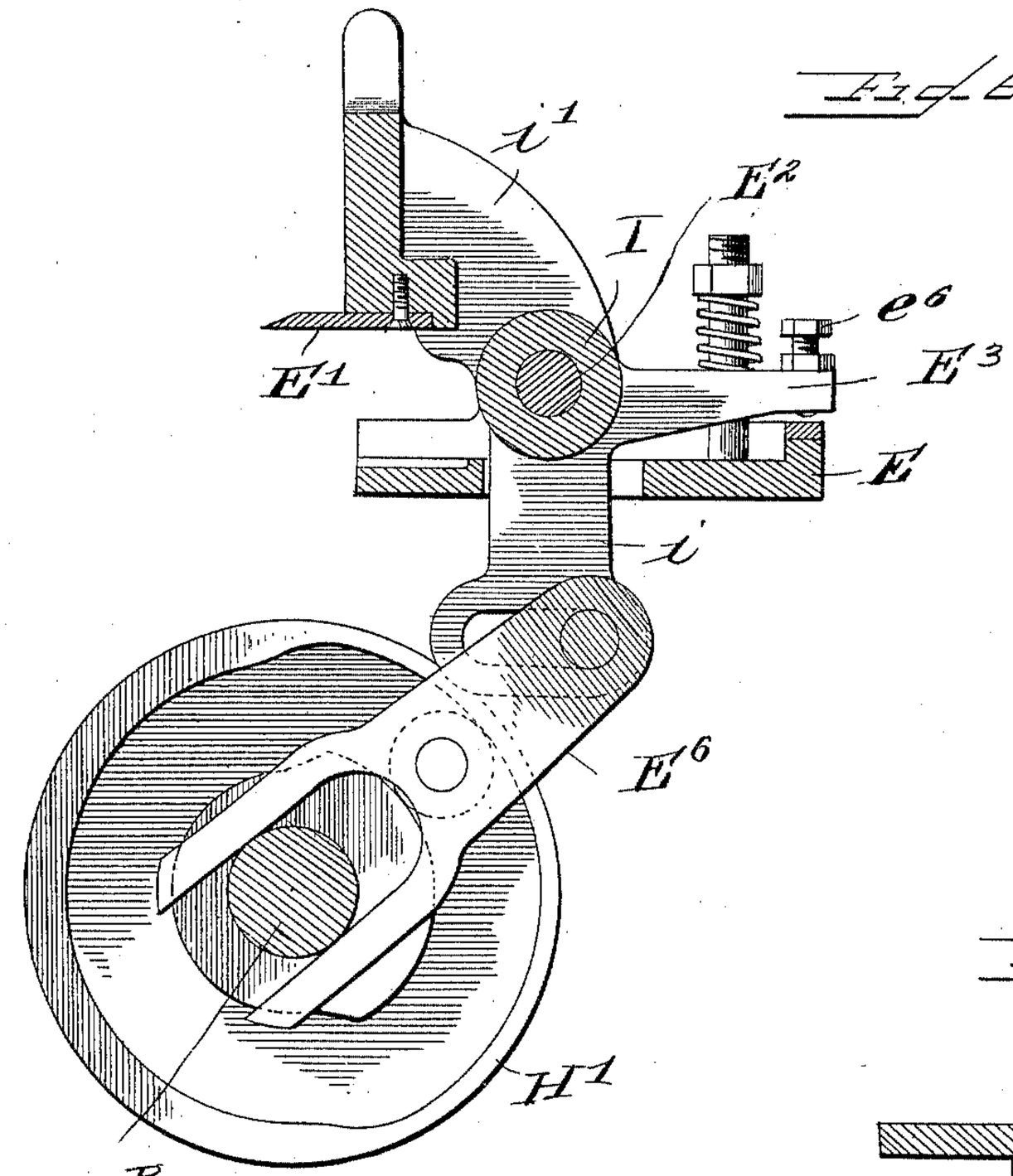
