

No. 667,290.

Patented Feb. 5, 1901.

E. M. T. BODDAM.

GUN FOR THROWING HIGH EXPLOSIVE CHARGES.

(Application filed Mar. 15, 1900.)

(No Model.)

4 Sheets—Sheet 1.

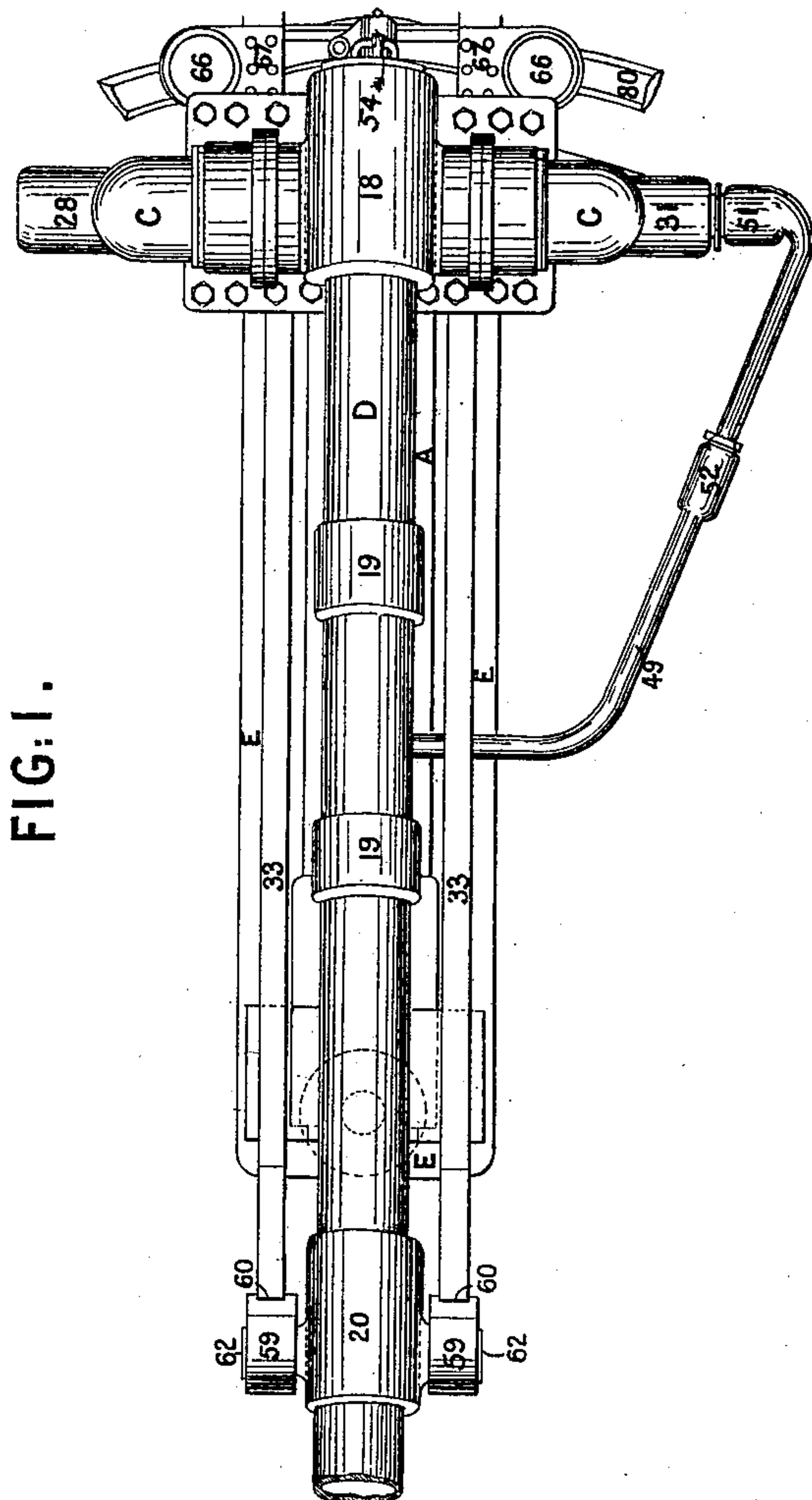


FIG. 1.

Witnesses.

