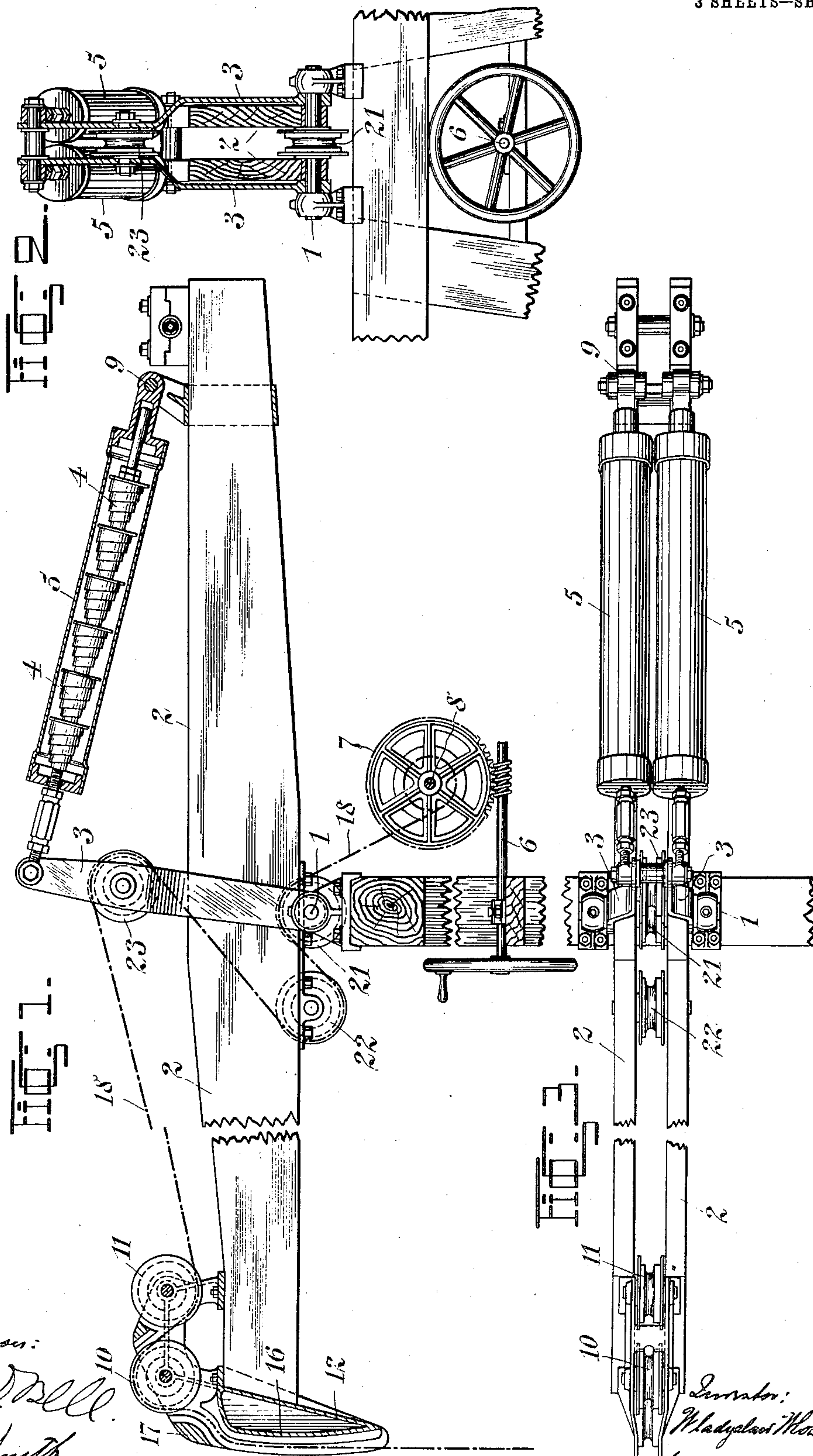


No. 812,541.

PATENTED FEB. 13, 1906.

