No. 868,565. PATENTED OCT. 15, 1907.

C. A. HUFFMASTER.

PIPE LAYING MACHINE.

APPLICATION FILED SEPT. 15, 1904.

4 SHEETS—SHEET 1.

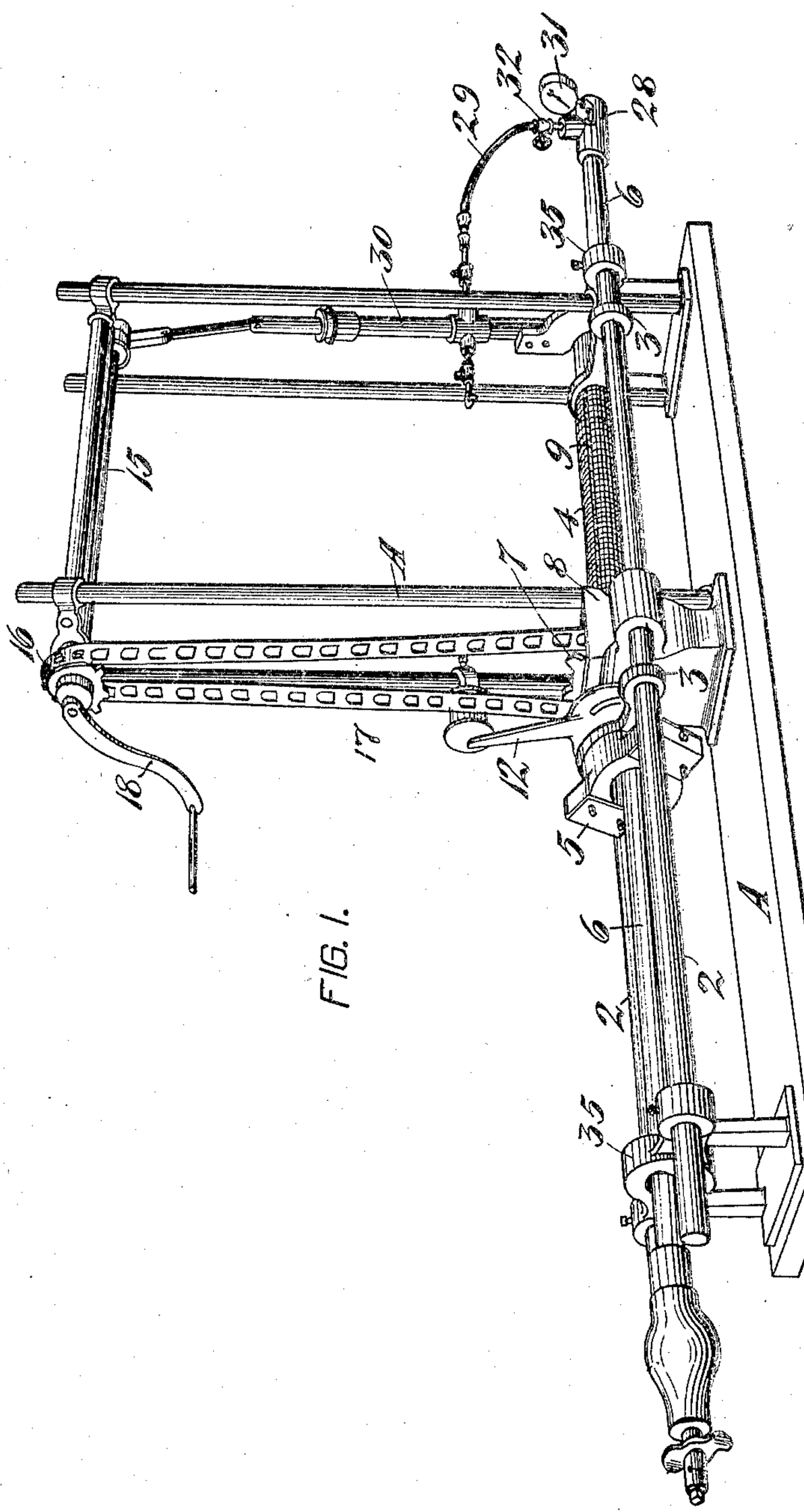

FIG. 1.