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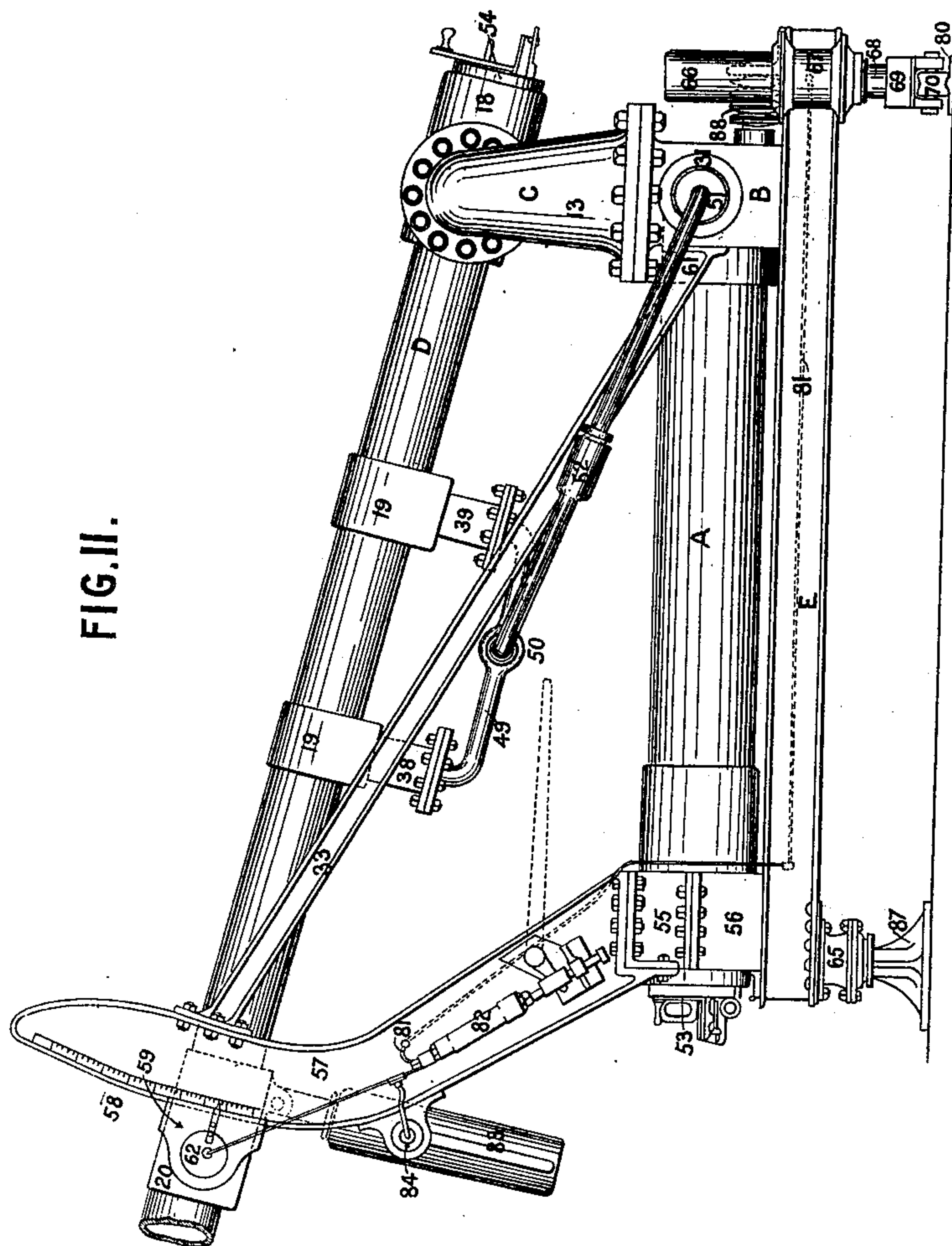


FIG. II.

