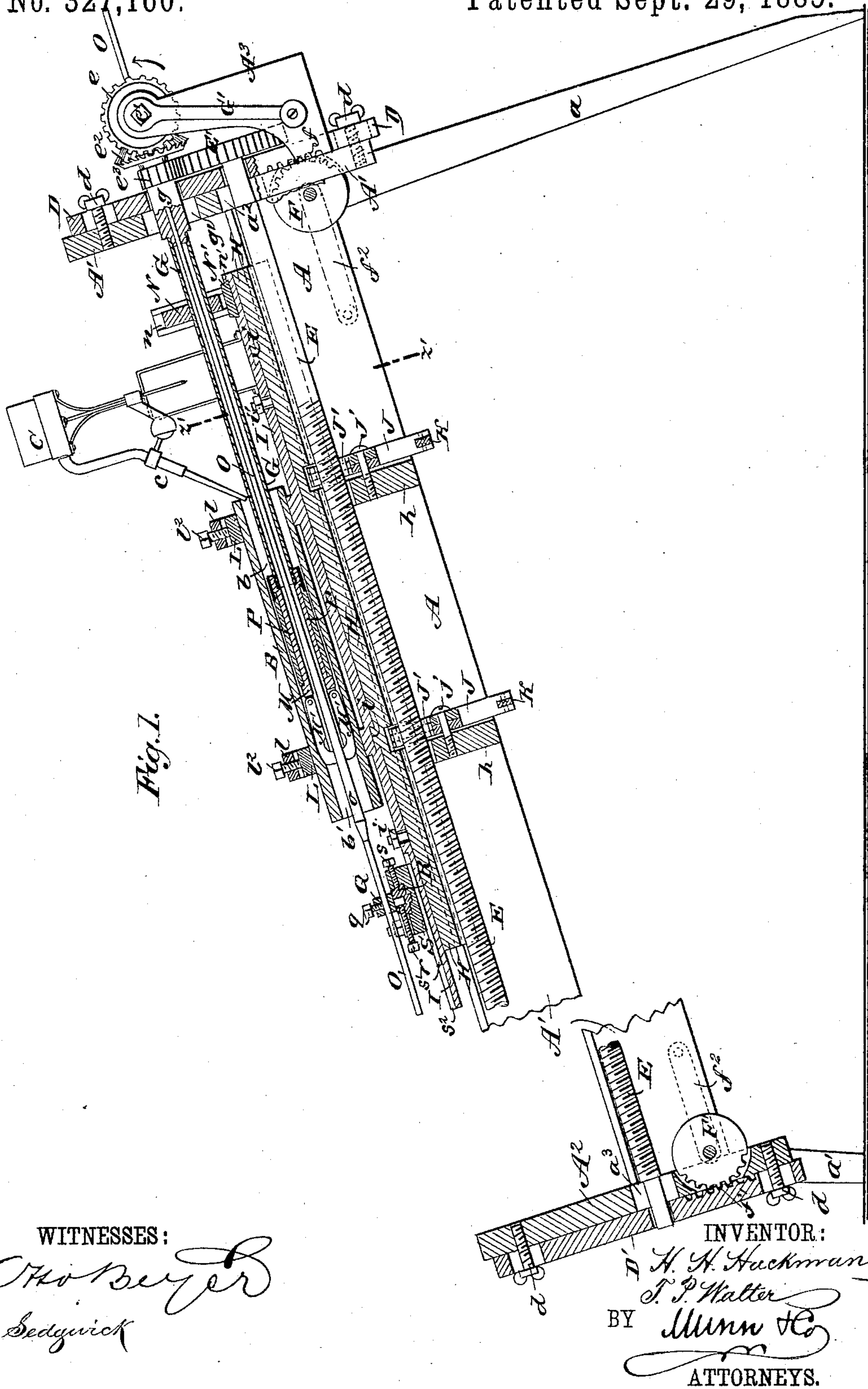



3 Sheets—Sheet 1.

MACHINE FOR BORING GUN BARRELS.

Patented Sept. 29, 1885.



WITNESSES:

WITNESSES:


C. Sedgwick

INVENTOR:

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(No Model.)

3 Sheets—Sheet 2.

H. H. HACKMAN & T. P. WALTER.

MACHINE FOR BORING GUN BARRELS.

No. 327,160.

Patented Sept. 29, 1885.