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By Geo. H. Strong Atty

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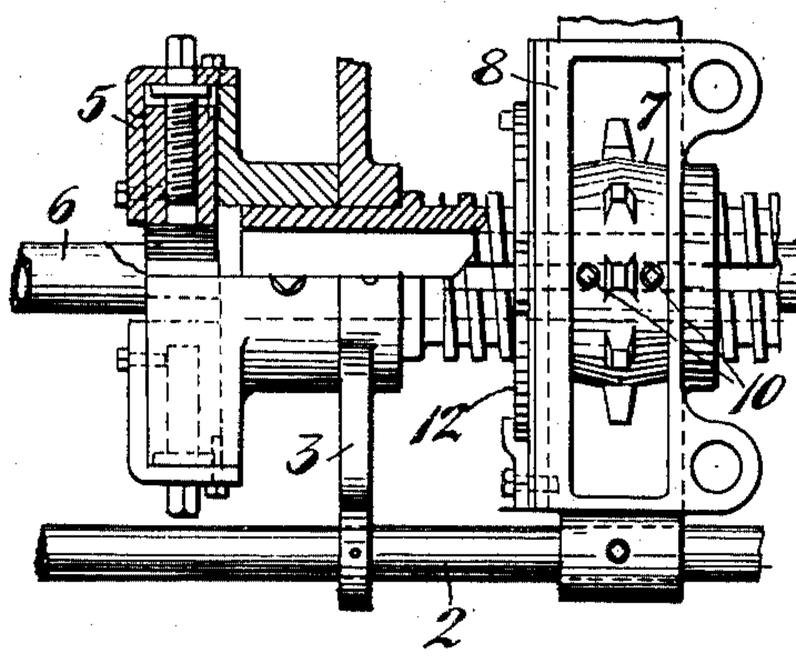


FIG. 3.

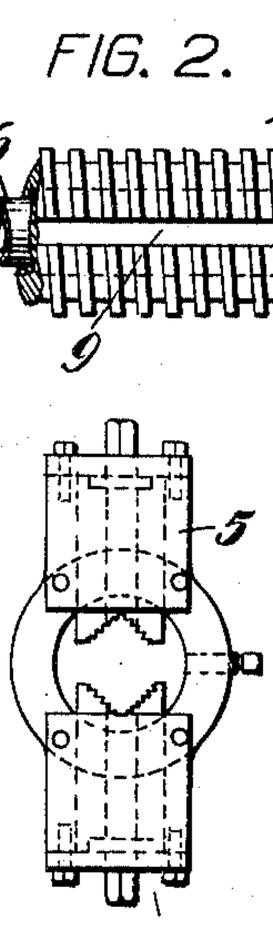


FIG. 2.

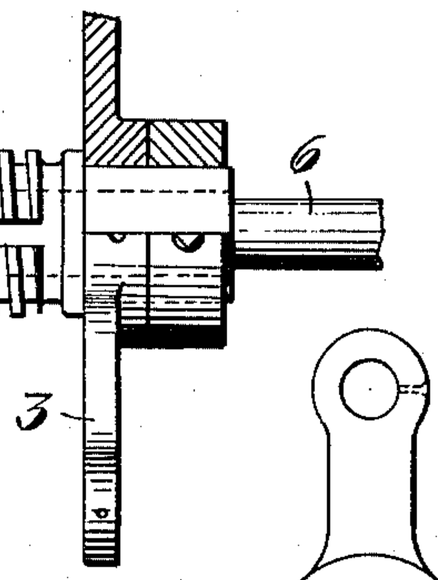


FIG. 4.

