No. 825,373. PATENTED JULY 10, 1906.

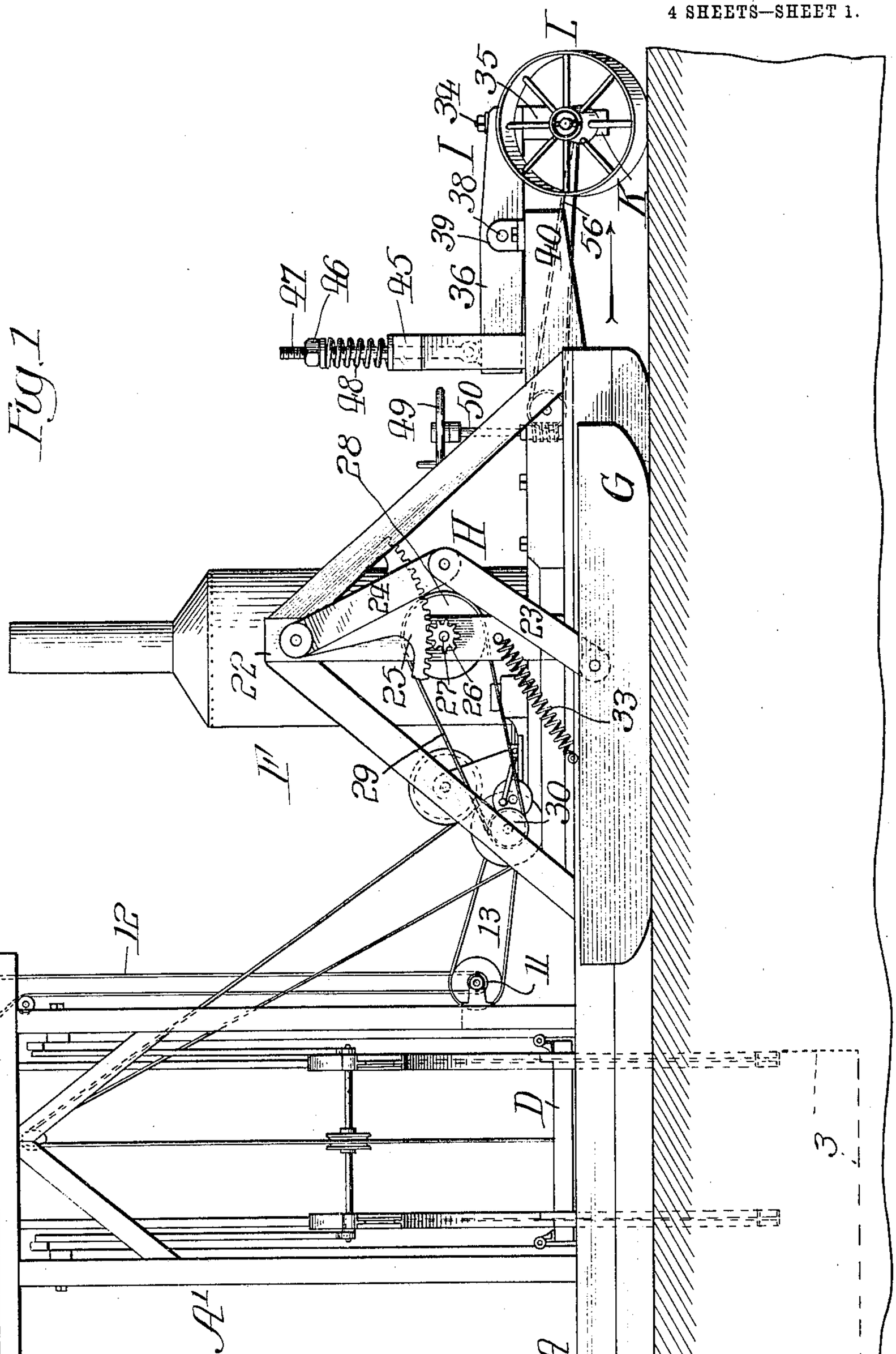
H. J. BENTSON.

TRENCHING MACHINE.

APPLICATION FILED NOV. 13, 1905.

4 SHEETS—SHEET 1.

Fig. 1



Witnesses:

H. G. Bunce

O. C. Freberg

Inventor:

Hans J. Bentson

by Chas. G. Page his Atty.

No. 825,373. PATENTED JULY 10, 1906.