Witnesses

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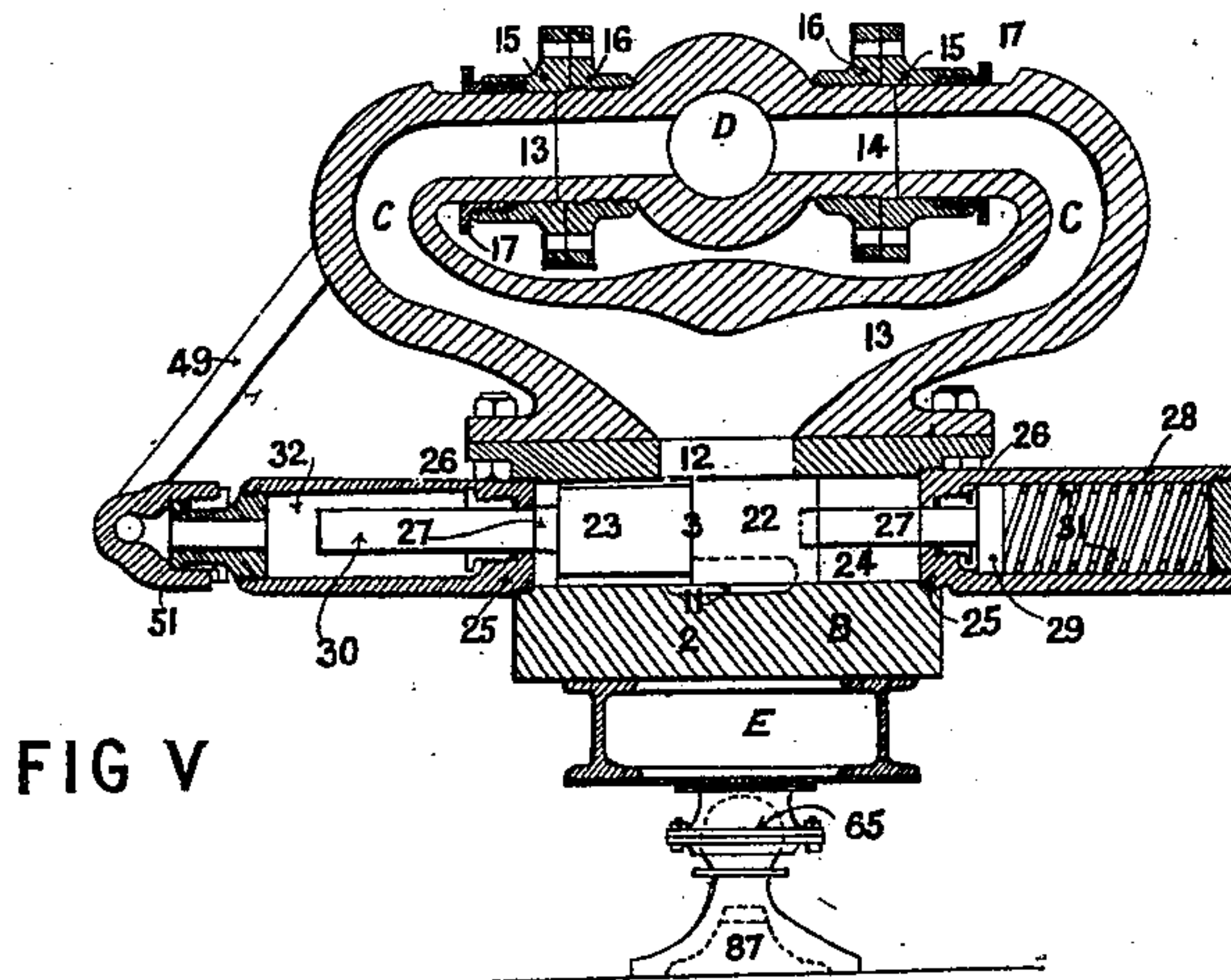