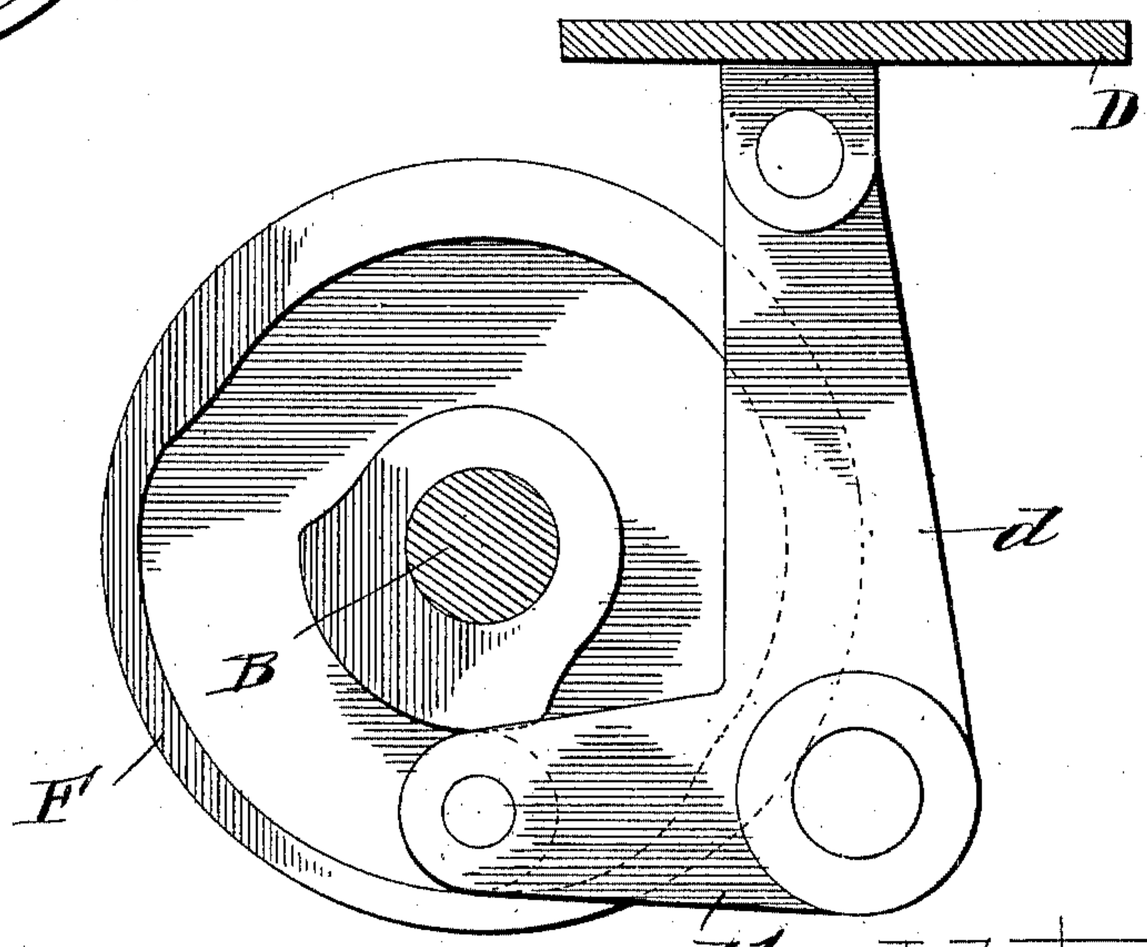


