

No. 708,870.

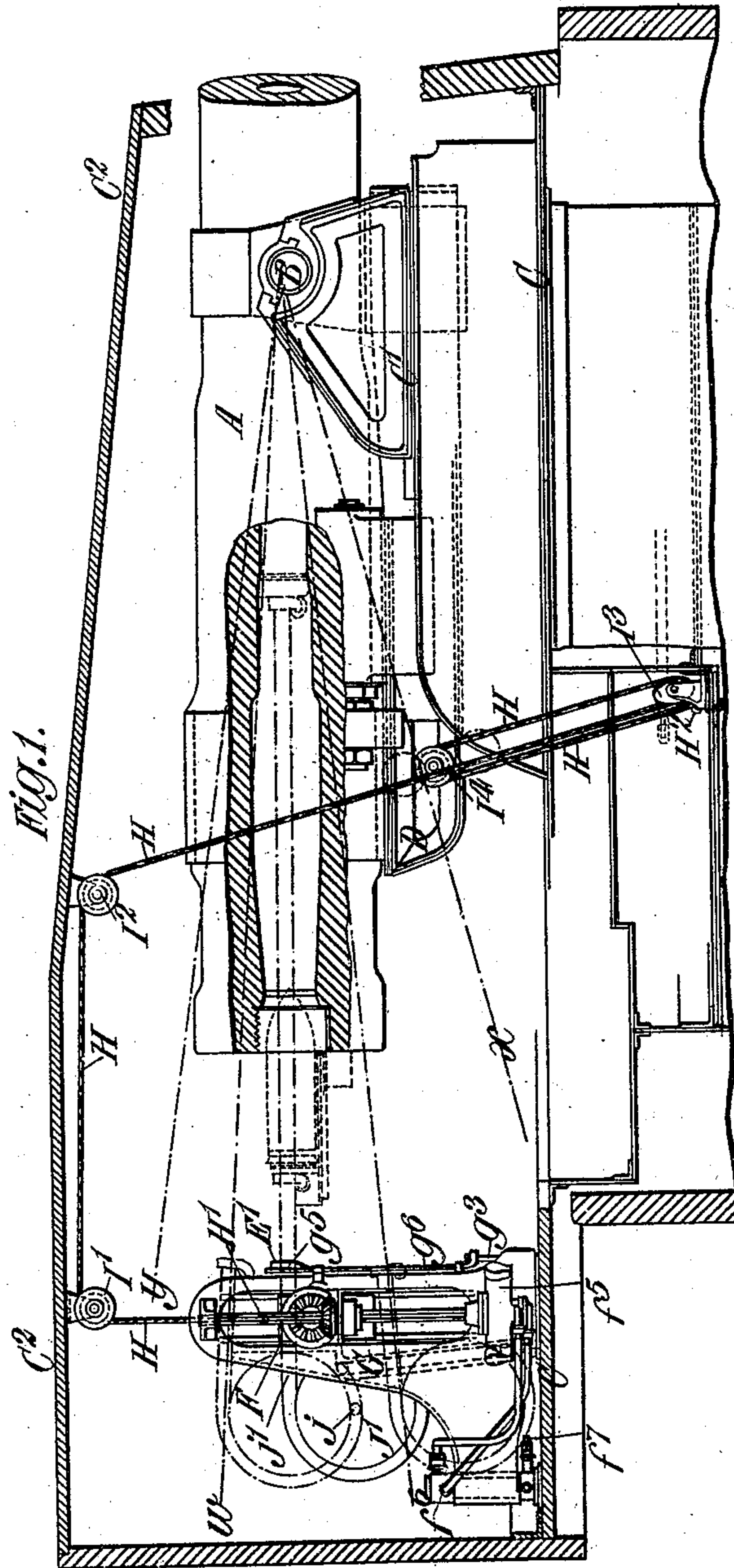
Patented Sept. 9, 1902.

A. T. DAWSON & J. HORNE.  
RAMMING APPARATUS FOR ORDNANCE.

(Application filed Dec. 9, 1901.)

(No Model.)

9 Sheets—Sheet 1.



Witnesses:

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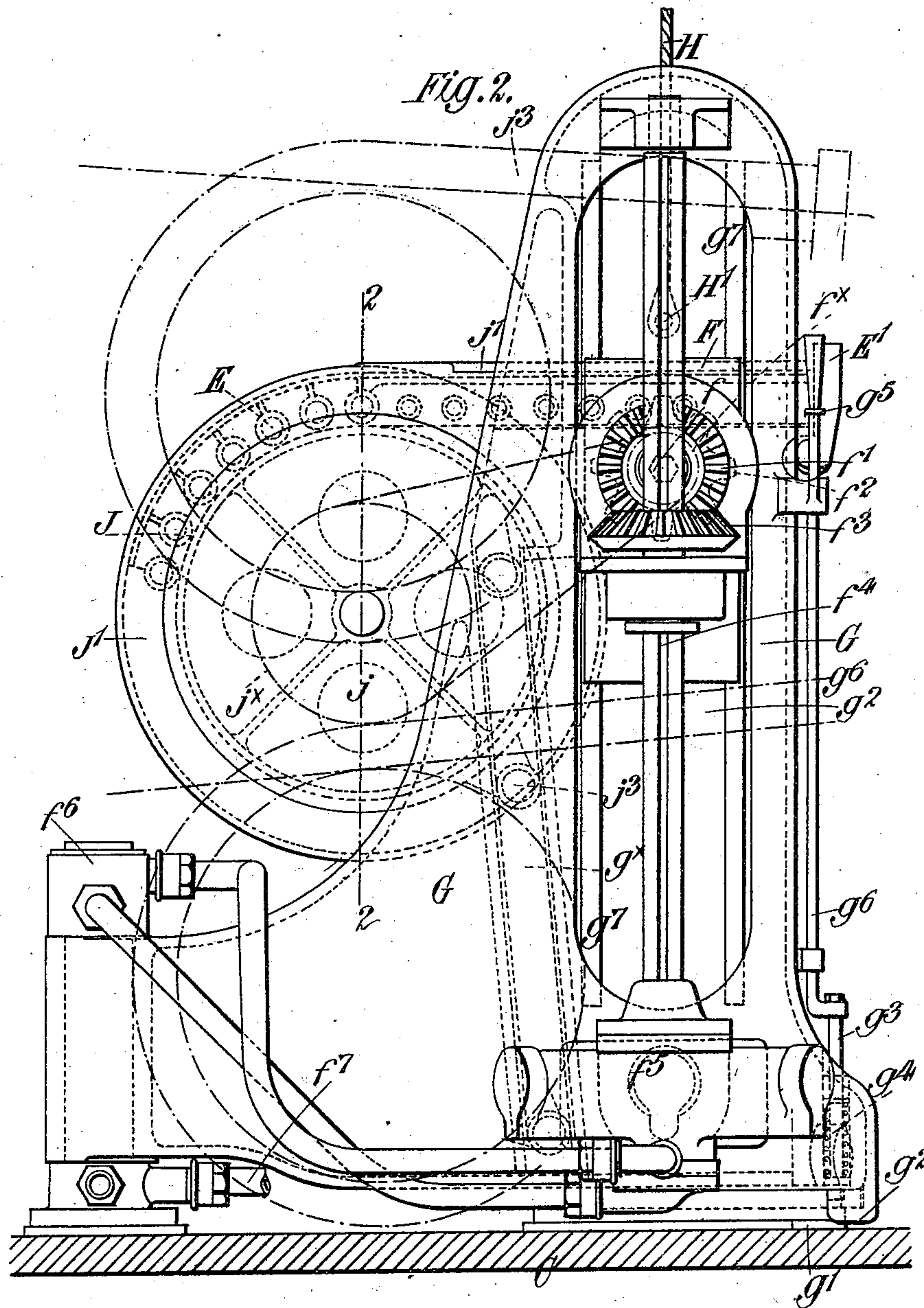
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**9 Sheets—Sheet 2.**



