N. H. DAVIS.

METAL CUTTING APPARATUS.

APPLICATION FILED AUG. 6, 1906.

923,954.

Patented June 8, 1909.

4 SHEETS—SHEET 1.

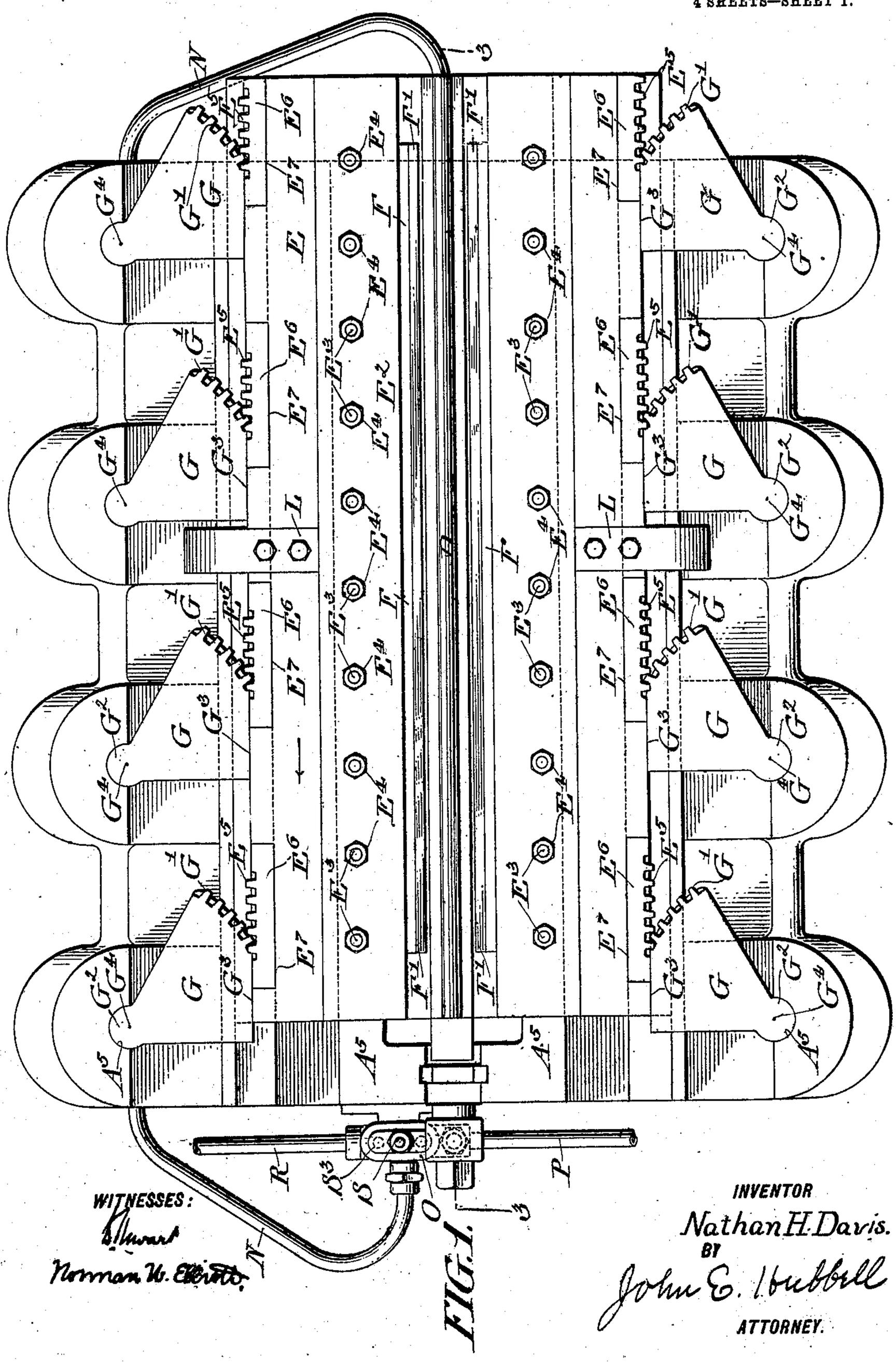

FIG. 1.