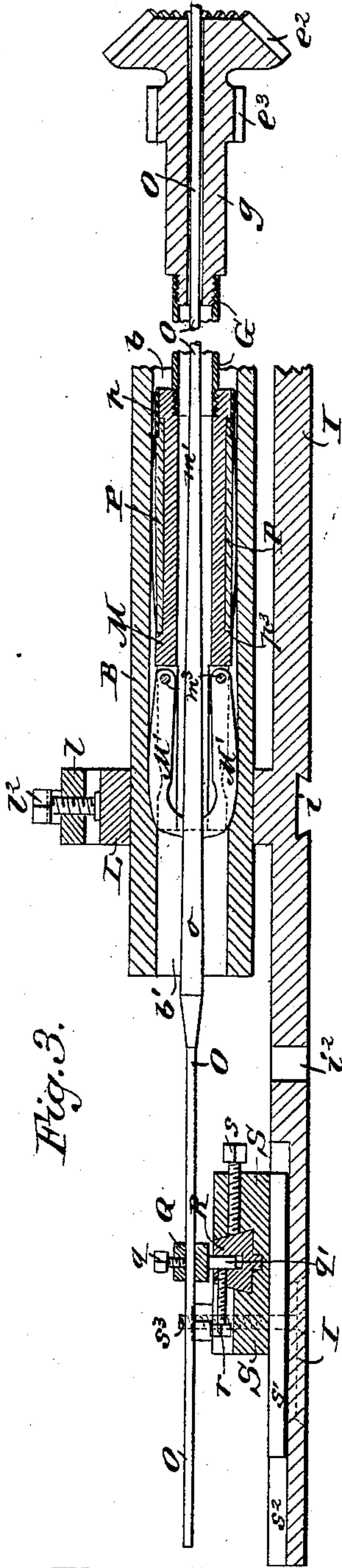


Fig. 3.

WITNESSES:

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Fig. 2.

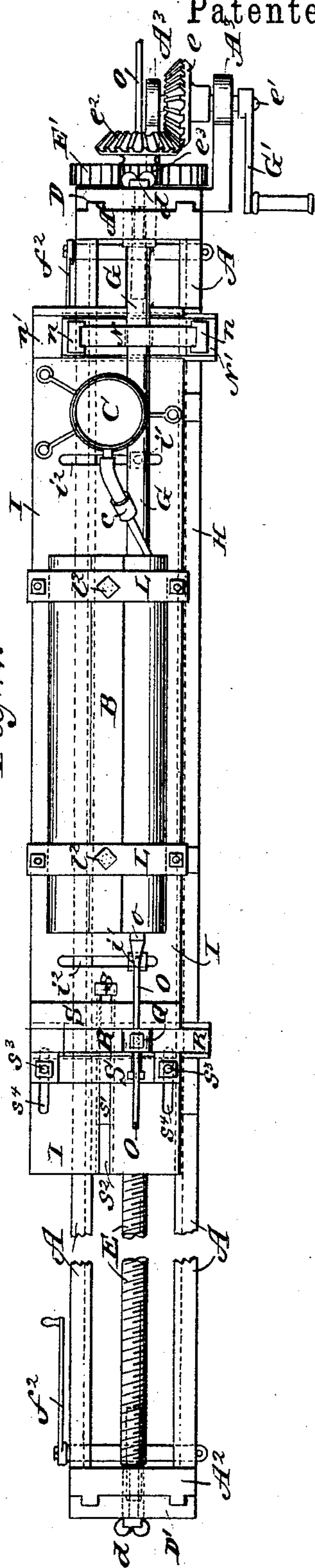


Fig. 4.