Fig. 7.



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No. 759,217. PATENTED MAY 3, 1904.

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METAL BENDING MACHINE.

APPLICATION FILED APR. 25, 1903.

NO MODEL. 7 SHEETS—SHEET 7.

Fig. 8.

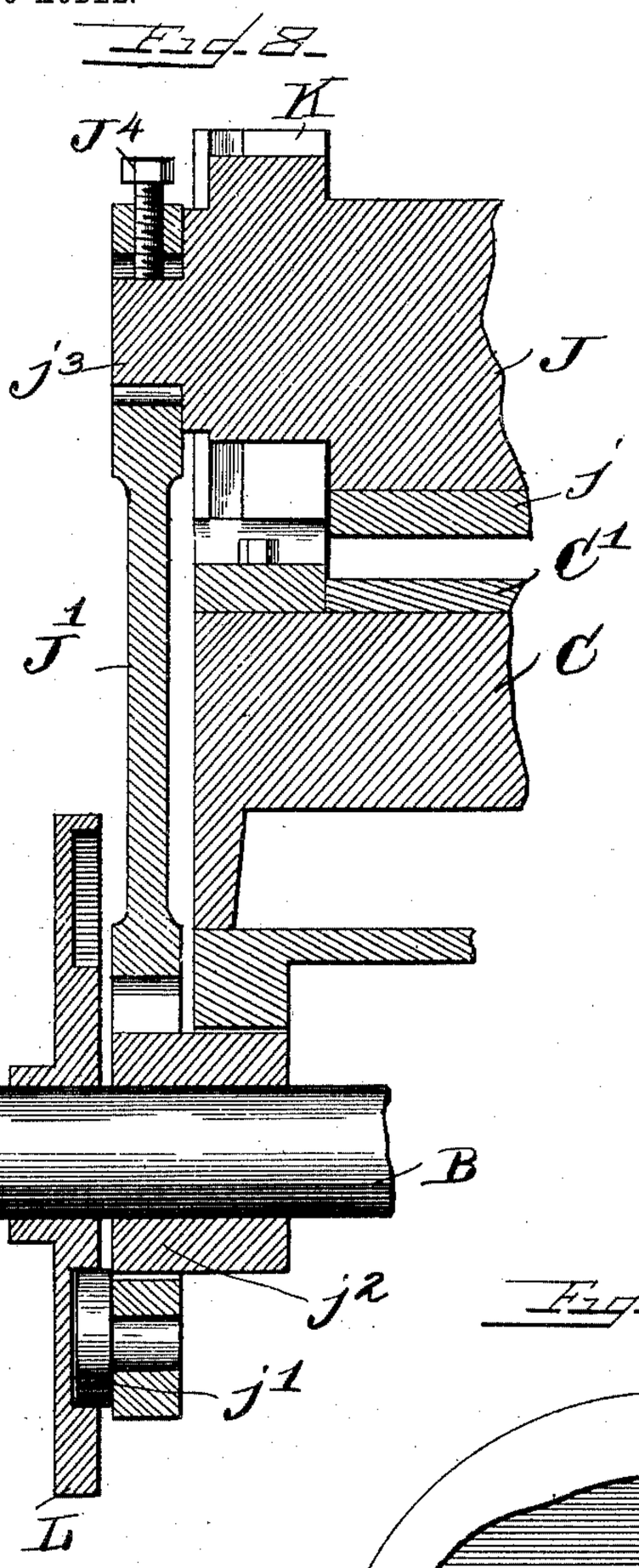


Fig. 9.