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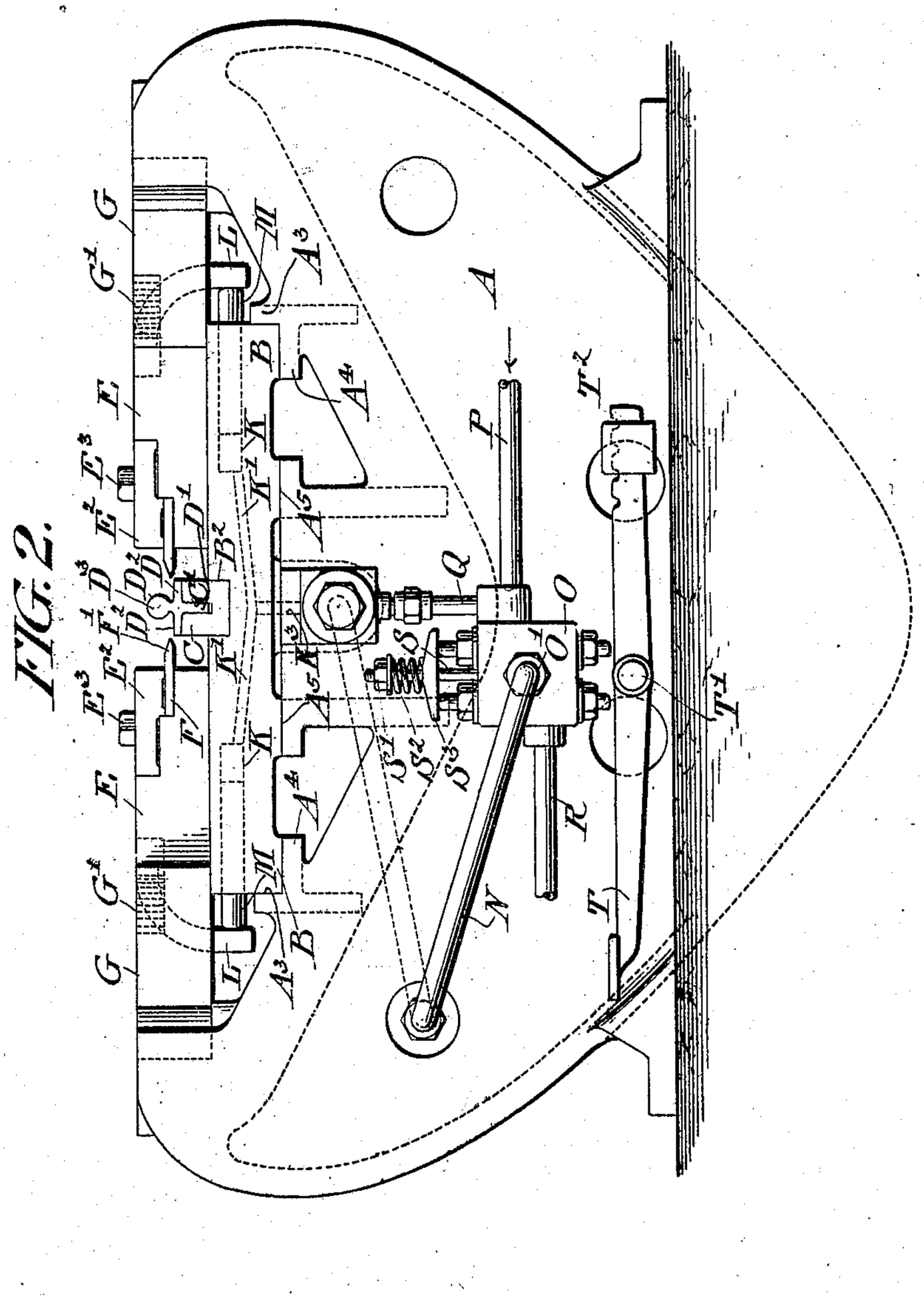
4 SHEETS—SHEET 2

FIG. 2.