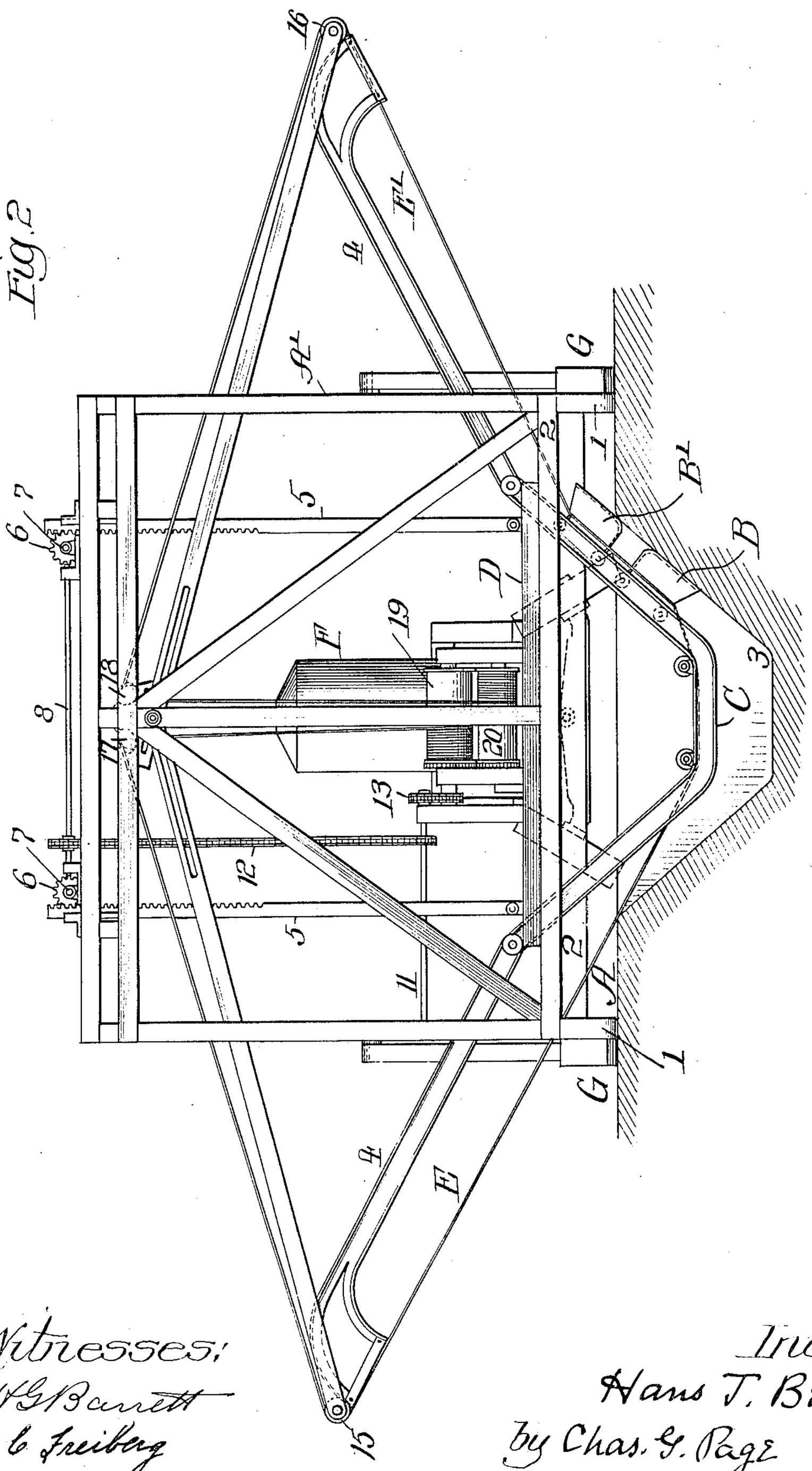
H. J. BENTSON.

TRENCHING MACHINE.

APPLICATION FILED NOV. 13, 1905.