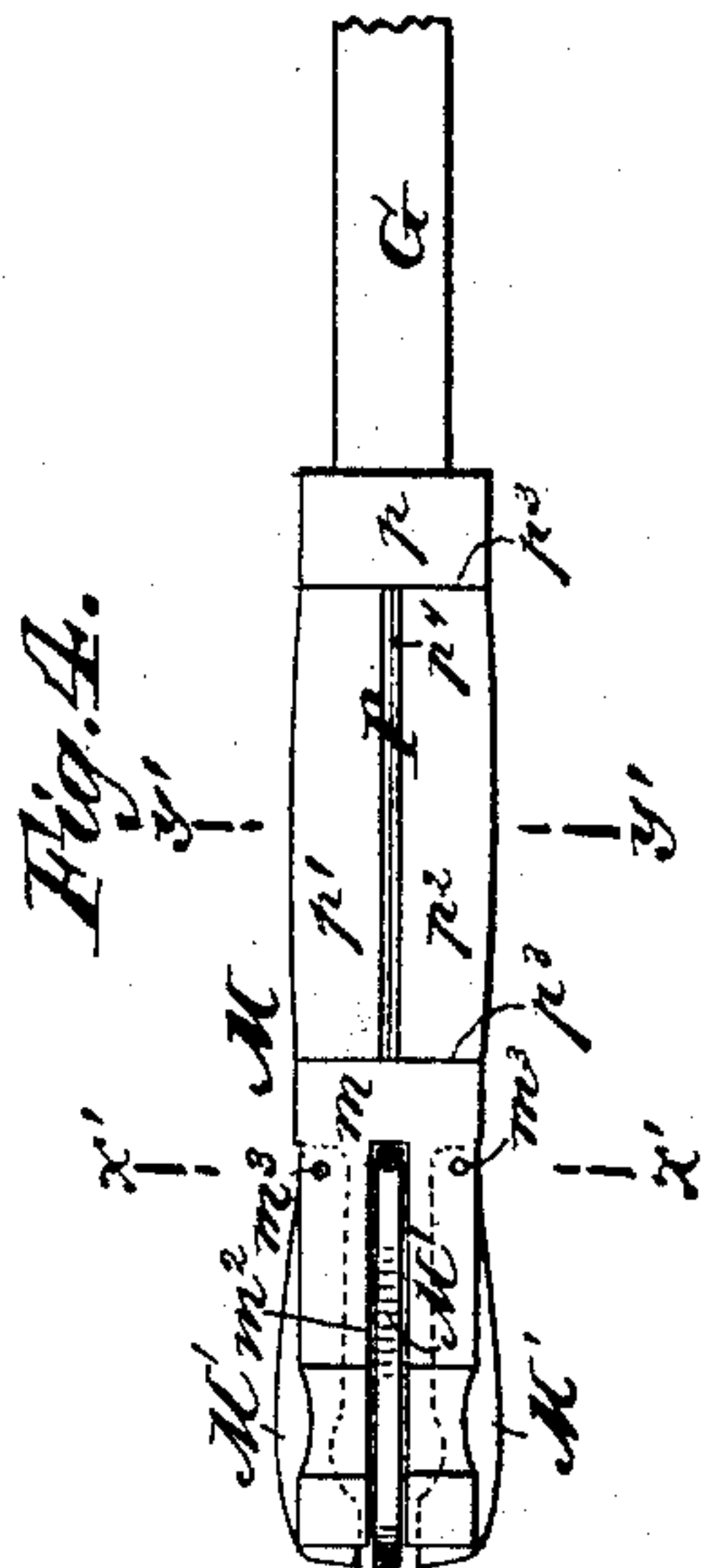


Fig. 5.



Fig. 6.

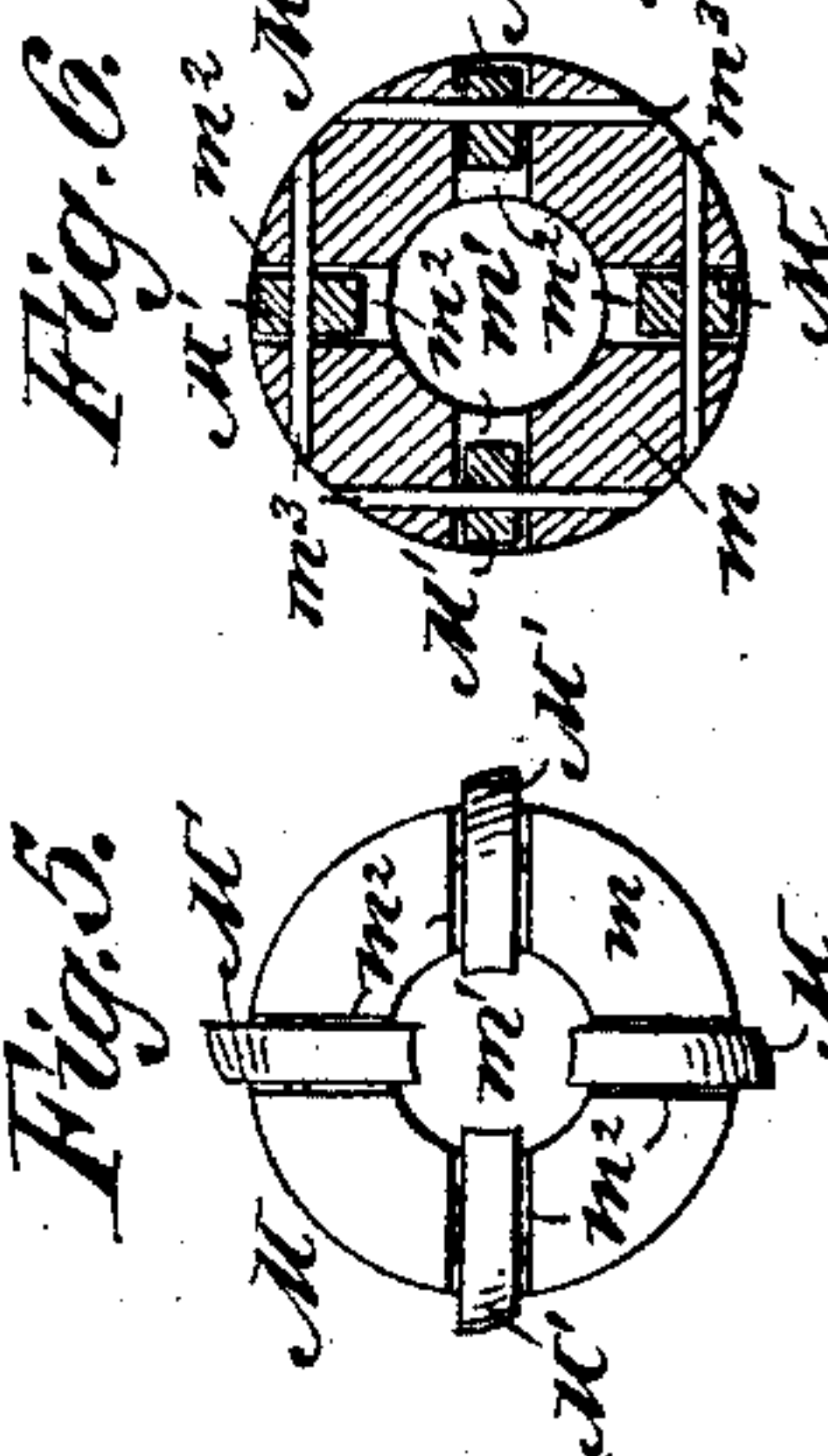
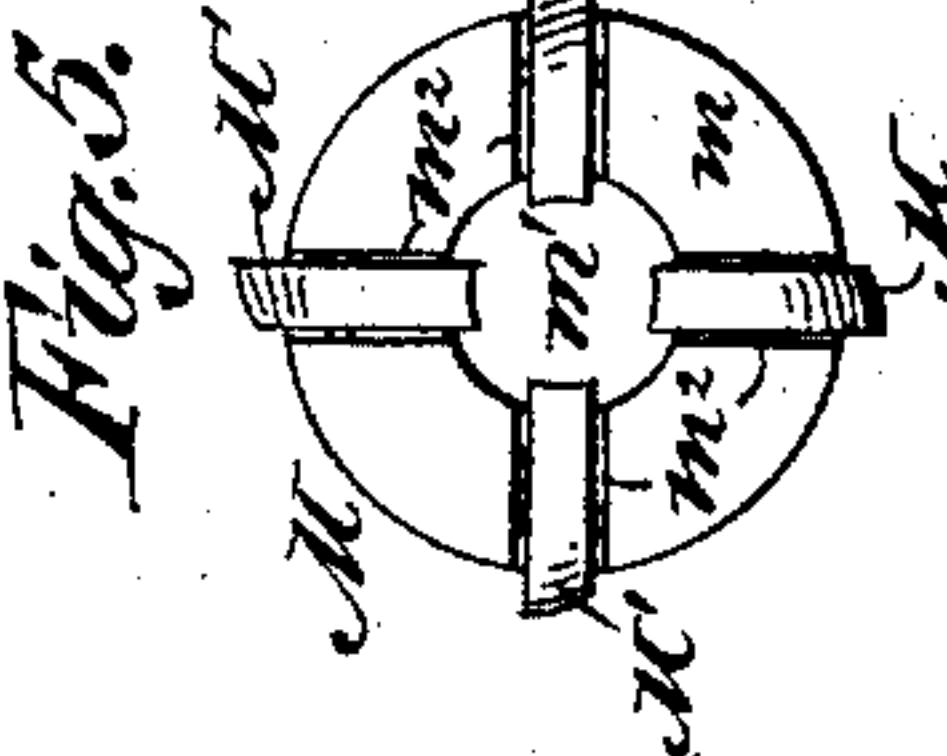