W. WLODARCZYK.
DEEP BORING APPARATUS.
APPLICATION FILED MAY 22, 1905.

3 SHEETS—SHEET 1.



Witness:
Wm. D. Bell
B. Smith

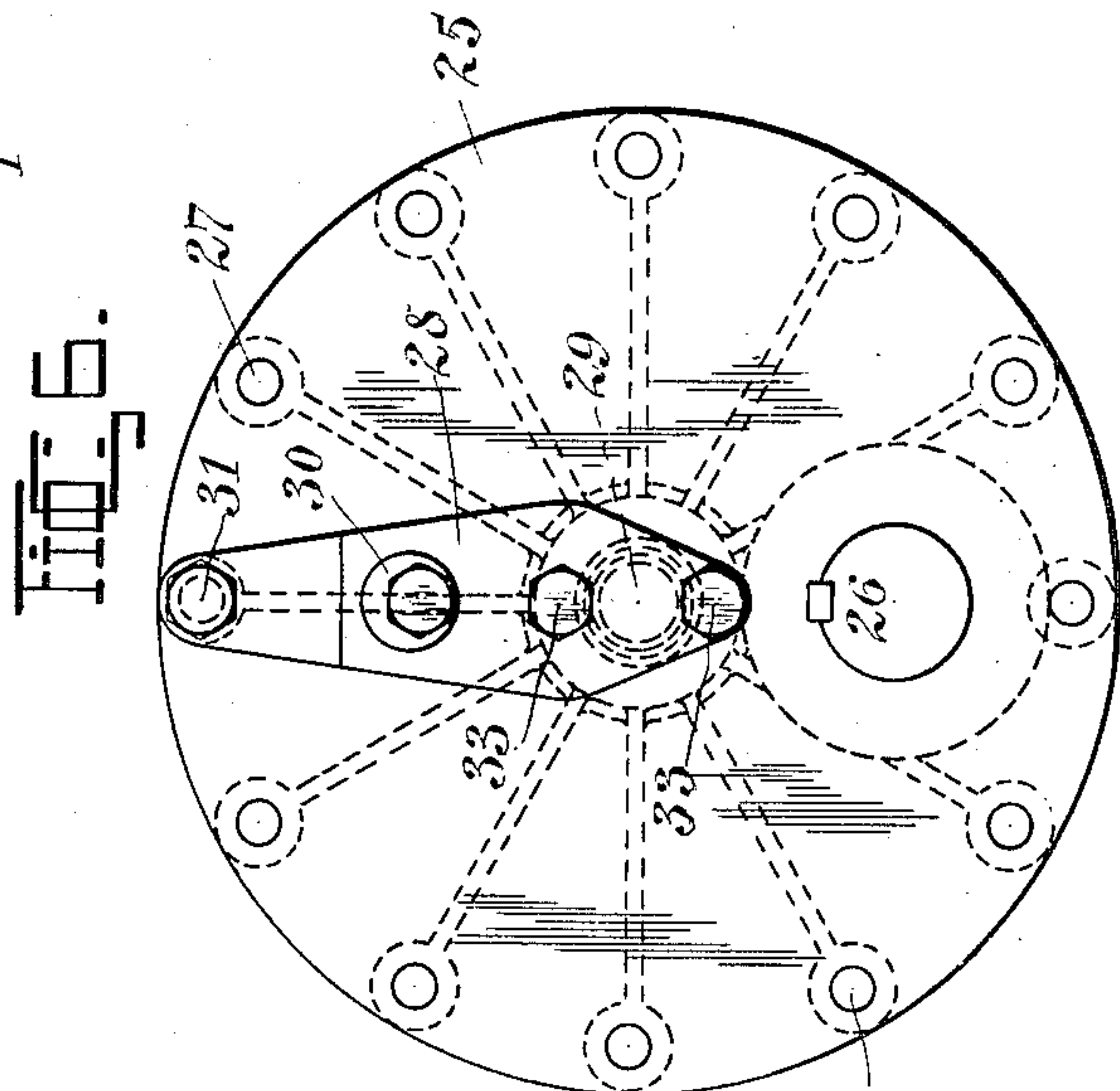
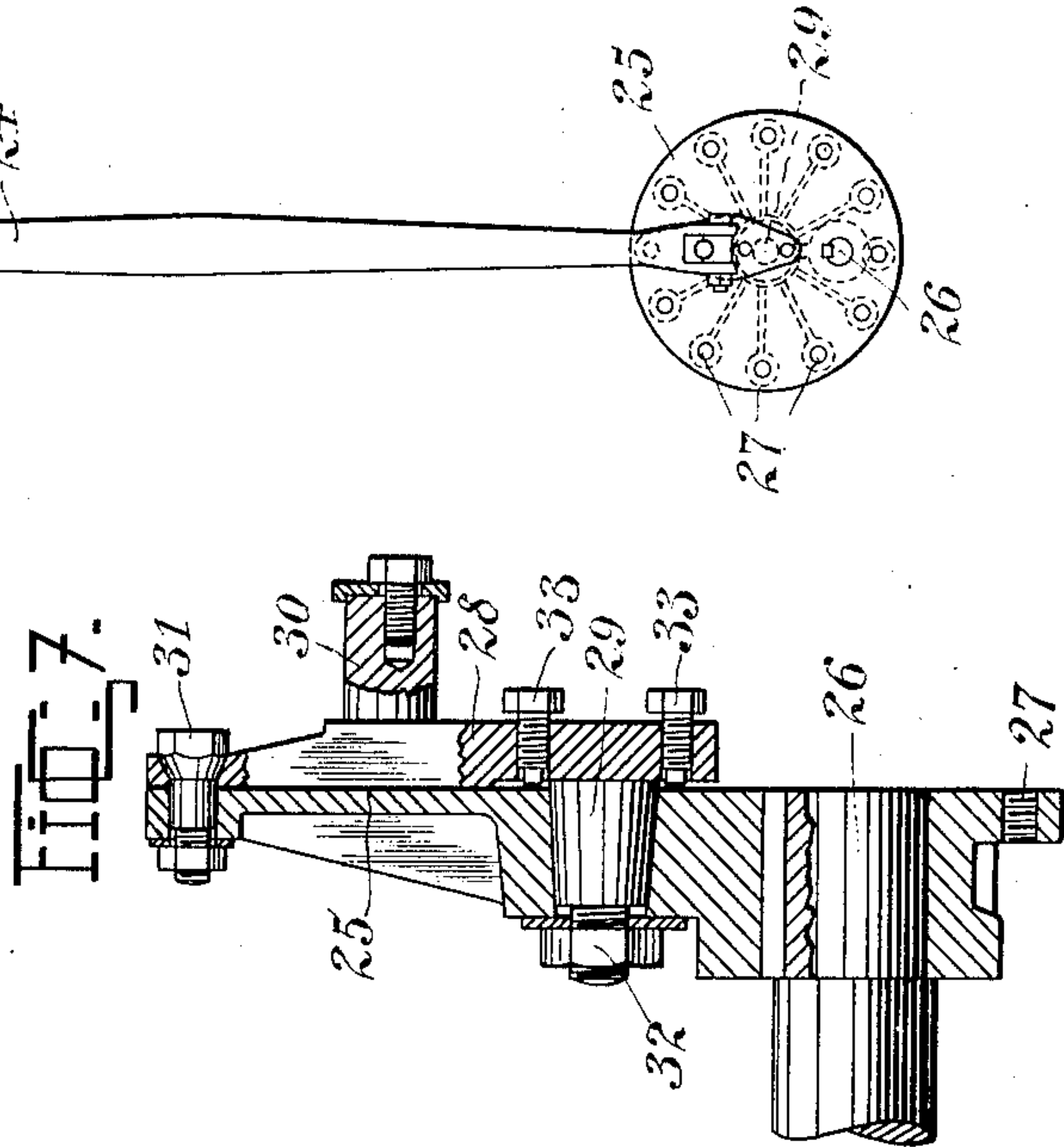
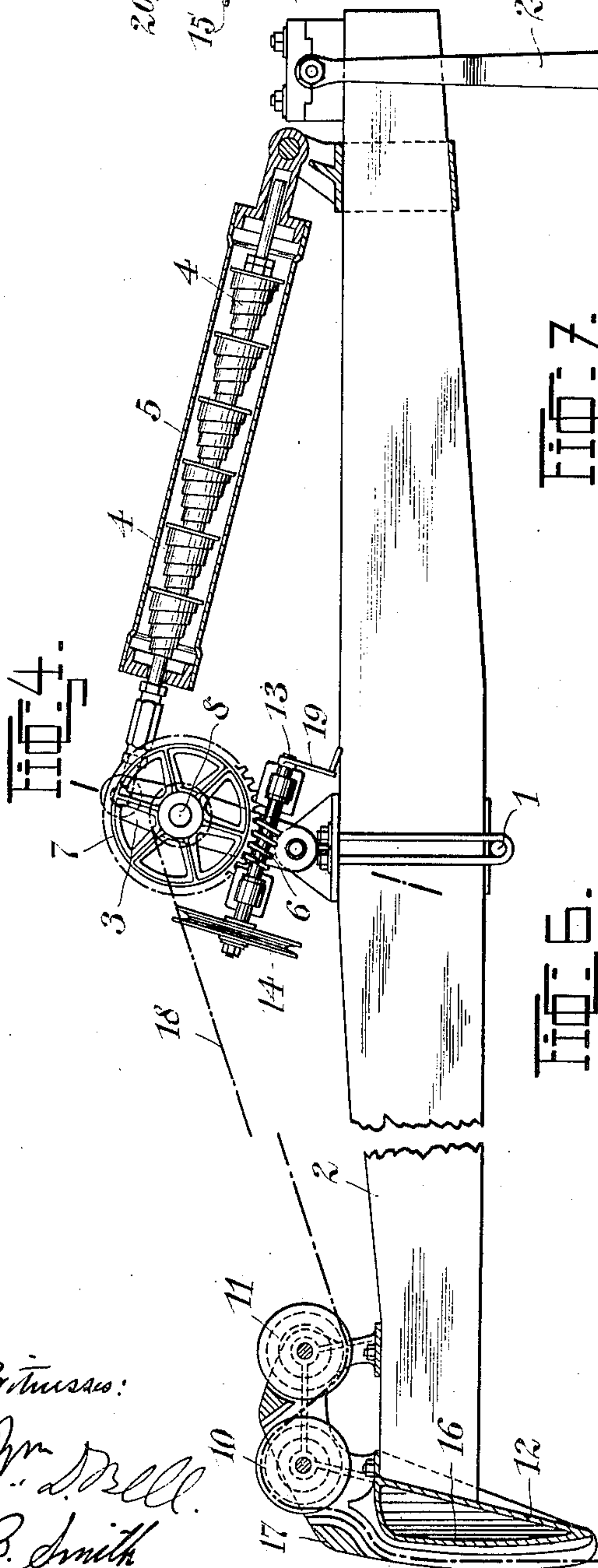