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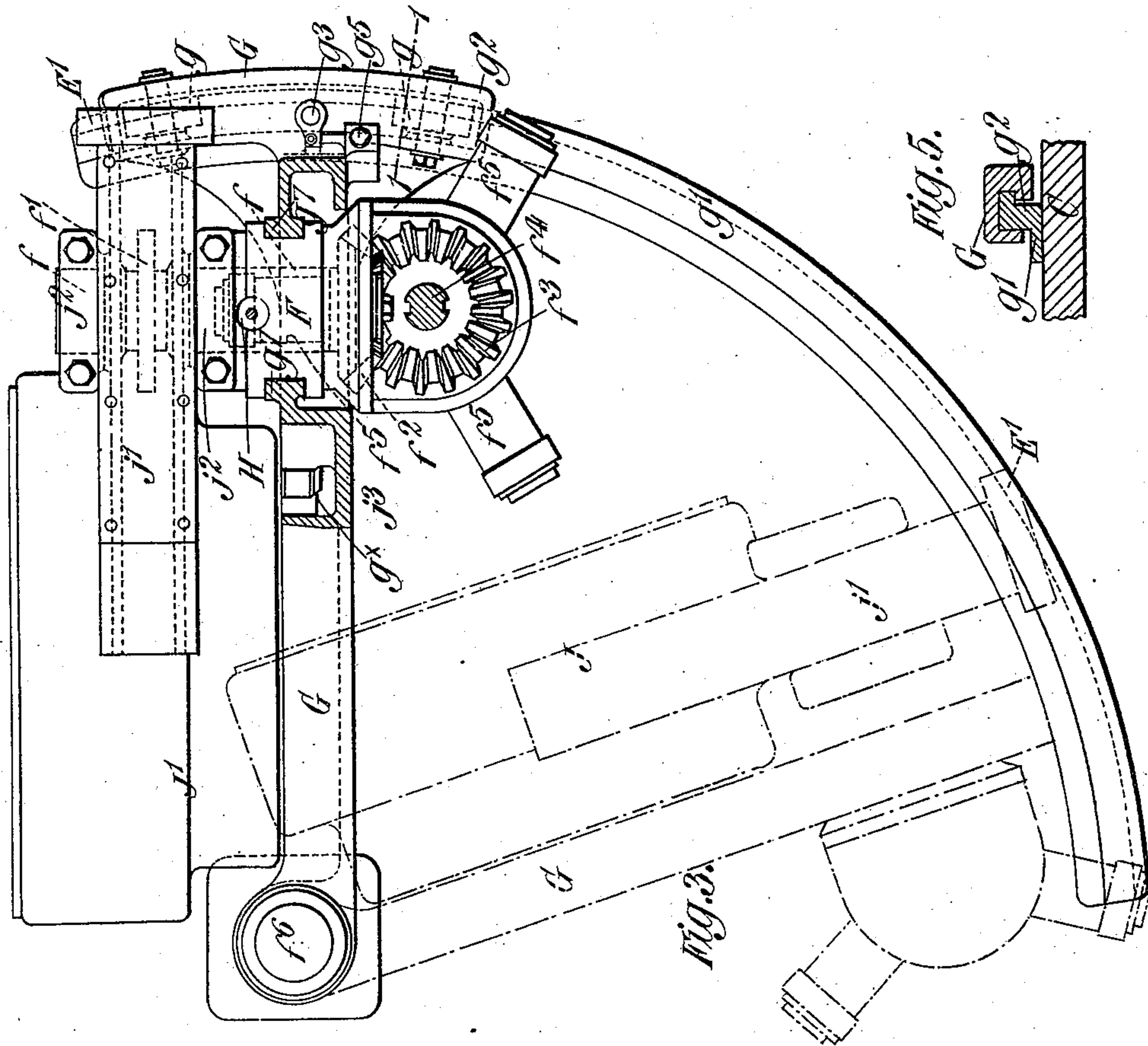
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9 Sheets—Sheet 3.



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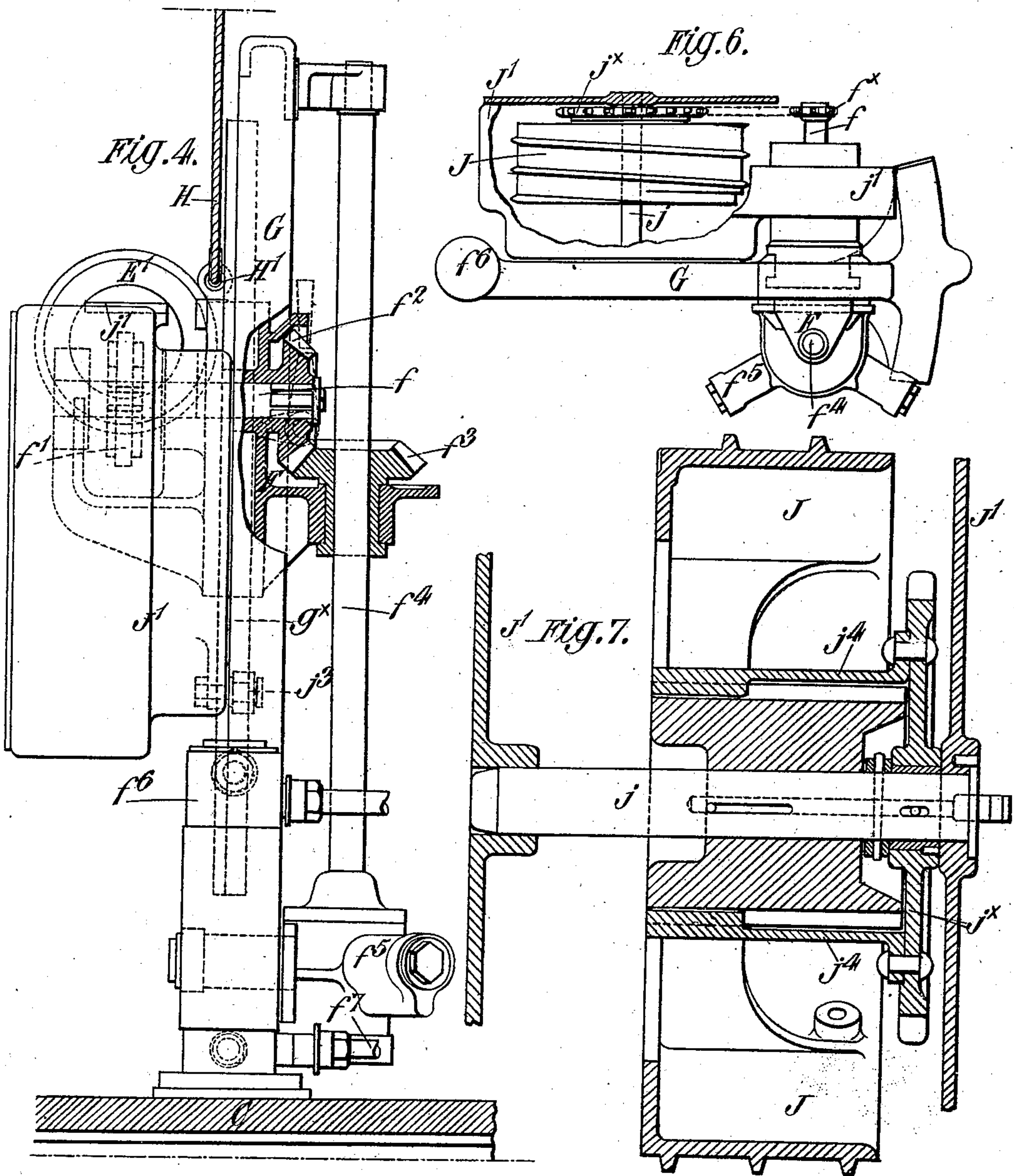
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(Application filed Dec. 9, 1901.)