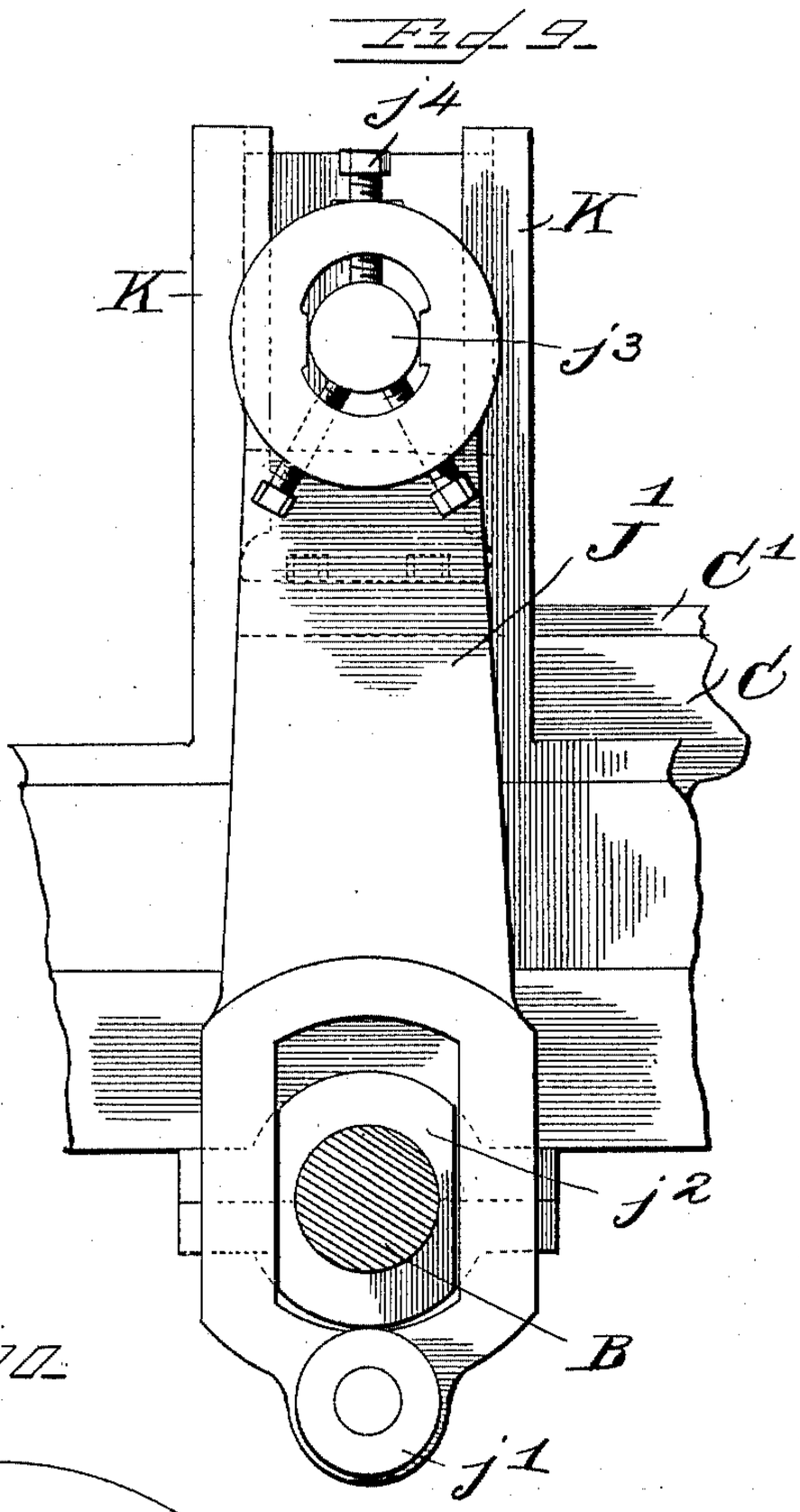
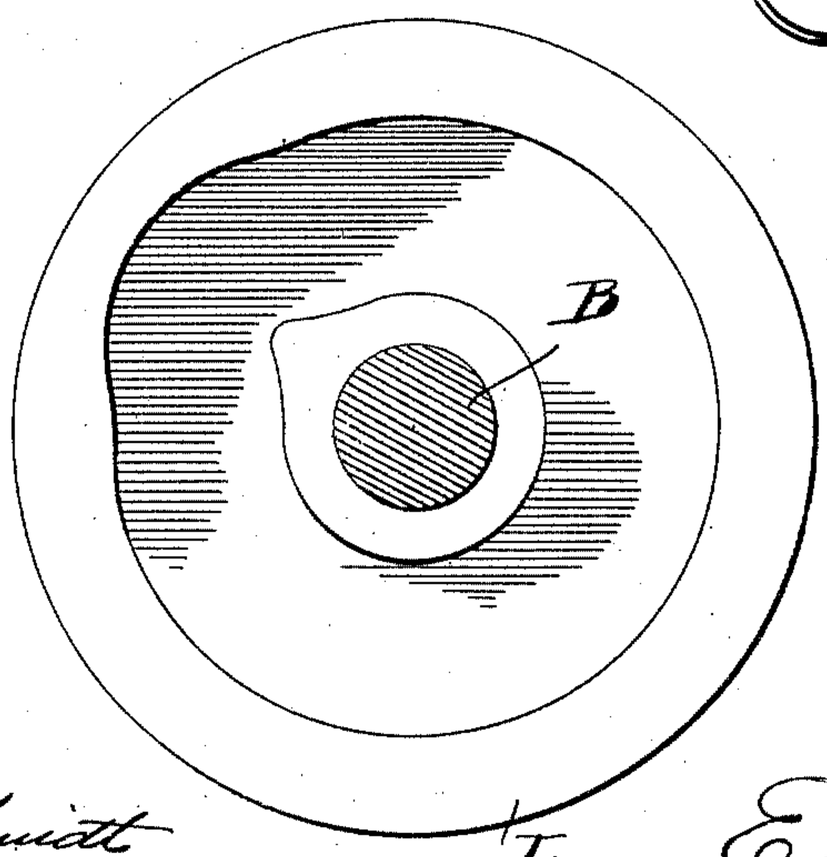