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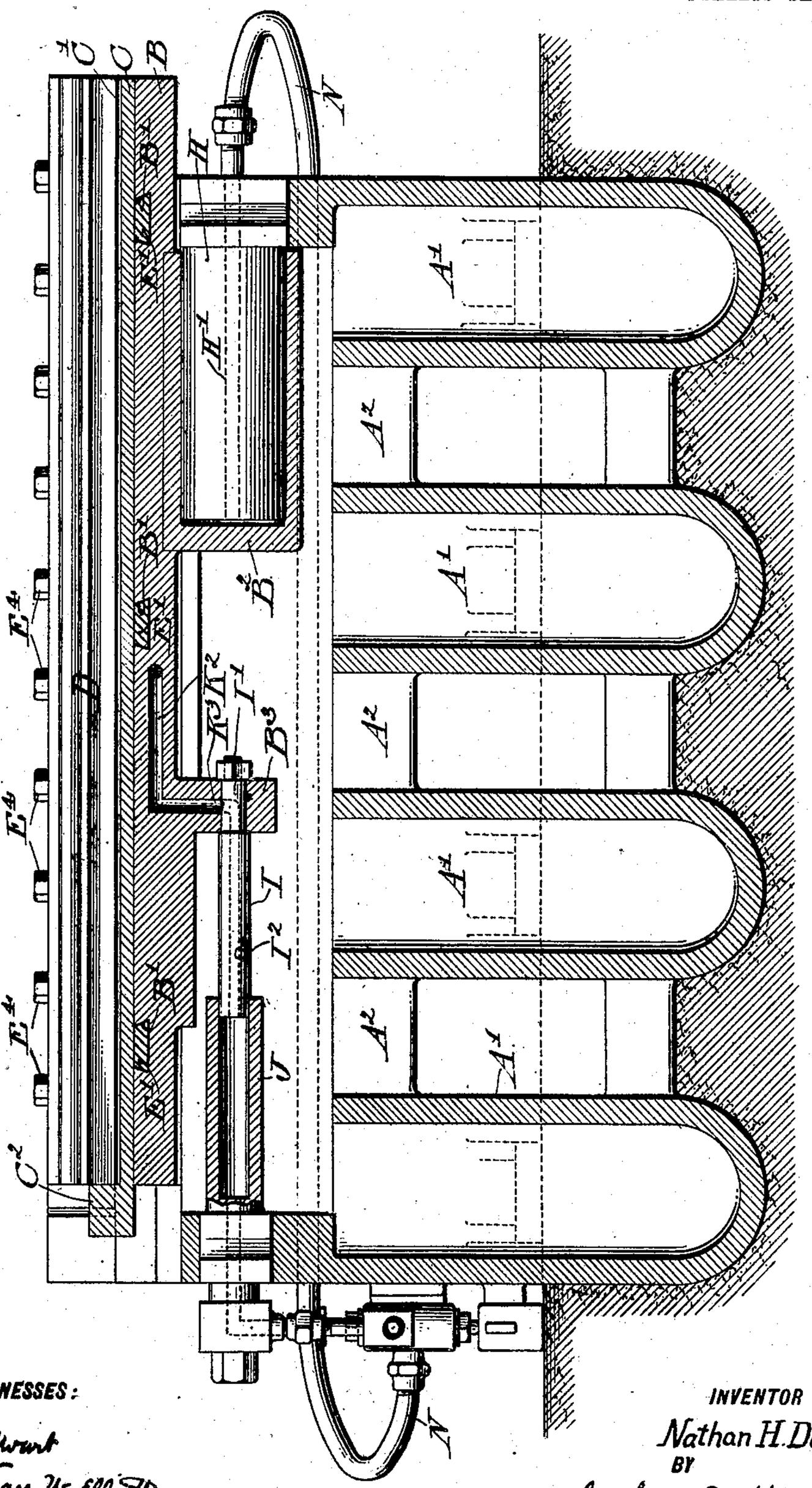
4 SHEETS—SHEET 3.

FIG. 3.



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4 SHEETS—SHEET 4.

FIG. 5.

