

No. 697,604.

Patented Apr. 15, 1902.

J. BRADLEY.

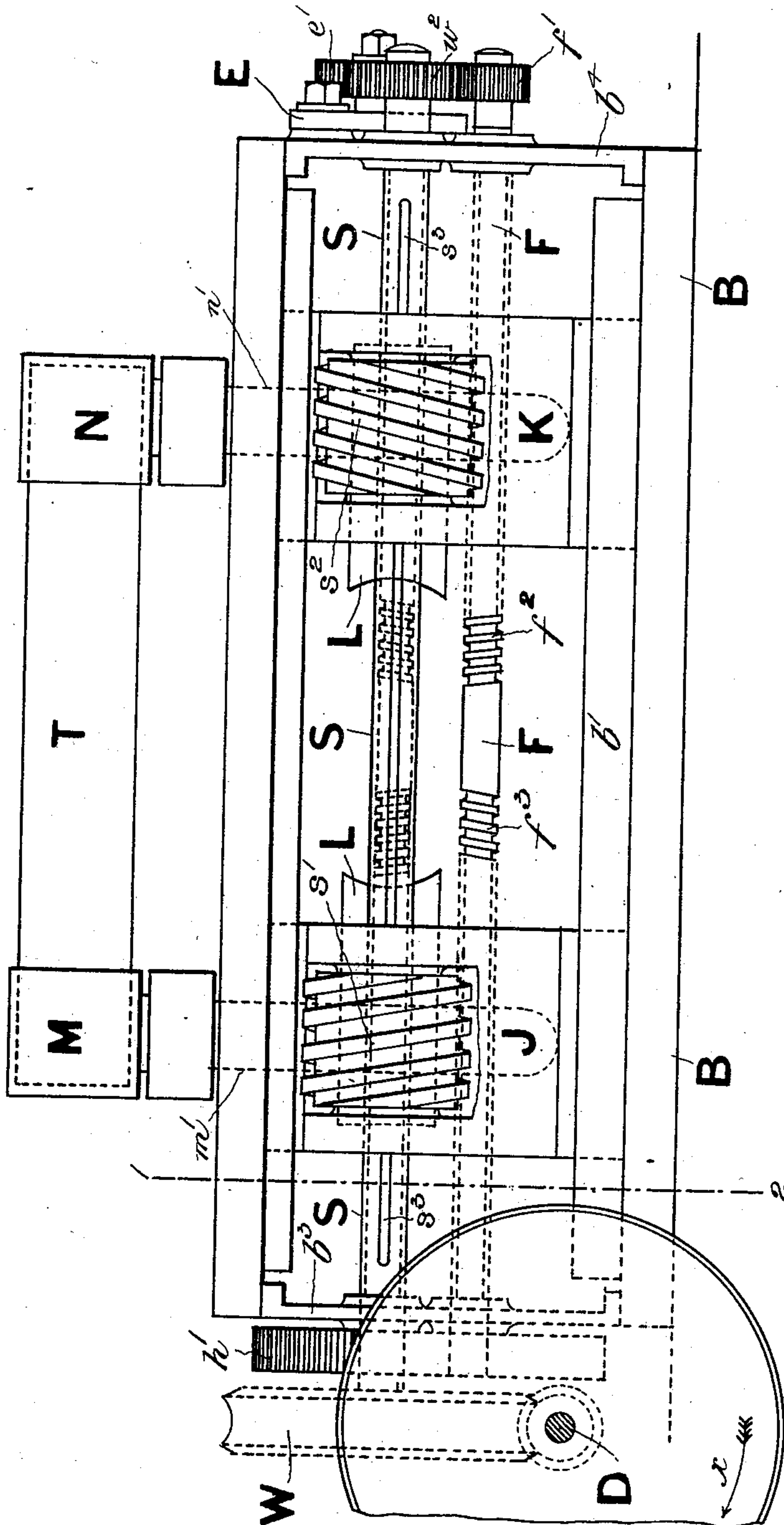
MACHINERY FOR MANUFACTURING TUBE BENDS.

(Application filed Aug. 29, 1901.)

(No Model.)

6 Sheets—Sheet 1.

FIG. 1



WITNESSES:

Isabella Aldrow
Adelaide Claire Pearson.