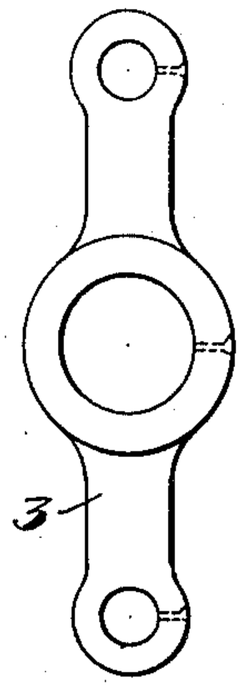


FIG. 5.

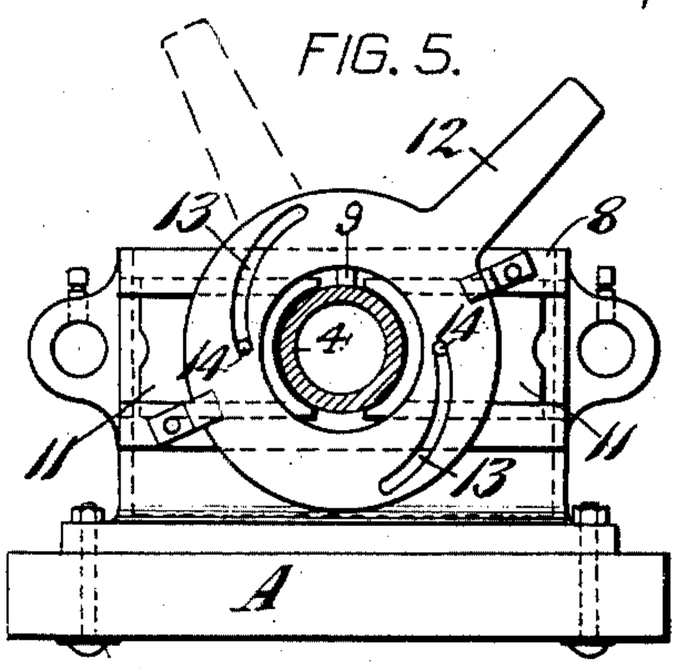


FIG. 6.

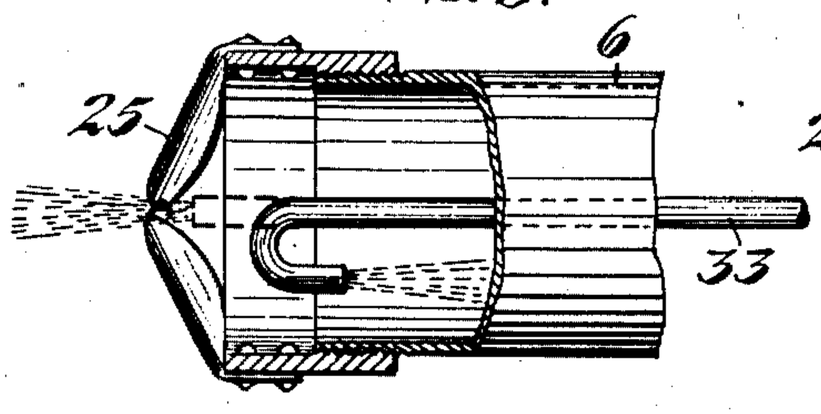


FIG. 7.