FIG V

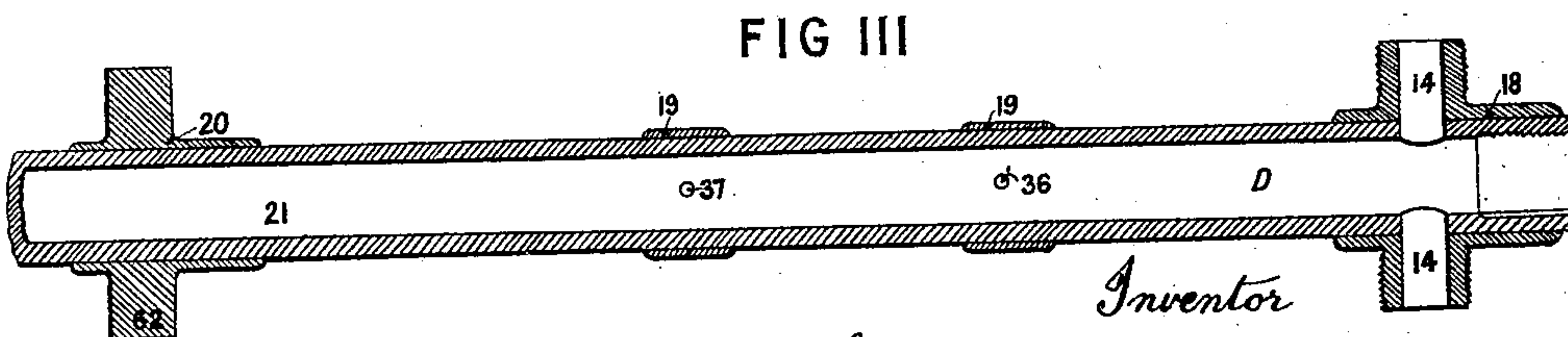


FIG III

Witnesses.

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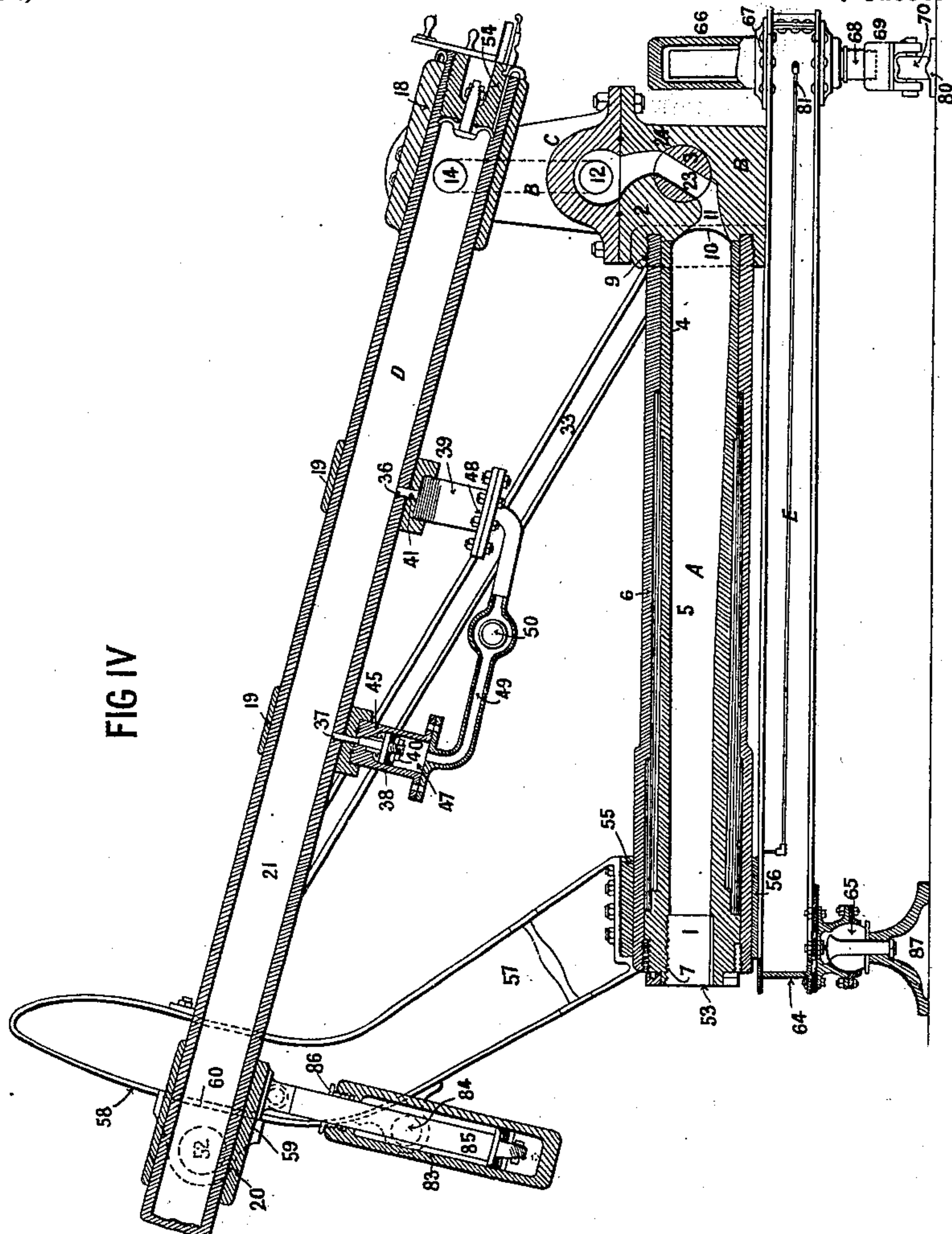
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4 Sheets—Sheet 4.



