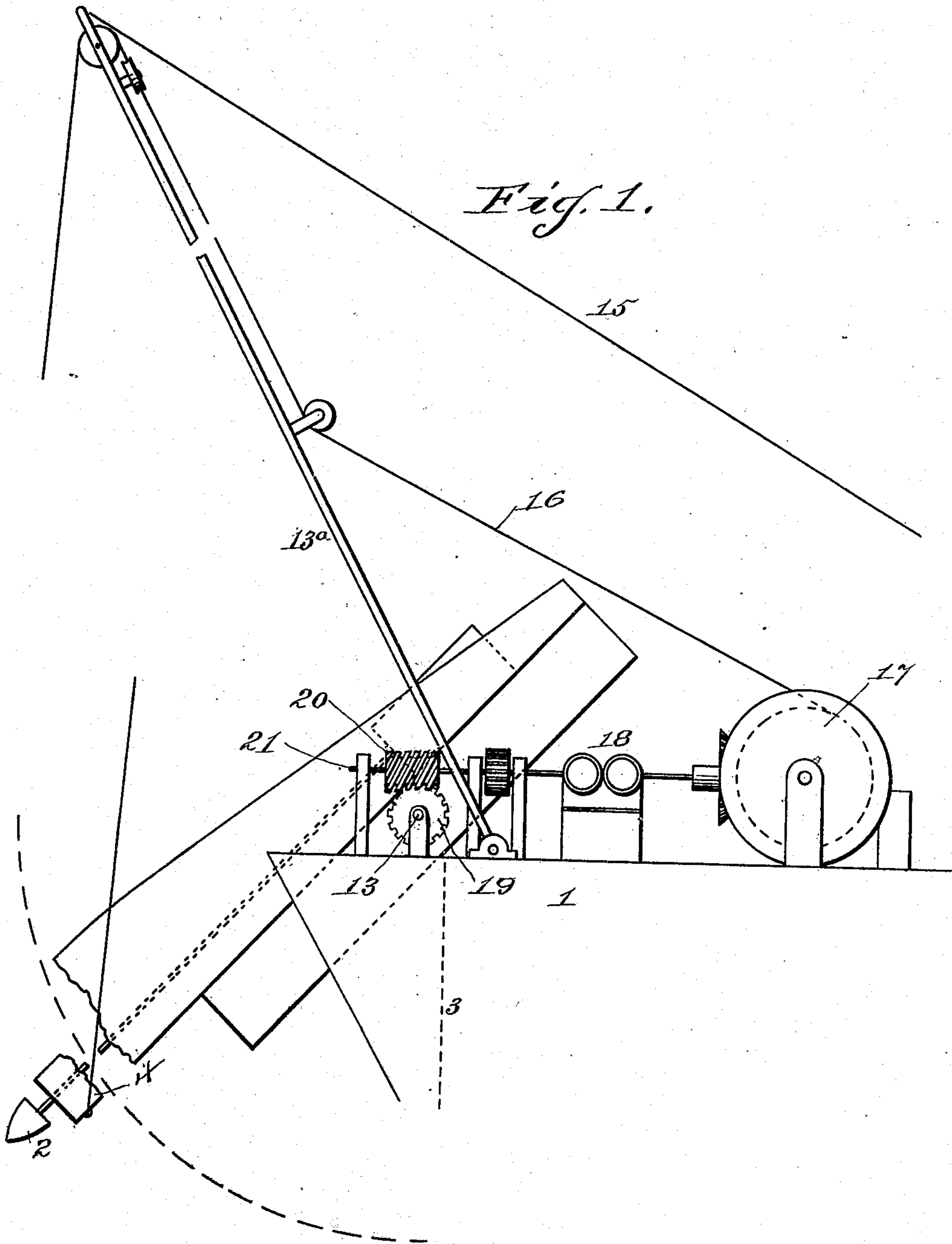


W. D. CUTHBERT.
 ROCK CHISEL MACHINE FOR CHANNEL EXCAVATION.
 APPLICATION FILED DEC. 17, 1908.

920,031.

Patented Apr. 27, 1909.
 7 SHEETS—SHEET 1.



Witnesses:

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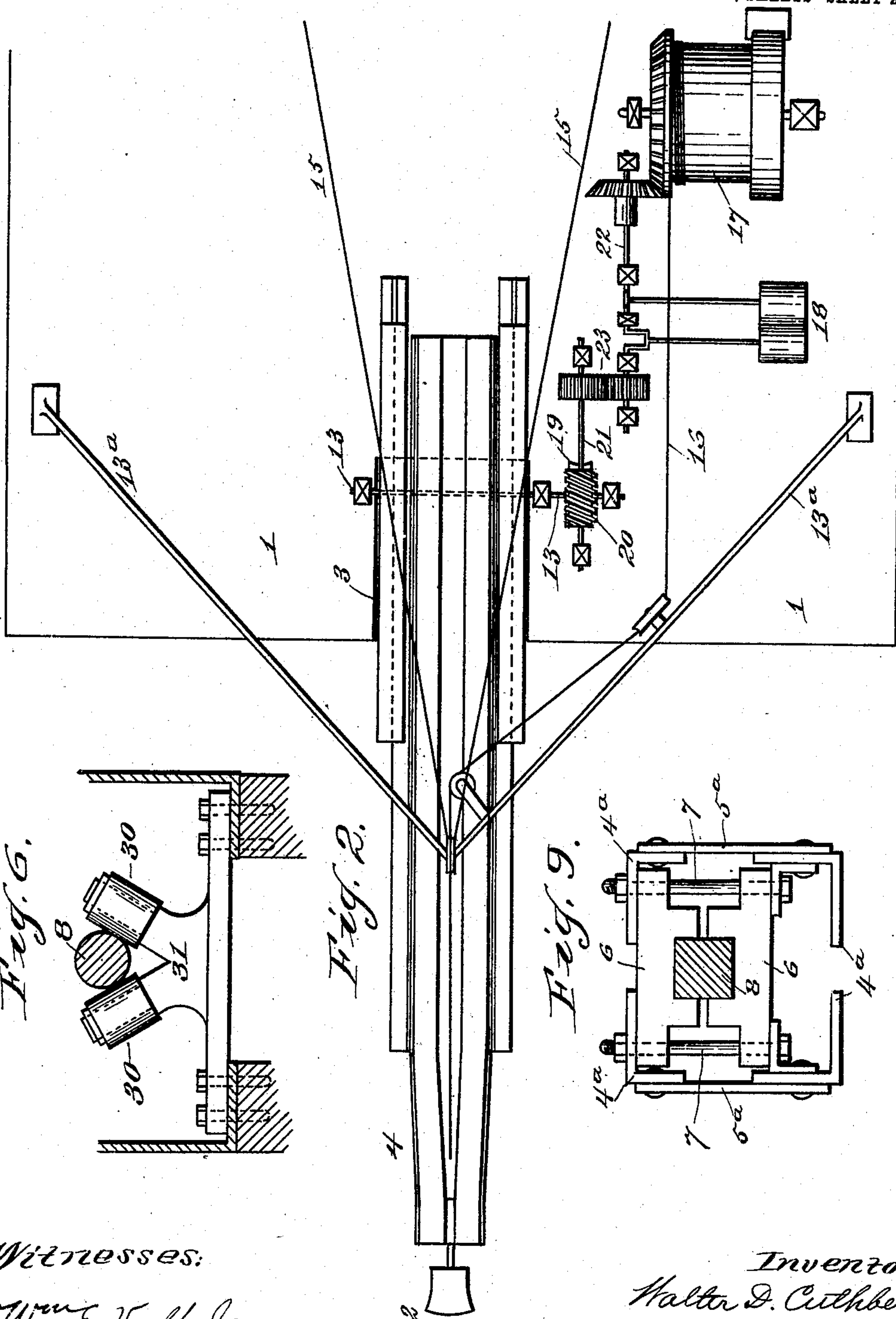