(No Model.)

9 Sheets—Sheet 4.



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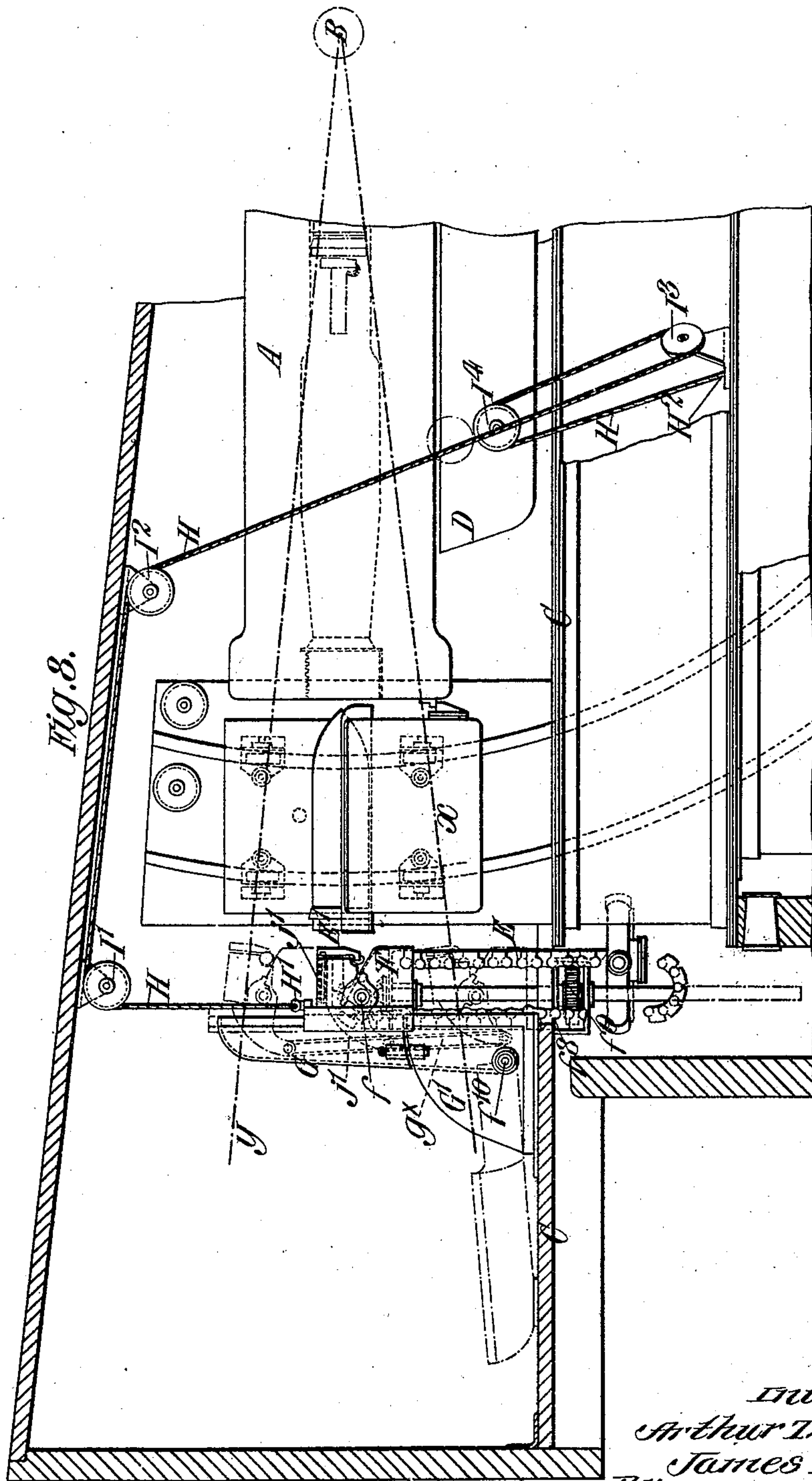
**Patented Sept. 9, 1902.**

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(Application filed Dec. 9, 1901.)

(No Model.)

**9 Sheets—Sheet 5.**



*Witnesses:*

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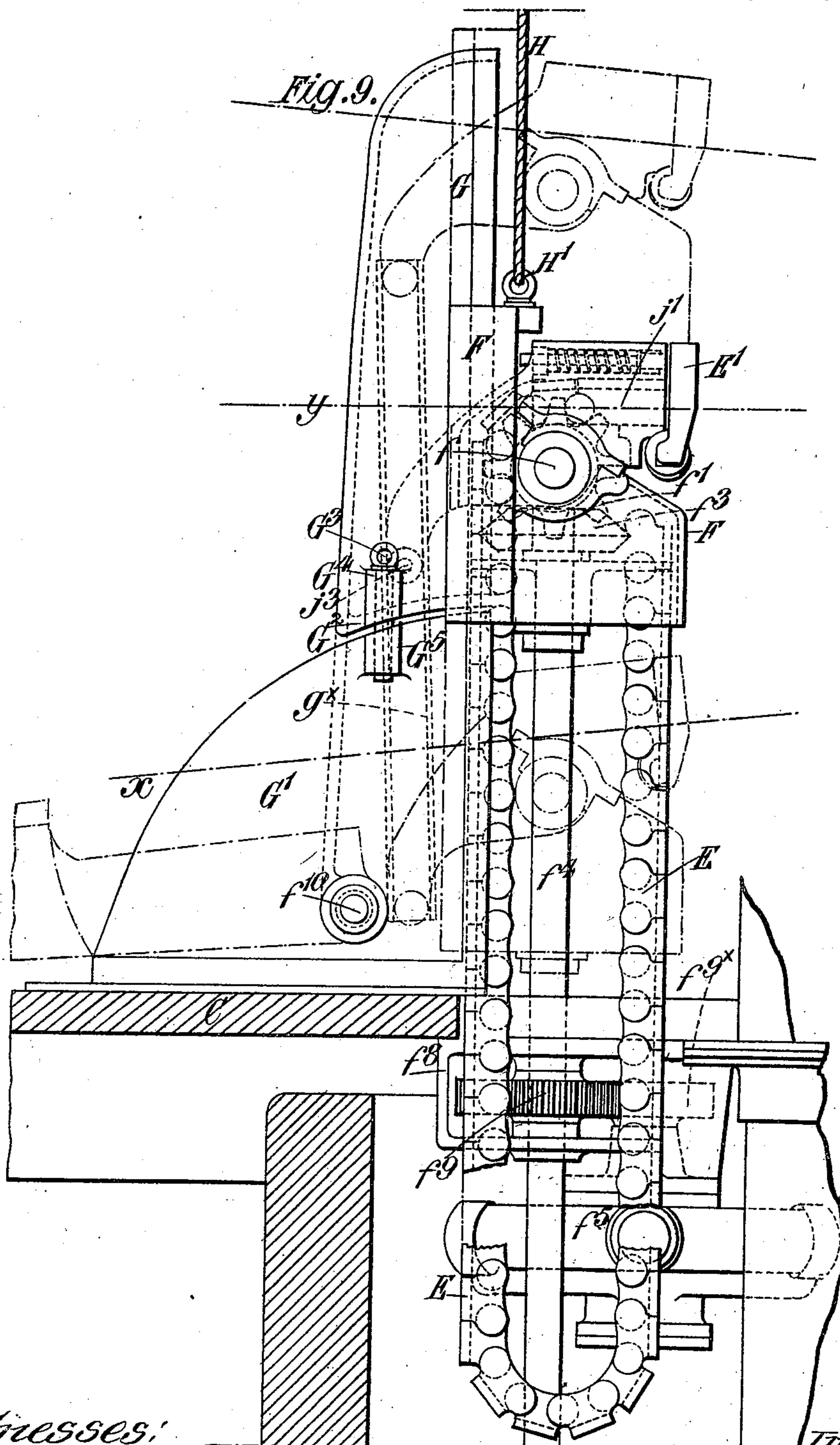
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**RAMMING APPARATUS FOR ORDNANCE.**

(Application filed Dec. 9, 1901.)

