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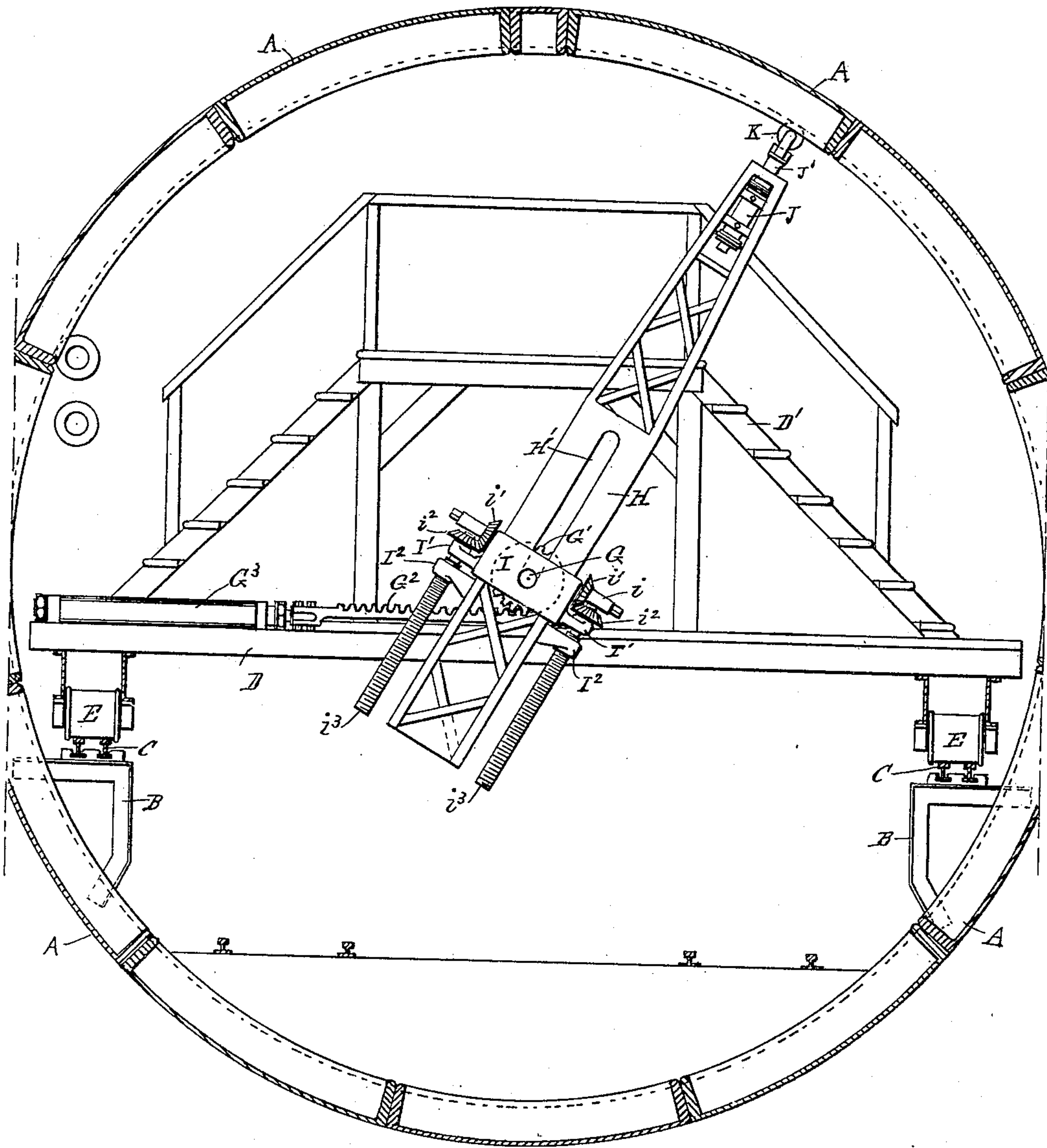
PATENTED JUNE 26, 1906.

E. W. MOIR.
CALKING APPARATUS FOR TUNNELS.

APPLICATION FILED DEC. 23, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Paul A. Blair
Milton Abbott

INVENTOR

Ernest W. Moir
BY

Howan and Howan

ATTORNEYS

No. 824,668.