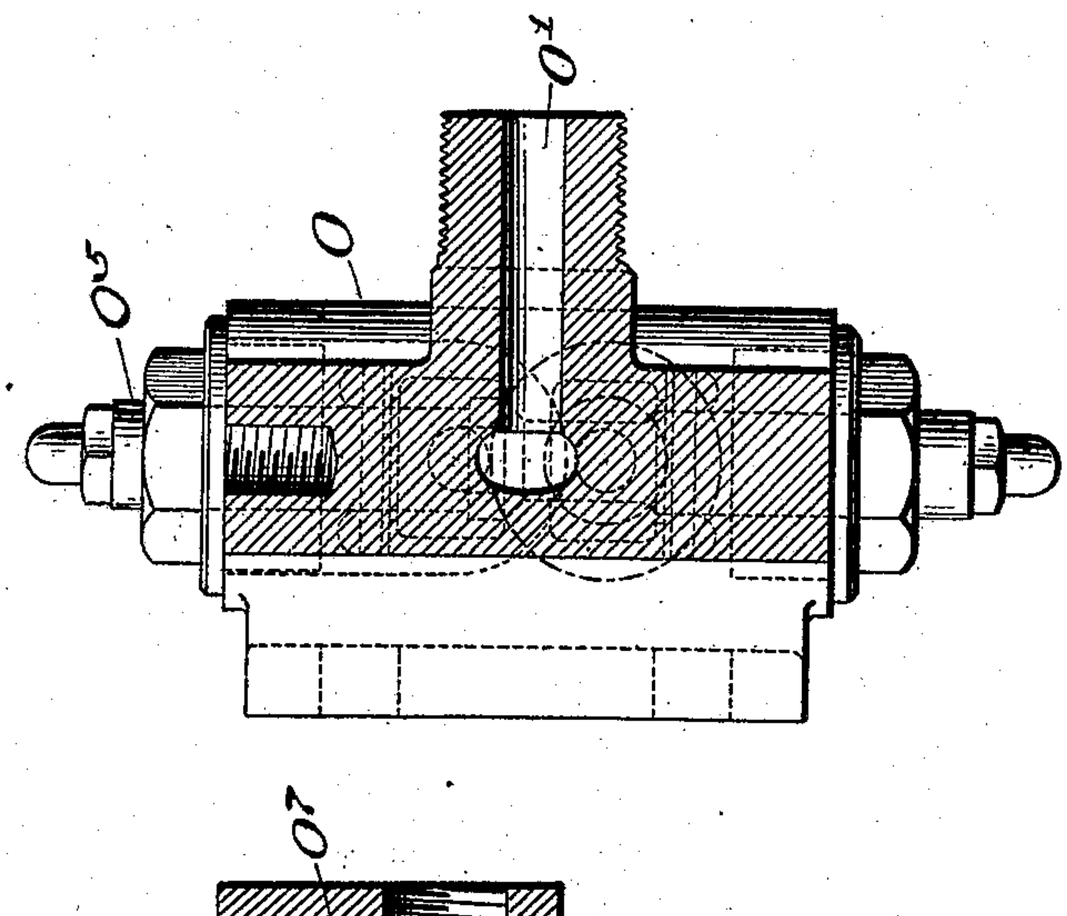