(No Model.)

**9 Sheets—Sheet 6.**



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RAMMING APPARATUS FOR ORDNANCE.

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9 Sheets—Sheet 7.

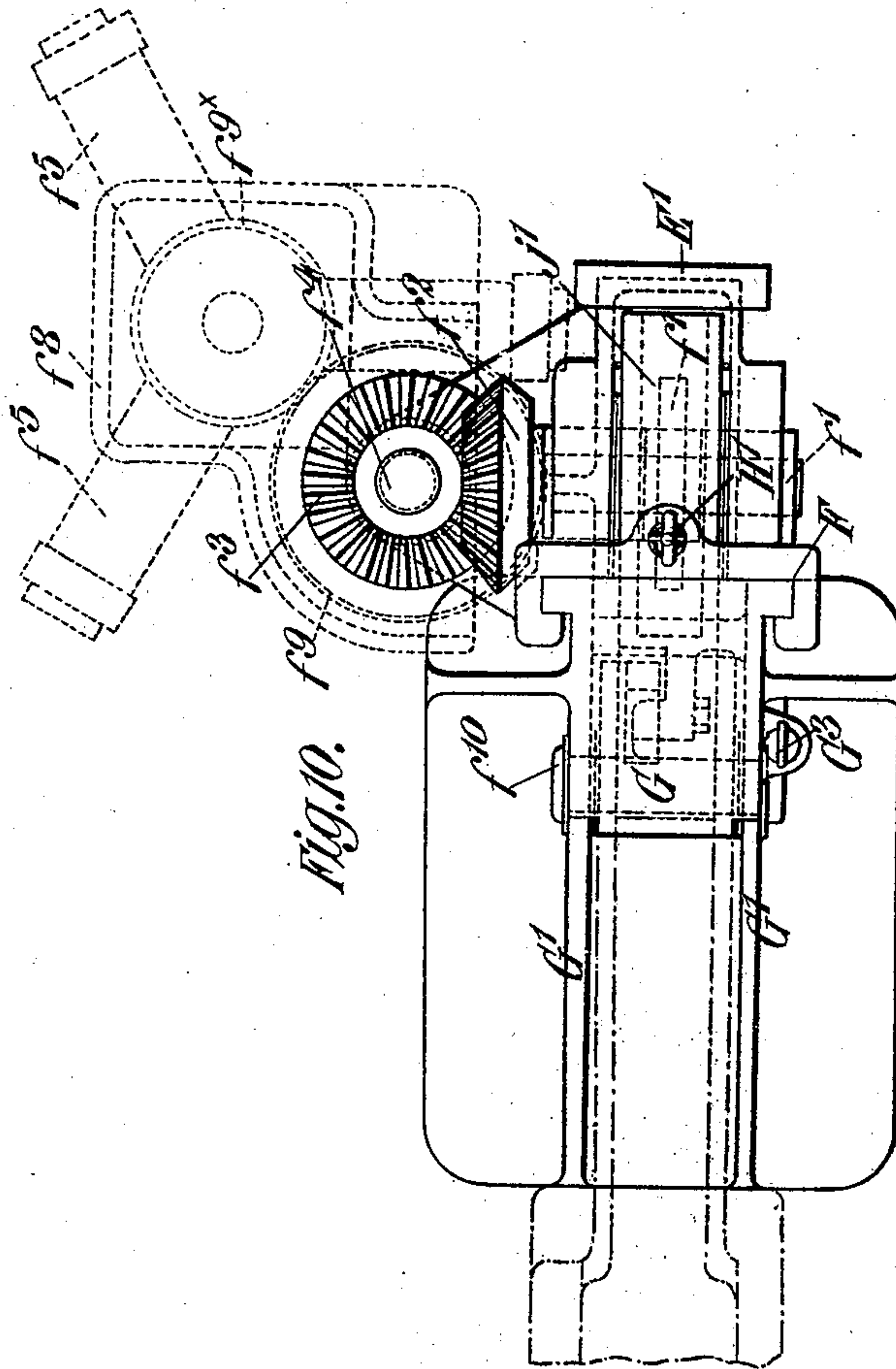


Fig. 10.

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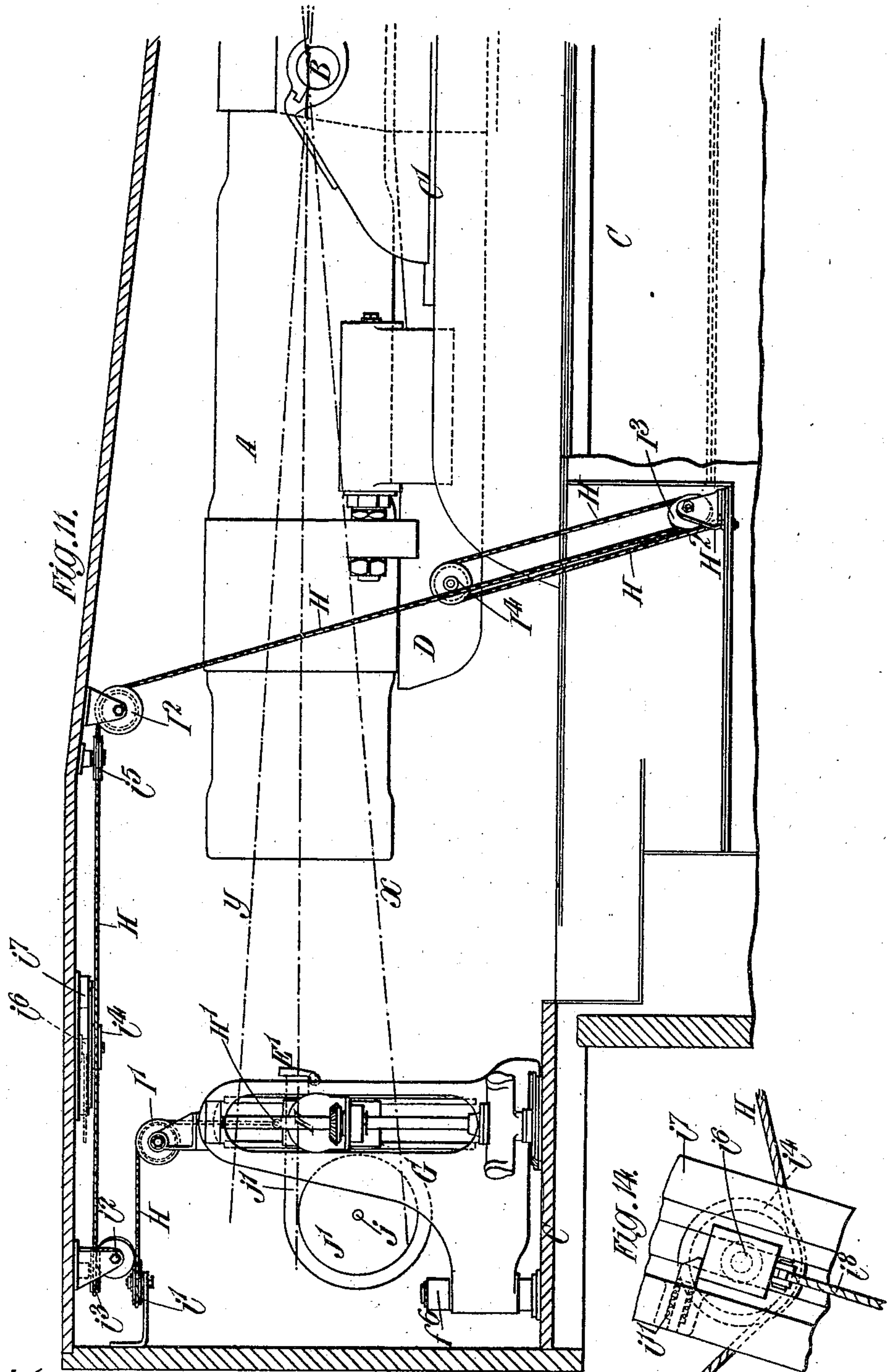
Patented Sept. 9, 1902.