Fig. 6.

Fig. 2.

Fig. 9.

Witnesses:

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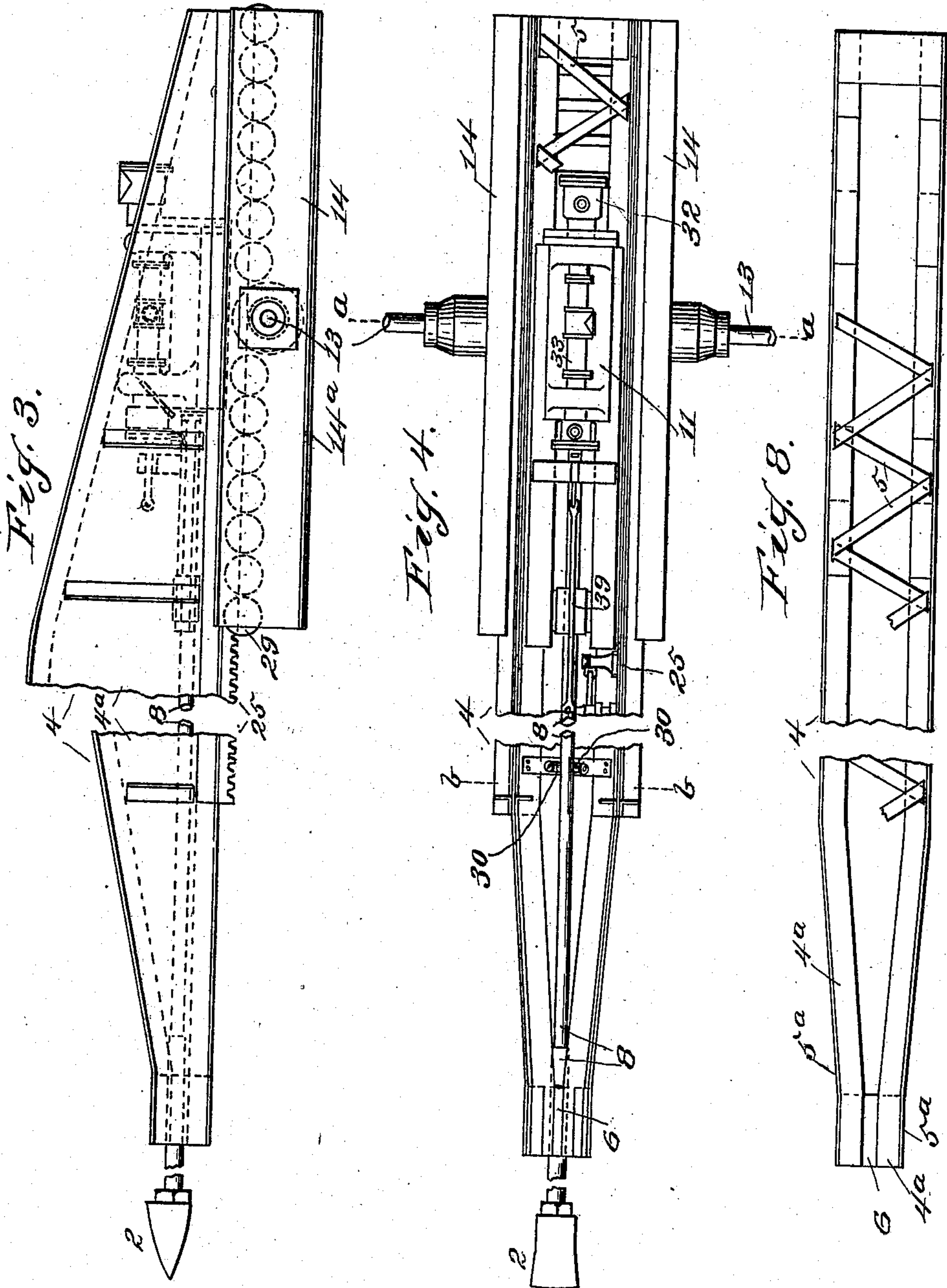
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 7 SHEETS—SHEET 3.



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7 SHEETS—SHEET 4.