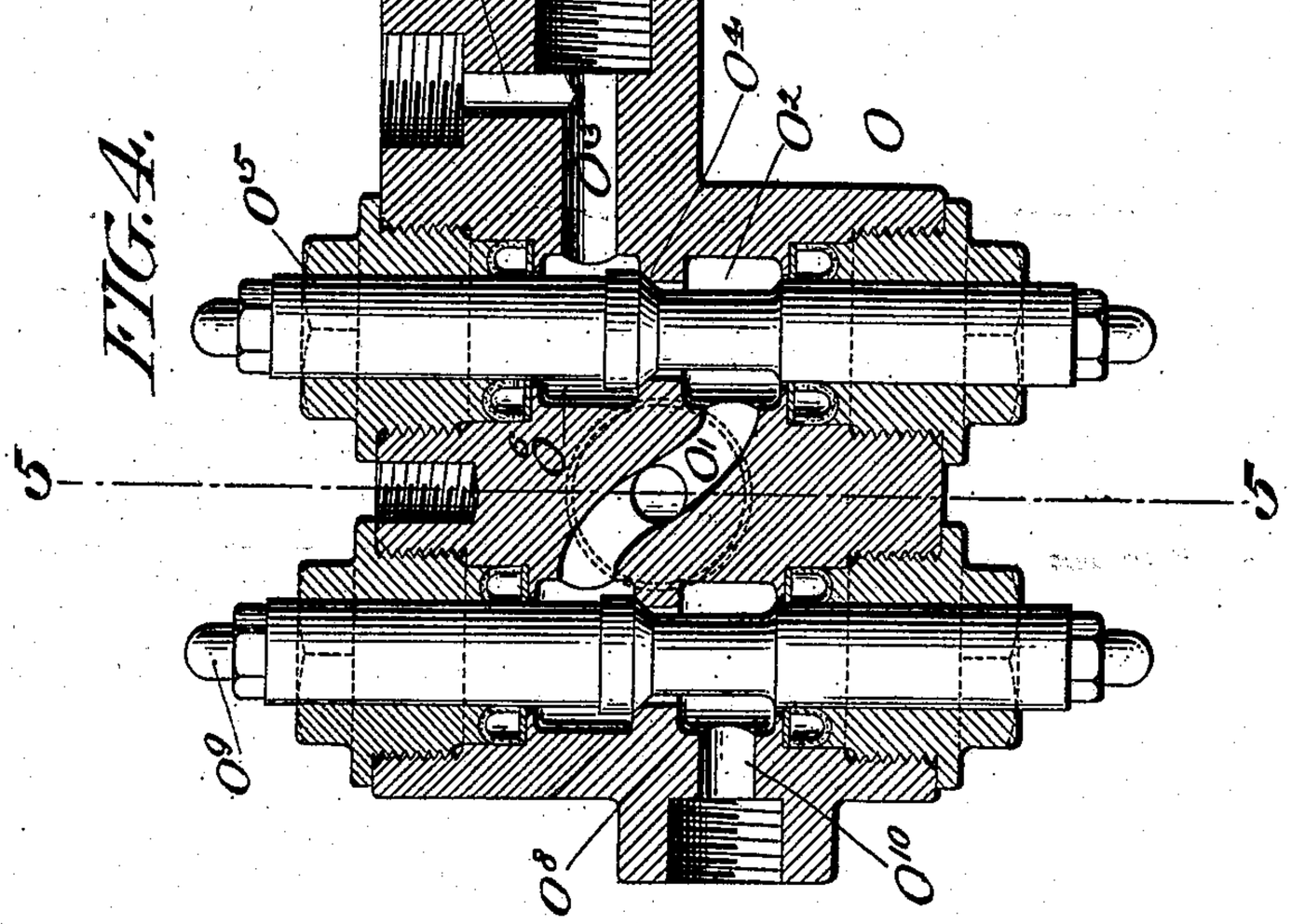