Fig. 7.



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(No Model.)

3 Sheets—Sheet 3.

H. H. HACKMAN & T. P. WALTER.

MACHINE FOR BORING GUN BARRELS.

No. 327,160.

Patented Sept. 29, 1885.

Fig. 9.

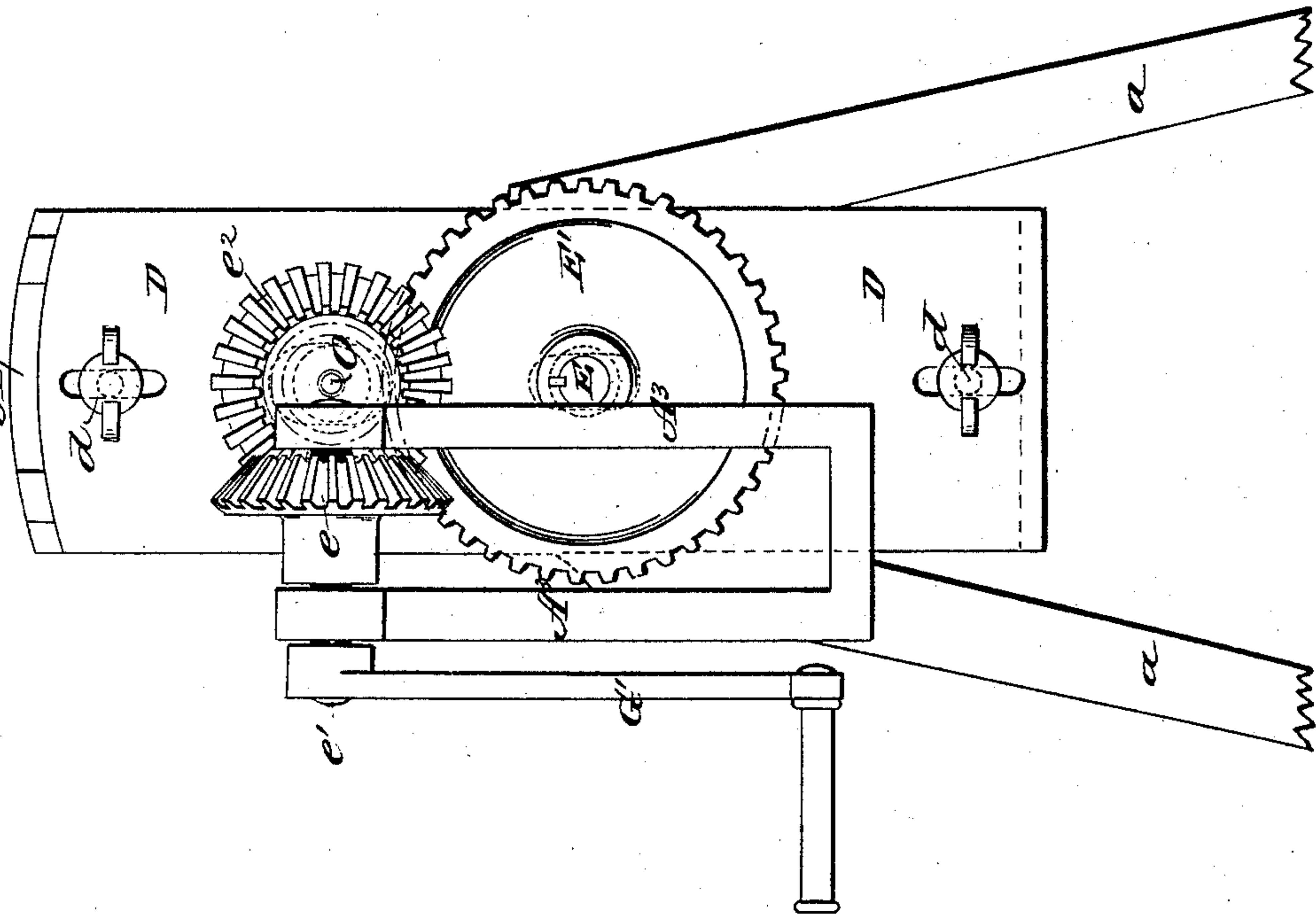


Fig. 8.

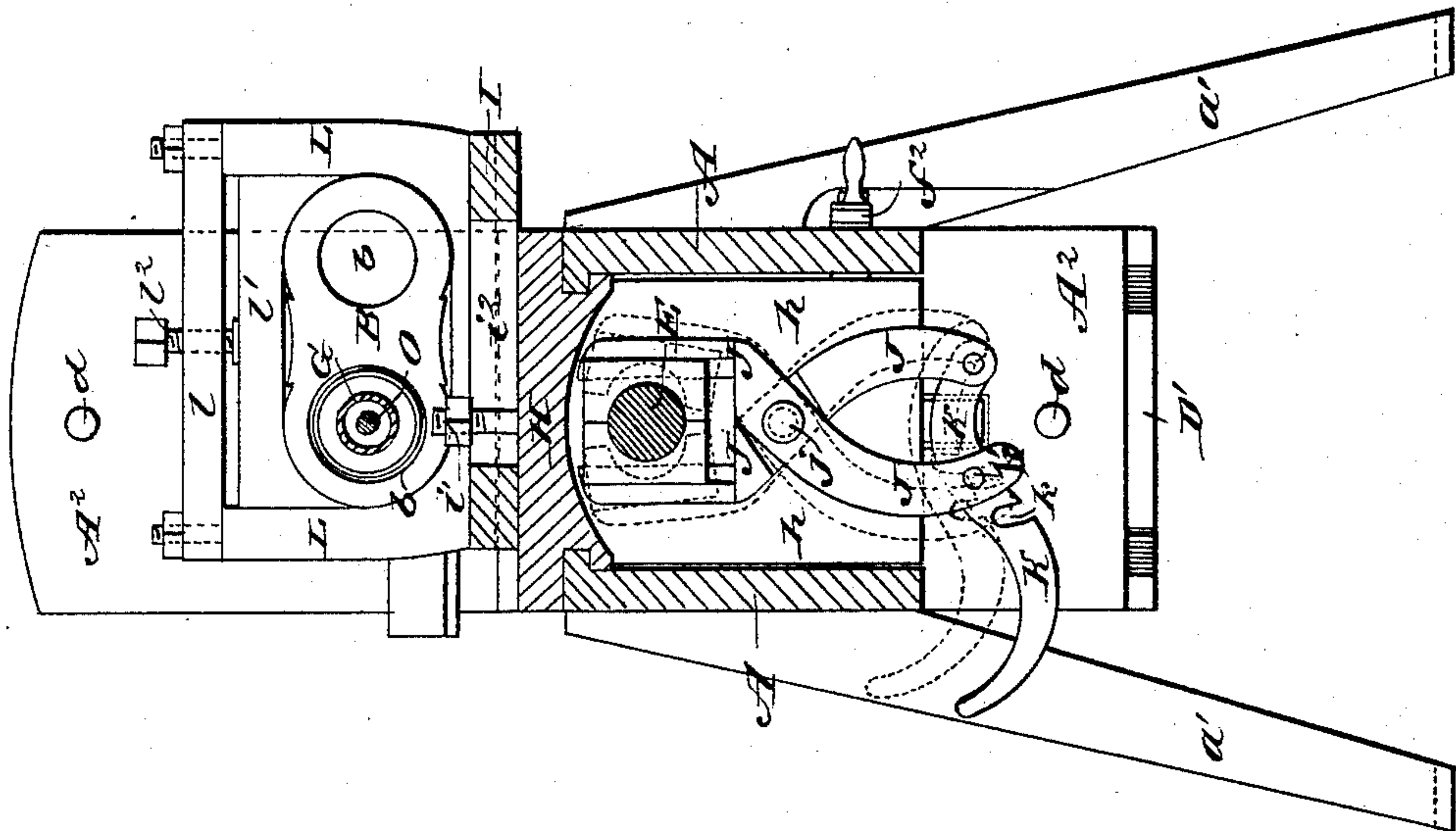
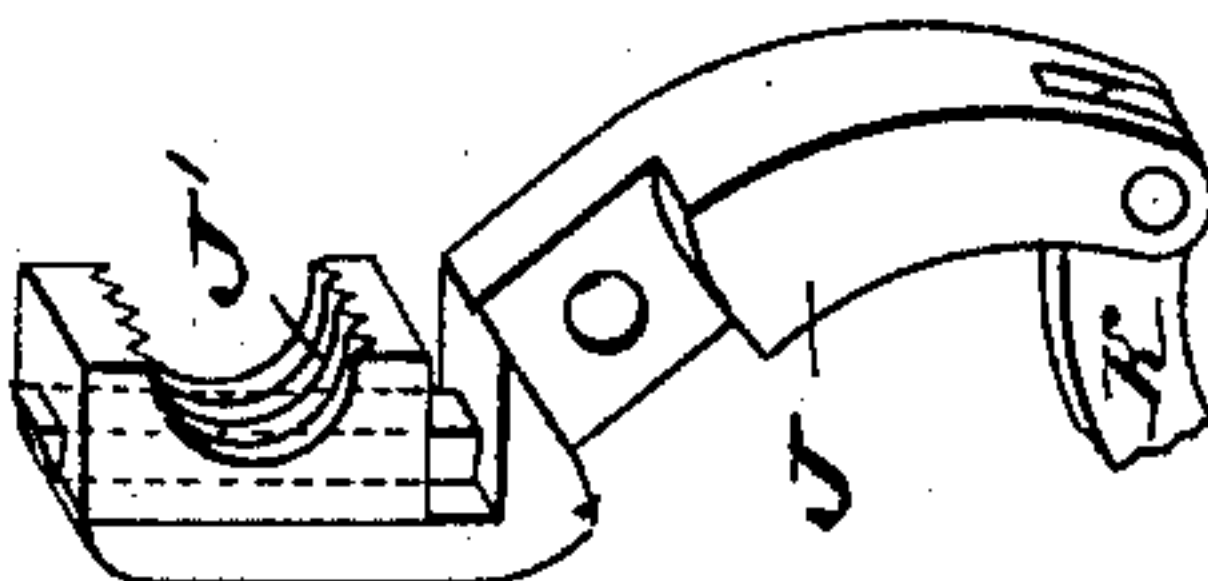