Fig. 10.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 759,217. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

EDWARD P. HOLDEN, OF CHICAGO, ILLINOIS.

METAL-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 759,217, dated May 3, 1904.

Application filed April 25, 1903. Serial No. 154,210. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. HOLDEN, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Metal-Bending Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, 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 metal bending and folding machines, and more particularly to a machine adapted to automatically bend a double fold in a sheet of metal, such as a can-body blank or the like.

The object of the invention is to provide a simply-constructed and rapidly-operating metal bending and folding machine automatic in its character and positive in operation.

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

In the drawings, Figure 1 is a top plan view of a device embodying my invention. Fig. 2 is a fragmentary front elevation, partly broken away. Fig. 3 is a section taken on line $x\,x$ of Fig. 2 and illustrates the position the parts assume at the time of receiving or engaging the blank. Fig. 4 is a similar section illustrating the position and adjustment of parts at the time of the completion of the fold. Fig. 5 is a similar section showing the retraction of the folding means and the hammer falling to close the folds or bends. Fig. 6 is a detail of the rear or holding blade and means for operating the same. Fig. 7 is a detail of the actuating means for the front carrier-table. Fig. 8 is a fragmentary vertical section taken longitudinally of the machine and illustrates the means for actuating the hammer. Fig. 9 is a fragmentary end elevation of the same. Fig. 10 is a detail of the cam for actuating the hammer.

As shown in said drawings, said machine is constructed with a strong frame of cast metal or other suitable material, (indicated as a whole by A,) which, as shown, is rectangular and in which in suitable bearings is revolubly journaled a central longitudinal actuating-shaft B, usually provided at one end with tight and loose pulleys in a familiar manner for the driving-belt, and which is provided intermediate the ends with the cams and other actuating means for the folding mechanism. Supported and secured on said frame A and having approximately the same length and breadth is the table A′, also of metal, and provided centrally with an integral raised elongated rib of considerable breadth, forming an anvil C, upon which is secured an anvil-facing C′, of steel or other suitable material. Supported on said frame A′ and slidable transversely toward and from the anvil are the reciprocating carriages D and E, on which, respectively, are carried the folding-blade D′ and the rear or holding blade E′. Referring more particularly to the construction of said folding means and the means for actuating the same, it will be seen by reference to the drawings that an integral arm a is provided on the inner side of the frame-front which projects inwardly and is provided on its extremity with an enlarged boss on which is pivotally engaged a bell-crank, one arm of which projects upwardly through a slot in the table A′ and is pivotally engaged on the carriage D, while the other arm, d', projects inwardly toward the shaft B and is provided with a roller at its inner end, which projects into a cam-groove in the side of a cam-disk F, whereby rotation of the shaft B with said cam-disk acts to reciprocate said table D. The folder-blade D′ is pivoted near its outer end on the carriage D, as shown in Figs. 3, 4, and 5, in such manner that when the carriage is retracted the upper surface of said blade lies approximately in the plane with the top of the anvil-plate.