FIG. 4.



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NATHAN H. DAVIS, OF PHILADELPHIA, PENNSYLVANIA.

METAL-CUTTING APPARATUS.

No. 923,954. Specification of Letters Patent. Patented June 8, 1909.

Application filed August 6, 1906. Serial No. 329,490.

To all whom it may concern:

Be it known that I, NATHAN H. DAVIS, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Metal-Cutting Apparatus, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to apparatus for cutting metal and is particularly designed for separating portions of metal beams to form brake beams of the character disclosed in my Patents 574,887 and 683,729, granted January 12, 1897 and October 1st, 1901, respectively.

In carrying out my invention I provide a support in which the work to be operated upon is securely held during the cutting operation. I prefer to employ as cutters a pair of coöperating cutting blades which are positively and simultaneously moved into the material to be cut from opposite sides thereof the cutting edges of the two blades usually meeting as the cutting operation is completed.

My invention comprises various novel features of construction and arrangement whereby the desired cutting operation is rapidly and accurately carried out.

All the various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention however, and the advantages possessed by it, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described somewhat in detail one form of apparatus in which my invention may be embodied.

In the drawings, Figure 1 is a plan of the assembled machine with the blank to be operated upon in place and the apparatus in its initial position. Fig. 2 is an end elevation of the apparatus shown in Fig. 1. Fig. 3 is an elevation, partly in section, on the line 3—3 of Fig. 1. Fig. 4 is a sectional elevation of a fluid controlling valve construction which may be employed, and Fig. 5 is a sectional elevation on the line 5—5 of Fig. 4.

In the drawings, A, represents the main base or frame work of the apparatus. The base A may advantageously be formed of a plurality of hollow box like members A′ connected together by integral webs A^2. A vertical guide rib A^3 and a coöperating horizontal guide rib A^4 extending transversely to the members A′ are carried by them at opposite sides of the base. A main table or platform B is slidingly received between the guide ribs A^3 and on the guide ribs A^4. Between the guide ribs A^4, the platform or table B is supported by a pair of horizontal guiding surfaces A^5 (see Fig. 1). In the upper surface of the platform or table B is provided a plurality of under cut slots B′ extending transversely to the direction of movement of the table. The table is also formed with a slot B^2 in which is received a work holder C. The work holder C is formed with a slot C′ extending parallel to the direction of movement of the table and closed at one end by the shoulder C^2.

The work to be operated on is a blank D which, in the form shown, comprises a rolled or otherwise formed iron or steel bar or beam D of cruciform cross section having a rib D′, a pair of ribs D^2 extending transversely to the rib D′ and a rib D^3 at opposite sides of the rib D^2 from the rib D′. The blank D is supported by the work holder C, the rib D′, entering the slot C′, and engaging the shoulder C^2, and the under sides of the ribs D^2 resting against the upper surface of the work holder.

Cutter heads E, one at each side of the work holder C are provided with under cut tenons E′, which are slidingly received in the slots B′. Each cutter head has secured to it by a clamp E^2, stud bolts E^3 and nuts E^4, a cutting blade F, having its edge adjacent the work holder beveled to form a cutting edge F′. Each cutter head E is provided with rack portions E^5. These may be formed by inserting short rack bars E^6 in recesses or pockets E^7 formed in the edge of each cutter head remote from the work. Cams G having portion in the form of toothed segments G′ which mesh with the racks E^5 are pivotally secured to the frame of the apparatus by means of cylindrical bosses or ribs G^2 formed one on each cam, each rib G^2 being received in a corresponding curved socket or seat A^5 formed in the frame or base member A. Each cam G is cut away at G^3 so that when the apparatus is in the work receiving position shown in Figs. 1 and 2, the edge of each cutter head is separated from the centers of oscillation G^4 of the corresponding cams, a distance less than the radius of the segment portion. When,

in a manner hereinafter described, the table B is moved in the direction of the arrow in Fig. 1, the cutter heads are simultaneously moved toward one another by the cams G which move the cutter heads in the slots B′. With the arrangement shown this cam action is produced with but little friction and the toothed connections between the cams and the cutter heads serve to secure uniformity of movement between the different cams and cutter heads, while at the same time forming a compact arrangement.