INVENTOR

John Bradley

BY

Richardson

ATTORNEYS

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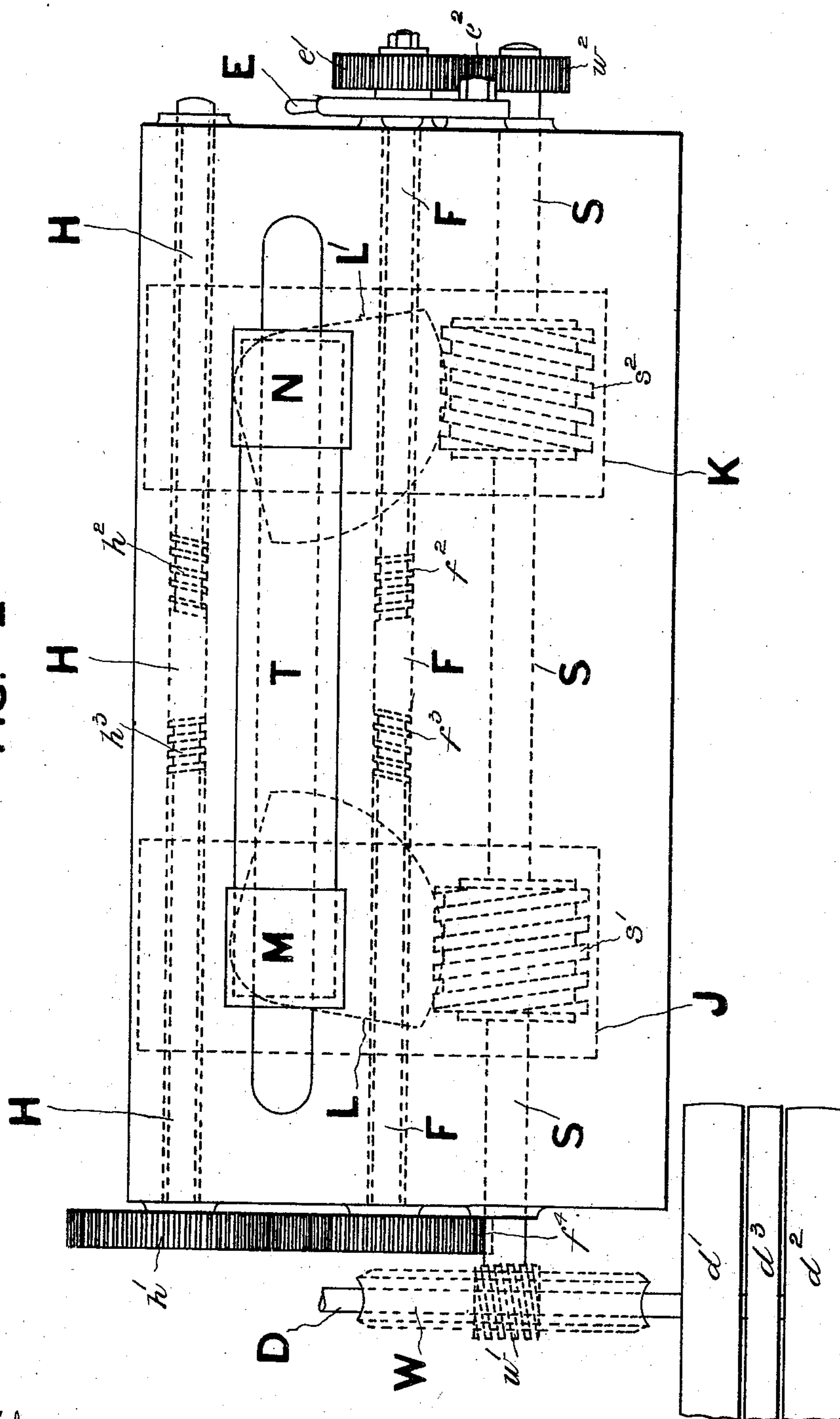
J. BRADLEY.
MACHINERY FOR MANUFACTURING TUBE BENDS.

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(No Model.)

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FIG. 2



WITNESSES:

Isabella Kaldron
Adele Claire Gleason

INVENTOR,

John Bradley
BY Richard S. Co
ATTORNEYS

No. 697,604.

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J. BRADLEY.