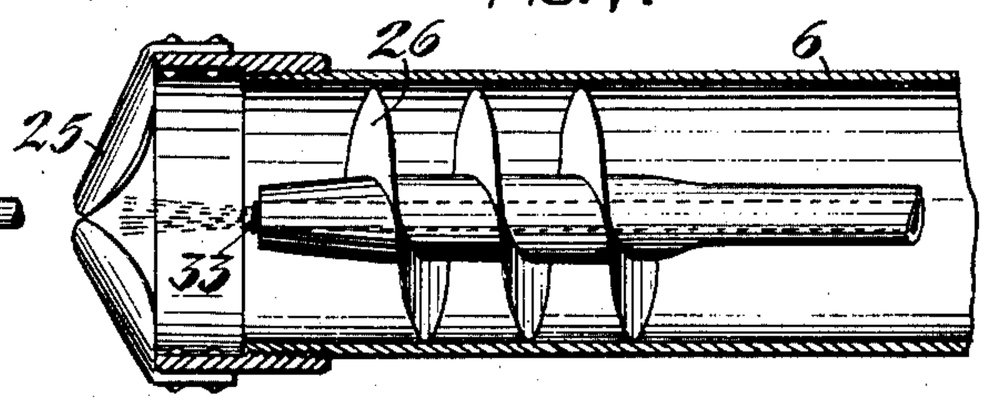
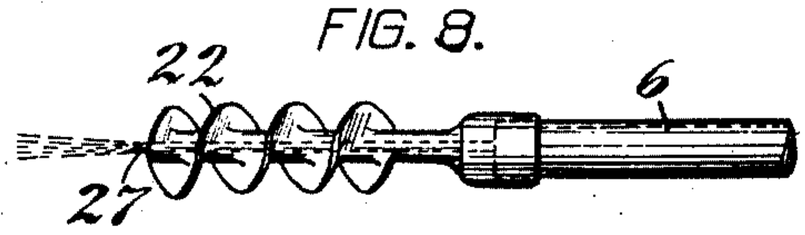


FIG. 8.



WITNESSES,
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