The table B is reciprocated along its supporting guides by means of a fluid pressure system which comprises a stationary hollow piston H secured to the frame A and slidingly received in a cylindrical shell B^2, secured, and preferably, integrally connected, to the under side of the table B; and a movable hollow piston I, secured to a lug B^3 projecting from the under surface of the table, and entering an open ended cylindrical shell J secured to the end of the framework A remote from that to which the piston H is secured. Piston chambers K extending transversely to the line of movement of the table are formed in the latter. The chambers K are connected by a passage K′ which in turn is connected by passages K^2 and K^3, through a lateral opening I′, with the passage I^2 in the piston I. Each cutter head is provided at its outer edge with a bent arm L which extends into position to be engaged by a piston member M located in the corresponding piston chamber K. As shown in Fig. 2, the pistons M and piston chambers K extend parallel to the line of movement of the cutter heads with respect to the table B. A pipe N leads from the interior of the piston shell B^2 through the passage H′ in the piston H to the port O′, of the controlling valve O. The port O′ is connected to a pressure supply pipe P through a valve chamber O^2 and passage O^3. The valve chamber O^2 has a port O^4 normally closed by a piston O^5. As shown in Fig. 4, a collar or circumferentially extending rib O^6 is provided on the valve stem O^5 so that the pressure in the upper portion of the valve chamber normally tends to hold the valve in position in which it closes the port O^4. A passage O^7 leads from the passage O^3 through a pipe Q to the interior of the piston shell J so that the latter is at all times connected to the pressure supply pipe P. The valve O is also provided with a valve chamber O^8 and valve member O^9 similar to the valve chamber O^2 and valve member O^5, respectively, controlling communication between the port O′ and the discharge passage O^{10} leading to the fluid discharge pipe R. Between the upper ends of the valve members O^5 and O^9 a socket is formed in the valve casing to receive a rod or post S, which carries at its upper end a nut S′, against the under side of which bears the upper side of a helical spring which surrounds the post S. The lower end of the spring bears on the upper end of a follower S^3 which bears on the upper end of the valve members O^5 and O^9 and tends normally to hold both of them closed. A valve operating lever T pivoted intermediate its ends to the framework at T′ carries at one end an adjustable counterweight T^2 which normally tilts the lever into the position in which it engages the lower end of the valve O^9 and holds it in a position in which it opens communication between the port O^1 and the passage O^{10}. When the opposite end of the lever T is depressed, as by the foot of the operator, the valve member O^5 is raised, opening communication between the port O′ and the supply pipe P. As the lever is thus tilted the valve O^9 is moved into the closing position by the spring S^2 and after pressure is admitted into the upper end of the valve chamber O^8 by the opening of the valve O^5, the valve O^9 is held closed by such pressure.

In operation, the beam D to be operated upon is inserted in the work holder with the rib D′ entering the slot C′ and the other rib bearing against the shoulder C^2. Preferably the beam to be operated upon is red hot. After the beam is inserted, the valve member O^5 is moved off of its valve seat O^4, thus establishing communication between the pressure supply pipe P and the interior of the piston shell B^2. This causes the table to be moved in the direction of the arrow applied to Fig. 1 since the area of the piston H is much larger than that of the piston I. As the table B thus moves, the cutter heads E are moved together until the cutting edges F′ actually or approximately meet at the conclusion of the cutting operation. At this instant and for the purpose of facilitating subsequent operations upon the beam, the rib D^3 is preferably bent away from the body of the beam at a point midway between its ends. When this has been done the lever T is allowed to be swung back by the counterweight T^2, whereby the valve member O^5 again closes the port O^3 and the valve member O^9 is moved upward, thus opening communication between the pipe R and the port O′. When this occurs, the pressure on the piston I, at all times communicating with the supply pipe P, causes the table B to be moved back to its original position. At the same time the fluid traveling through the passages I′, K^3, K^2, and K′, to the piston chambers K causes the pistons M to be moved outwardly carrying with them the arms L and cutter heads E. This continues until the apparatus is returned to the position shown in Fig. 1.

By the cutting operations described it will be observed that the rib D^3 is severed from the body of the beam throughout its length with the exception of the portions of

the beam extending beyond the ends of the cutter blades. The cutting operation is such that none of the material of the beam is wasted and at the same time the surfaces cut are smoothed and compressed by the action of the tapered cutting blades. The construction is such that the cutting blades may be readily adjusted or removed by removing nuts E^3.

While the form of my invention hereinbefore described and illustrated has been found in actual practice to be simple, reliable and effective in operation, yet it will be readily understood by all those skilled in the art that changes may be made in the form of my invention without departing from its spirit, and I do not wish the claims hereinafter made to be limited to the particular embodiment of my invention disclosed more than is made necessary by the state of the art.