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FIG. 4

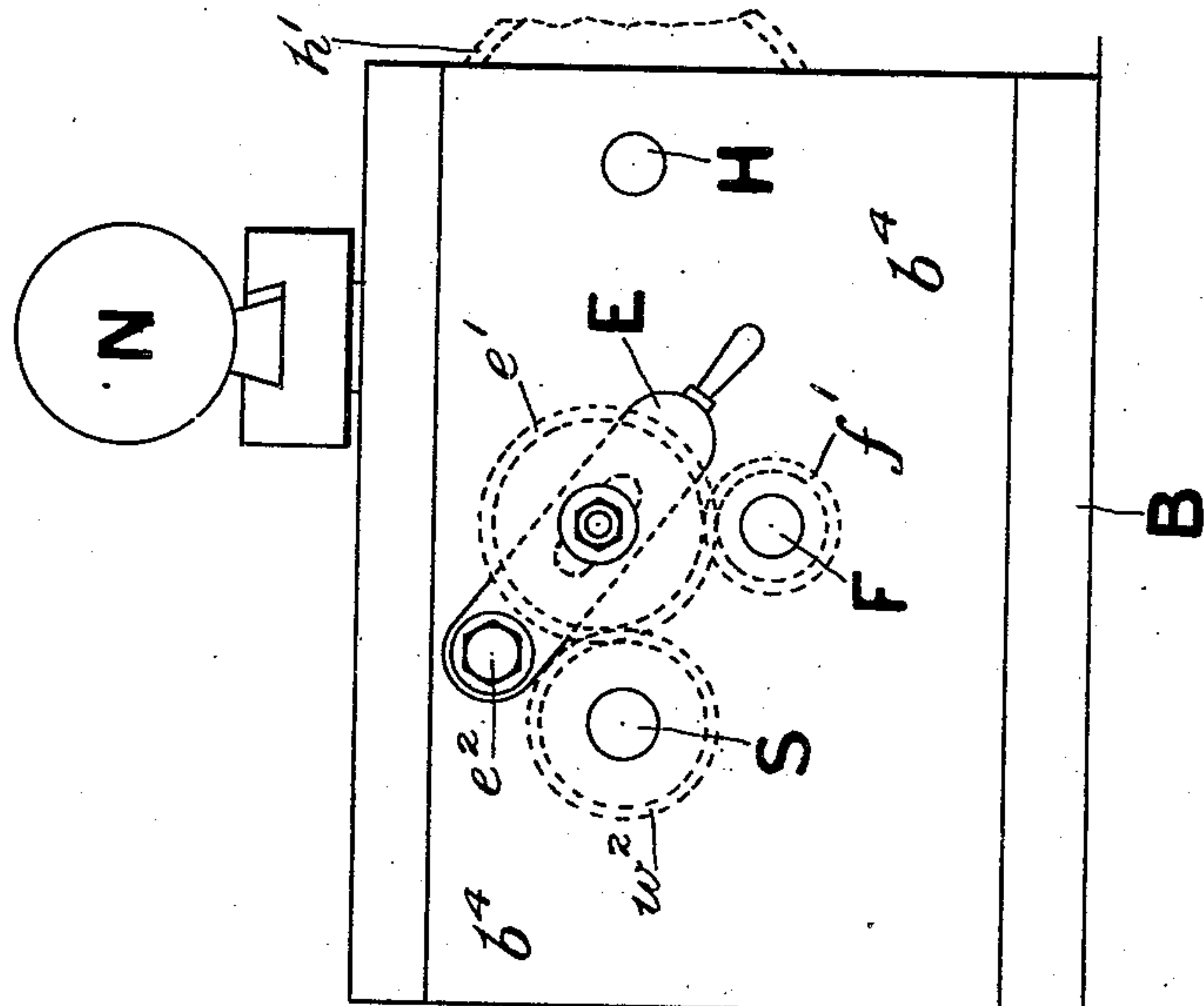
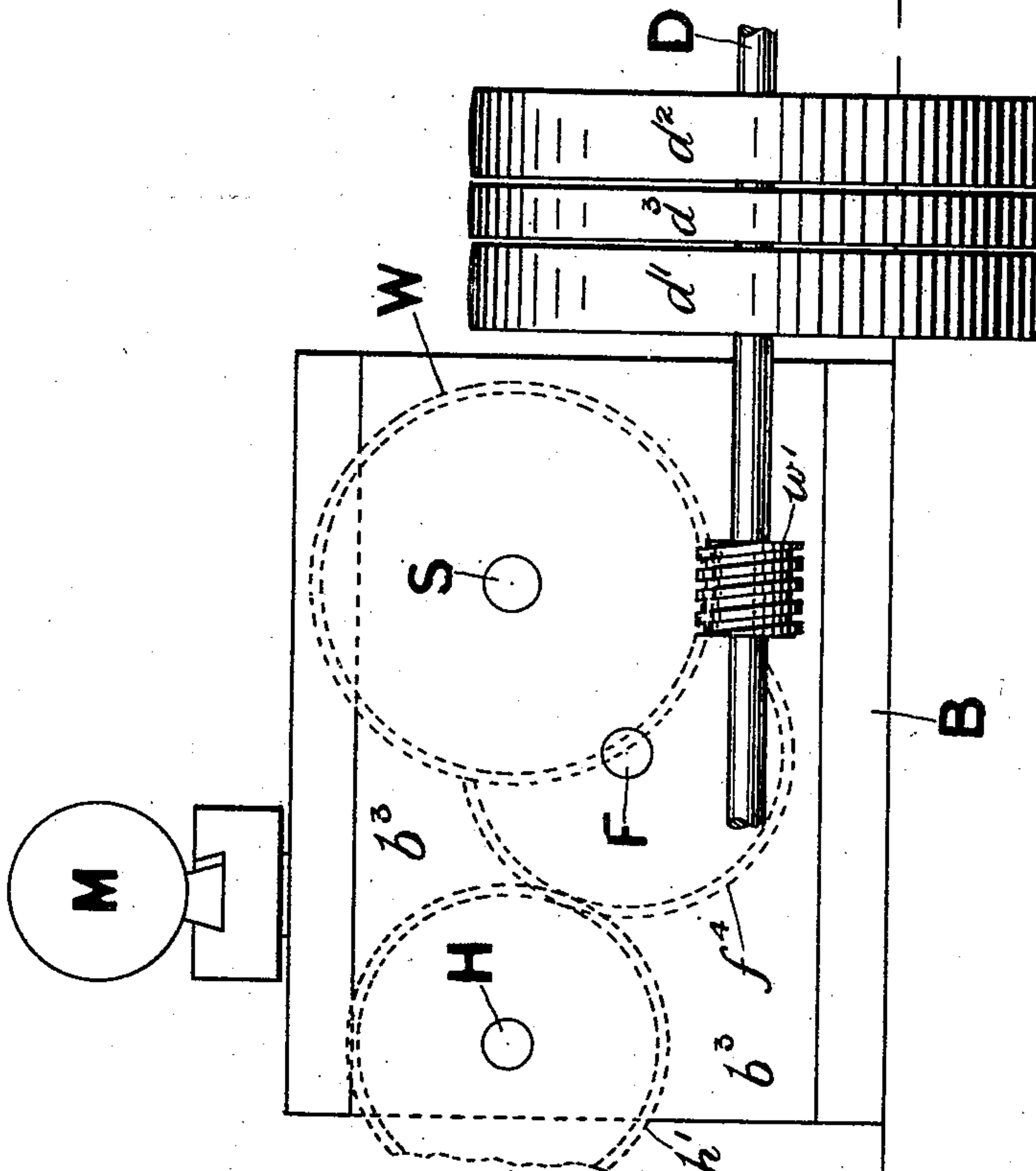


FIG. 3



WITNESSES:
Isabella Haldron
Adelaide Blair Pearson

INVENTOR.
John Bradley
BY *Richard L. [Signature]*
ATTORNEYS.

No. 697,604.

Patented Apr. 15, 1902.