Means are provided for elevating the inner end d^3 of said folder-blade simultaneously with the inward movement thereof comprising a lever G, pivoted at the rear side of the frame and extending forwardly over the shaft B and provided on its inner side with a roller engaging in a suitable cam-groove in the cam-disk G′. The inner end of said lever G is provided with a rod g, pivoted thereon, which extends upwardly through the table A′ on the front side of the anvil and is provided at its

top with a flattened plate or head g', on which tracks a roller g^2, secured on the lower side of the tucker-blade D′ near the inner edge thereof. The cam-groove disk G′ is formed to elevate the inner edge of the folder-blade D′ when the bell-crank acts to move the same inwardly into the position shown in Fig. 4, said roller g^2 moving back and forth over the enlarged head or plate g' as said blade is reciprocated. While said folder-blade may be constructed integrally, it is shown provided with a facing d^3, of steel or other suitable metal, at its inner edge, which, as shown, inclines upwardly and inwardly on its under side.

The rear carriage E is reciprocated toward and from the anvil in a manner similar to the carriage D—that is to say, integral arms a' project inwardly from the rear side of the frame and provided with a boss, as before described, on which is pivoted a bell-crank, one arm e of which extends upwardly through a slot in the table A′ and pivotally engages on the under side of the carriage E. The other end of said bell-crank extends inwardly beneath the shaft B and is provided with a roller which engages in a cam-groove in a disk H. Pivoted on the carriage E by means of a transverse shaft E^2 is a clamping-jaw I, which projects toward and above the anvil at its front i'' and having below the shaft E^2 downwardly-extending ends i, which pass through the table A′ and carriage E. Said ends are each provided with an elongated transverse slot at the lower ends. Said jaw has approximately the same length as the anvil and is provided on its under side with the forwardly-projecting holding-blade E′, comprising a plate of steel or other suitable material rigidly bolted in place, and which forms a facing for the clamping-jaw to engage the metal blank to be bent or folded upon the anvil-facing C′. The upper side of said plate E′ adjacent to its edge is beveled downwardly or complementary with the beveled edge of the folding-plate d^3. Said jaw is actuated in part by the reciprocation of said carriage E and in part by means of a cam-disk H′, each provided in one side with a cam-groove in which engages a roller carried on a connecting-rod E^6. Each connecting-rod at one end is provided with a roller engaging in a transverse slot in one of the ends i of said jaw I and at its lower end is yoked and engages over the shaft B, as shown in Fig. 6. The said cam-disk H′ is so adjusted upon the shaft B that when the table E reciprocates inwardly toward the anvil the connecting-rod E^6 is forced upwardly and outwardly to the rearmost limit of the groove, the lower ends i of said jaw thereby forcing said jaw to its forward limit of movement, as shown in Fig. 4, or, in other words, into position to engage a blank upon the anvil-facing. The reverse or outward movement of the table E is accomplished simultaneously with the downward and inward movement of the connecting-rod, which acts to move said jaw or holding-plate in the position indicated in Fig. 5.

At each end of the machine and rigidly bolted on the table are the ways K, between which moves the hammer J, provided with a facing j, corresponding with the facing C′ of the anvil. Said hammer is in length equal to said anvil or, in other words, of a length somewhat greater than the maximum length of the material or blank to be formed thereunder. Means are provided for actuating said hammer automatically and in unison with the various movements of the folding means. As shown, said actuating means comprise a cam-disk L, rigidly secured on the shaft B at each end of the machine, as shown in Figs. 1 and 2, and in which engages a roller j'' of a reciprocating rod J′. Said rods are each provided at its end with an elongated slot or aperture through which the shaft B passes and within which and rigidly secured on the frame is an angular collar j^2, which serves as a guide for said connecting-rod. The upper end of each rod is apertured to receive the reduced end j^3 of the hammer, said aperture having its greatest length vertically. Set-screws j^4 are provided, extending into said aperture and bearing against the ends of the hammer, thereby permitting adjustment of the hammer.