4 SHEETS—SHEET 2.

Fig. 2



Witnesses:
H. G. Barrett
O. C. Freiberg

Inventor:
Hans J. Bentson
by Chas. G. Page
Attorney

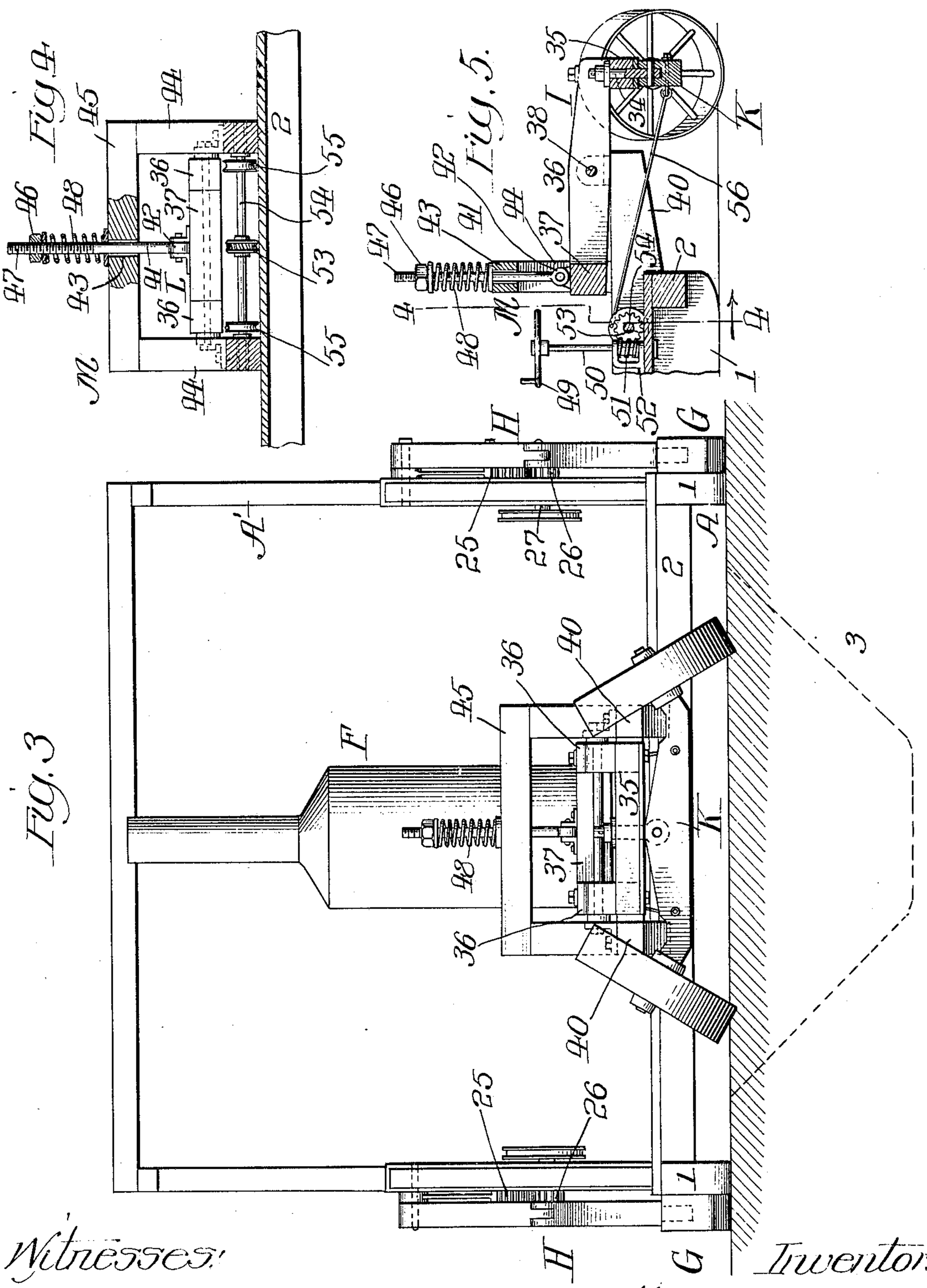
No. 825,373. PATENTED JULY 10, 1906.

H. J. BENTSON.

TRENCHING MACHINE.

APPLICATION FILED NOV. 13, 1905.

4 SHEETS—SHEET 3.



Witnesses:

O. C. Freiberg

Fred P. Cleveland—

Inventor:

Hans J. Bentson

by Chas. G. Page his Atty.

No. 825,373. PATENTED JULY 10, 1906.