J. BRADLEY.

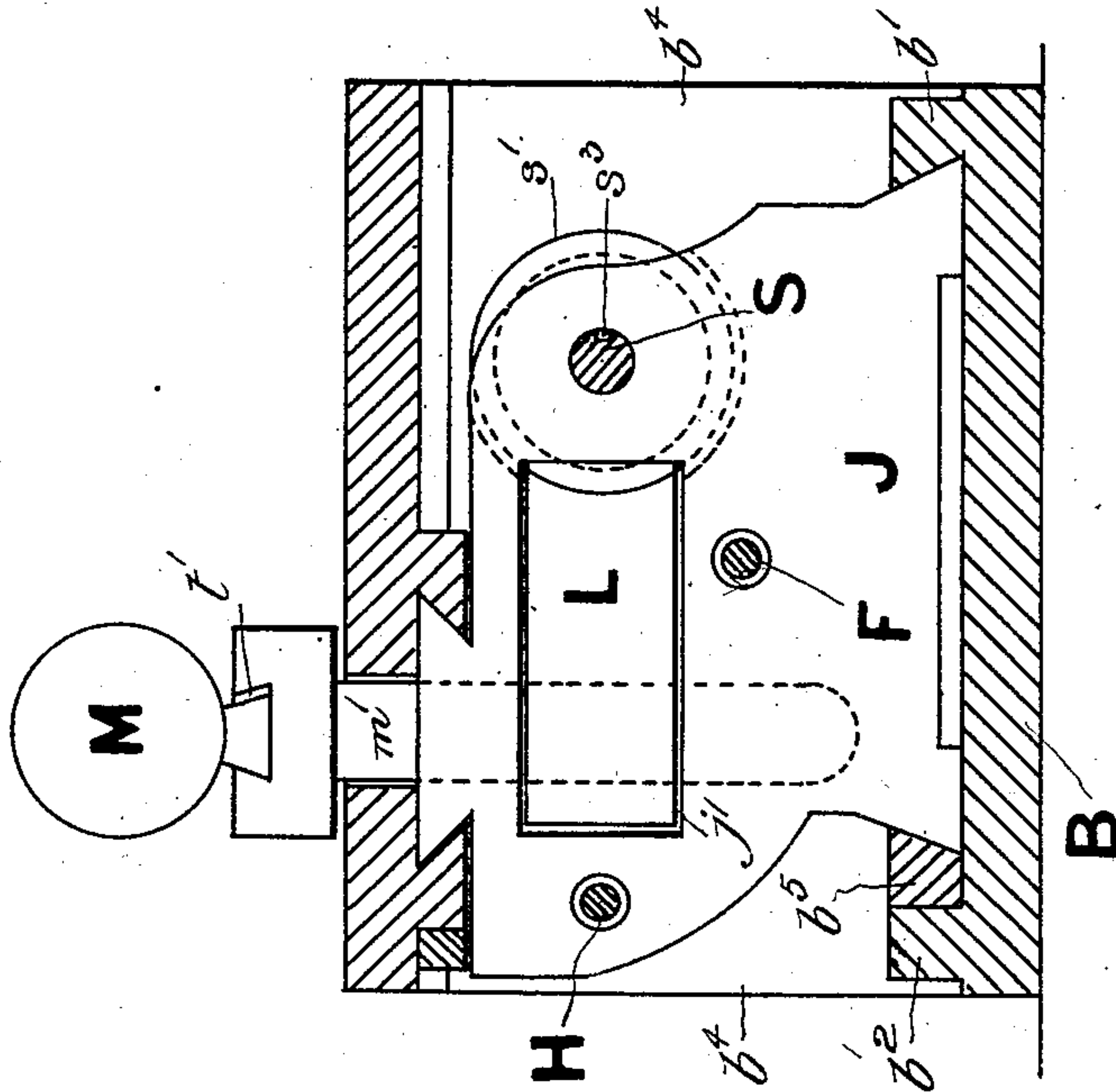
MACHINERY FOR MANUFACTURING TUBE BENDS.