As shown, an arm E^3, integral with the jaw I, extends rearwardly and is provided in its extremity with a set-screw e^6, whereby the rearward throw of the jaw may be regulated. A tension device is also provided on said arm comprising a vertical stud E^4, rigidly secured in said carriage and passing through said arm E^3 and on which is provided a strong coiled spring bearing on said arm and against a nut secured at the upper end of the stud. Said tension device acts to take up the jar or concussion incident to the violent inward movement of said jaw and acts to prevent said holding-blade from imparting a blow upon the blank. Means are also provided to prevent said jaw from moving inwardly until the hammer is retracted. For this purpose a strong rod or stud M is secured on the rear side of the hammer and extends through a notch or slot in the top of the jaw I and which as the jaw is retracted rearwardly acts to prevent the return of said jaw until the hammer is elevated sufficiently to permit said stud M to pass again through the slot, the inward strain on said hammer being meanwhile sustained against the end of said stud and on the tension before described.

The operation is as follows: The blank when fed into the machine is slid along over the folding-blade D′ and upon the facing C′ of the anvil, at which moment the holding-blade E′ is reciprocated inwardly by means of the bell-crank $e\ e'$ and the outward movement of the connecting-rod E^6, thereby bringing the said holding-plate into firm clamping

engagement with the inner margin of the plate or blank. At the moment said holding-blade engages the blank the bell-crank *d d'* is reciprocated inwardly at its upper end, moving the carriage D' toward the anvil, and simultaneously with said movement the inner end of the lever G is elevated, carrying upwardly the inner end of the folder-blade, which owing to the beveled or complemental inclinations of the holder-plate and folding-blade slides upwardly and inwardly, as shown in Fig. 4, forming a double or compound bend for the entire length of the blank. At this moment, the bend having been formed, the bell-crank levers *e e' d d'* and the connecting-rod E^6 and lever G act simultaneously to retract said holding and folding means out of the path of the hammer, which immediately is drawn downwardly with some violence by the rod J', bringing sufficient pressure to bear upon the folded blank to entirely close said folds. Fig. 5 shows the hammer at about the middle of its downward movement and the holding and folding means retracted as before described. This operation is repeated with great rapidity or as rapidly as it is possible to supply the blanks to the machine, the hammer in each instance being returned to its elevated position by means of the cams L and the folding-blade and holding-plate or jaws reciprocating inwardly and outwardly to form the bends and folds, as shown and described. Obviously the movement of the holding, folding, and closing mechanism may be otherwise effected, and many details of arrangement, construction, and means of operation may be varied without departing from the principles of this invention.

I claim as my invention—

1. The combination with a holding-jaw, of an upwardly and inwardly reciprocating folding-plate having an edge beveled complementary therewith, means for retracting the holding-jaw and folding-plate simultaneously, a hammer and means for actuating said hammer into engagement with the blank after the retraction of the holding and folding means.

2. The combination with an anvil, of a holding-jaw adapted to engage a blank thereon, folding means adapted to bend a sheet of material upwardly over the holding-jaw forming a compound bend therein, a hammer carried above said jaws, and means for simultaneously retracting the holding-jaw and folding means and reciprocating actuating means for the hammer acting when the blank is released from the folding and holding means.

3. The combination with an anvil, of a holding-jaw adapted to engage a blank thereon, a folding-plate adapted to be reciprocated inwardly and upwardly over the holding-jaw and having an edge beveled complementary therewith, a hammer and means acting to retract the holding-jaw and folding means and to actuate said hammer simultaneously therewith.