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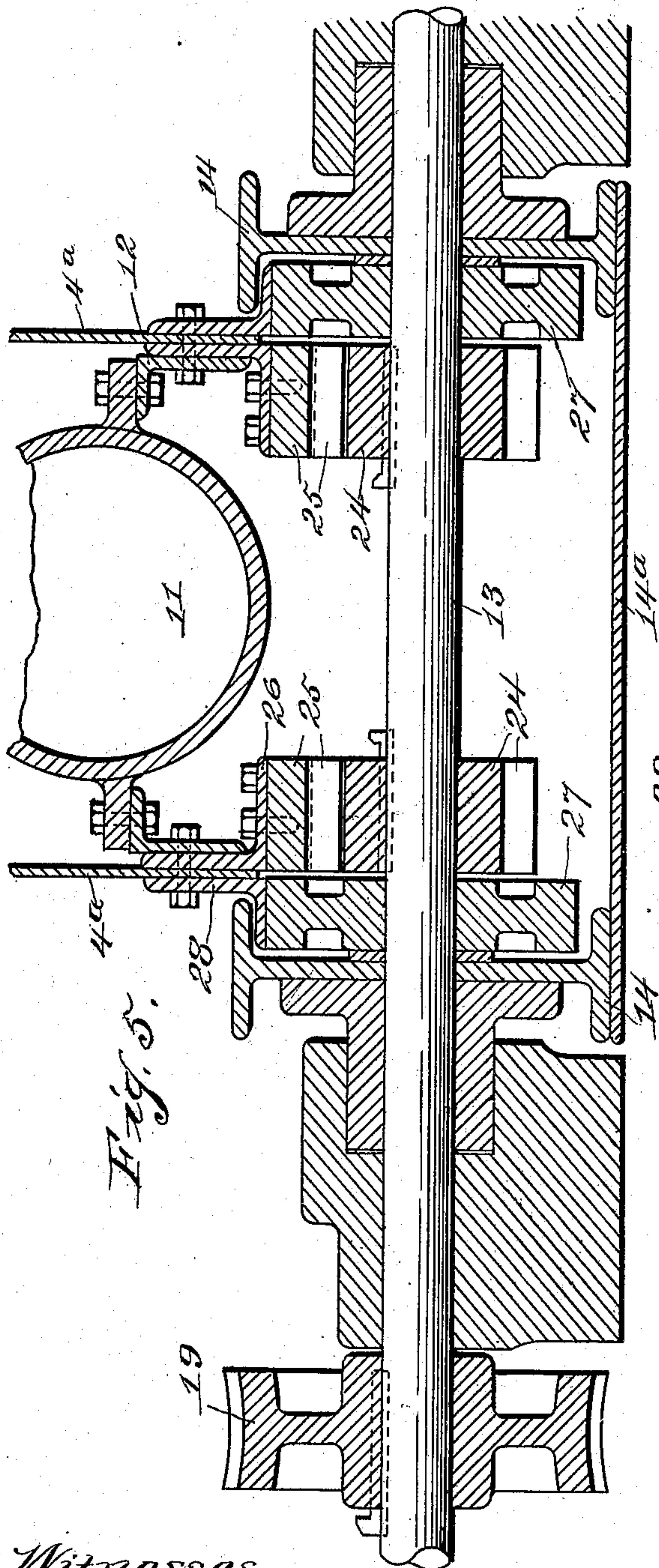


Fig. 5.

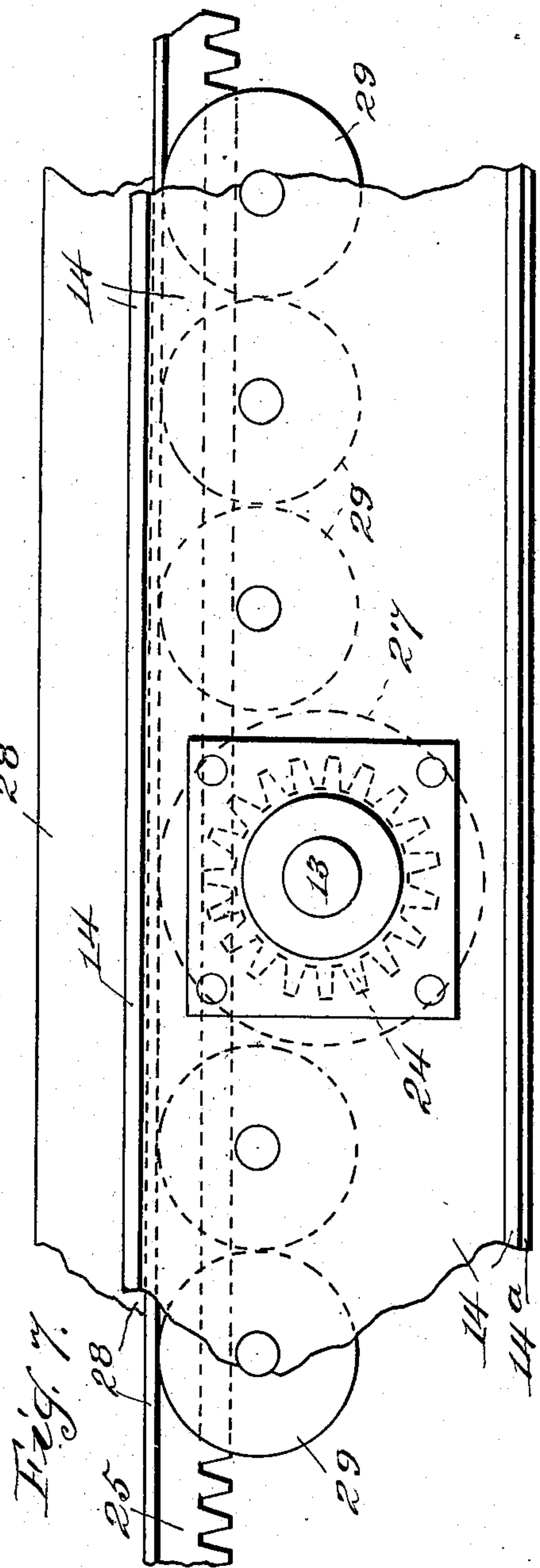


Fig. 6.