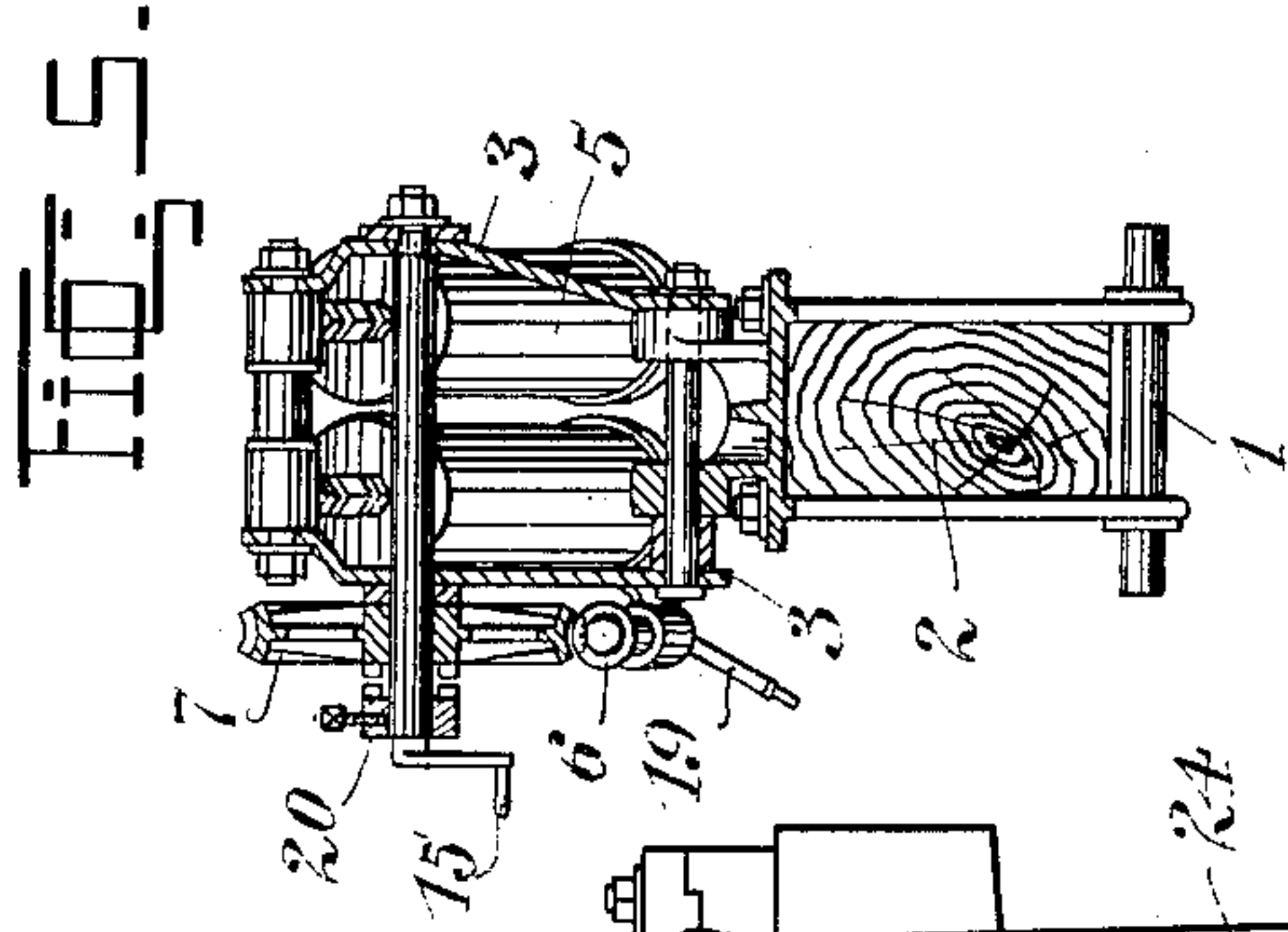
Inventor:
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3 SHEETS—SHEET 2.