A. T. DAWSON & J. HORNE.  
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(No Model.)

9 Sheets—Sheet 8.



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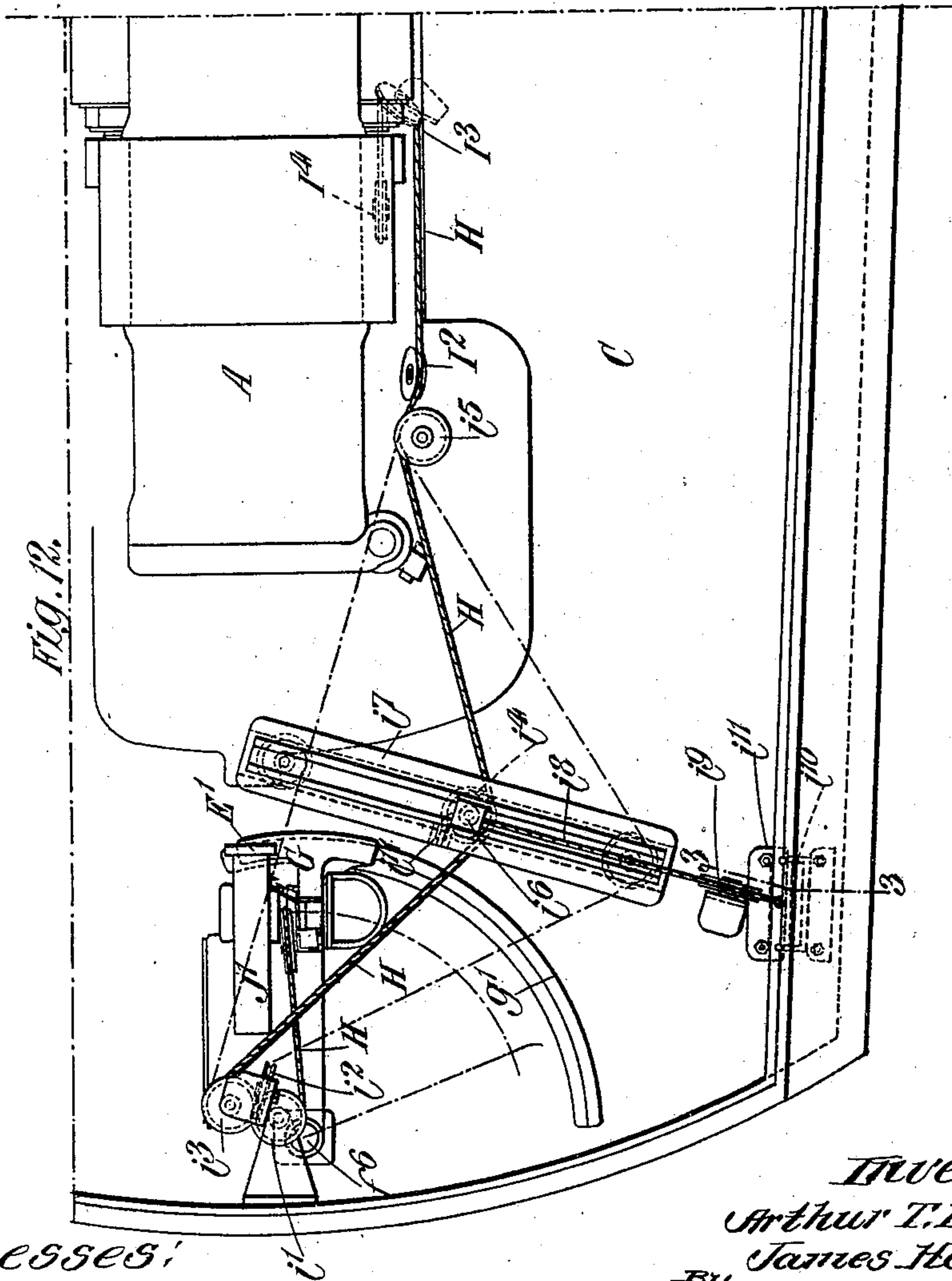
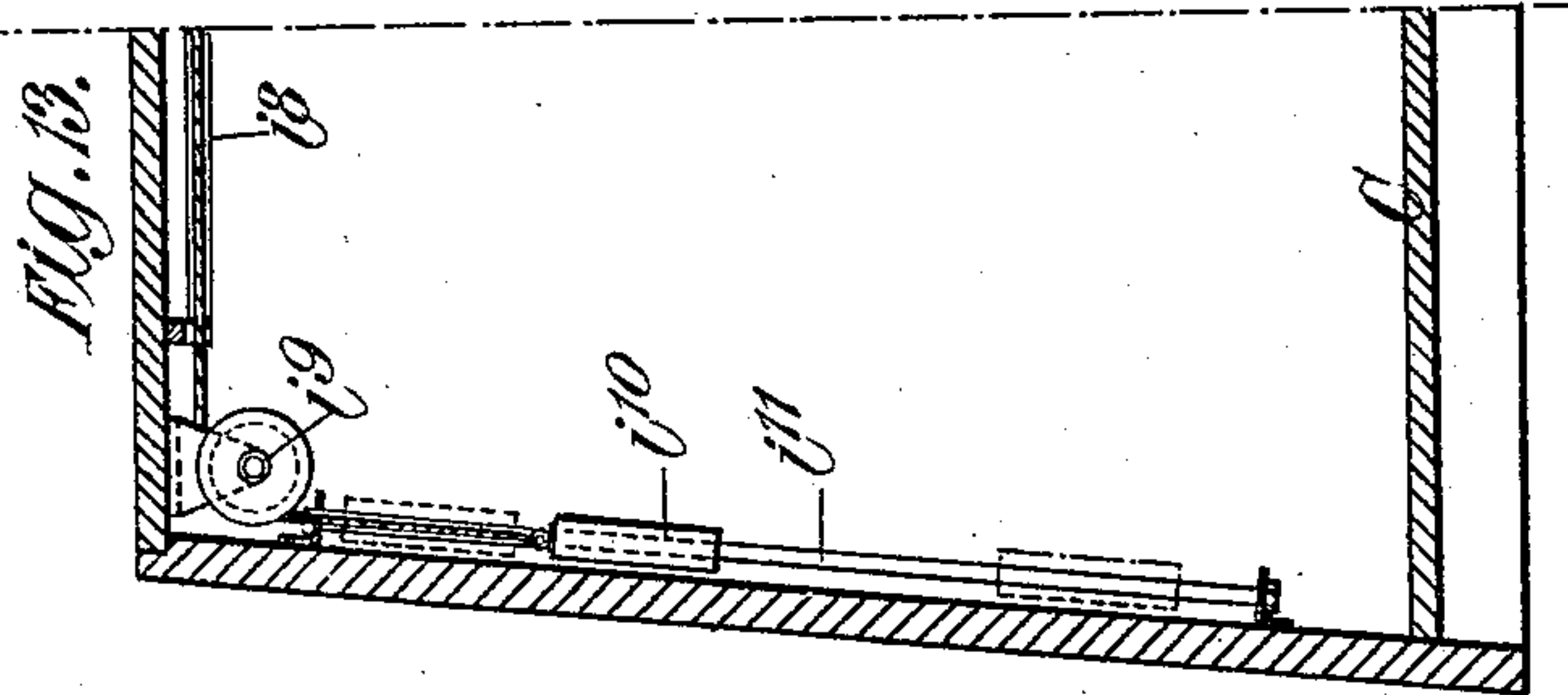
Patented Sept. 9, 1902.