Fig. 10.



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UNITED STATES PATENT OFFICE.

HERMAN H. HACKMAN AND THEOPHIEL P. WALTER, OF VINCENNES, IND.

MACHINE FOR BORING GUN-BARRELS.

SPECIFICATION forming part of Letters Patent No. 327,160, dated September 29, 1885.

Application filed April 14, 1885. (No model.)

To all whom it may concern:

Be it known that we, HERMAN H. HACKMAN and THEOPHIEL P. WALTER, both of Vincennes, in the county of Knox and State of Indiana, have invented a new and Improved Machine for Boring Gun-Barrels, of which the following is a full, clear, and exact description.

Our invention relates to machines for boring gun-barrels, and has for its object to facilitate this operation, so that it may be carried on by unskilled labor, and at a reduced cost and with precision, so that all the barrels of a given caliber will shoot with like effect.

The invention consists in various constructions and combinations of parts of the boring-machine, all as hereinafter fully described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of our improved machine for boring gun-barrels, partly broken away, and showing a section of a gun-barrel being operated on by the boring-tool. Fig. 2 is a plan view thereof. Fig. 3 is an enlarged longitudinal sectional elevation of the gun-barrel, the boring-tool, its guide-bar, and adjacent parts. Fig. 4 is a side elevation of the boring-tool, drawn to the same scale as Fig. 3. Fig. 5 is an enlarged end view of the boring-tool. Fig. 6 is an enlarged cross-section of the tool, on the line $x'x'$, Fig. 4. Fig. 7 is an enlarged cross-section on the line $y'y'$, Fig. 4. Fig. 8 is an enlarged cross-sectional elevation of the machine, taken on the line $z'z'$, Fig. 1. Fig. 9 is a front end view of the machine, and Fig. 10 is a perspective view of one of the jaws of the feed-screw nuts.

The letter A indicates the bed of the machine, which has long legs a at its front end and short legs a' at its back end, to support the machine at a downward rearward incline, to allow the water to flow into the bore b of the gun-barrel, B, being operated upon, from a suitable tank or vessel, C, through a hose and nozzle, c , the vessel C being supported from the bed A.