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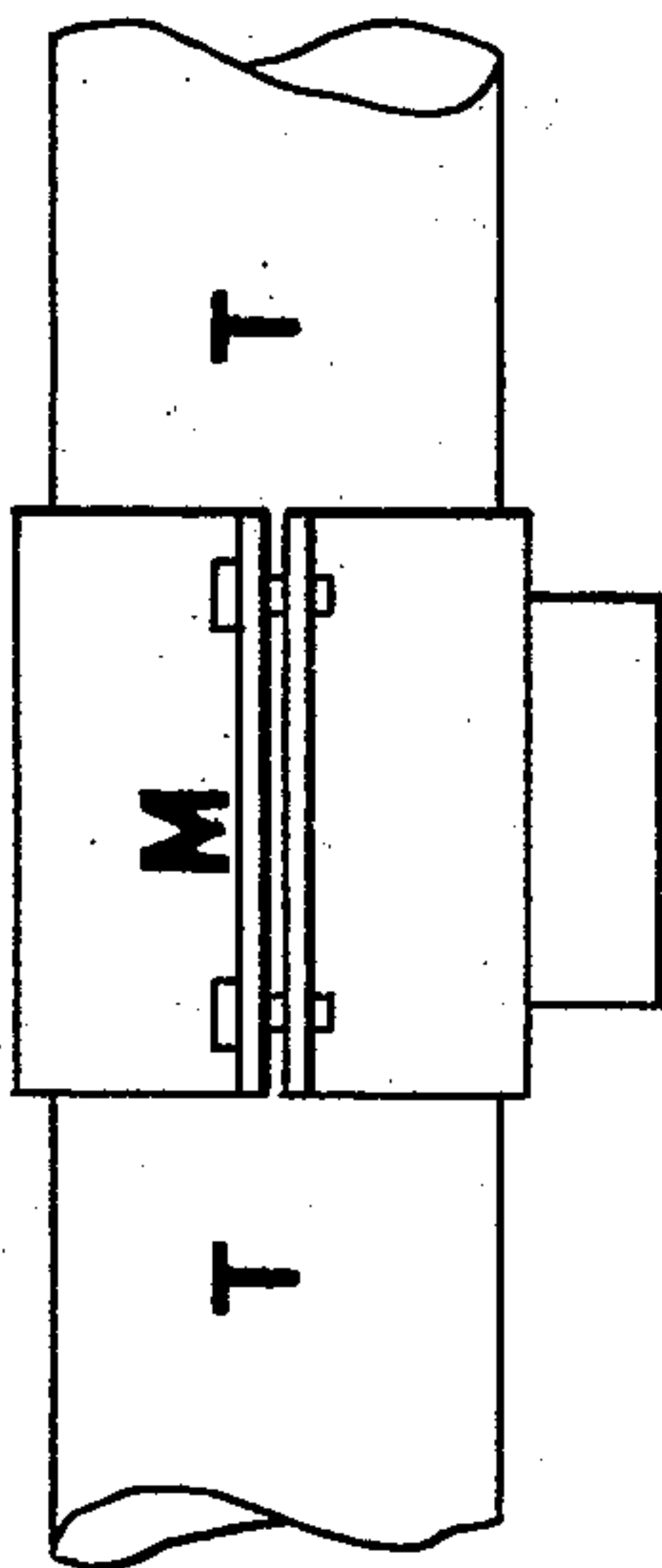
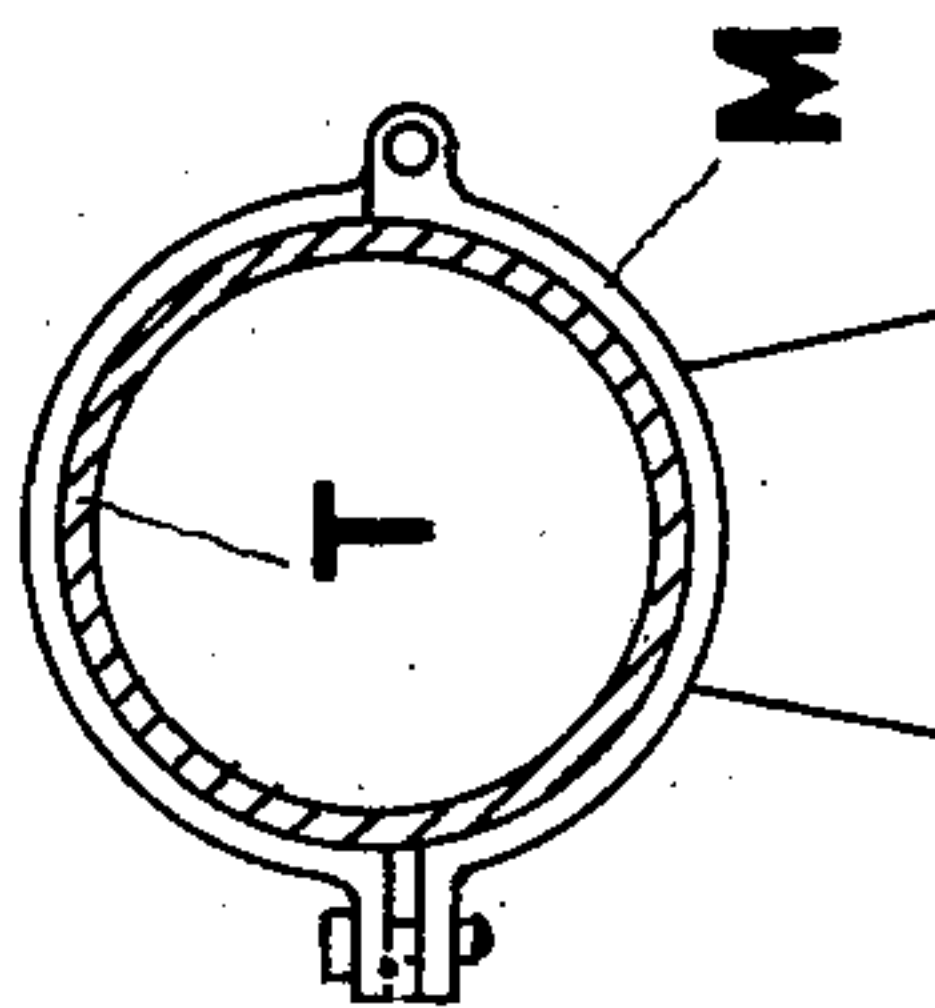


FIG. 7



WITNESSES:

Isabella Maldron.
Adelaide Claire Gleason.

INVENTOR

John Bradley.
BY P.

BY

Richard L.
ATTORNEY

No. 697,604.

Patented Apr. 15, 1902.

J. BRADLEY.

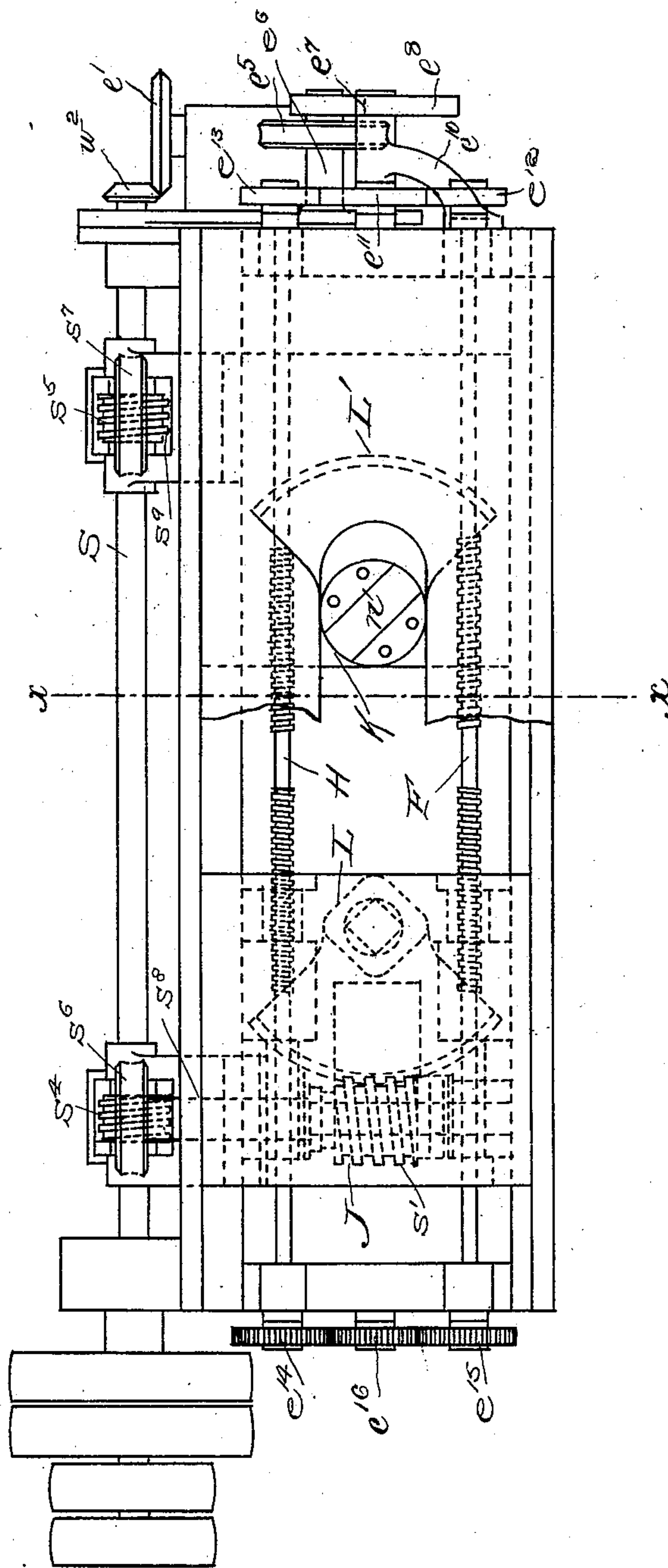
MACHINERY FOR MANUFACTURING TUBE BENDS.