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(Application filed Dec. 9, 1901.)

(No Model.)

9 Sheets—Sheet 9.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

ARTHUR TREVOR DAWSON, OF LONDON, AND JAMES HORNE, OF BARROW-IN-FURNESS, ENGLAND, ASSIGNORS TO VICKERS SONS & MAXIM, LIMITED, OF WESTMINSTER, LONDON, ENGLAND.

## RAMMING APPARATUS FOR ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 708,870, dated September 9, 1902.

Application filed December 9, 1901. Serial No. 85,295. (No model.)

*To all whom it may concern:*

Be it known that we, ARTHUR TREVOR DAWSON, late lieutenant of Royal Navy, residing at 32 Victoria street, Westminster, in the  
5 county of London, and JAMES HORNE, engineer, of Vickers Sons & Maxim, Limited, Naval Construction Works, Barrow-in-Furness, in the county of Lancaster, England, subjects of the King of Great Britain, have  
10 invented certain new and useful Improvements Relating to Ramming Apparatus for Ordnance, of which the following is a specification.

This invention relates to ramming apparatus of the flexible or chain type, and has for  
15 its chief object to so construct and arrange said apparatus that the rammer will automatically follow the movements of the gun in its elevation or depression, so as to occupy  
20 the proper loading position at any usual angle of elevation of the gun.

According to our invention we mount the rammer and the sprocket-wheel for actuating it in a sliding piece or "slipper," which is  
25 adapted to move up and down in guides formed on a suitable standard or support which is independent of the gun, motion being imparted to said sprocket-wheel from a  
30 piece or slipper receives its movement from the gun-slide or some other part that participates in the movement of elevation and depression of the gun. For this purpose we  
35 prefer to connect said slipper to one end of a rope or chain which passes around suitably-arranged pulleys, the other end of the rope or chain being connected to the turn-table or  
40 some part of the gun-mounting that does not participate in the movement of elevation of the gun. One of the said pulleys is carried by the gun-slide and another of said pulleys is located on the turn-table, the rope or chain  
45 passing in a bight around these two pulleys, so that during the movements of the gun in its elevation or depression the distance between these two pulleys increases or diminishes, and thus actuates the rope or chain, whereby the said slipper is shifted and the  
50 rammer moved up or down in its standard to a greater or less extent in accordance with

the amplitude of the changes in the elevation of the gun. The aforesaid standard or support is adapted to be readily shifted away from its operative position behind the gun-breech when it becomes necessary or desirable to effect the ramming by hand—as, for  
55 instance, when the gun is required to be shifted beyond the loading-range of the rammer—and in such case we provide what we term a "compensating" device for avoiding the  
60 necessity of disconnecting the rope or chain.

In order that our said invention may be clearly understood and readily carried into effect, we will describe the same more fully with reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of a portion of a gun and its mounting with our improved ramming apparatus applied thereto. Fig. 2 is a side elevation, Fig. 3 a plan, and  
70 Fig. 4 a sectional end elevation, of the ramming apparatus drawn on a larger scale. Fig. 5 is a detail cross-section on the line 1 1 of Fig. 3. Fig. 6 is a plan of the ramming apparatus shown in Fig. 1 with a portion broken  
75 away to show the drum upon which the rammer is wound. Fig. 7 is a vertical section of the drum, taken approximately on the line 2 2 of Fig. 2. Fig. 8 is an elevation of a portion of a gun and its mounting with a modified form of the ramming apparatus. Fig. 9  
80 is a side elevation, and Fig. 10 a plan, of this form of the ramming apparatus drawn on a larger scale. Fig. 11 is a sectional elevation of a portion of a gun and its mounting provided with ramming apparatus of the kind  
85 illustrated in Figs. 1 to 7 and illustrating the aforesaid compensating arrangement applied thereto. Fig. 12 is a plan of this compensating arrangement, and Fig. 13 is a vertical section on the line 3 3 of Fig. 12. Fig. 14 is a  
90 detail view drawn on a larger scale.

In all the figures like letters of reference indicate similar parts.

A is the gun, B its trunnions, C the rotating turn-table, carrying the mounting C'.

D is the gun-slide.

E is the rammer-chain, and E' is the rammer-head.

F is the slipper, and G the standard or support.



port, within which said slipper is capable of moving up and down.

H is the rope or chain, to the end H' of which the slipper is connected, and H<sup>2</sup> is the point to which the opposite end of said rope or chain is secured. I' I<sup>2</sup> I<sup>3</sup> I<sup>4</sup> are the pulleys around which the said rope or chain passes.

Referring more particularly to Figs. 1 to 7, the rammer-chain E is adapted to be wound in spiral form upon a drum J, inclosed in a casing J' and revolving on a transverse shaft *j*. The casing of the said drum is provided with a straight portion *j'*, constituting the rammer-guide, through which the rammer-chain is directed in a straight course coincident with the bore of the gun. The drum J is furnished with a spiral groove and is adapted to slide laterally on and revolve on its shaft *j* during the winding and unwinding of the rammer-chain on and off said drum, so that the portion of the drum on or from which the chain is passing will always lie truly opposite the guide *j'*. The said rammer-guide is connected with the aforesaid slipper F, so that the latter and the guide, as well as the drum and drum-casing, can all move together. The said slipper is provided with bearings *j*<sup>2</sup>, Fig. 3, for a transverse shaft *f*, which is furnished with a sprocket-wheel *f'*, that gears with the links of the rammer-chain and serves to actuate said chain when the shaft *f* is revolved by its motor. The said shaft is provided with a beveled pinion *f*<sup>2</sup>, which gears with another beveled pinion *f*<sup>3</sup>, carried rotatably by the said slipper F and adapted to slide with said slipper on a vertical shaft *f*<sup>4</sup>. This shaft is provided with a groove or grooves engaging with a feather or feathers in the boss of the said beveled pinion, so that the latter can revolve with the said shaft, as well as move vertically up and down thereon, as aforesaid. The connection of the guide *j'* to the slipper F is a pivotal one, so as to permit of said guide turning about the axis of the shaft *f*, and thus keep the face of the rammer-head parallel with the breech of the gun at all positions the said rammer-head assumes in the standard G, this being necessary in view of the fact that the movement of the slipper is rectilinear and that of the breech of the gun curvilinear. For this purpose the said drum-casing J' is furnished with a projection or roller *j*<sup>3</sup>, that works in an inclined slot *g*<sup>x</sup> in the said standard, the inclination of this slot being such as to cause the drum and rammer-head to turn to the required extent about the axis of the shaft *f* as the said drum and rammer rise and fall in the standard. At the lower end of the said shaft *f*<sup>4</sup> is a three-cylinder hydraulic motor *f*<sup>5</sup>, which is connected by suitable piping with a vertical chamber *f*<sup>6</sup>, which receives the liquid under pressure through a supply-pipe *f*<sup>7</sup>. The said standard G is adapted to swivel around the said vertical chamber *f*<sup>6</sup> in a horizontal plane when it is desired to move said standard away from its ramming position, the said standard