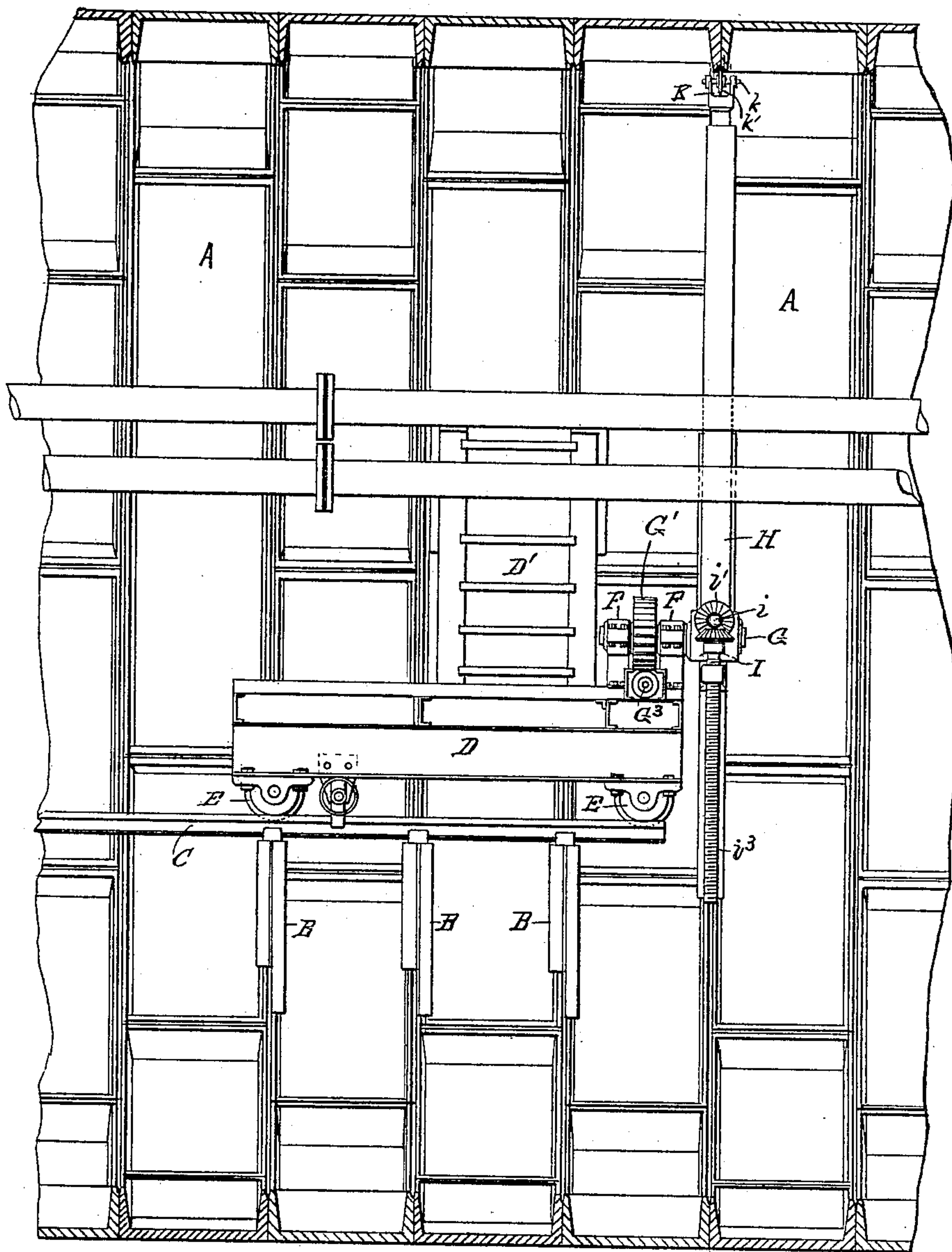
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Fig. 2.