4 SHEETS—SHEET 3.

Fig. 11.

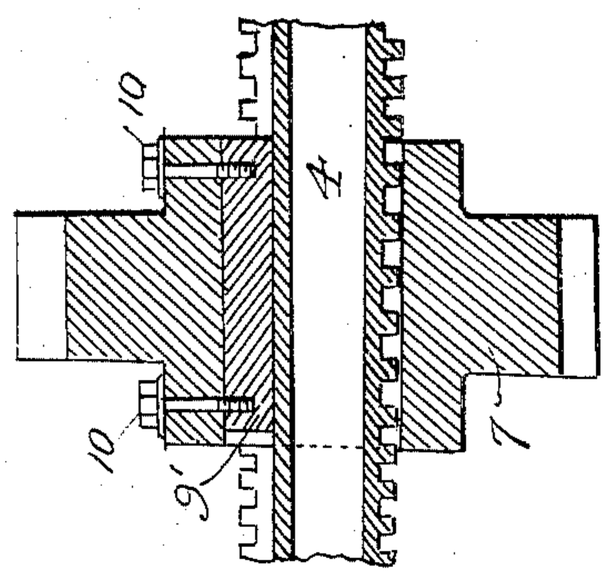
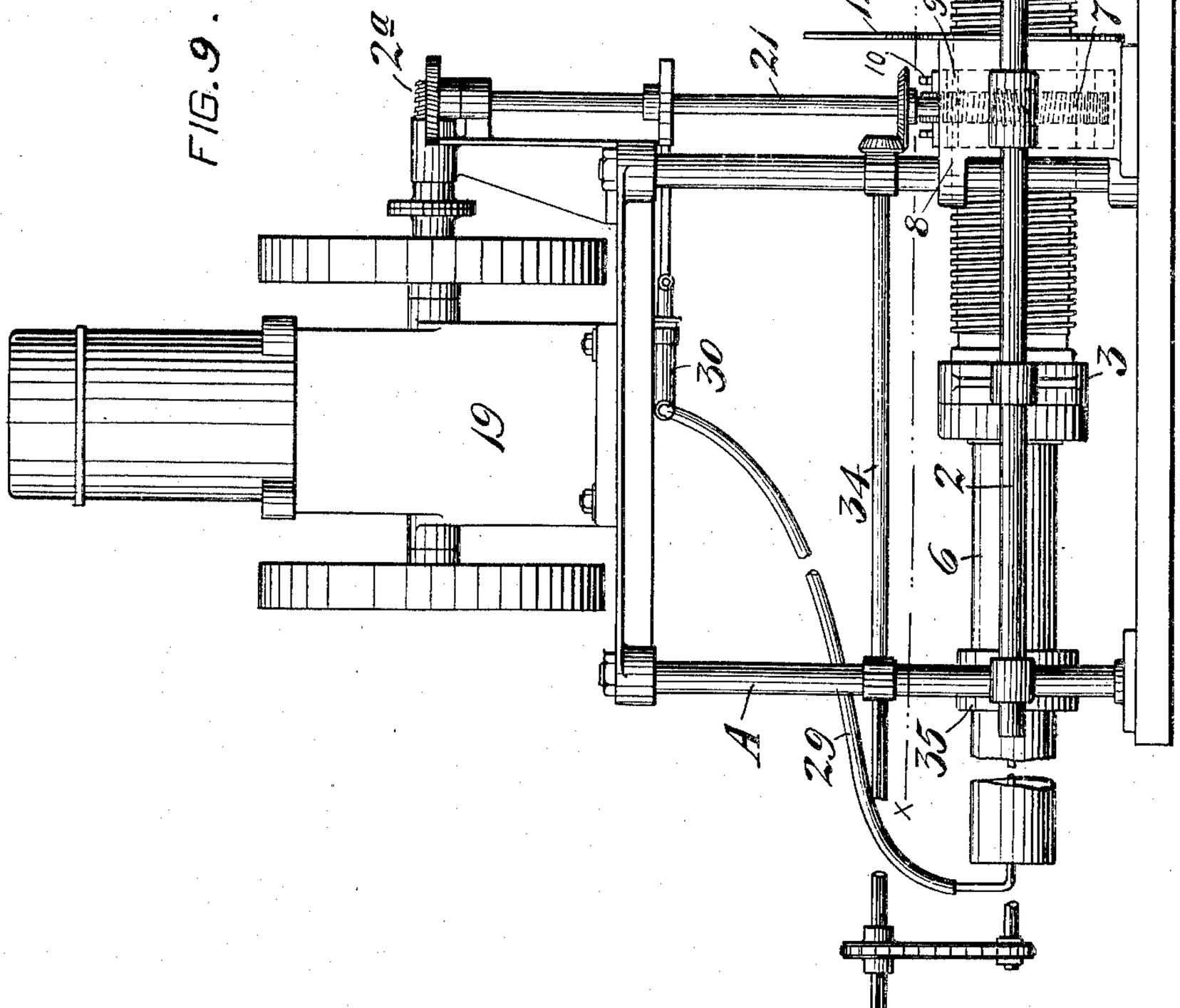