being for this purpose furnished with rollers *g g*, adapted to run on a segmental roller-path *g'*. This roller-path is preferably flanged to permit of a lip *g*<sup>2</sup> on the lower part of the standard G to engage with the under side of said flange for the purpose of assisting in firmly supporting the standard. In order to secure the standard in proper position behind the breech of the gun, said standard is provided with a bolt *g*<sup>3</sup>, which is adapted to enter a suitable recess in the roller-path by the action of a spring *g*<sup>4</sup>, surrounding the bolt. A handle *g*<sup>5</sup> is connected with the said bolt by a rod *g*<sup>6</sup> for enabling the bolt to be withdrawn from the aforesaid recess when the standard is to be removed from its ramming position. The aforesaid slipper F is provided with recesses that engage with vertical guides *g*<sup>7</sup> *g*<sup>7</sup> on the said standard. The shaft *j* is provided with a loose sprocket-wheel *j*<sup>x</sup>, geared by means of a chain with a sprocket-wheel *f*<sup>x</sup> on the shaft *f*, Figs. 6 and 7, so that the drum J' receives a positive movement from the shaft *f* during the winding and unwinding of the rammer-chain. This sprocket-wheel *j*<sup>x</sup> is provided with lateral fingers *j*<sup>4</sup> *j*<sup>4</sup>, which enter guide-slots in the boss of said drum J', whereby said drum is revolved by the sprocket-wheel and permitted to slide on the shaft *j*, as aforesaid. (See Fig. 7.) If desired, the said sprocket-wheels *j*<sup>x</sup> *f*<sup>x</sup> may be dispensed with and a spring be provided on the shaft *j*, said spring being stretched or energized as the chain is unwound from the said drum during the ramming operation and reacting to wind up the chain as the rammer-head is withdrawn from the gun. The aforesaid rope or chain H, to one end of which the said slipper F is connected, passes, as already stated, over guide-pulleys I' I<sup>2</sup> I<sup>3</sup> I<sup>4</sup>, the pulleys I' I<sup>2</sup> turning in bearings or brackets secured to the roof of the armor-plated structure C<sup>2</sup>, inclosing the gun. From the pulley I<sup>2</sup> the said rope passes downward to the pulley I<sup>3</sup>, which turns in bearings or brackets secured to the rotating turn-table C. The said rope then passes upward to the pulley I<sup>4</sup>, connected to the gun-slide C', and thence said rope passes downward to the fixed point H<sup>2</sup> on the turn-table C. As the gun turns about its trunnions in changing its angle of elevation the said pulley I<sup>4</sup> advances toward or recedes from the said pulley I<sup>3</sup>, thereby actuating the rope H and raising or lowering the slipper F in its standard G. The position of the pulley I<sup>4</sup> is approximately midway between the axis of the gun-trunnions and the rammer-head. Consequently it is necessary for the said slipper and rammer to move through an angle of approximately twice that of the angular movement of the axis of the said pulley I<sup>4</sup> in order for the said rammer-head to maintain its position of alinement with the gun-breech during the changes in the angle of elevation of the gun. By reason of this rope H passing in a bight around the said pulleys I<sup>3</sup> I<sup>4</sup> the slipper at the end H' of the rope will be



caused to move twice the distance the pulley  $I^4$  moves relatively to the pulley  $I^3$ , as is well understood. We would here state that although this position of the pulley  $I^4$  will be usually found most convenient, yet we may vary such position when necessary or desirable and arrange the rope  $H$  to take more than one bight or turn around the pulleys so long as we insure that the vertical adjustment of the slipper  $F$  when the angle of elevation of the gun is changed is such as to keep the rammer-head in alinement with the gun-breech.

From the foregoing description it will be obvious that if the angle of elevation of the gun be changed from that represented by the full lines in Fig. 1 to that represented by the dotted line  $w$  the distance between the pulleys  $I^3$   $I^4$  will be correspondingly increased, and as a consequence the end  $H'$  of the rope will be raised a distance equal to twice the distance the pulleys  $I^3$   $I^4$  are separated. The slipper  $F$ , the rammer-drum, and the rammer-head therefore assume the elevated position represented by the dotted lines at the upper part of the standard  $G$ . As the said slipper rises the projection  $j^3$  on the casing  $j'$  of the rammer-chain ascends in the said groove  $g^x$ , and by reason of this groove being inclined outwardly with respect to the vertical path of the slipper the guide  $j'$  for the rammer-chain is angularly displaced about the shaft  $f$  of the slipper, so as to bring the rammer-head in alinement with the axis of the gun. The projectile is thrust into the breech-chamber by the rammer-head as the rammer-chain is unwound from its drum by the action of the sprocket-wheel  $f'$  when revolved by the motive fluid admitted to the motor  $f^5$ . The return movement of the rammer-head is effected by the revolution of the sprocket-wheel in the reverse direction.

In the modified construction of the ramming apparatus (illustrated by Figs. 8, 9, and 10) the chain of the rammer instead of being wound around a drum is arranged to hang down in a bight or bend. As in the previously-described arrangement, the slipper  $F$  works up and down guide-surfaces on the standard  $G$ . The guide  $j'$  for the rammer is mounted pivotally on the shaft  $f$ , that carries the sprocket-wheel  $f'$ , and is furnished with a projection or roller  $j^3$ , which works in the inclined slot  $g^x$  in the said standard for keeping the face of the rammer-head parallel with the breech end of the gun. The bevel-pinion  $f^3$ , which gears with the bevel-pinion  $f^2$ , is in this case mounted fast on the vertical shaft  $f^4$ , which is adapted to move longitudinally with the slipper. On the rotating turn-table  $C$  is a bearing  $f^8$  for said shaft, said bearing carrying a toothed wheel  $f^9$ , through which the shaft passes, and said wheel  $f^9$  is connected thereto by a groove and feather, so that it will revolve with the shaft without impeding the longitudinal movement of the latter. The three-cylinder hydraulic motor  $f^5$  is sus-

pending by suitable brackets from the said rotating turn-table and imparts motion to the said toothed wheel  $f^9$  through a pinion  $f^{9x}$ , gearing with the latter. The movements of the slipper  $F$  are effected in an analogous manner to that already described with reference to Figs. 1 to 7. The said standard  $G$  instead of being adapted to turn about a vertical pivot, as in the previously-described arrangement, is adapted to turn about a horizontal pivot  $f^{10}$  when the ramming apparatus is required to be moved from its ramming position, and for this purpose the lower portion of the standard is formed with curved cheeks  $G'$ , between which the pivotal portion of said standard is adapted to move. The said standard is also furnished with shoulders  $G^2$ , which slide against the curved edges of the cheeks  $G'$ . To lock the standard in its vertical or operative position, a detachable pin  $G^3$  is provided for engaging with lugs  $G^4$   $G^5$ , formed, respectively, on the pivotal portion of the standard and the curved cheeks.

Figs. 11, 12, 13, and 14 illustrate the compensating arrangement for avoiding the necessity of disconnecting the rope  $H$  from the slipper when it is desired to change the angle of elevation of the gun beyond the loading range of the rammer or when the rammer is shifted from its ramming position. Instead of attaching the pulley  $I'$  to the roof of the turret, as in Fig. 1, we locate it on the standard  $G$  and lead the rope  $H$  horizontally to a pulley  $i'$ , thence around a vertical pulley  $i^2$  to a horizontal pulley  $i^3$ , whence the said rope passes over other horizontal pulleys  $i^4$   $i^5$  to the pulleys  $I^2$   $I^3$   $I^4$ . This arrangement of the pulleys permits the portion of the rope connected with the pulley on the standard  $G$  to reeve off in a horizontal plane, so that the said standard can swivel about the vertical chamber  $f^6$ , as in Figs. 1 to 7, without materially increasing the length of the rope, it being understood that the axis of the horizontal pulley  $i'$  is approximately in alinement with the axis of the said chamber  $f^6$ . The pulley  $i^4$ , which is located approximately midway between the other horizontal pulleys  $i^3$   $i^5$ , has its pivot mounted in a block  $i^6$ , which is adapted to slide in a horizontally-arranged guide  $i^7$ . This block  $i^6$  is connected with a cord  $i^8$ , passing over a vertical pulley  $i^9$  and carrying a weight  $i^{10}$ , which is adapted to slide up and down in a guide  $i^{11}$ . This weight causes the said pulley  $i^4$  to be constantly pressed against the portion of the rope  $H$  lying between the two pulleys  $i^3$   $i^5$ , said portion of the rope being normally at an angle or in a bend, as represented by the full lines in Fig. 12. When it is necessary for the angle of elevation of the gun to exceed that of the range of the rammer, so that, for instance, the axis of the gun lies on the line  $x$ , which is the position of the extreme loading angle of elevation, the length of rope between the pulley  $I^4$  on the gun-slide and the slipper will be lengthened owing to the pulleys  $I^4$   $I^3$  ap-



proaching each other. The weight  $i^{10}$  by acting on the said portion of the rope between the two pulleys  $i^3$   $i^5$  will then take up the slack portion of said rope. On the other  
 5 hand, if the axis of the gun lies on the line  $y$ , which is the position of the extreme angle of depression of the gun, the length of rope between the pulley  $I^4$  on the gun-slide and the  
 10 slipper will be diminished and as a consequence will in tightening cause the slide  $i^6$  to move in a direction to raise the weight. When the gun is being shifted within the limits of the ordinary angle of elevation and depression, the sliding pulley  $i^4$  and its slide  
 15  $i^6$  are limited in their movement by means of a spring-controlled stop  $i^{17}$ , carried by the said guide, this stop being so arranged that it can be readily removed from its stopping position when it is desired to allow the slide  
 20  $i^6$  and its pulley to move beyond such position by the tightening of the rope H, as already explained.