WITNESSES

Paul A. Blair,
Walter Abbe

INVENTOR

Ernest W. Moir
BY

Howar and Howar

ATTORNEYS

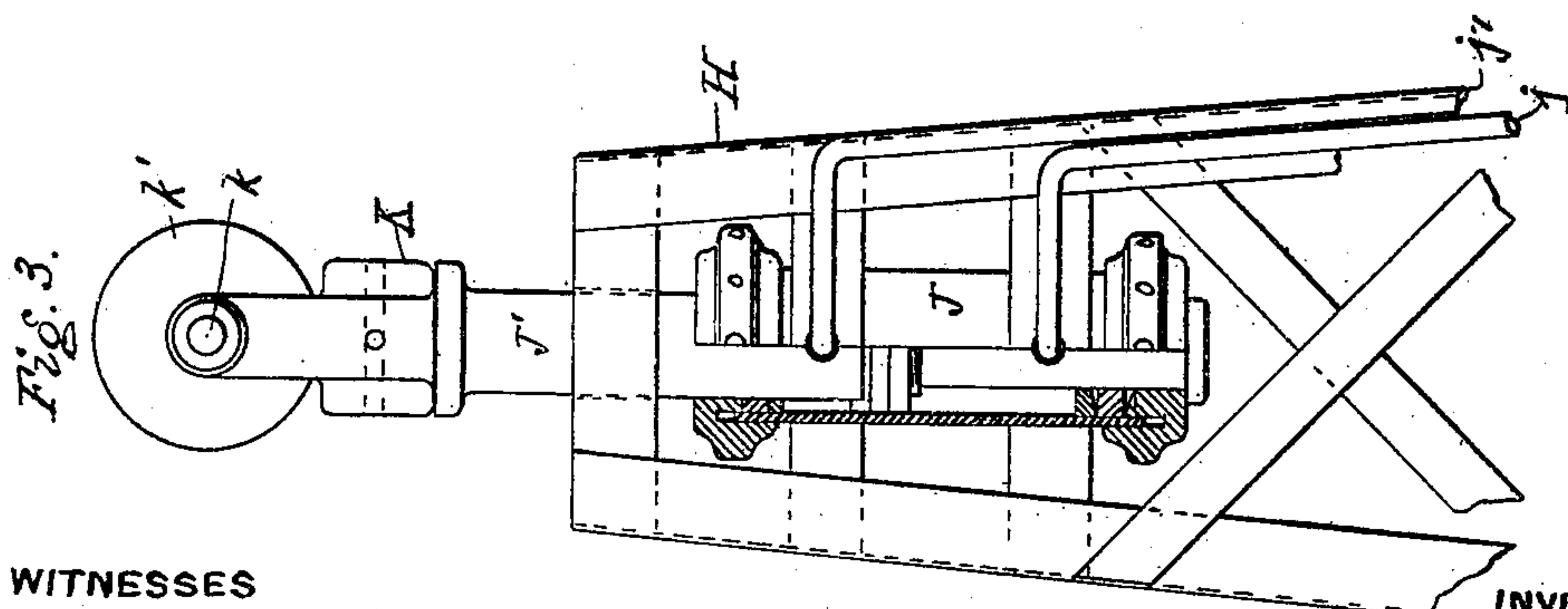
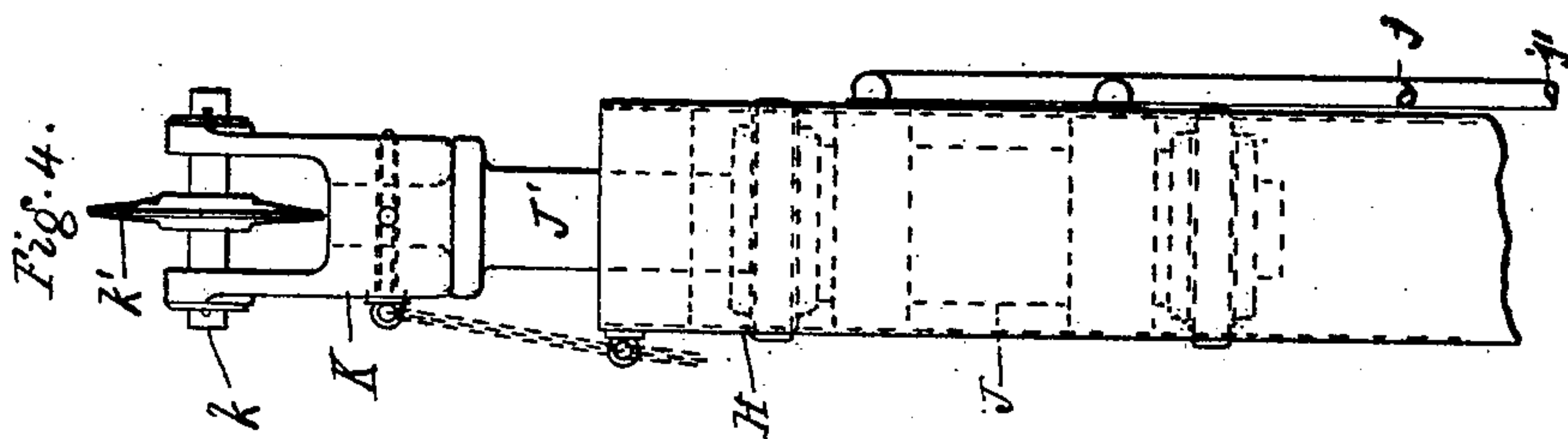