FIG. 9.



WITNESSES,
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4 SHEETS—SHEET 4.

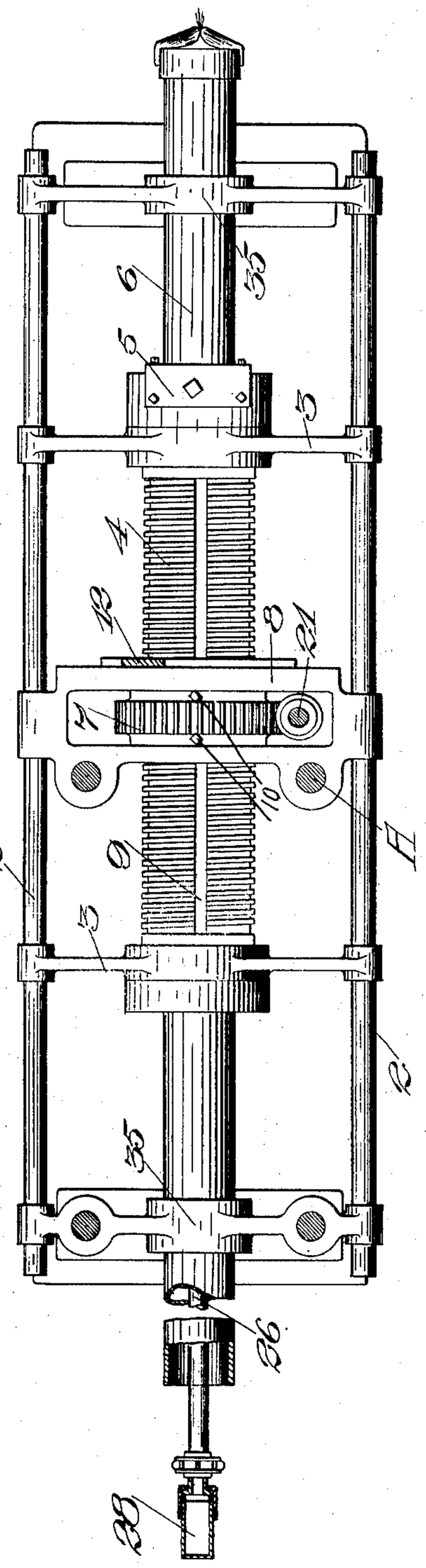

Fig. 1.

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J. L. Stowe

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By Geo. H. Strong. Atty.

UNITED STATES PATENT OFFICE.

CHARLES A. HUFFMASTER, OF SAN LEANDRO, CALIFORNIA.

PIPE-LAYING MACHINE.

No. 868,565. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed September 15, 1904. Serial No. 224,552.

To all whom it may concern:

Be it known that I, CHARLES A. HUFFMASTER, a citizen of the United States, residing at San Leandro, in the county of Alameda and State of California, have invented new and useful Improvements in Pipe-Laying Machines, of which the following is a specification.

My invention relates to an apparatus for running pipe underground.

It is usual in laying gas and water pipes and the like to dig a trench, lay the pipe and then fill the trench in again. In cities this practice leads to a familiar but unsightly and unsafe condition of torn up streets and of scarred uneven pavements showing where pipes have been previously laid.

The design of my invention is to provide a convenient, practical and portable means by which pipe of any size up to six or eight inches or possibly larger, may be laid horizontally at any desired depth underground, without the need of cutting long trenches, or otherwise disturbing the surface of the street or roadway further than to make such excavations at intervals as are necessary to receive the apparatus and insert the sections of pipe.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a perspective view of my invention. Fig. 2 is a plan view of chuck and screw. Fig. 3 is an end view of chuck. Fig. 4 is an end view of cross-head. Fig. 5 is an elevation of the clutch for engaging the screw, with the latter shown in section and engaged by the clutch members. Fig. 6, is a sectional view of the front end of the boring tool. Figs. 7 and 8, represent boring tools of modified form. Fig. 9 is a side elevation of a power driven machine. Fig. 10 is a horizontal sectional view on the line *x*—*x* of Fig. 9. Fig. 11 is a vertical sectional view of the wheel 7 and a portion of the screw.

A represents a suitable portable frame supporting the boring and driving mechanisms and capable of being introduced into and operated in a comparatively narrow space.

Fixed to and carried by the frame are two longitudinal parallel tracks or guides 2 on which the cross-heads 3, forming a carriage for the hollow or tubular screw 4, are reciprocal. The screw is journaled at its ends in these cross-heads whereby it may have a rotary movement in addition to its longitudinal movement on the tracks or guides 2. The forward end of the screw is provided with a chuck 5 shown in detail in Figs. 2 and 3 and adapted to grip a drill rod or pipe section as 6 acting as a drill rod.

7 is a sprocket wheel concentric with the screw and journaled in a part 8 stationary on the frame and intermediate of the ends of the guides 2. The screw has a longitudinal peripheral groove 9 in which a key 9′ carried by the sprocket engages, and which key is secured by suitable means as the set bolts 10. By means of the key engaging the groove 9 the screw is made to rotate in unison with the sprocket at the same time leaving the screw to have a free sliding longitudinal movement through the sprocket. The reciprocation of the screw in boring is effected on its rotation by means of suitable parts on the frame engageable and disengageable at will with the threads of the screw.

I have shown Fig. 5 a chuck comprising two plates 11 slidable in suitable guides at right angles to the axis of the screw and adapted when moved inward to engage the threads of the screw and when moved outward to release the screw. The reciprocation of the plates 11 is effected by a lever 12 fulcrumed coaxially with the screw and having the eccentric slots 13 engaging pins 14 in the respective plates. An oscillation of the lever in one direction closes the clutch to make the screw reciprocate consistent with its rotary movement as in boring; an oscillation of the lever in the opposite direction opens the clutch to free the screw and allow it to slide through the sprocket as where it is desired to quickly retract the screw and its carriage in order to take a fresh hold on the drill rod or pipe, or to receive a new section of pipe as will be more fully explained later.