Witness:

Wm. A. Bell.
B. Smith

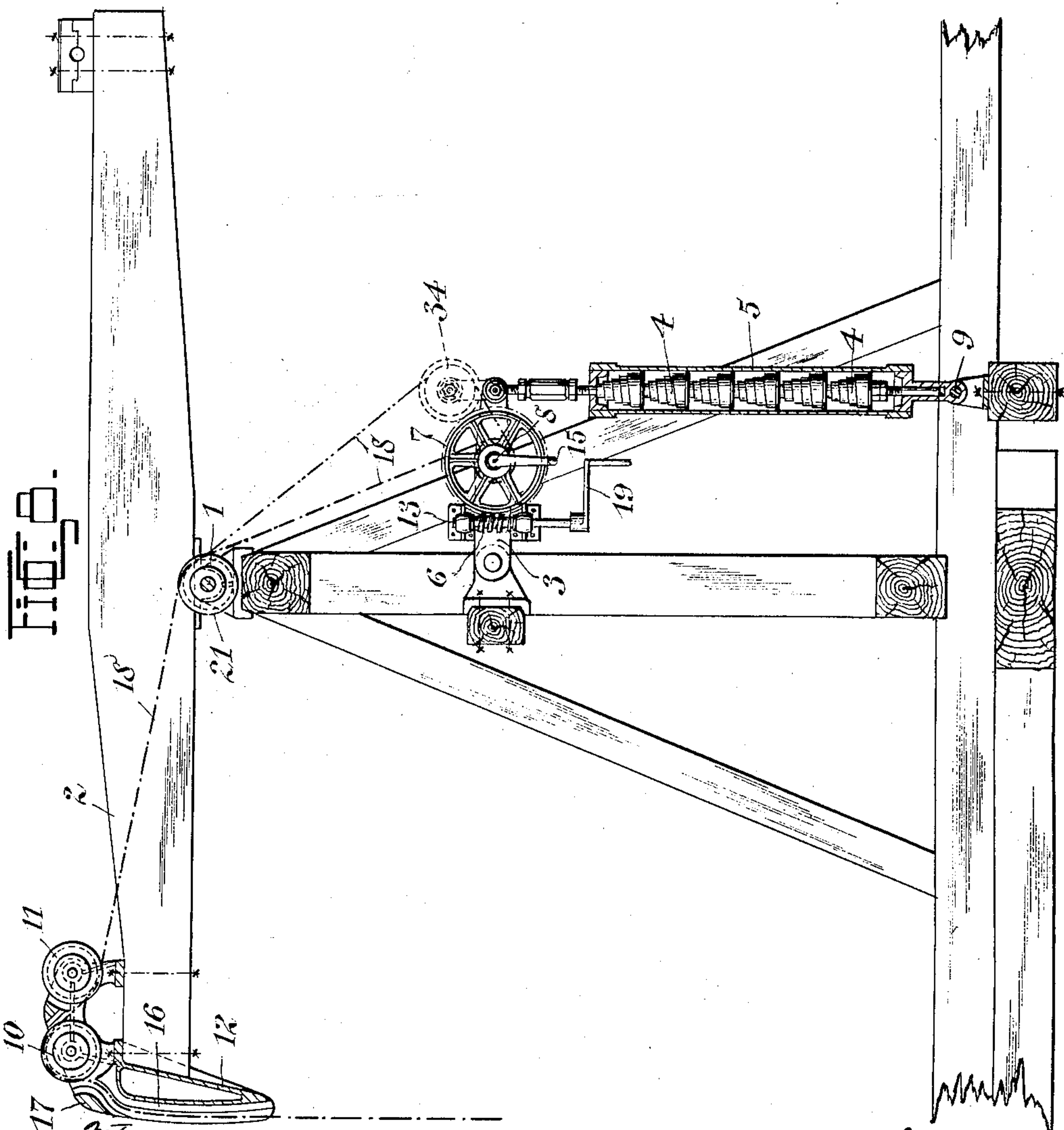
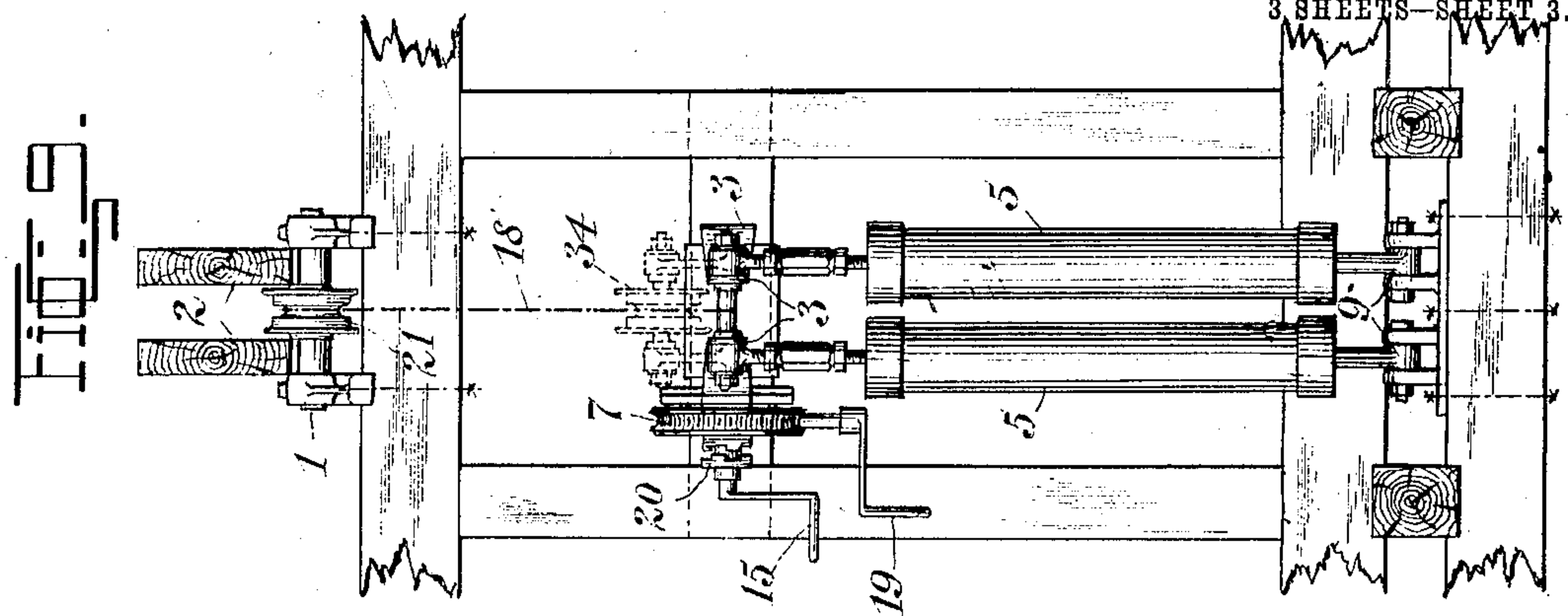
Inventor:
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No. 812,541.

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W. WLODARCZYK.
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3 SHEETS—SHEET 3.



Witnesses:
Wm. D. Bell.
B. Smith

Inventor:
Wladyslaw Wlodarczyk,
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UNITED STATES PATENT OFFICE.

WLADYSLAW WLODARCZYK, OF BORISLAW, AUSTRIA-HUNGARY.

DEEP-BORING APPARATUS.

No. 812,541.

Specification of Letters Patent.

Patented Feb. 13, 1906.

Application filed May 22, 1905. Serial No. 261,703.

To all whom it may concern:

Be it known that I, WLADYSLAW WLODARCZYK, engineer, a subject of the Emperor of Austria-Hungary, residing at Borislav, Galicia, Austria-Hungary, have invented new and useful Improvements in and Relating to Deep-Boring Apparatus, of which the following is a specification.