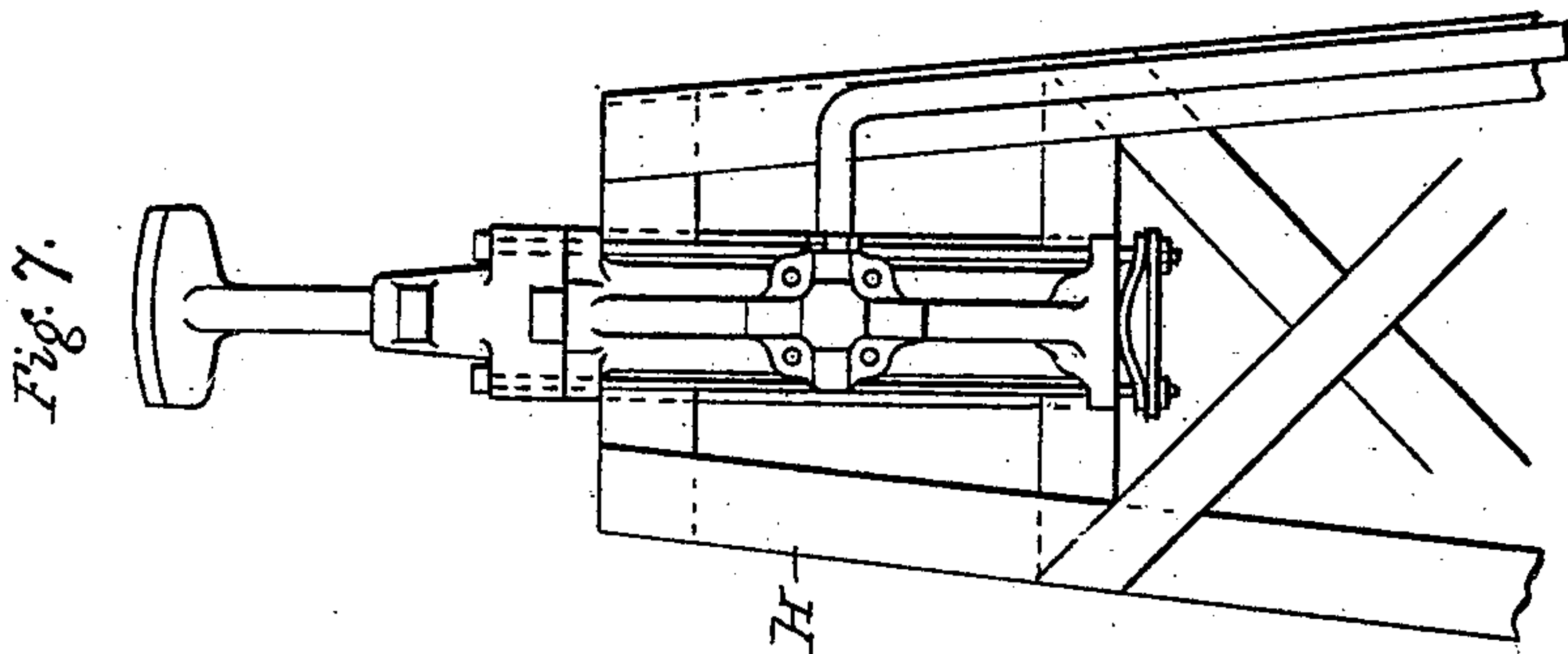
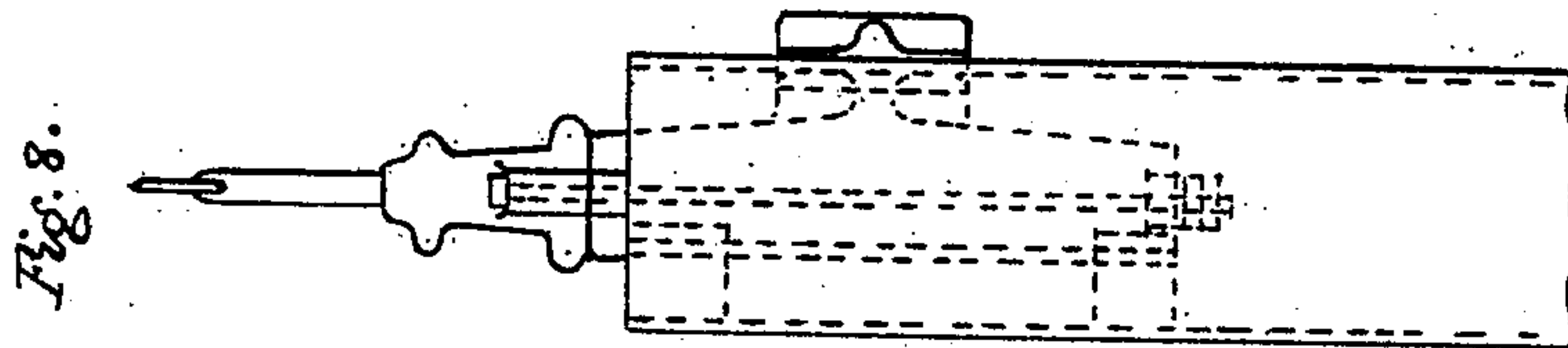
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4 SHEETS—SHEET 3.