Witnesses

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UNITED STATES PATENT OFFICE.

EDMOND MEYER TUDOR BODDAM, OF LONDON, ENGLAND.

GUN FOR THROWING HIGH-EXPLOSIVE CHARGES.

SPECIFICATION forming part of Letters Patent No. 667,290, dated February 5, 1901.

Application filed March 15, 1900. Serial No. 8,802. (No model.)

To all whom it may concern:

Be it known that I, EDMOND MEYER TUDOR BODDAM, residing at 153 Leadenhall street, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Guns for Throwing High-Explosive Charges; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in guns for throwing high-explosive charges, and in accordance therewith, as hereinafter fully described, I make use of, in combination with a built-up explosion-chamber opened and closed by a suitable breech-block with the usual attachments, a specially designed and operated partially-open valve for admitting into a gun-barrel, opened, closed by a breech-block, and served with a projectile in the usual manner, the gas generated from the ignition of the charge of any suitable explosive inserted into the explosion-chamber aforesaid.

Further, in accordance with this invention I provide a specially-constructed framing for connecting the explosion-chamber, the release-valve, and the gun-barrel and for allowing for the elevation and depression of the gun necessary for varying the range of the projectile, all as hereinafter fully explained with reference to the accompanying drawings, upon which—

Figure I, in plan view, and Fig. II, in side elevational view, illustrate the complete apparatus constructed and arranged according to this my invention. Fig. III is a section of the gun-barrel. Fig. IV is a longitudinal section on the center line, and Fig. V is a cross-section through the center of the hollow trunnion-arms and valve.

Similar reference characters indicate like parts wherever occurring throughout the drawings.

The gun consists, essentially, of an explosion-chamber, gas-control valve and valve-block, trunnion-arms, and gun-barrel with elevating and depressing mechanism, the gun-barrel and explosion-chamber being connected together by a framing and the whole slid-

ing practically without recoil on a traversing platform of a simple construction.

A, Figs. I, II, and IV, is the explosion-chamber, built up and bored out to a varying diameter. At one end of this chamber is fixed the breech-block 1, (see particularly Fig. IV,) and to the other end is screwed gas-tight the steel block B, Figs. II, IV, and V, containing an automatically-opened release-valve 3, Fig. IV. The casing of the chamber A is formed of an inner tube 4, Fig. IV, of gun-steel of varying thickness and dimensions. At the reduced part of the inner tube 4 is wound a thickness of steel wire 5, the whole incased by a steel tube 6, checked and shrunk on in the usual manner. The breech is closed by an interrupted screw 7 of the usual pattern. (See Fig. IV.) The forward end is closed by means of a steel forging screwed gas-tight, as at 9, Fig. IV, onto the enlarged end 10 of the explosion-chamber. The tube 2, Fig. IV, for the valve is bored out of the solid metal, and openings 11, Fig. IV, are led from this tube 2 into the explosion-chamber A. Other openings 12 lead from the top of this forging into the steel block C, Figs. IV and V, bolted thereto and through the hollow arms 13 13 into the hollow trunnions 14 14 of the gun-tube D. The hollow arms 13 of the block C (see particularly Fig. V) are made to embrace the trunnions 14 of the gun-tube concentrically by the sliding collars 15, bolted to flanges 16 on the arms and having stuffing-boxes 17 on the insides to secure the block C to the trunnions.