My invention relates to boring apparatus, particularly for very deep boring purposes, in which the boring-chain is directly connected to the springs. The object of this is to adjust the tension of the springs to the strain on the chain caused at any moment by the varying load on or resistance to the boring-rods. As is well known, these springs, used to compensate for excessive and constantly-varying strains and to prevent breaking of the chain or damage to the boring-rods, have hitherto been arranged on the deep-boring beams in such way that the action of the springs was unfavorably affected by the beam or limited by the driving device.

In order to make the springs entirely independent of the rest of the apparatus, they are arranged according to the present invention either on the framing or on the beam, being, on the one hand, connected with the latter or with the frame and, on the other hand, engaging directly or by means of a rocking frame-lever with the boring-chain. This frame-lever is used for guiding the chain by means of rollers to the unwinding device on the frame of the crane apparatus. The unwinding device or winch can, however, be arranged directly on the frame-lever, so that it is inserted between the springs and the chain, and thus can oscillate with the frame-lever under the influence of the action of the springs and chain. The driving of the beam is effected by means of a crank-disk with an adjustable crank-pin, by means of which the stroke of the boring-tool can be increased or reduced, as may be desired.

Figure 1 is a view in side elevation, partly in section, of one form of the apparatus. Fig. 2 is an end view of what is shown in Fig. 1 and looking from the left in said figure, certain parts being shown in section in a transverse plane coincident with the longitudinal axis of a certain lever 3. Fig. 3 is a plan view of the apparatus shown in Fig. 1. Fig. 4 is a view in side elevation, partly in section, of another form of the apparatus, certain parts be-

ing omitted. Fig. 5 is a transverse sectional view of the apparatus shown in Fig. 4, taken on the line $x x$ in said figure. Fig. 6 is a face view of a certain crank-disk. Fig. 7 is a sectional view of said disk, taken coincident with a line joining the centers of its shaft 26 and pivot 29. Fig. 8 is a view, partly in side elevation and partly in section, of still another form of the apparatus; and Fig. 9 is a view in end elevation of the apparatus shown in Fig. 8 and looking from the right in said figure.

In Figs. 1, 2, and 3 a frame-lever 3 is pivotally mounted on the rocking spindle 1 of the beam 2, a spring 4 engaging with the upper end of the said frame-lever, the casing 5 serving as abutment for the said spring, being pivoted or attached to the beam at 9. In order to obtain greater elasticity of the spring, more particularly in the case of deep boring, there is provided a number of volute springs 4, arranged one behind another, which can be brought to the desired state of tension whenever required. Such an arrangement of the springs has the further advantage that in the event of one spring breaking only that spring need be replaced. On the frame is arranged the chain-unwinding winch 67, (worm-winch,) which supplies the boring-tool chain 18 from the drum arranged on the spindle 8. The chain thence passes over a roller 21, mounted on the rocking spindle 1 of the beam, round a roller 22 on the beam 2 to a roller 23 in the pivoted lever 3, and thence about rollers 11 and 10 to the beam-head 12. The position of the roller 23 on the lever-arm 3 relatively to the pivot 1 may be varied to allow for different degrees of tension on the chain.

When in working the boring-tool is raised, the lever 3 is swung forward by the weight of the boring-rods, the springs 4 being compressed, and at the same time the chain 18, owing to its guidance on the lever 3, can follow the pull acting upon it from one or the other side. The tension of the spring is greater or smaller according to the load on the boring-chain; but it is always exactly in proportion to the load on the boring-chain and the boring-rods, it being always possible (owing to the large number of springs arranged one behind another) to obtain an elastic shock even when the load on the chain and rods is very great after the boring work has greatly advanced.

In boring apparatus of less strong con-

struction it is possible to arrange the unwinding-winch 6 7, Figs. 4 and 5, directly on the pivoted lever, in which case it participates in the oscillation of the latter. The operation
 5 of the winch for unwinding the chain as the boring advances and when necessary for raising the boring-tool is effected from below either by means of a chain-wheel 14, mounted on the spindle 13 of a worm 6, with the assistance of a chain, or by means of a crank-
 10 handle 19, arranged on the same spindle. In order, however, to enable the boring-chain when without any load to be quickly raised, the hub of the non-keyed worm-wheel 7 is
 15 formed as one-half of a clutch-coupling, the other coupling-half 20, Fig. 5, being longitudinally adjustable on the spindle 8 of the worm-wheel, so that it can be secured in the desired position. The spindle 8 can there-
 20 fore be coupled by the clutch to the worm-gear or made to rotate independently of the latter by uncoupling the clutch, so that the chain can be quickly wound on the drum mounted on the spindle by turning a crank-
 25 handle 15 on the spindle.