Any suitable means may be employed to rotate the screw. In Fig. 1 is shown a means for operating it manually and in Fig. 9 is shown a power-driven machine. In the first instance a shaft 15 suitably journaled on the frame carries a sprocket 16 over which passes a chain 17 to sprocket 7. A hand crank 18 serves to rotate shaft 15.

In Fig. 9 a motor 19 of suitable construction is mounted directly on the frame; its shaft carries a suitable worm 2^a engaging a corresponding gear on shaft 21. The latter has a worm at the other end to engage a corresponding gear 7′ which latter engages the screw in a manner similar to sprocket 7. In this power-machine of Figs. 9 and 10 the same clutch mechanism shown in detail in Fig. 5 is employed. By moving the gripping members 11 to engage the threads of the screw, the latter is advanced in unison with the rotative motion of the drive-member; moving the plates outward to release the screw, permits the latter to be moved lengthwise independent of the driver 7, all in a manner as described, in connection with Fig. 1. Likewise the pipe gripping device 5 is the same as that shown in Fig. 3 and used on the machine of Fig. 1. In fact the two machines are alike in principle and mode of operation, except that one is operated by a chain and sprocket and the other by a worm gear.

In practice an excavation is made large enough to receive the machine and leave room for its operation and for sections of pipe to be passed lengthwise through the screw. Either separate drill rod sections or sec-

tions of the pipe to be laid may be passed successively through the hollow of the screw, united to the section immediately in advance, clamped in the chuck and driven forward; the foremost section being provided with a suitable bit or auger. In most cases it is preferred to bore the hole and lay the pipe simultaneously, forcing the pipe forward as the boring proceeds. In such cases the pipe sections themselves constitute the drill rod.

Where small pipes say up to an inch and a half or two inches in diameter are to be laid I may employ an auger as 22 attached directly to a pipe section and the pipe forced forward and laid section after section as the boring proceeds. For still larger pipe I may use a boring tool 25 as shown in Fig. 7 in which the loosened earth is taken into pipe 6 and withdrawn therefrom by suitable means as the screw conveyer 26. When the boring has proceeded a screw length, the lever 12 is operated to release the screw, the chuck 5 is opened to ungrip the pipe and the screw is pushed or pulled back to bring its forward end close. to the sprocket 7. The chuck 5 may then be closed on the pipe, the plates 11 reëngaged with the screw and the boring and pipe laying may again proceed a screw length or until a new section of pipe has to be added.

With whatever form of boring tool or bit used, it is designed that water be fed to the bit as the boring advances. Accordingly the auger 22 which screws directly on to the end of the pipe is channeled as at 27 so that water may pass through and serve to soften the earth about the tool and make the sides of the hole slippery whereby the pipe may easily follow after.

Water under pressure may be delivered into the pipe and to the bits by the following means: The outer end of the last section of pipe 6 carries a swiveled union 28 having a flexible connection 29 with a suitable force pump 30 operated in unison with the screw feed. The pump may be operated from shaft 15 by a crank and pitman as shown in Fig. 1, or from shaft 21 by an eccentric and connecting rod, as in Fig. 9. The pump is connected with a suitable source of water supply and its object is to deliver water to the drill to soften the ground; and in some instances to maintain an internal pressure in the pipe operating as a drill rod to help to hold the pipe stiff and keep it from possibly buckling; and again in other instances to permit of the pipe being tested when laid. For this latter purpose, preferably a gage 31 is connected with the union 28 and the flow of fluid to the gage and to the interior of the pipe controlled by a cock 32. By removing the bit or auger on the end of the pipe, capping the end of the latter and opening the chuck plates 11, the pump may be operated without moving the pipe. When a sufficient pressure is indicated by the gage 31, the pump may be stopped and the cock turned off. If the register of the gage is maintained the joints of the pipe are tight and well made. If the gage runs down it indicates a leak which may be corrected before laying the pipe or forcing it further forward. Or in lieu of the force pump and water-gage, a steam gage connected with a steam or air pressure may be used as an indicator for testing.