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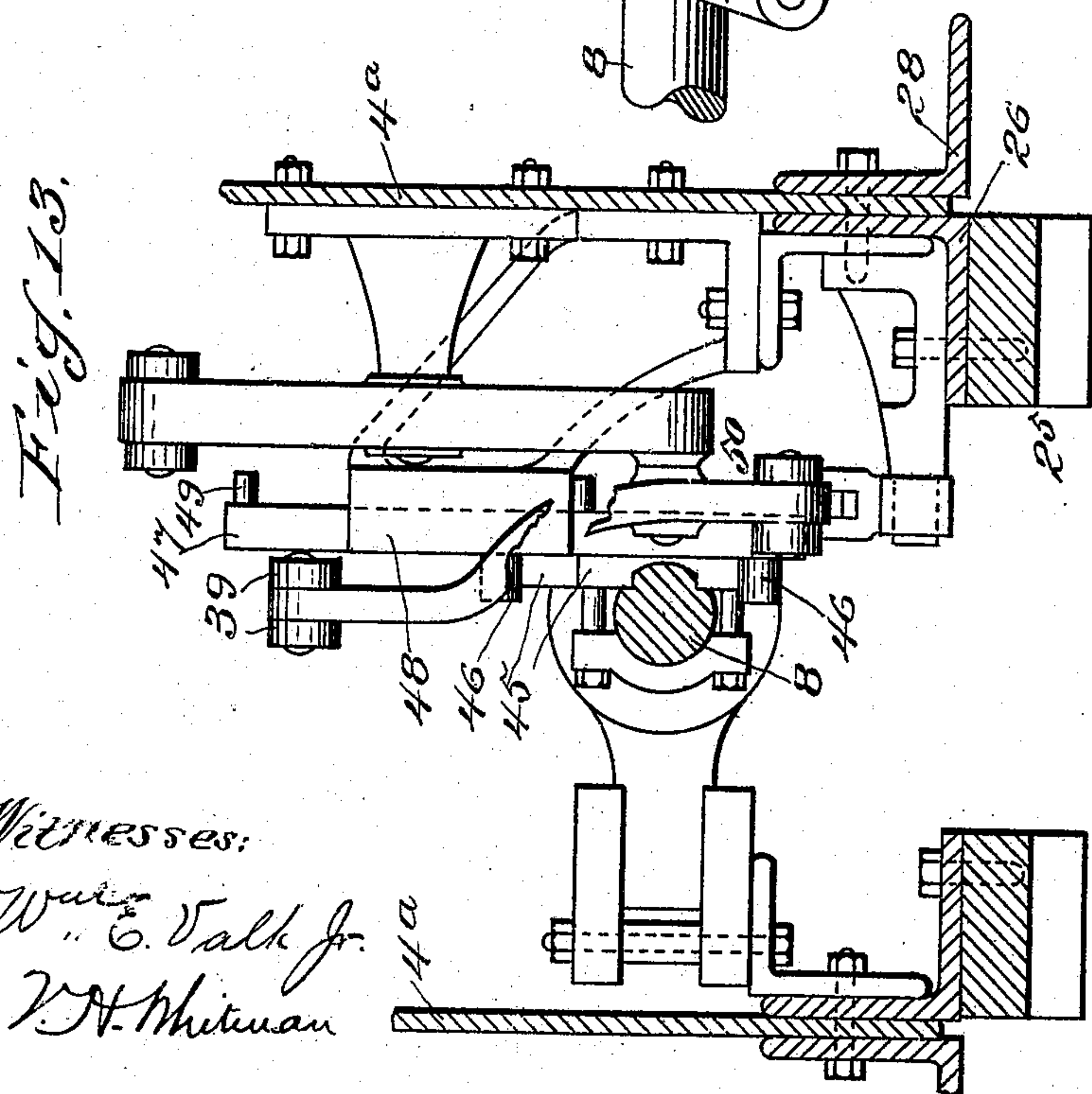
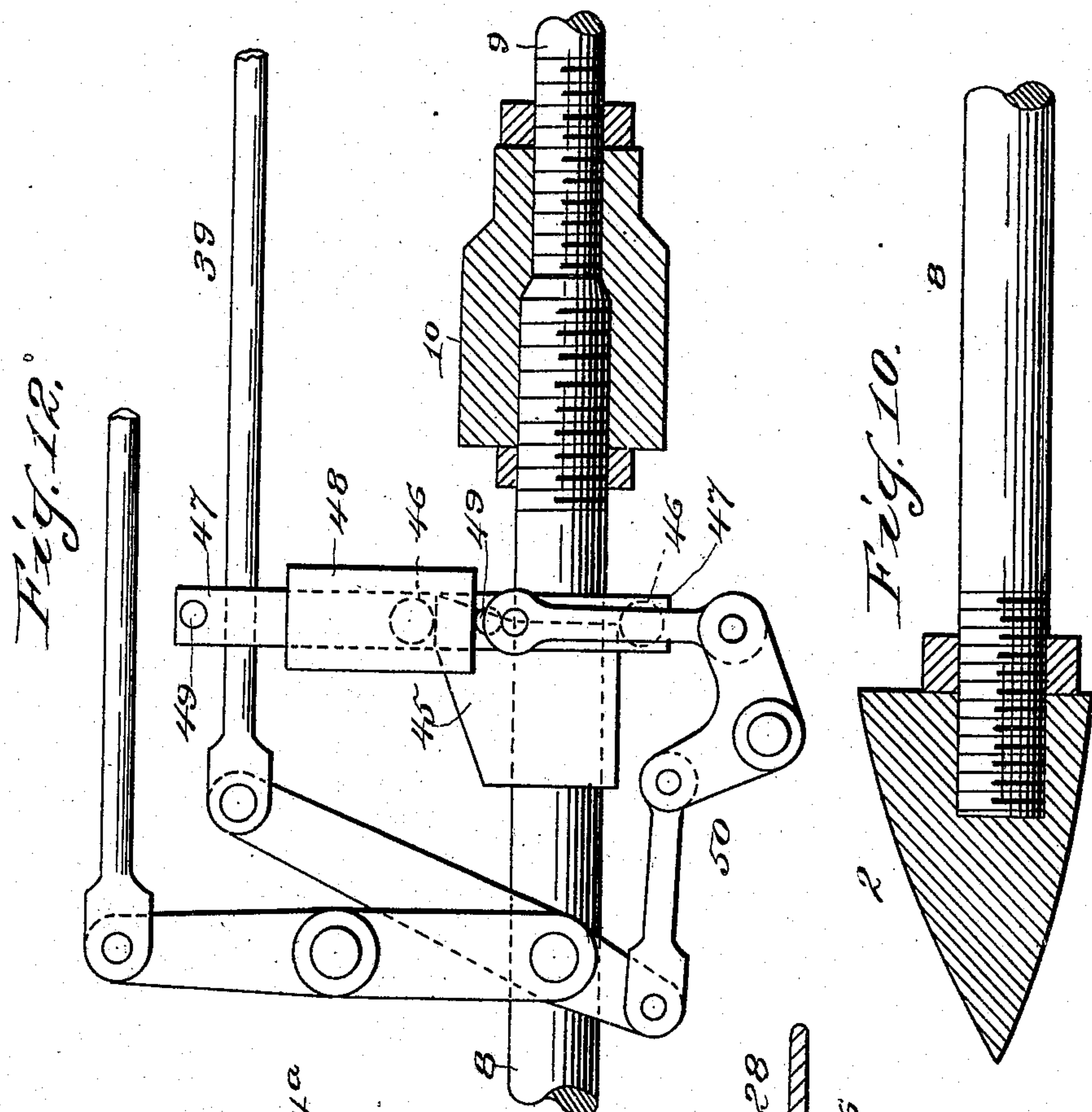
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7 SHEETS—SHEET 5.