WITNESSES

F. Paul & Blair.
Walter Abbott

INVENTOR

Ernest W. Moir
BY

Howe and Howe
ATTORNEYS

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4 SHEETS—SHEET 4.

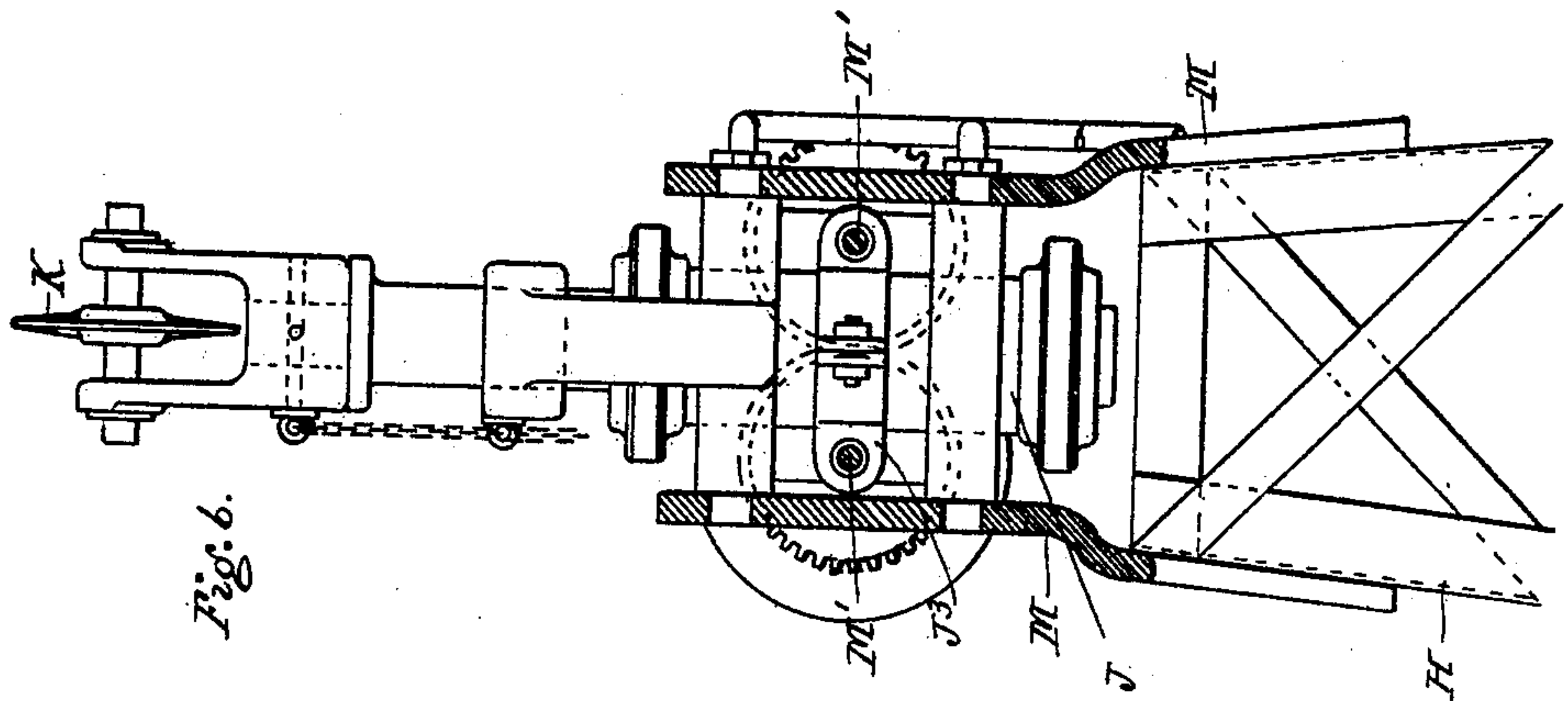


Fig. 6.