What we claim, and desire to secure by Letters Patent of the United States, is—

25 1. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper mounted to slide in a support independent of the gun, of a pivotal guide on said slipper for the rammer-chain, of means for controlling the position of the guide relatively  
 30 to its pivot during the sliding of said slipper, of gearing interposed between the gun and slipper for causing said slipper and guide to automatically follow the movements of the  
 35 gun in its elevation or depression and of means for actuating the rammer for the purpose specified.

2. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper  
 40 provided with a guide for the rammer and mounted to slide vertically in a support independent of the gun, of a guide for operating the rammer-guide, of a sprocket-wheel on said slipper engaging with the links of the  
 45 rammer-chain, of means for imparting rotary motion to said sprocket-wheel, and of gearing connected with said slipper and actuated by the movement of the gun for causing said slipper to automatically follow the  
 50 movements of the gun in its elevation or depression for the purpose specified.

3. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper provided with a guide for said rammer mounted  
 55 to slide vertically in a support independent of the gun, of a sprocket-wheel mounted on a shaft carried by said slipper and engaging with the links of the rammer-chain, of means for actuating said sprocket-wheel, of  
 60 means for causing said slipper to automatically follow the movements of the gun in its elevation or depression, and of means for keeping the said guide parallel with the axis of the gun as the slipper moves up or down  
 65 in its support substantially as described.

4. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper

provided with a guide for said rammer and mounted to slide vertically in a support independent of the gun, of a sprocket-wheel  
 70 mounted on a shaft carried by said slipper and engaging with the links of the rammer-chain, of means for actuating said sprocket-wheel, of means for causing said slipper to automatically follow the movements of the  
 75 gun in its elevation or depression and of a projection on the said guide engaging with an inclined groove in the said support substantially as and for the purpose specified.

5. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper  
 80 provided with a guide for the rammer and mounted to slide vertically in a support independent of the gun, of a sprocket-wheel mounted on a shaft carried by said slipper  
 85 and engaging with the links of the rammer-chain, of a gear-wheel on said sprocket-wheel shaft meshing with another gear-wheel adapted to revolve with and slide on a vertical shaft to which rotary motion is imparted from  
 90 a suitable motor, of means for causing said slipper to automatically follow the movements of the gun in its elevation or depression, and of means for keeping the said guide parallel to the axis of the gun as the said  
 95 slipper moves vertically up or down in its support, substantially as described.

6. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper  
 100 provided with a guide for the rammer and mounted to slide vertically in a support independent of the gun, of a sprocket-wheel mounted on a shaft carried by said slipper and engaging with the links of the rammer-chain, of a gear-wheel on said sprocket-wheel  
 105 shaft meshing with another gear-wheel adapted to revolve with and slide on a vertical shaft to which rotary motion is imparted from a suitable motor, of means for causing said slipper to automatically follow the movements of  
 110 the gun in its elevation or depression, of means for keeping the said guide parallel with the axis of the gun as the slipper moves vertically up or down in its support, and of a drum carried by said slipper for receiving the chain of  
 115 the rammer substantially as described.

7. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper  
 120 provided with a guide for the rammer and mounted to slide vertically in a support independent of the gun, of a sprocket-wheel mounted on a shaft carried by said slipper and engaging with the links of the chain-rammer, of a gear-wheel on the said sprocket-wheel shaft meshing with another gear-wheel  
 125 adapted to revolve with and slide on a vertical shaft to which rotary motion is imparted from a suitable motor, of means for causing said slipper to automatically follow the movements of the gun in its elevation or depression, of  
 130 means for keeping the said guide parallel with the axis of the gun as the slipper moves vertically up or down in its support, of a spiral drum inclosed in a casing connected with said



guide, of a shaft on and with which said drum can slide and revolve and of means for actuating said shaft from the sprocket-wheel shaft substantially as and for the purpose described.

8. In ramming apparatus for guns, the combination with a rammer mounted in a standard or support independent of the gun, of means for causing the said rammer to automatically follow the movements of the gun in its elevation or depression, of means for actuating the rammer, and of means for enabling said standard or support to be readily moved from its operative position for the purpose specified.

9. In ramming apparatus for guns, the combination with a rammer mounted on a standard or support independent of the gun, of means for causing the said rammer to automatically follow the movements of the gun in its elevation or depression, of means for actuating the rammer, and of a pivot about which said support can hinge substantially as and for the purpose specified.

10. In ramming apparatus for guns, the combination with a rammer mounted in a standard or support independent of the gun; of means for causing the said rammer to automatically follow the movements of the gun in its elevation or depression; of means for actuating the rammer, of a pivot about which said support can hinge, and of means for locking said support in its operative position substantially as and for the purpose specified.

11. In ramming apparatus for guns, the combination with a flexible rammer, of a slipper provided with a guide for the rammer and mounted to slide in a support independent of the gun, of a rope or chain having one end connected with the slipper and the other end with a part that does not participate in the movements of elevation or depression of the gun, of guide-pulleys for said rope or chain one of which is carried by a part that participates in the elevation or depression of the gun and around which a bight of the said rope or chain passes and of means for compensating for the slackness or the tightness

in the said rope or chain for the purpose specified.

12. In ramming apparatus for guns, the combination with the flexible rammer, the rammer-guide, the support independent of the gun, the sliding slipper, the rope or chain and its guide-pulleys; of a pulley adapted to slide in a fixed guide, and of a weight tending to press said pulley against a portion of the aforesaid rope or chain substantially as and for the purpose specified.

13. In ramming apparatus for guns, the combination with the flexible rammer, the rammer-guide, the support independent of the gun, the sliding slipper, the rope or chain and its guide-pulleys; of a pulley adapted to slide in a fixed guide, of a weight tending to press said pulley against a portion of the aforesaid rope or chain and of a removable stop for limiting the extent of movement of said pulley in its guide substantially as described.

14. In ramming apparatus for guns, the combination with the flexible rammer, the rammer-guide, the support independent of the gun, the sliding slipper, the rope or chain and its guide-pulleys; of a vertical pivot for said support to swivel upon, and of a horizontal pulley working on an axle which is approximately coincident with the axis of the pivot of said support, so that the length of the rope or chain passing from said pulley to the slipper will not materially vary in length when said support is turned about its pivot substantially as described.

In testimony whereof we have hereunto set our hands, in presence of two subscribing witnesses, this 28th day of November, 1901, as to ARTHUR TREVOR DAWSON, and this 29th day of November, 1901, as to JAMES HORNE.

ARTHUR TREVOR DAWSON.

JAMES HORNE.

Witnesses to signature of Arthur Trevor Dawson:

C. A. SEARLE,

HENRY KING.

Witnesses to signature of James Horne:

W. H. ATKINSON,

H. G. JAMES.