Witnesses:

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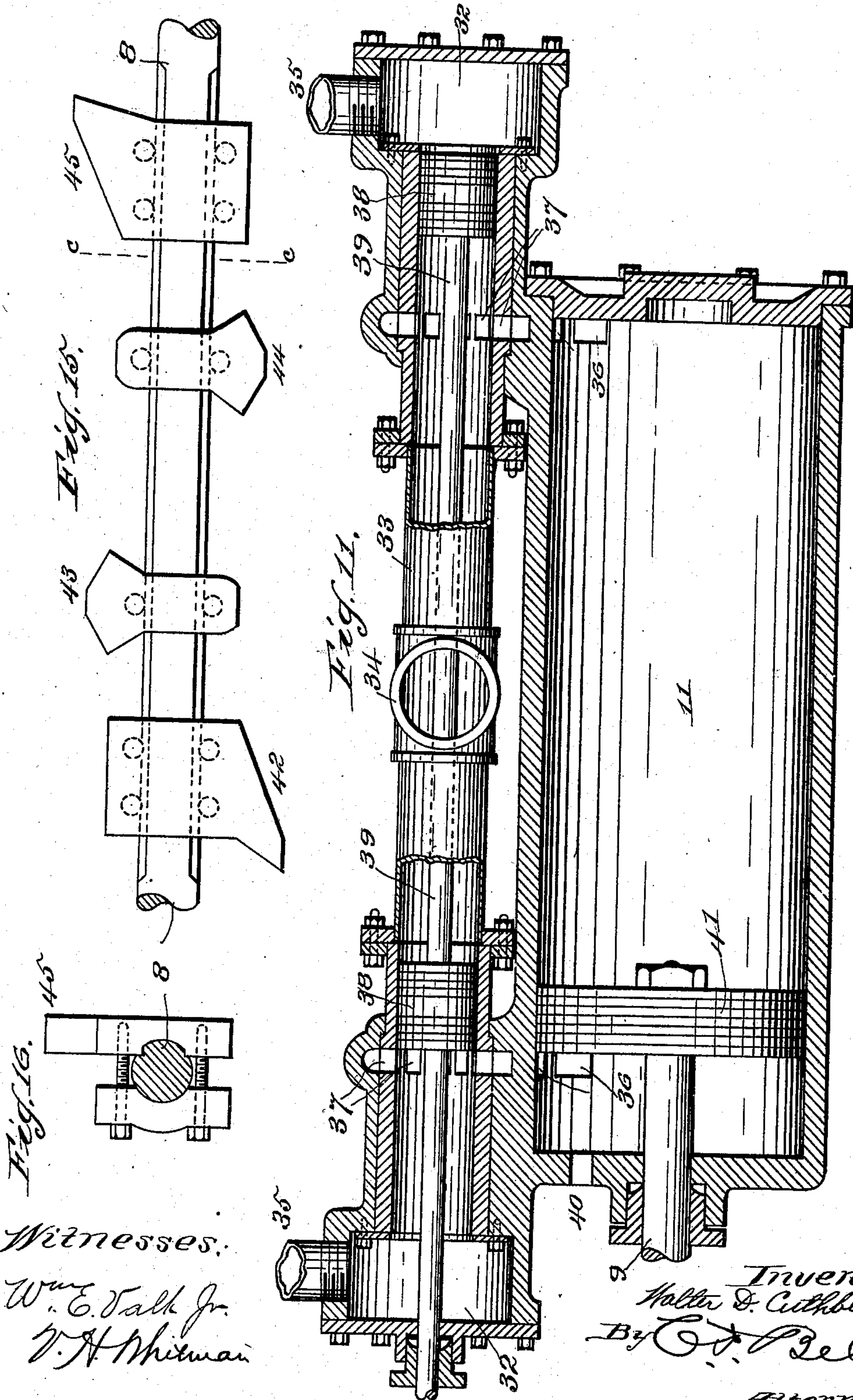
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Patented Apr. 27, 1909.

7 SHEETS—SHEET 6.



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APPLICATION FILED DEC. 17, 1908.

Patented Apr. 27, 1909.
7 SHEETS—SHEET 7.

Fig. 14.

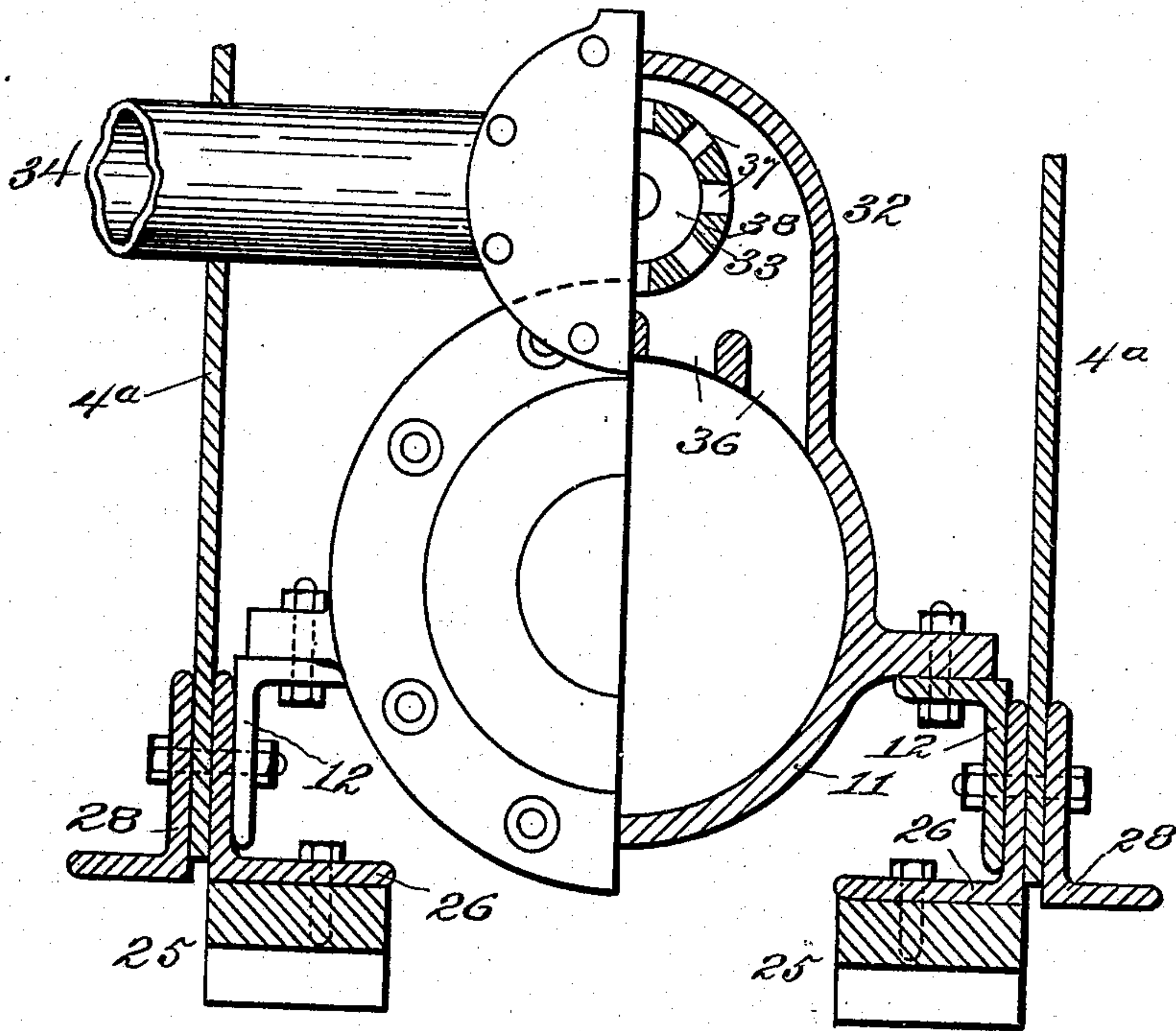


Fig. 17.