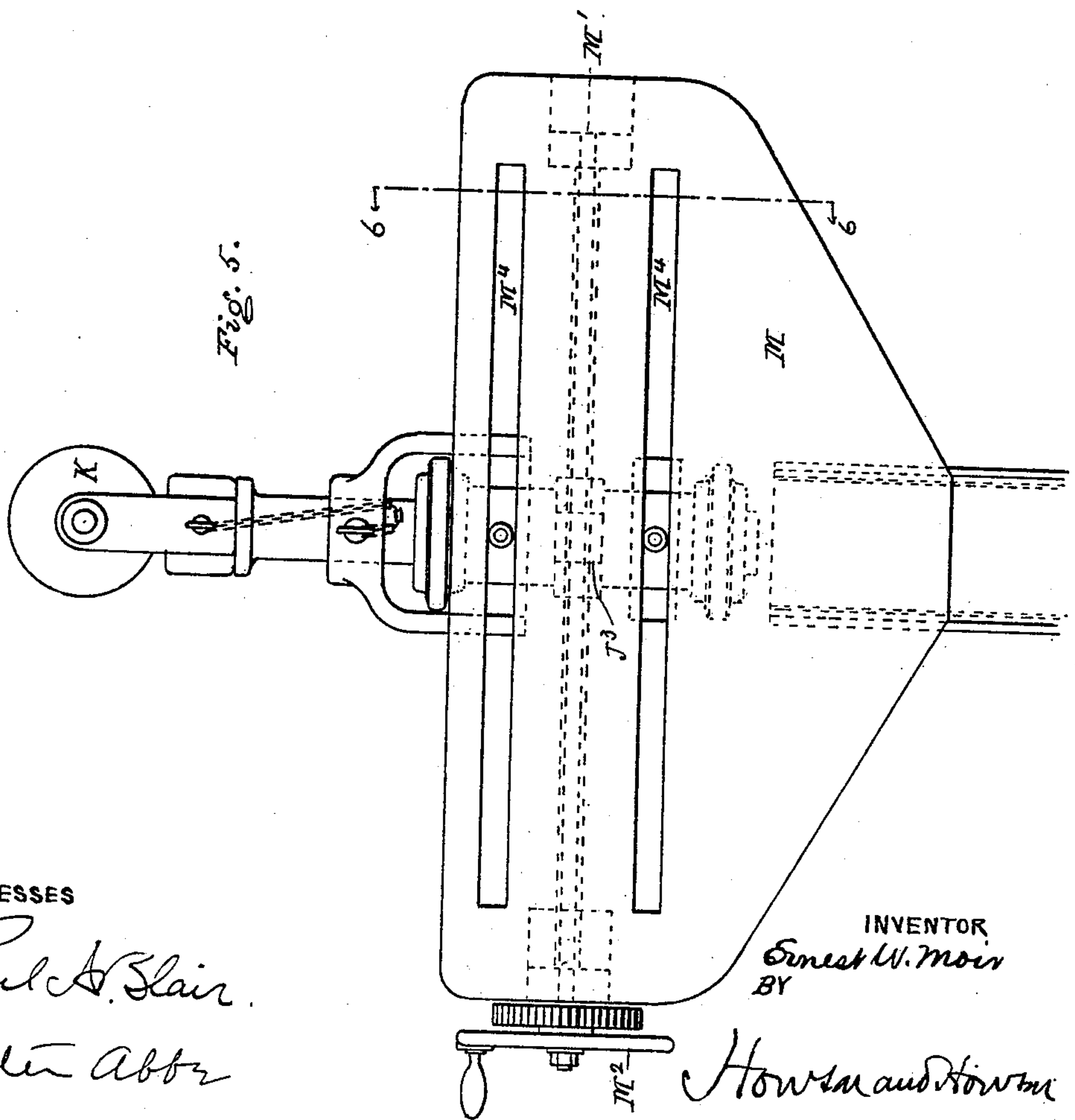


Fig. 5.