(Application filed Aug. 29, 1901.)

(No Model.)

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FIG. 8



WITNESSES:

Isabella Waldron.
Adelaide Claire Gleason.

INVENTOR

John Bradley.

BY *Richardson & Co.*
ATTORNEYS.

No. 697,604.

Patented Apr. 15, 1902.

J. BRADLEY.

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FIG. 10

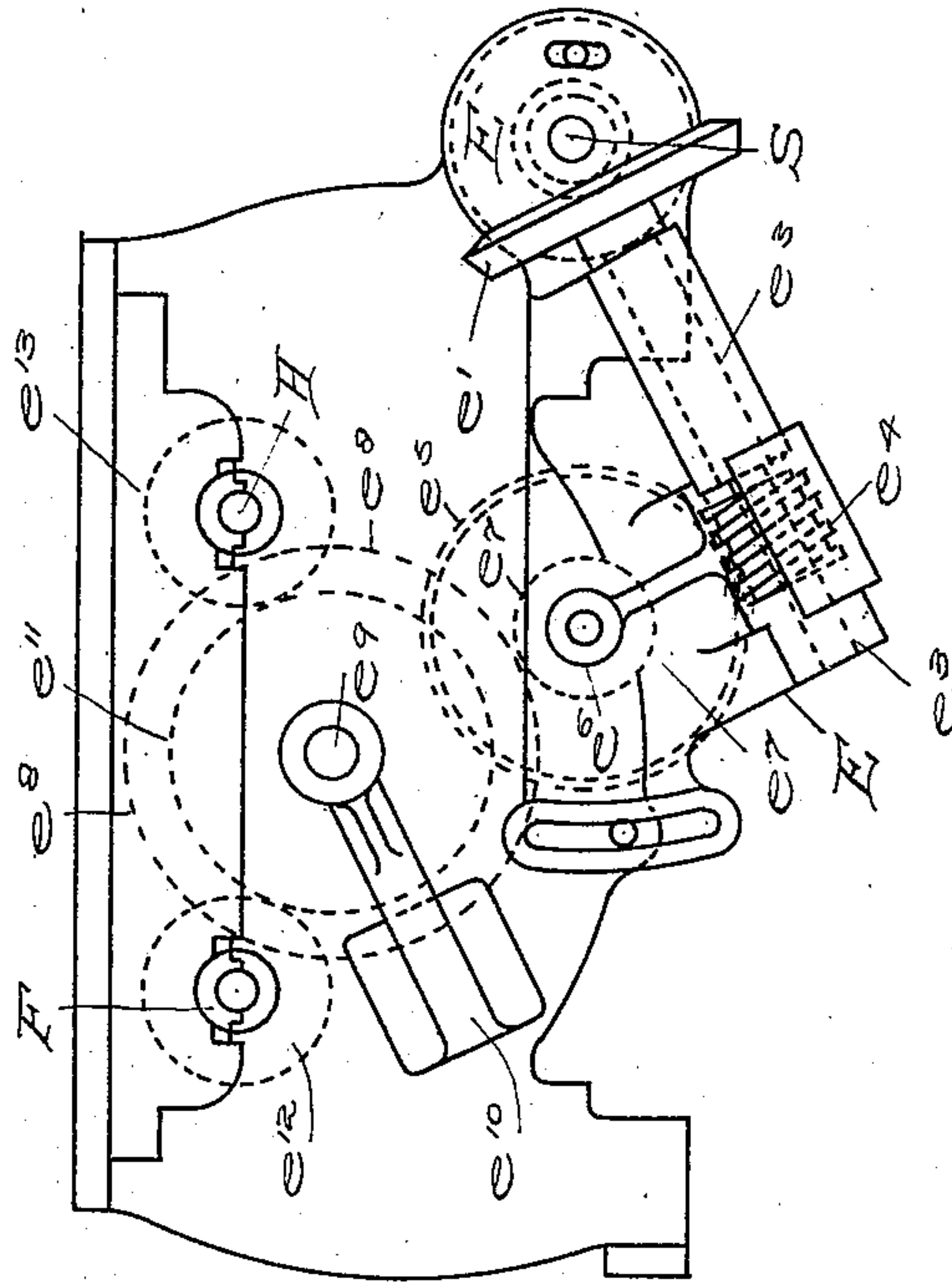
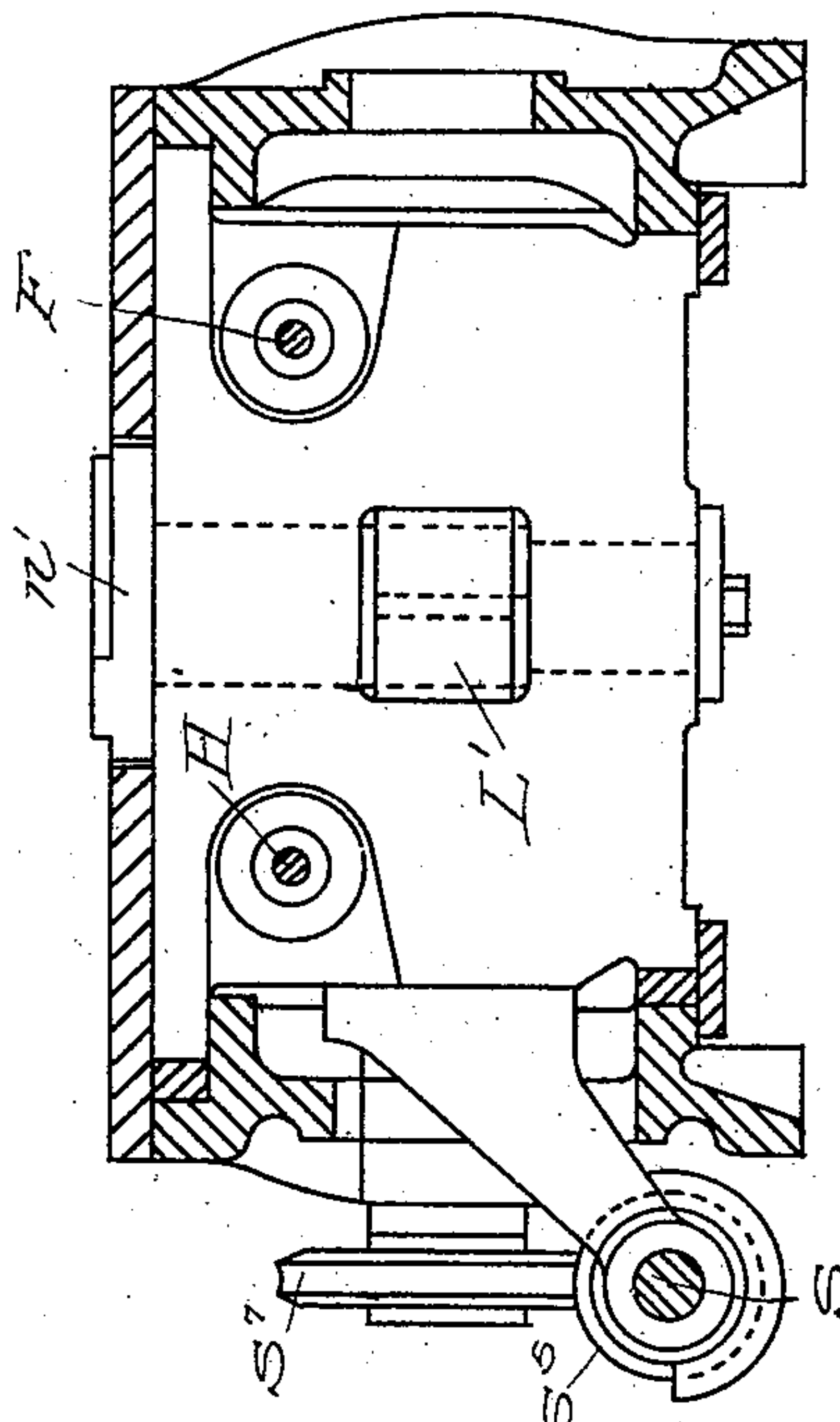