The slitted bars formed in the manner hereinbefore described may advantageously be formed into completed beams while still hot in the manner and by means of the apparatus disclosed by my applications Serial Numbers 329,491 and 329,492 filed of even date herewith.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is,

1. In combination, a table, means for reciprocating it, cutter heads mounted on said table to move relatively thereto toward and away from each other, and means for causing said heads to so move as the table is reciprocated.

2. In combination, a table, a work holder supported by the table and having a slot to receive one rib of a flanged bar, cutter heads mounted on said table to move relatively thereto in a direction transverse to said rib, means for reciprocating said table in the direction of said rib and means for simultaneously reciprocating said cutter heads transversely to such direction.

3. In a machine for separating one rib of a flanged bar cruciform in cross section from the body of the bar, a work holder for the bar having a recess for the rib opposite to the one to be separated from the body and a pair of cutters, one on each side of the work holder, each having a cutting edge substantially parallel to the length of the bar operated on, and means for moving said cutters into the bar from opposite sides thereof and above the two ribs at the sides of the rib to be separated.

4. In combination, a support, a table, slidingly mounted thereon, a cutting blade mounted on said table to move transversely with respect thereto to the line of movement of the table, means for moving said table, and a cam extending between the cutter and the support for moving the latter transversely to the line of movement of the table as the latter is moved.

5. In a machine for longitudinally separating a portion of a bar from the remainder of the bar, a work holder for the longitudinally flanged bar, said work holder being formed with a groove in which one of the flanges of the bar is received, cutting blades, one at each side of the work, each provided with a beveled cutting edge, and means for moving said cutter blades relatively toward one another to bring the cutting edges into contact in said portion and smooth and symmetrically shape the cleavage surfaces.

6. In combination, a support, a table slidingly supported on said support, means for reciprocating said table on said support, a cutter mounted on said table, and a cam engaging said cutter and said support and serving to move said cutter relatively to the table in a direction transverse to the reciprocatory movement of the table as the latter is reciprocated.

7. In combination, a support, a table slidingly supported on said support, means for reciprocating said table on said support, a cutter mounted on said table to reciprocate thereon in a line transverse to the direction of movement of the table and a cam engaging said cutter and said support and serving to move said cutter relatively to the table in a direction transverse to the reciprocatory movement of the table as the latter is reciprocated, said cam being pivotally connected to said support, and in toothed engagement with said cutter.

8. In combination, a support having guides, a table slidingly supported on said guides and provided with cutter head guides extending at right angles to the first mentioned guides, a cutter head, sliding supported on said guides and having gear teeth, means for reciprocating said table on its guides, and a cam pivotally connected to said support and having a toothed segment which meshes with said teeth, said cam having a portion cut away, the cutter head normally engaging said cut away portion so that the cutter head is then separated from the center of movement of the cam by a distance less than the radius of a pitch circle of its teeth.

9. In combination, a support, a table slidingly mounted thereon, a cutter head mounted on the table to slide relatively thereto in a direction at right angles to the line of movement of the table relative to the support, said cutter head being provided with a gear, a segmental gear pivotally connected to said support and meshing with the cutter head gear, means normally holding the table in a position such that the engagement of the segment with the cutter head gear takes place at a point at one side of a perpendicular from the center of movement of the

gear to the line of movement of the table, means for moving the table relative to the support in a direction to bring said point of engagement into coincidence with said perpendicular and means tending at all times to hold said cutter head gear in engagement with said segment.

10. In combination, a support, a table slidingly mounted thereon, a ram tending at all times to hold the table in an initial position relative to the support, a cutter head mounted on said table to move relatively thereto in a direction transversely to the line of movement of the support, a ram connected to the first mentioned ram and tending at all times to move the cutter head relatively to the table in one direction, a cam for moving the table relatively to the support in the opposite direction as the table moves away from said initial position, and means for moving said table away from said initial position.

11. In combination, a support, a table slidingly mounted thereon, a cutter head slidingly mounted on the table to move relatively thereto in a direction transverse to the line of movement of the support and provided with gear teeth E^5, a cam G pivotally connected to the support and formed with a toothed segment G′ and the cut away portion G^3, means for moving the table relative to the support and means including the piston M for holding the cutter head so that the teeth E^5 mesh with the teeth G′.

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