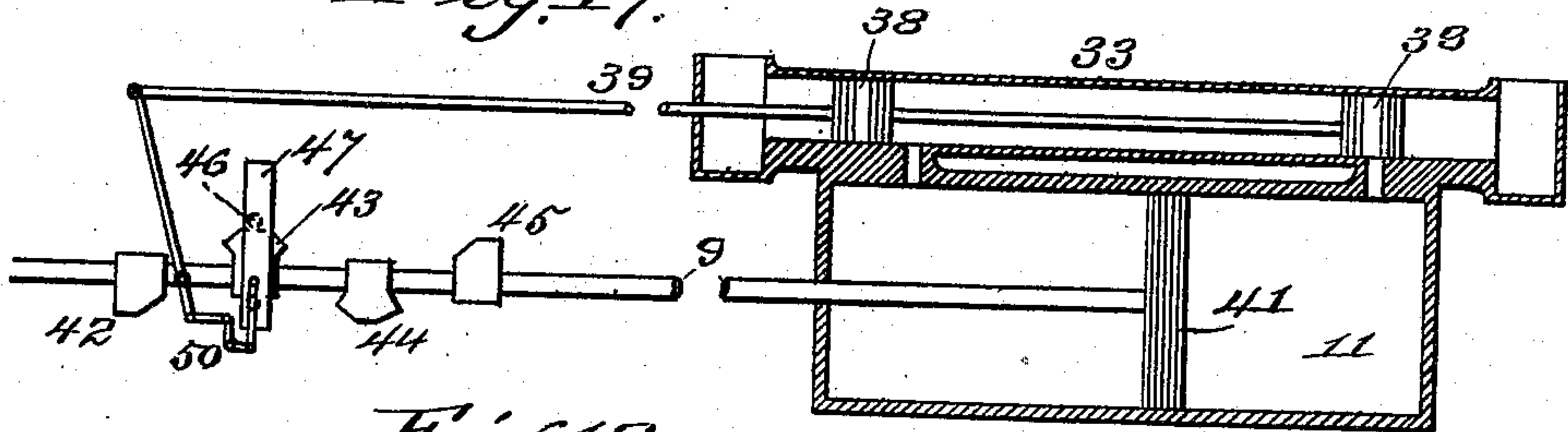
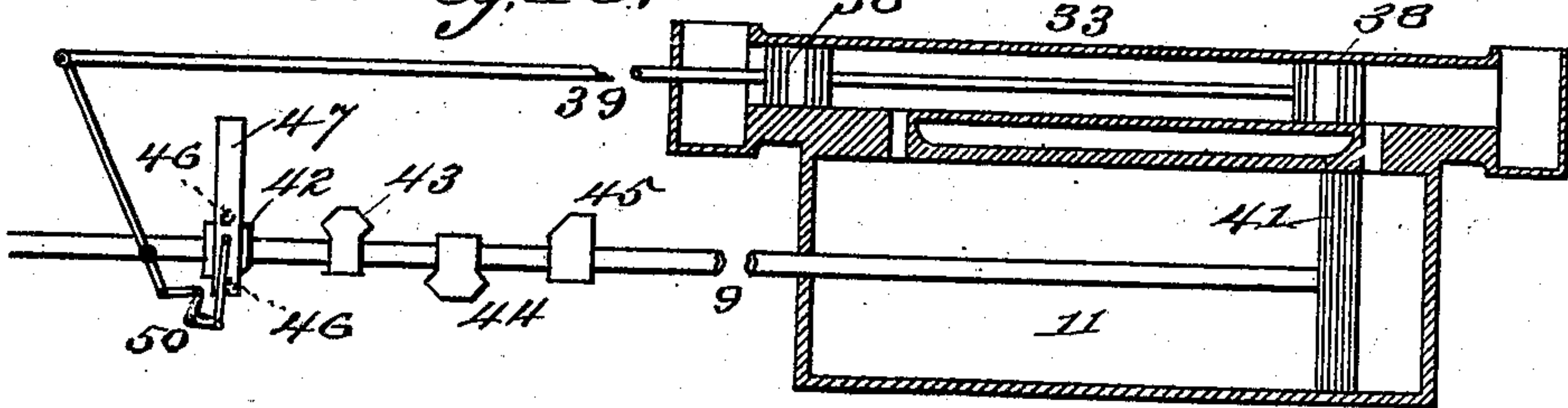


Fig. 18.



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UNITED STATES PATENT OFFICE.

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ROCK-CHISEL MACHINE FOR CHANNEL-EXCAVATION.

No. 920,031.

Specification of Letters Patent.

Patented April 27, 1909.

Application filed December 17, 1908. Serial No. 467,936.

To all whom it may concern:

Be it known that I, WALTER D. CUTHBERT, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented certain new and useful Improvements in Rock-Chisel Machines for Channel-Excavation, of which the following is a specification.

This invention relates to river channeling or excavating, and pertains especially to a machine or apparatus for operating rock-chisels.

The invention is designed to impart to a chisel a reciprocating sliding movement without revolving the chisel, and is therefore not a drill, nor is it capable of a drilling operation, but the purpose of the chisel is to crush, break or cut such stone or rock as may be found in rivers or harbors which is too soft to be effectively blasted and yet too hard or solid to be removed by a scoop or hoisting bucket. The purpose of the chisel is distinguished from the well known drop-chisels operated on the principle of a steam hammer or pile-driver.

The object of the invention is to provide means for operating a rock-chisel at various angles and depths under water for the purpose of cutting and severing rock and stone into such condition as may be found necessary for removal from the water, and to provide means for giving the chisel a slidable reciprocating motion at such angles and depths as the chisel may be placed in for driving it into or through bed-bottom stone or rock.

A further object of the invention is to provide a steam engine for operating a chisel which is connected to the piston-rod of such engine so as to be given every movement of the piston-rod.

A further object of the invention is to provide a special arrangement of inclined planes for controlling the steam chest valves of the engine, and to furnish a peculiar arrangement of levers operated in connection with the inclined planes and a reversing lever.

A still further object of the invention is to provide especial means upon which the chisel engine is mounted and carried with such means to various angles for operating a chisel as occasion may demand.

The object still further of the invention is to provide a hoisting engine specially geared for operating the mechanism which swings the chisel-engine and its carrying means to

various angles in accordance with the angle or position in which it may be desired to drive the chisel.