The explosion-chamber is vented, and the vent is fitted with a central firing-gear having a removable vent-bolt pierced and fitted to receive an electrical or mechanical primer of usual construction, and the gun may be fitted with sights for laying and with a bracket on the elevating-trunnion for telescope-sights, as required; but these do not form part of this invention. The gun-tube D is a suitable steel tube enlarged at the breech 18, at each valve connection 19, and at the elevating-trunnions 20. It is bored out, as at 21, to any suitable diameter and may or may not be rifled, all according to requirement.

The regulating-valve 3, placed in valve-

block B, (see particularly Fig. IV,) consists of a steel cylinder 22, (see also Fig. V,) having a rectangular aperture 23 of requisite dimensions slotted through it equal to the area of the bore 21 of the gun-tube D. This cylinder 22 moves truly in the cylindrical tube 24, Fig. V, bored out of the steel closing-piece of the explosion-chamber A, and is arranged to be always partially open, being used for the regulation of the gas during expansion and not for completely closing the explosion-chamber. The ends of the tube 24 are closed by the bases of the cylinders or plugs 25, having neck-glands 26 to allow the rods 27, which move the valve 3, to pass. The bases of the steel cylinders 25 are screwed into the block B, and a piston 29 and plunger 30 are formed on the sides, projecting within them. One of these pistons 29 is solid and works against a steel spring 31 in its cylinder.

The plunger 30 is a plain rod-plunger. The rods 27 of both pistons pass through the stuffing-boxes 26, having ordinary cup leather rings 35, and are screwed into the cylindrical slide-valve aforesaid. In operation the slide-valve, as shown, is arranged so as to be partly open at the commencement of the stroke.

In the central enlarged portions of the gun-tube D two or more small holes 36 37 (see particularly Fig. IV) are drilled. Around and over these holes are screwed the casings 38 and 39 of two small steel hydraulic cylinders provided with hydraulic pistons 40 41, the rods of which move in the holes 36 37, bored into the gun-barrel and provided with stuffing-boxes, as at 45, at the entrance to the cylinders 38 39. These hydraulic cylinders have their lower ends 47 48 filled with liquid. The pipes 49, connecting the cylinders, are also filled with liquid and are carried, by means of trunnion-joints 50 51 (see also Fig. I) at either end and a lengthening-socket 52 in the center, to the hydraulic cylinder 32, Fig. V, on the release-valve 3. Any movement of the pistons 40 41, leading into the gun-tube, is therefore directly transmitted proportionally to the working of the piston in the hydraulic cylinder attached to the release-valve 3.

The admission of gas is by a gradual opening of the valve, and the rate of opening is regulated by the gas in the bore of the gun, which propels and follows the projectile in its passage through the gun-tube, being by the adjustment of stroke of the pistons worked by the gas-pressure in the bore of the gun regulated to give gradually-increasing volumes and consequent pressures on the base of the projectile, and thereby a gradually-increasing velocity.

The mechanism 53 54, Fig. IV, for closing the two breeches may be on the ordinary interrupted-screw system. They are arranged to swing clear for loading and are fitted with the necessary catches for holding them in firing and loading positions and provided with

suitable levers and handles all in the usual manner.

The construction of the framing and the mechanism for elevating and depressing the gun for varying the range of the projectile will be now more fully explained with particular reference to Figs. II and IV of the drawings.

Around the breech end of the explosion-chamber and secured thereto are two half-ring flanged castings 55 56 to hold the cylinder and to which the supporting-arms 57 are bolted. These arms, which are of steel, have the front surface planed to the requisite radius, as at 58, to receive and carry the trunnion-rings 59, which are grooved on the under side to slide accurately on the curved planed flanges 58. Along the curve thus formed is screwed a brass arc graduated in degrees of elevation. Two steel struts are securely bolted to the supporting-arms 57 and also to the closing-block in the forward end of the explosion-cylinder. The trunnion-rings 59, fitted to the trunnions 62, are preferably of phosphor-bronze, having accurately turned and grooved under sides to travel radially over the planed edges of the supporting-arms 57. The gun-tube, supporting-frame, and explosion-chamber slide on the platform E. This platform is carried at the end 64 on a ball-and-socket joint 65. The other end of the platform E has two hydraulic cylinders 66 secured to its sides by brackets 67. The rams 68, working on these cylinders, have at their outer ends sockets 69, which are arranged to form brackets to carry suitable rollers 70, traveling on the racer 80. These cylinders are connected by piping 81 direct to any suitable force-pump 82 and thence to an elevating-cylinder 83, secured by trunnions 84 to the supporting-arms 57. The necessary stop-valve and return-pipe (not shown) for reversing the action of the pump by a reversal of leads are also provided. The elevating-cylinder 83 is similar to the cylinders 66, and the areas are proportioned so that the weight of the gun D, supported on its hollow trunnions 14, and the weight of the platform E, pivoted on the ball-socket 65, and the weight carried by said platform E will nearly balance one another when connected by the fluid in the pipes 81 and a transfer of the fluid from the one to the other and the consequent elevation and depression of the gun D can be obtained by means of the pump and its return-pipe and reversing-valve.