WITNESSES

Paul A. Blair
Walter Abbott

INVENTOR

Ernest W. Moir
BY

Howson and Howson

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ERNEST W. MOIR, OF LONDON, ENGLAND, ASSIGNOR TO S. PEARSON AND SON, INC., OF LONG ISLAND CITY, NEW YORK, A CORPORATION OF NEW YORK.

CALKING APPARATUS FOR TUNNELS.

No. 824,668.

Specification of Letters Patent.

Patented June 26, 1906.

Application filed December 23, 1905. Serial No. 293,129.

To all whom it may concern:

Be it known that I, ERNEST W. MOIR, a subject of the King of Great Britain and Ireland, and a resident of London, England, have invented certain new and useful Improvements in Calking Apparatus for Tunnels, of which the following is a specification.

My invention relates more particularly to the apparatus and attachments for calking the joints between the segments of tunnel-linings, particularly tunnel-linings of the character illustrated and described in my patent of July 11, 1905, No. 794,635.

It is the object of my invention to provide an apparatus which can be conveniently employed to calk the joints both circumferentially and longitudinally in a rapid and efficient manner.

In the accompanying drawings, Figure 1 is a transverse section of a tunnel with such an apparatus embodying my improvements. Fig. 2 is a side elevation of the same with the tunnel-lining in section. Fig. 3 is an enlarged view of some details. Fig. 4 is a similar view at right angles thereto. Figs. 5 and 6 are enlarged views at right angles to each other, representing a modified form of tool-holder; and Figs. 7 and 8 are views of a modified form of tool used with a pneumatic hammer.

Referring to Figs. 1 and 2, A A are metallic segments which are fitted together to form the finished tubular lining of the tunnel. B B are brackets which are secured at a suitable height to the flanges of the segments of which the finished lining has been built up. On these brackets are mounted rails C C, on which travel the wheels of the stage D, carrying the calking-tool and the means for operating the same. The manner of advancing the stage and the arrangement of the rails may be the same as described in my above-mentioned patent. The carrying-stage comprises the main platform D, mounted on wheels E. On the rear part of the platform D is a superstructure D', arranged so that a man can always reach the head of the tool. On the forward part of the platform are arranged bearings F F, having their centers concentric with the tunnel-lining. The shaft G of the tool-carrying arm H is supported in

these bearings. Suitable means are also provided for revolving the arm H. As shown, a pinion G' is mounted on the shaft G and is engaged by a rack G², operated by a hydraulic cylinder G³. The tool carrying or revolving arm H passes through a suitable yoke I at the end of the shaft G in such a manner as to permit the arm being drawn in and out perpendicularly to the shaft in the event of having to clear obstructions, such as pipes, &c., passing along the tunnel. To do this, I prefer to provide a shaft i, mounted on the yoke I and having at each end a bevel-gear i', meshing with a corresponding gear i² at the end of each threaded shaft i³. Each shaft i³ passes through suitable bearings I' on the yoke and threaded projections I² on the arm H, parallel with the arm. The shafts i' may have cranks or other operating means. The arm H is provided with a slot H' to permit its being raised or lowered without interfering with the shaft G, which passes therethrough. At the end of the arm H is carried the calking-tool and holder, which vary in shape for different materials used in calking as well as for calking circumferential or longitudinal seams or joints.

In Figs. 3 and 4 is shown a tool especially adapted for calking circumferential joints or the seams between the rings of tunnel-segments. The tool, which is preferably mounted at the end of the revolving arm, consists of a hydraulic cylinder J or the like, having a piston J', at the end of which is attached the tool. The piston J' is subjected to a constant pressure maintained at its back through the supply-pipe j. A second pipe j' is also connected to the cylinder for the liquid to act on the opposite side of the piston. Swiveled to the end of the piston-rod is the tool-head K, carrying a loosely-mounted roller or wheel K' on the pin k in order that it may have sufficient lateral play to accommodate itself to the longitudinal variations of the seams. The head may be secured to the piston-rod by a pin passing through one of two holes at right angles to each other in order to enable the tool to do both circumferential and longitudinal joints. The necessary longitudinal movement may be arranged for by having the arm traverse the comparatively