Another modification of the above boring apparatus (shown in Figs. 8 and 9) consists in the pivoted lever with the unwinding-winch being arranged on the framing, preferably between the supports for the beam, in
 30 which case the spring 4 engages at one end with the lever 3 and is secured at its other end to the framing, the chain 18 being guided from the drum over the roller 21 of the beam-spindle 1 to the beam-head 12. This arrangement has the important advantage of
 35 facilitating the manipulation of the unwinding-winch and of making the latter, as well as the springs, more easily accessible. The chain-dotted lines in Figs. 8 and 9 show a
 40 plan of direct connection of the chain 18 with the spring. To that end the chain is guided from the beam-head 12 over the roller 21 to a roller 34, connected with the spring, and
 45 thence to the unwinding-winch, so that the chain is acted upon directly by the spring. The beam is provided at one end with a curved head 16, which, as is well known, serves to insure correct guiding of the chain
 50 in axial direction of the boring-hole in any position of the beam. From this head the chain is not, however, guided in a straight line to the unwinding-winch, as hitherto, but is caused to follow a sinuous path in the head
 55 by a winding chainway 17, arranged above the part 16, and by the rollers 10 and 11. The object of this arrangement is, on the one hand, to prevent the chain from jumping off the guide when the boring-tool is thrown
 60 back and the chain suddenly springs upward and, on the other hand, to facilitate smooth movement of the chain without great friction. The rocking of the beam is effect-

ed by means of a connecting-rod 24, Fig. 4, the other end of which engages with the
 65 crank-disk. The latter is constituted by a disk 25, Figs. 6 and 7, eccentrically keyed on the driving-shaft 26 and provided with holes or recesses 27, arranged in a circle round the disk. In the center of this circle is pivoted
 70 about a pin 29 an arm 28, provided with the crank-pin 30, to which the connecting-rod is secured and which can be secured in any desired position in the circle by means of screws,
 75 bolts 31, or the like introduced into the holes 27. The second attachment of the arm 28 is constituted by its pivot 29, which to that end is tapered and can be tightened by means of
 80 a nut 32. The distance of the holes 27 from the driving-shaft varies, so that by securing the arm 28 to one or other of the holes 27 the distance between the crank-pin 30 and the driving-shaft 26 can be altered, thereby obtaining a variable crank-throw within certain
 85 limits.

An important advantage of the crank-disk described consists in the quick and easy shifting of the arm 28 and in the reliability with which it retains a position once given to it. In order to simplify and to facilitate still more
 90 the shifting of the crank-pin, there are provided on the arm 28 round the pin 29 set-screws 33, whereby by screwing them in the conical pin 29 can be easily forced out should it have become jammed.
 95

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

1. A deep-boring apparatus comprising a rocking beam, a boring-tool chain, a pivoted chain-guide lever and a spring attached to
 100 the free end of the pivoted lever, substantially as described.
2. A deep-boring apparatus comprising a rocking beam, a boring-tool chain, a pivoted chain-guide lever, and a spring controlling
 105 the lever and mounted on the beam, substantially as described.
3. A deep-boring apparatus comprising a rocking beam, a boring-tool chain, a pivoted chain-guide lever mounted on the beam, and
 110 a spring controlling the lever and mounted on the beam, substantially as described.
4. A deep-boring apparatus comprising a rocking beam, a chain, a pivoted chain-guide lever, a spring controlling said lever and
 115 mounted on the beam and a chain-winch, substantially as described.
5. A deep-boring apparatus comprising a rocking beam, a chain, a winch and a chain-guiding head on the beam, said head having
 120 means for guiding the chain through itself in a sinuous path, substantially as described.
6. A deep-boring apparatus comprising a rocking beam, a chain, a chain-guide lever mounted on the beam, elastic means connect-
 125 ing the lever and the beam and a chain-winch

mounted on the lever, substantially as described.

7. A deep-boring apparatus comprising a rocking beam, a chain, a pivoted chain-guide
5 lever, a spring controlling said lever, and a chain-winch mounted on the lever, substantially as described.

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

WLADYSLAW WLODARCZYK.

Witnesses:

WENZEL SNIKEFRNZ.

FRANZ REITER.