4. A machine of the class described comprising laterally-reciprocating means for engagement of a blank or the like upon an anvil, folding means comprising a blade adapted to be moved upwardly and inwardly over the holding means and a vertically-reciprocating hammer adapted to close the folds of the partly-folded blank after the retraction of said holding means.

5. The combination with an anvil, of a holding-jaw adapted to engage a blank thereon, an upwardly and inwardly reciprocating folding-plate having its upper surface normally in a plane with the anvil, means for reciprocating said folding-plate upwardly and inwardly over the holding-jaw, means for retracting said holding-jaw and folding-plate, a hammer and means for actuating the same into engagement with the blank upon the anvil after the holding-jaw and folding-plate are retracted.

6. The combination with an anvil, of a vertically-reciprocating hammer located above the same, a holding-jaw adapted to engage a blank of sheet metal upon the anvil, a folding-plate having its surface normally in a plane with the top of the anvil, means for reciprocating said folding-plate upwardly and inwardly over the holding-jaw, thereby forming an inward bend in the blank upon the anvil between the hammer and holding-jaw, means acting to simultaneously retract the holding-jaw and folding-plate, and means actuating the hammer simultaneously with such retraction.

7. In a metal folding or bending machine, the combination with an anvil, of a vertically-reciprocating hammer, oppositely-reciprocating holding means and folding means between said anvil and hammer, means for operating the holding and folding means alternately inwardly and simultaneously outwardly, said holding and folding means acting to engage a blank upon the anvil and form between the same a double fold or bend in the blank between the anvil and the hammer and means actuating the hammer to fall and close the fold.

8. The combination with an anvil, of a holding-jaw having an upwardly-beveled surface, and adapted to engage a blank on the anvil, a folding-plate having an under beveled surface and reciprocating upwardly and inwardly over the holding-jaw, a hammer positioned in proximity with and above the anvil and against which the blank is forced in forming the initial part of the fold said hammer acting when the folding means are retracted to close the folds in the blank upon the anvil.

9. The combination with an anvil, of a vertically-reciprocating hammer above the same, inwardly and upwardly reciprocating folding means adapted to engage a blank on said anvil and to form a compound bend therein,

means for moving said folding means alternately in one direction and simultaneously in the opposite, one of said folding means serving as a feed-table when in its normal position.

10. The combination with an anvil, of a holding-jaw adapted to engage a blank thereon, a hammer positioned above the anvil, and an upwardly and inwardly reciprocating feed-table having an under beveled inner edge, and adapted to jam a fold on the blank between the hammer and the holding-jaw, thereby forming a compound bend in the blank adapted to be closed by the fall of the hammer and when the holding-jaw and feed-table is retracted.

11. The combination with an anvil, a hammer positioned above the same, of a holding-jaw reciprocating between the hammer and anvil and engaging a blank on the anvil, means for folding the metal between the holding-jaw and hammer, a resilient tension device on the holding-jaw and means for throwing the holding-jaw and folding means alternately into operative position.

12. In a machine of the class described the combination with an anvil, of means for engaging a blank thereon comprising an inwardly-reciprocating pivotally-supported holding-jaw, a rearwardly-directed projection or arm thereon and spring tension engaged on said arm and acting to regulate the inward throw of said holding-jaw.

13. The combination with an anvil, of a carriage on each side of the same, a holding-jaw pivotally supported on one of the same and a feed-table comprising a folding-plate on the other, means acting to move the folding-plate and holding-jaws alternately in one direction and simultaneously in the opposite direction, said folding-plate and holding-jaw acting simultaneously to fold a blank on the anvil.

14. In a machine of the class described the combination with an anvil, of oppositely-reciprocating carriages on each side thereof, a holding-jaw on one of the carriages movable with and independently of the carriage and acting to engage a blank on the anvil, a holding-plate on the other carriage reciprocating therewith and in one position of the carriage forming a table and in the other position reciprocating inwardly and upwardly over the holding-jaw, said holding and folding means retracting simultaneously after the blank has been initially folded and a hammer acting to close the folds after the retraction of said hammer and folding means.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

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