FIG. 9



WITNESSES:
Isabella Waldron
Adelaide Claire Gleason

INVENTOR.
John Bradley
BY *Richard R*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN BRADLEY, OF BIRMINGHAM, ENGLAND.

MACHINERY FOR MANUFACTURING TUBE-BENDS.

SPECIFICATION forming part of Letters Patent No. 697,604, dated April 15, 1902.

Application filed August 29, 1901. Serial No. 73,673. (No model.)

To all whom it may concern:

Be it known that I, JOHN BRADLEY, a subject of the King of Great Britain, and a resident of Birmingham, England, have invented certain new and useful Improvements in Machinery for Manufacturing Tubes, of which the following is a specification.

My invention has for its object improvements in machinery for manufacturing tube-bends by which I am enabled to form any number of bends all of one uniform and accurate angle in a cheap and simple manner, thus enabling both ends of each bend to be automatically screwed or tapped simultaneously without having to alter or reset the dies for each bend. My machine is specially applicable for forming bends from tubing of a large diameter, but can with equal advantage be used for bends made from small-diameter tubing.

In order that my invention may be clearly understood and more easily carried into practical effect, I have illustrated it in the accompanying drawings, in which—

Figure 1 is a front elevation of my machine for forming bends, showing a length of tubing in position ready for being bent. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a left-hand end view of Fig. 1. Fig. 4 is a right-hand end view of Fig. 1. Fig. 5 is a sectional end elevation taken on the line 1 2 of Fig. 1. Fig. 6 is a front view of my open-ended dog or gripper. Fig. 7 is an end view of Fig. 6. Fig. 8 is a plan view showing a slight modification in the construction of my machine for forming bends. Fig. 9 is an enlarged cross-section view taken on the line $x x$ of Fig. 8. Fig. 10 is a right-hand end elevation of Fig. 8.