The object still further of the invention is to provide certain detail construction and arrangement of the several parts of the machine, and to furnish an apparatus by means of which the chisel may be given unusual force and an increased number of strokes per minute.

Other objects, advantages and improved results are attainable by and through the general construction and arrangement of the various mechanisms hereinafter to be described in detail.

In the accompanying drawings forming part of this application: Figure 1 is a side elevation showing, without details, the application of the invention, the dotted lines showing the arc in which the chisel boom may be turned. Fig. 2 is a plan view of what is shown in Fig. 1, showing gears and shafting connections from the hoisting engine to the boom or truck which carries the chisel and driving engine. Fig. 3 is a side elevation of the boom partly broken away and showing the chisel engine in dotted lines. Fig. 4 is a plan view of the boom partly broken away showing the chisel engine thereon. Fig. 5 is an enlarged section on the line *a—b*, Fig. 4, partly broken away. Fig. 6 is a detailed section on the line *b—b*, Fig. 4, showing a pair of roller bearings for the chisel bar. Fig. 7 is a detailed elevation of part of the boom-rack, rack-pinion and boom rollers. Fig. 8 is a detail elevation of part of the top of the boom showing its special construction. Fig. 9 is an end view of the boom showing the chisel-bar in section. Fig. 10 is a detail section of the chisel. Fig. 11 is a longitudinal section of chisel engine. Fig. 12 is a side elevation of the valve levers, showing in section the coupling between the piston and the chisel-bar, and one of the inclined planes secured to said bar. Fig. 13 is an end view of what is shown in Fig. 12, also showing the racks and part of the boom in cross-section. Fig. 14 is a part section and part end elevation of the chisel-engine. Fig. 15 is a detailed elevation of part of the chisel-bar showing various inclined planes thereon. Fig. 16 is a section on the line *c—c*, Fig. 15. Figs. 17 and 18 are sectional elevations showing various positions of the steam-chest valves and their operating levers.

The same reference numerals denote the

same parts throughout the several views of the drawings.

The whole apparatus is shown upon the deck of a dredge or scow 1, but the machine 5 may be anchored or fixed to some other object or in such position as will permit the chisel 2 to cut or be driven into rock or hard earth for severing or crushing the same. The bow of the scow is cut away at 3 to permit the boom 4 to be swung to vertical or other position as desired. The boom comprises four angle-beams 4^a, a top lacing 5, and side plates 5^a, said beams and plates converge at the chisel end of the boom into a square end 10 (Fig. 9) having blocks 6 and bolts 7 for slidably clamping the square end of the chisel-bar 8 in aligned position relative to the piston-rod 9, to which the round end of the bar 8 is connected by a coupling 10. The chisel-engine is fixed in the other or upper end of the boom by securing the cylinder 11 to angle-plates 12 of the boom, so that the engine is carried with and by the boom in every movement of the latter. The boom is hung 25 to swing by means of a shaft 13 extending through I-plates 14 having a connecting base-plate 14^a, which plates 14 are held from sliding by the said shaft and between which plates the boom slides. The boom is arranged to be turned or swung with the plates 30 on the shaft 13 for the purpose of fixing the chisel in operative position at various angles. The boom is swung on the shaft 13 by means of a derrick 13^a, having a guy-rope 15, and 35 hoisting cable 16 operated by a drum 17, which is operated by suitable shafts and gears from a two-cylinder hoisting engine 18, on the deck of the scow. The boom with the chisel and its engine (hereinafter to be described in detail) is reciprocated by the shaft 40 13 having a worm-gear 19 keyed thereto and meshing with a worm 20 on a shaft 21 which is driven from the hoisting engine. The shaft 21 and the hoisting engine shaft 22 are 45 connected by gears 23, one of which is slidably secured to its shaft so as to disengage the other and thereby disconnect the hoisting drum during the driving operation of the chisel. The shaft 13 has keyed to it a pair 50 of pinions 24, which engage racks 25, suitably secured to or hung from the inner sides of the boom by hanger-plates 26. A pair of track rollers 27 are loosely mounted on the shaft 13 adjacent the pinions 24 and engage 55 a boom track formed by angle-plates 28 secured to the outer side of the boom-sides 4^a. A series of smaller track rollers 29 are mounted on the inner side of the I-plates 14, and engage the plates 28. Guide-rollers 30 for the chisel-bar are positioned central of the boom in pairs, the rollers of each pair being 60 journaled at an angle to each other (Fig. 6) by means of forked journal blocks 31, bolted to the boom. It is obvious that the boom 65 and the elements carried by it may be slid

back and forth according to the revolution of the shaft 13 which revolves the pinions in mesh with the racks, for the purpose of fixing the boom at various depths desired for operating the chisel.

The engine for operating the chisel has a steam chest 32 on each end of the cylinder 11, such chests being connected by a pipe 33, having an exhaust pipe 34, and each chest is supplied with steam by flexible pipes 35. 75 Steam ports 36 of the cylinder are connected with similar ports 37 of the steam chests, and the chest-valves 38 are operated by a valve-rod 39. One end of the cylinder is provided with a hole 40, for a (standard) check- 80 valve, and this end of the cylinder has an excessive amount of clearance to allow steam in this end of the cylinder to compress and stop the piston 41 and arrest the movement of the chisel, and thereby stop the 85 piston and the chisel gradually. The point of steam admission may be changed or varied by adjusting one or more of four inclined planes on the chisel-bar or piston-rod 90 so as to admit steam into the cylinder after the piston has passed the port in this end of the cylinder, and thereby move the cylinder back and forth until it uncovers the said port. The four inclined planes 42, 43, 44 95 and 45 are engaged by rollers 46 mounted on a bar 47 slidable in a bracket 48, fixed to the boom, and the slidable movement of said bar is limited by stop-pins 49 on said bar which is operated by the chain of valve 100 levers 50, said levers having a reversing-rod 51 connected therewith. It is obvious that by adjusting the inclined planes on the chisel-bar or piston-rod, different cut-offs 105 may be made, and by removing the intermediate planes 43 and 44, steam will be admitted throughout the entire stroke of the piston. An exemplification of the relative 110 varying positions of the check-valves, and the piston and the valve levers is shown in Figs. 17 and 18.

It will be observed that in the event of the chisel missing a rock or stone the impact is counteracted by and expansive use of the steam in the clearance end of the cylinder controlled by the intermediate planes 43 and 115 44. In the event of the chisel striking a rock or other substance without passing through it and thus stop the piston in the center of its stroke, the expansive valve will close the nearest port thereto (if set for an 120 early cut off) and the port in the other end of the cylinder will be opened to exhaust, the reversing rod may then be operated to force the piston to its starting point.