The letters $A' A^2$ indicate, respectively, the stationary front and rear end plates of the ma-

chine, which are fixed to the opposite ends of the bed, and on these end plates are fitted to slide up and down upon suitable tongues and grooves for guides the front plate, D, and rear plate, D' , in which plates the feed-screw E is journaled. The plates $A' A^2$ are slotted, as at $a^2 a^3$, respectively, to allow the feed-screw to be raised or lowered by means of pinions $F F'$, journaled to the bed, and meshing, respectively, with racks $f f'$, formed on or fixed to the plates D D' . The shafts of the pinions have levers or cranks f^2 , by which the pinions may be turned, and when the feed-screw is adjusted properly as to its height from the bed to adjust the boring-bar vertically to suit any particular size of gun-barrel to be bored the screw and boring-bar will be held to place by set-screws d , which pass through slots in the plates $D' D^2$, and enter the bed end plates, $A' A^2$. (See Figs. 1, 8, and 9.)

The feed-screw E receives motion from gearing consisting of a bevel-gear, e , fixed to a short shaft, e' , journaled in a yoke or frame, A^3 , fixed to bed A. Said gear e meshes with a bevel-gear, e^2 , formed on or fixed to a short driving-shaft, g , to which the hollow boring-bar G is fixed in any approved way, and the shaft g , which is journaled in plate D, carries fixedly the pinion e^3 , by which the boring-bar is rotated, and the pinion e^3 meshes with a gear-wheel, E' , fixed to the feed-screw E, to impart motion thereto.

The driving-gearing is proportioned to give about six turns to the boring-bar G for one turn of the feed-screw E, and a crank, G' , fixed to shaft e' allows the gearing to be operated by hand; but the gearing may be arranged for driving it by foot-power or by steam-power or other motor, as will readily be understood.

The end plate, A' , of the bed is slotted, as at g' , Fig. 1, to accommodate the movement of plate D on the plate A' as the feed-screw and boring-bar are adjusted while lining the bar vertically with the gun-barrel, B, to be operated upon, as above explained.

The carriage for supporting the gun-barrel consists of a base-plate, H, which is fitted to slide in and along the bed A, and a top plate, I, which is fitted by dovetailed grooves i to correspondingly-shaped projections on plate H, so as to be adjustable laterally on said plate

H, and fastened by bolt end or set-screws i' , passing through slots i^2 of plate I into plate H.

The plate H has pendent lugs h , which are apertured for the passage of the feed-screw E, and move freely between the side plates of the bed A, and to each of the lugs h is pivoted on a pin, j , a pair of jaws, J J, the upper parts, J' , of which are threaded to form, when closed, a nut, which fits the feed-screw E.

To the lower end of one jaw J of each pair of jaws is pivoted a lever, K, which has a couple of notches, k , one of which may be engaged with a pin or stud, k' , on the lower end of the other jaw, to hold the jaws closed upon the feed-screw, so that a turning of said screw shall move the carriage, and the other of which notches, when engaged with pin k' , holds the jaws free from the screw, to allow the carriage to quickly be slid back to the starting-point for boring successive gun-barrels.

As best seen in Fig. 10, the parts or nut-blocks J' are fitted by suitable tongue-and-groove joints to the jaws J J, so that the nut-blocks may be shifted to fairly clamp around the feed-screw E, as it may be raised or lowered, by raising or lowering the end plates, D D', in adjusting the boring-bar to the size of the gun-barrel to be bored.

The gun-barrel B is held to the carriage-plate I by heads or yokes L, fixed to the plate and provided with removable top bars, l , which allow insertion in the yokes of the clamp-block l' , which is pressed upon the gun-barrel by one or more set-screws, l'' , threaded into the bar l . The heads or yokes L may be of any size suitable to hold gun-barrels having single, double, or multiple bores, proper clamp-blocks, l' , being provided to suit the various styles of gun-barrels to hold them firmly in place on the carriage, and so as to move therewith against the boring-tool M, which is held to the forward end of the boring-bar G, and will presently be described.

The boring-bar G has a bearing in a block, N, which is free to slide vertically in standards n , which rise from a base-piece, N' , which is fitted to slide laterally in a guide-slot, n' , of the plate I of the carriage. This construction allows the bar G to shift vertically with the end plate, D, and also to be set over laterally independently of the lateral movement of the plate I on plate H, so as to shift the boring-bar and boring-tool sidewise to either bore of a double barrel.

The boring-tool M consists of a head-piece, m , which is centrally apertured lengthwise, as at m' , for the passage of the guide-bar O, and the head m has a number—say four—of radial slots, m^2 , in which the cutters M' are pivoted at their back ends on pins m^3 , passed through the head, so that the cutters M' may move freely in or out at their forward ends, the inner edges of which ends are finished so as to bear on the outer surface of the guide-bar O as the boring-tool operates on the gun-barrel.

The boring-tool is connected to the boring-bar preferably by screwing it onto the end of

the bar, and on the back part of the body of the tool is held by a ferrule, p , an exterior sleeve or bushing, P, made preferably of wood, slightly convexed longitudinally on the outside, and in two parts, p' p^2 , allowing the sleeve to be entered by a rear tongue beneath or inside of the ferrule p , and so the forward end of the sleeve drops behind a shoulder, p^3 , of the boring-tool. This sleeve P steadies the boring-tool in the bore of the barrel B as the sleeve rests loosely on the shank of the tool, and by its sectional construction is free to expand or contract at its forward end as the boring progresses. The sleeve has lengthwise grooves, as at p^4 , through which may pass freely the water flowing from nozzle c into the bore, and also the cuttings which are washed backward. The bore thus will be kept cool and free from chips, which otherwise might clog the boring-tool.