In carrying my invention into practice I provide the bed B, along one edge of which is formed the cheek b' and on the other edge the stop b^2 , and at either end are the end supports or sides $b^3 b^4$. Mounted in suitable bearings in these supports is the main shaft S, on one end of which is fixed the worm-wheel W, gearing with the worm w' , fixed on the driving-shaft D, and on the other end of the shaft S is fixed the gear-wheel w^3 , gearing with the intermediate gear-wheel e' , mounted on a stud supported by the bracket E. This bracket E is pivoted at e^2 to the outer face of the support b^4 , so as to enable the interme-

diate gear-wheel e' to be changed, and this intermediate gear-wheel also gears with the gear-wheel f' , fixed on the end of the screw-shaft F, mounted in bearings in the supports $b^3 b^4$. The one portion f^2 of the shaft F is screwed with a right-hand thread and the other portion with the left-hand thread f^3 , as clearly shown at Figs. 1 and 2. Fixed on the opposite end of the screw-shaft F is the gear-wheel f^4 , gearing with the gear-wheel h' , fixed on the end of the screw-shaft H, also mounted in bearings in the supports $b^3 b^4$, and the portion h^2 of this shaft H is screwed with a left-hand thread and the portion h^3 with a right-hand thread. Mounted on the bed B and held in position by the loose cheek b^5 are the traveling carriers J and K, through which the screw-shafts F and H pass, and in sockets formed in these carriers I fit the dogs or grippers M and N upon their supports or carriers $m' n'$, respectively. These dogs or grippers are capable of being turned or operated in their sockets by the worms $s' s^2$, mounted upon the shaft S, which worms gear with the quadrants L L', fixed upon the supports or pivots m' and n' , which said quadrants work in the slots or openings formed in the carriers J and K. The worms s' and s^2 are mounted upon the shaft S in the feather-way s^3 , so as to be capable of sliding thereon, and the loose pulleys d' and d^2 , with the fixed pulley d^3 between, are mounted upon the driving-shaft D for imparting motion to the machine. By changing the intermediate gear-wheel e' the speed of the screw-shafts F and H can be altered, thus enabling the speed of the carriers J and K to be altered for making bends of various radii.

The length of tubing T before being inserted in the machine is first filled with sand and the ends with marl or clay and then heated to the required temperature.

It will easily be understood that if motion is imparted to the driving-shaft D it will be transmitted through the various gearing to the main shaft S and from thence to the screw-shafts F and H. Now supposing the dogs and length of tubing T to be in the position as shown upon the drawings ready for bending and the driving-shaft revolving in the direction of the arrow x , the carriers J and K would then advance or close together,

and as the dogs advance with them they would gradually turn on their pivots by the action of the worms s' and s^2 , which revolve with the shaft S and are in gear with the quadrants L and L', respectively. By this means the length of tubing would be easily and readily bent to the required angle. The machine is now stopped and the bend removed, the open and crossed driving-belts, which drive the machine, now being situated upon the inner half or side of the loose pulleys d' d^2 . To move the carriers and dogs back to their former positions ready for inserting another length of tubing, the crossed driving-belt on the loose pulley d^2 is moved by the belt-fork onto the fixed pulley d^3 , and the open belt is simultaneously removed onto the outer half or side of the loose pulley d' , thus reversing the motion of the shafts S, F, and H, and consequently the movements of the carriers and dogs.

At Figs. 6 and 7 I have shown my open-ended dogs suitable for holding a long length of tubing which requires to be bent at a certain portion of its length. In this case the upper portion of the dog is hinged to the lower portion, thus enabling the tube to be laid in position.

At Figs. 8, 9, and 10 I have shown a slight modification in the construction and gearing mechanism of my machine for forming bends. In this case I drive direct onto the main shaft S, and on the end of this shaft I mount the gear-wheel w^2 , gearing with the intermediate gear-wheel e' , fixed on the shaft e^3 , supported by the bracket E. Fixed on the opposite end of this shaft e^3 is the worm e^4 , gearing with the worm-wheel e^5 , mounted on a stud supported by the boss e^6 , fixed to or forming part of the bracket E. Also mounted on the same stud as the worm-wheel e^5 is the pinion-wheel e^7 , gearing with the gear-wheel e^8 , fixed on the shaft e^9 , supported by the bracket e^{10} , and on the opposite end of this shaft e^9 is fixed the gear-wheel e^{11} , gearing with the gear-wheels e^{12} and e^{13} , fixed on the ends of the screw-shafts F and H, respectively, by which means motion is imparted to these shafts, each shaft being screw-threaded at the right hand with a right-hand thread and at the left hand with

a left-hand thread. The gear-wheels e^{14} and e^{15} on the opposite ends of these screw-shafts, which gear with the intermediate wheel e^{16} , are for the purpose of enabling the screw-shafts to run evenly and steadily. Mounted on the main shaft S in a keyway are the worms s^4 s^5 , gearing with the worm-wheels s^6 s^7 , mounted on the ends of the cross-shafts s^8 s^9 , mounted in bearings supported by the carriers J and K, and on these cross-shafts are fixed the worms s' s^2 , which gear with the quadrants or segments L L'. It will thus be seen that by this arrangement the dogs or grippers, which are supported by their carriers, are caused to travel toward each other and at the same time turn or revolve.

What I claim, then, is—

1. The improvements in machinery for manufacturing tube-bends consisting essentially of two carriers capable of traveling in reverse directions, a dog or gripper pivotally mounted in each carrier with means for operating or moving the dogs upon their pivots in the manner and for the purpose substantially as herein set forth.

2. In machines for making tube-bends, a pair of carriers capable of traveling in reverse directions, a dog or gripper pivotally mounted in each carrier, and quadrants and worms for operating said dogs, substantially as described.

3. In machines for bending tubes, a pair of carriers, dogs or grippers mounted therein, and means for simultaneously moving said dogs or grippers and carriers, substantially as described.

4. In machines for bending tubes, a pair of traveling carriers, dogs or grippers having quadrants and pivotally mounted in said carriers, an operating-shaft, worms keyed to said shaft and engaging the quadrants, and screw-shafts for operating said carriers in reverse directions, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN BRADLEY.

Witnesses:

H. W. DENTON INGHAM,
H. C. GRUNDY.