In operation, the boom is swung by means 125 of the hoisting engine, derrick and guy-ropes, to such angle or position as may be desired, the hoisting engine is connected with the boom sliding mechanism by means of the slidable gears so as to slide the boom and 130

all the elements carried by it to such depth as may be desired, the hoisting engine is then disconnected which leaves the boom fixed in said swung and depth positions, then the
5 chisel engine is operated to drive the chisel in quick reciprocative motion.

It will be understood that the dredge may be moved in the usual manner of dredging during the aforesaid operations, that the
10 swinging of the boom may be accomplished at intervals as occasion may demand during said operations, that the boom may be raised and swung back upon the deck of the dredge for inspection and repair or for changing or
15 renewing the chisel, and it will be seen that the whole apparatus is one of compactness, durability and great power in giving the chisel such force that one blow thereof will, in ordinary cases, suffice to split, break or
20 crush a rock into condition to be removed by a grapple, scoop or bucket in the usual way.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a rock chiseling machine, a reciprocating non-rotatable chisel, a swinging boom or beam in and from which the chisel is operated, means carried by the boom for reciprocating the chisel without moving the boom, and means for swinging the boom.

2. In a rock chiseling machine, a reciprocating non-rotatable chisel, a swinging and sliding boom in and from which the chisel is
35 operated, means carried by the boom for operating the chisel, means carried by the boom for sliding it, and means for swinging the boom.

3. In a rock chiseling machine, a reciprocating non-rotatable chisel, a pivot boom in and from which the chisel is reciprocated, means for swinging the boom so as to place the chisel from vertical to various angles, means detachably connected with the swinging force for sliding the boom independent of the reciprocating movement of the chisel.

4. In a rock chiseling machine, a swingable slidable boom, a non-rotatable chisel carried by the boom, a shaft extending across the boom upon which the latter is pivoted, means connecting the shaft with the boom to slide it, and means to reciprocate the chisel independent of the swinging and sliding movements of the boom.

5. In a rock chiseling machine, a swingable slidable boom, a non-rotatable chisel slidably mounted on the boom, a shaft upon which the boom is pivoted, means for swinging the boom, mechanism operated by the
60 shaft for sliding the boom independent of the swinging movement, and an engine mounted on the boom for reciprocating the chisel independent of the movements of the boom.

6. In a rock chiseling machine, a driven

shaft, a boom pivoted on the shaft, mechanism connecting the shaft with the boom to slide it, a non-rotatable chisel carried by the boom, and an engine mounted on the boom to reciprocate the chisel independent of the
70 movement of the boom.

7. In a rock chiseling machine, a boom pivoted to swing and to slide, a reciprocating chisel carried by the boom, means for swinging the boom, mechanism for sliding the
75 boom, an engine for operating the swinging means and slidable mechanism, and an engine carried by the boom for reciprocating the chisel independent of the movements of the chisel.

8. In a rock chiseling machine, a reciprocating non-rotatable chisel, a boom carrying the chisel and adapted to swing and to slide independent of the reciprocation of the chisel, a shaft upon which the boom is pivoted, pinions secured to the shaft, rack-bars attached to the boom and engaged by the pinions to slide the boom, and means for driving the shaft.

9. In a rock chiseling machine, a swinging boom, slide plates through which the boom is slid, a shaft working through the plates to hold them from sliding but permitting them to turn thereon with the boom, means for swinging the boom, mechanism to convert a
95 rotating movement of the shaft to a sliding movement of the boom, and means for revolving the shaft.

10. In a rock chiseling machine, a boom, a chisel slidable on the boom, a shaft having fixed journals, I-plates at the sides of the boom through which the latter slides and through which the shaft extends for pivoting the boom and the plates, mechanism connecting the shaft and the boom for sliding
105 the latter, an engine carried by the boom to slide the chisel independent of the sliding of the boom, and means for rotating the said shaft.

11. In a rock chiseling machine, the combination with a slidable chisel, of a boom having guide-rollers for the chisel-bar and converging into a centralizing end for said bar, adjustable blocks within said end for slidably clamping the bar, and an engine
115 carried in the other end of the boom for operating the chisel.

12. In a rock chiseling machine, the combination with a slidable boom, a chisel carried by the boom and slidable thereon independent thereof, and mechanism for sliding the boom, of an engine having its cylinder secured to and between the sides of the boom and slidable with the latter, and its piston rod coupled to the chisel-bar for reciprocating the chisel independent of the movement of the boom.

13. In a rock chiseling engine, the combination with a slidable boom, a chisel slidable with and adapted to be reciprocated in the
130

boom, mechanism for sliding the boom, and an engine carried by the boom and having its piston-rod coupled with the chisel for reciprocating it.

- 5 14. In a rock chiseling machine, the combination with a swinging and sliding boom, means for swinging the boom, and a chisel slidable with the boom and adapted to be reciprocated in the boom independent of the
- 10 sliding movement of the boom, of a driven shaft upon which the boom is pivoted to swing, a pair of racks carried by the boom, a pair of pinions secured to the shaft and meshing with the rack to slide the boom, a pair of
- 15 I-plates through which the shaft extends and between which the boom is slid, and an engine mounted in the boom and having its piston coupled with the chisel to reciprocate it.
- 20 15. The combination with a boom having racks, and a driven shaft having pinions meshing with the racks to slide the boom, of a pair of plates pivoted upon the shaft and forming guides in the sliding of the boom therebetween, of a pair of rollers loosely
- 25 mounted on the shaft between the pinions and the said plates and working against tracks projecting from the boom, and a series of rollers mounted on the said plates for the travel of the boom.
- 30 16. The combination with a boom, a chisel reciprocated in the boom, an engine mounted in the boom for operating the chisel, a hoisting engine, and a shaft upon which the boom

is mounted to swing, of the shafts and gearing connecting the said shaft with the hoisting engine to swing the boom, and mechanism connecting the said shaft with the boom for sliding it. 35

17. The combination with an engine for operating a rock chisel having a series of inclined planes adjustable on the chisel bar which is coupled to the piston-rod of the engine, and the steam chest valves of the engine having a valve rod, of the slidable bar having limiting pins, a pair of rollers on the bar to engage the inclined planes, a series of valve levers connecting said bar with the valve-rod, and a reversing lever connecting the levers and the rod. 40 45

18. The combination with a boom, and the engine mounted thereon, of a bracket fixed to the boom adjacent the piston rod of the engine, a bar slidable in the bracket and having limiting pins, and a pair of rollers on the bar, of a series of levers connecting the valve rod of the engine with the said bar, and a series of inclined planes adjustable on the piston rod and adapted to engage the said rollers for varying the stroke of the engine. 50 55

In witness whereof I hereunto set my hand in the presence of two witnesses. 60

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