As indicated most clearly in the enlarged view, Fig. 3, the guide-bar O extends through the boring-bar G, its shaft g , and the bore b' , first made in the gun-barrel B, said bar O having a long nicely-fitting bearing in the shaft g , to center and steady it at that end, and at its back end the bar O is held by a set-screw, q , in a bore of a block, Q, which is fitted by a tenon, q' , into a mortise of a plate or block, R, to which the block Q may be held by a set-screw, r , passed through block R against the tenon q' , thus allowing the bar O to be set vertically with accuracy. The block R is fitted to slide laterally in a block, S, and may be held at any lateral adjustment by a set-screw, s , passed through block S against it. The bar O may thus be nicely adjusted both vertically and laterally with relation to the gun-barrel B, clamped to the carriage, so as to center the tool M to and in the bore or bores of the barrel.

To make allowance for varying lengths or shapes of different guide-bars O, we prefer to make the block S adjustable lengthwise of the machine, and to this end a tongue, s' , on the block is fitted in a slot, s^2 , of carriage-plate I, and bolt ends or screws s^3 , passing through slots s^4 of plate I, may be tightened to hold block S and the connected parts in any desired position.

It is evident that the boring-tool guide-bar O—being held by the set-screw q to the carriage—will move with it and the gun-barrel, and as the cutters M' rest on the bar O the shape of the bore of the barrel will be governed by the shape of the guide-bar, which may be of like diameter throughout, or may have a slightly-tapering shape from end to end, or may be formed at one, two, or more places with enlargements o of any preferred length, size, or shape, so as to form one or more enlargements, thereby producing "chokes" of the bore of the gun-barrels at preferred places along their lengths, the positions of the chokes being governed by the set of the guide-bar O relatively with the gun-barrel before the boring begins.

When the boring by the tool M M' is com-

pleted, an expansible finishing and polishing head may be fitted to the boring-bar to work over the guide-bar O, for smoothing the bore to a more perfect finish.

- 5 It only is necessary to clamp the gun-barrels to the carriage and turn the crank G', and the barrels will be bored to any desired caliber, according to the size of the bar O, and with exactness, and without requiring high-
10 priced labor, and so that all the guns of a given caliber will shoot with like effect, as will readily be understood.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

- 15 1. A machine for boring gun-barrels, constructed with an expansible and hollow boring-tool, and a guide-bar clamped to the work-carriage and passing through the boring-tool, its bar, and the gun-barrel, to govern the diameter and shape of the bore of the barrel, substantially as herein set forth.

2. In a boring-machine, the combination, with the bed A, feed-screw E, and boring-bar
25 G, of the end plates, D D', and means, substantially as specified, for moving and holding said plates, substantially as herein set forth.

3. In a boring-machine, the combination,
30 with the bed A, feed-screw E, boring-bar G, and movable end plates, D D', of the clamp-jaws J, pivoted to the carriage and provided with shifting nut-blocks J', substantially as herein set forth.

- 35 4. In a boring-machine, the combination, with the bed A and the work-carriage comprising a base-plate, H, and laterally-movable plate I, of the clamp-heads L, to hold the gun-barrel, the vertically-movable boring-bar
40 guide-block N, fitted in a base, N', adapted to slide laterally in the plate I, and the guide-bar O and its clamp-head, comprising a ver-

tically-adjustable block, Q, fitted in a plate, R, made laterally adjustable in a base-block, S, held to the carriage, substantially as here- 45 in set forth.

5. In a boring-machine, the combination, with the bed A and the work-carriage, comprising a base-plate, H, and laterally-movable plate I, of clamp-heads L, boring-bar
50 guide-block N, fitted in a base, N', adapted to slide laterally in plate I, and the guide-bar O and its clamp-head, comprising a vertically-adjustable block, Q, fitted in a plate, R, laterally adjustable in a base-block, S, held to
55 the carriage, and said block S being adjustable lengthwise of the carriage, substantially as herein set forth.

6. In a gun-barrel-boring machine, the combination, with the boring-tool M and boring-
60 bar G, of the guide-bar O, passing through said tool and bar, and said tool M provided with pivoted cutters M', bearing on the bar, substantially as herein set forth.

7. The boring-tool M, made hollow, and
65 with cutters M', pivoted in slots of the tool, and with a sectional sleeve, P, confined at one end and free to expand at the other end, and provided with lengthwise grooves p^t , substantially as herein set forth. 70

8. In a gun-barrel-boring machine, the combination, with the work-carriage, the feed-screw E, the boring-tool guide-bar O, clamped adjustably to the carriage, and the hollow boring-tool M, having expansible cutters, of
75 the hollow boring-bar G, the hollow shaft g , connected therewith and provided with the gearing $e^2 e^3$, and the gears E' e, substantially as herein set forth.

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THEOPHIEL P. WALTER.

Witnesses:

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