short length of the longitudinal seams. The calking of these longitudinal seams is however, usually done by means of a tool-holder, such as shown in Figs. 5 and 6, which consists of a longitudinal frame M, along which the hydraulic cylinder carrying the tool K is caused to travel. As shown, the frame M is provided with two threaded shafts M' M', passing through collars J³ on the cylinder. The shafts are geared together at one end, and one of the shafts is provided with a hand-wheel M² or other means for rotating the same. As this shaft rotates the cylinder is caused to move along the guideways M⁴ in the frame. The calking medium may be round lead wire, which is carried on a spool on the staging D and is led around in front of the roller, so that as the roller advances around the seam it forces the lead into the seam in front of it. Soft iron may be preferred to lead on account of its rusting capabilities. In the use of iron it may be more desirable to use a pneumatic hammer, such as illustrated in Figs. 7 and 8. To the head of the hammer is attached or swiveled a calking-tool best adapted for the work. It is obvious that this style of tool may be used with the tool-holder shown in Figs. 5 and 6 in calking longitudinal joints, in which case flexible tubes for operating the hammer should be used.

I claim as my invention—

1. A calking apparatus for tunnels, comprising a stage, an arm carried thereby, and means carried by said arm for calking the seams between the tunnel-segments.

2. A calking apparatus for tunnels, comprising a stage, an arm carried thereby, and means carried by said arm for calking the seams between the tunnel-segments, in combination with means for moving the calking means circumferentially.

3. A calking apparatus for tunnels, comprising a stage, an arm carried thereby, and means carried by said arm for calking the seams between the tunnel-segments, in combination with means for moving the calking means longitudinally.

4. A calking apparatus for tunnels comprising a stage, an arm carried thereby, and a calking-tool at the end of said arm, in combination with means for exerting a constant pressure at the back of said tool.

5. A calking apparatus for tunnels comprising a stage, an arm carried thereby, and a calking-tool at the end of said arm, in combination with means for moving said tool in the direction of the length of the arm.

6. A calking apparatus for tunnels, comprising a stage, an arm carried thereby, means for revolving said arm, and means carried by the arm for calking the seams between the tunnel-segments.

7. A calking apparatus for tunnels, comprising a traveling stage, an arm carried thereby, means on said stage for revolving said arm, and means at the end of said arm for calking the seams between the tunnel-segments.

8. A calking apparatus for tunnels, comprising a stage, a revolving arm having its spindle mounted thereon, means for rotating said spindle, and a tool carried on the end of said arm for calking the seams between the tunnel-segments.

9. A calking apparatus for tunnels, comprising a stage, a revolving arm having its spindle mounted thereon, means for rotating said spindle, and a tool carried on the end of said arm for calking the seams between the tunnel-segments, in combination with means for moving said arm perpendicularly to said spindle.

10. A calking apparatus for tunnels, comprising a stage, a revolving arm having its spindle mounted thereon, means for rotating said spindle, and a tool carried on the end of said arm for calking the seams between the tunnel-segments, in combination with means for moving said tool in and out at the end of said arm.

11. A calking apparatus for tunnels, comprising a stage, a revolving arm, means carried by said arm for calking the seams between the tunnel-segments, said means comprising a cylinder having a piston, and a tool carried at the end of said piston.

12. A calking apparatus for tunnels, comprising a stage, a revolving arm, means carried by said arm for calking the seams between the tunnel-segments, said means comprising a cylinder having a piston under constant pressure, and a tool swiveled to the end of said piston.

13. A calking apparatus for tunnels, comprising a stage, a revolving arm, means carried by said arm for calking the seams between the tunnel-segments, said means comprising a cylinder having a piston, and a tool carried thereby, and means whereby said tool may be moved in and out.

14. A calking apparatus for tunnels, comprising a stage, a revolving arm, means carried by said arm for calking the seams between the tunnel-segments, said means comprising a cylinder, having a piston, and a tool carried at the end of said piston, said tool having means to permit lateral play.

15. A calking apparatus for tunnels, comprising a stage, a revolving arm, means carried by said arm, for calking the seams between the tunnel-segments, said means comprising a cylinder having a piston, and a tool carried at the end of said piston, and having separate means to prevent lateral and longitudinal movement.

16. A calking apparatus for tunnels, comprising a stage, a revolving arm and means for revolving said arm, consisting of a hydraulic cylinder and rack, in combination
5 with a calking-tool carried by said arm, and means for moving said tool longitudinally and circumferentially.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST W. MOIR

Witnesses:

W. J. SEIS,

W. G. McLAUGHLIN.