The recoil of the gun, explosion-chamber, framing, and attachments may be absorbed by suitable guides and springs, as at 88, attached to the rear of the platform.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In guns for throwing high-explosive charges the built-up explosion-chamber having a breech-block at one end, and a closing-block at the other end with a partially-open expansion-valve with hydraulic means for

opening such valve therein for the purpose of controlling the admission into the gun-barrel of the gas generated in the explosion-chamber by the ignition of the explosive charge; in combination with the hollow trunnion-brackets and a gun-barrel provided with hollow trunnions and closed by a breech-block; all substantially as hereinbefore described and illustrated in the drawings accompanying.

2. In guns for throwing high-explosive charges the combination of the built-up explosion-chamber having a breech-block at one end and a closing-block at the other end with a partially-open gas-controlling valve therein, and the hollow trunnion-brackets connected to a gun-barrel provided with hollow trunnions and closed by a breech-block; with two or more hydraulic cylinders attached to the gun-barrel and connected to the gas-controlling valve by piping and having pistons the rods of which form plungers open to and communicating with the bore of the gun-barrel free to be moved successively by the gas-pressure following the projectile and by means of a plunger moving in a cylinder attached to the valve-casing regulating the amount of opening of said gas-controlling valve so as to give gradually-increasing volumes of gas in the bore of the gun and consequent pressures on the base of the projectile and thereby a gradually-increasing velocity to the projectile, all substantially as described and shown in the accompanying drawings.

3. In guns for throwing high-explosive charges the built-up explosion-chamber having a breech-block at one end and a closing-block at the other with a gas-controlling valve therein; the hollow trunnion-brackets; the gun-barrel provided with hollow trunnions and closed by a breech-block; the hydraulic cylinders with pistons, the rods of which form plungers open to and communicating with the gun-bore and water-pipes connecting said cylinders with a plunger moving in a cylinder attached to the valve-casing; the gas-controlling valve; and the gun-supporting

arms or framing having front surface planed to a desired radius; all in combination with, and capable of sliding upon, a platform carried at the forward end upon a ball-and-socket joint in a suitable standard, and working at rear end on rollers traveling upon a racer; substantially as and for the purposes described, and as shown in the drawings.

4. In guns for throwing high-explosive charges the built-up explosion-chamber having a breech-block at one end and a closing-block at the other with gas-controlling valve therein; the hollow trunnion-brackets; the gun-barrel provided with hollow trunnions and closed by a breech-block; the hydraulic cylinders with pistons the rods of which form plungers open to and communicating with the gun-bore and water-pipes connecting said hydraulic cylinders a plunger moving in a cylinder attached to the valve-casing with the gun-supporting arms or framing having front surface planed to a desired radius and an arc graduated in degrees of elevation along the curve thus formed; the gun-tube fitted with elevating-trunnions and trunnion-rings; and the platform upon which the whole is capable of sliding carried at the forward end on a ball-and-socket joint in a suitable standard, and working at rear end on rollers traveling upon a racer and furnished with springs for checking recoil; in combination with hydraulic cylinders and rams at rear end of platform, an elevating-cylinder secured by trunnions to the gun-supporting arms, and a suitable force-pump connected by piping with the rear end hydraulic cylinders and the front elevating-cylinder; all constructed, arranged, and operating, substantially as shown and for the purposes described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

EDMOND MEYER TUDOR BODDAM.

Witnesses:

FRANCIS GEORGE HUGHES,
HERBERT ARTHUR MARSHALL.