The boring device 25 of Fig. 6 has inwardly operating cutting edges, and a pipe 33 may be arranged to direct a jet of water either outward ahead of the cutting edges as indicated by dotted lines, or backward to flush out the casing. This water pipe may be either in conjunction with the screw 26 as in Fig. 7 or independent of it. In the former case the shaft of the conveyer may be hollow and the pipe 33 inserted throuoh this shaft. Where a conveyer as 26 is used suitable means to operate it is provided as the connections 34 with shaft 21.

35 are suitable guides and supports for the pipe at the ends of the frame.

The distance to which a hole may be advanced without changing the position of the machine depends on the character of the formation, the size of the hole to be bored or the pipe to be laid and on the power of the machine. It may be necessary every hundred feet more or less, to make a new excavation in the line to be followed, for the machine. When the boring has proceeded as far as it is practicable from one point, an excavation is made to intercept the boring tool, the latter attached, the joints of the section of pipe last laid tested in the manner explained, and the necessary connections made if this happens to be the end of the line; or if the line is continued the machine is brought up and set in this new excavation and the boring and the forcing of the pipe forward into permanent position proceeds as before described.

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

1. A pipe laying machine having in combination a suitable support, a carriage adapted to reciprocate thereon, a hollow, longitudinally-grooved screw rotatably mounted on the carriage, gripping elements carried by the front end of the screw, a drill rod supported concentrically within the screw, said elements adapted to grip said rod whereby the rod and screw are turnable in unison, and means to rotate the screw, said means including a rotatable member provided with a fixed key engaging the groove in the screw whereby the latter may have a free longitudinal movement relative to said rotatable member.

2. A pipe laying machine comprising in combination a suitable support, a carriage reciprocal on said support, a hollow screw rotatably mounted on said carriage, a drill rod supported concentrically within the screw, means on the latter to grip the drill rod, means to rotate the screw, said screw having a peripheral slot, a key carried by the rotative means engaging said slot and movable clamp members carried by the support engageable with the threads of the screw.

3. In a pipe laying machine, the combination of a suitable support, a carriage reciprocal thereon, a hollow, longitudinally-slidable, rotatively-mounted screw, a chuck concentric with the screw, said chuck having jaws slidably mounted in guides therein at right angles to the axis of the screw and adapted to engage the threads of the latter, and a gripping device fixed to the front end of the screw and having jaws to grip the drill rod.

4. In a pipe laying machine, the combination with a pipe to be laid of a hollow longitudinally grooved screw for advancing the pipe, guides arranged parallel with the screw and said screw slidably supported on said guides, a gripping device carried by the screw and operable to grip the pipe when the latter is inserted into the screw, a rotary drive member encircling the screw and having a key to engage the longitudinal groove in the screw, said drive member mounted on a support which is stationary with relation to the screw, means to revolve said drive member, and means engageable and disengageable with the threads on the screw to cause the screw to advance on the rotation of the drive member.

5. In a pipe laying machine, the combination with a pipe to be laid of a hollow longitudinally grooved screw for advancing the pipe, guides arranged parallel with the screw

and said screw slidably supported on said guides, a gripping device carried by the screw and operable to grip the pipe when the latter is inserted into the screw, a rotary drive member encircling the screw and having a key to engage the longitudinal groove in the screw, said drive member mounted on a support which is stationary with relation to the screw, and sliding plates movable into and out of engagement with the threads on the screw to cause the latter to move lengthwise in unison with the rotative movement of said drive-member, or to permit said screw to be moved lengthwise independent of said drive-member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES A. HUFFMASTER.

Witnesses:
D. B. RICHARDS,
J. J. SCRIVNER.