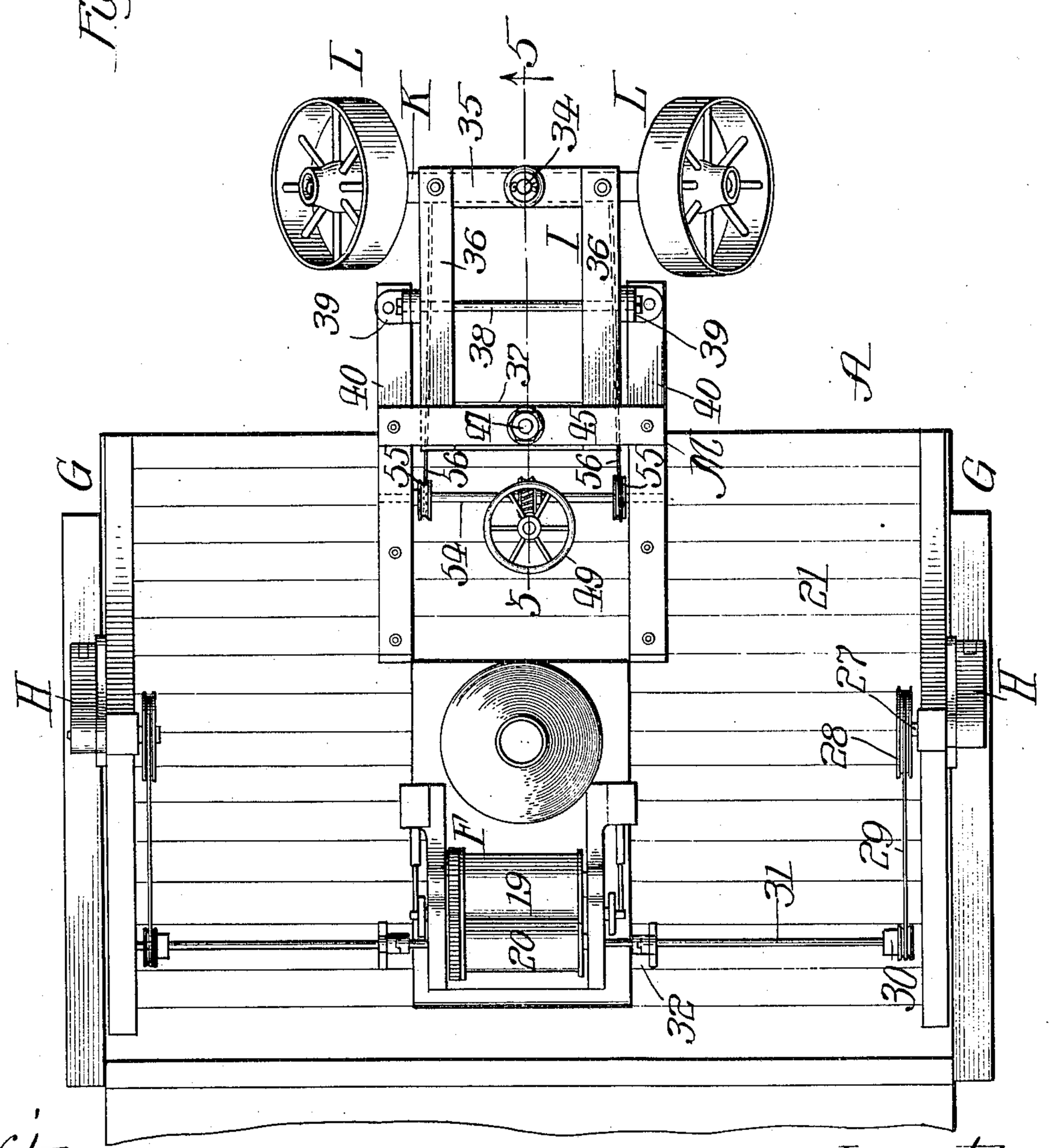
H. J. BENTSON.

TRENCHING MACHINE.

APPLICATION FILED NOV. 13, 1905.

4 SHEETS—SHEET 4.

Fig. 6



Witnesses:
H. G. Barnett
O. C. Freiberg

Inventor:
Hans J. Bentson
by Chas. G. Page
his Atty.

UNITED STATES PATENT OFFICE.

HANS J. BENTSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO FREDERICK C. AUSTIN, OF CHICAGO, ILLINOIS.

TRENCHING-MACHINE.

No. 825,373. Specification of Letters Patent. Patented July 10, 1906.

Application filed November 13, 1905. Serial No. 287,164.

To all whom it may concern:

Be it known that I, HANS J. BENTSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Trenching-Machines, of which the following is a specification.

My invention relates to a construction of trenching-machine comprising a body-frame carrying excavating devices and means for operating the trenching devices and means for advancing the machine as a whole as the work progresses, and more particularly to a trenching-machine provided with excavating means arranged to reciprocate transversely to the line of trench and a transversely-arranged guide for the excavating means.

In the accompanying drawings, Figure 1 is a side elevation of a trenching-machine embodying my invention. Fig. 2 is a rear end elevation of the machine, illustrating the same supported upon the ground-surface at opposite sides of the trench-line. Fig. 3 is a front end elevation of the machine, showing the steering-wheels on the ground-surface ahead of the forward end of the trench shown in Fig. 2, the trench in Fig. 3 being indicated by dotted lines. Fig. 4 is a sectional detail, the section being on line 4 4 in Fig. 5. Fig. 5 is a sectional detail, the section being on line 5 5 in Fig. 6. Fig. 6 is a top plan view of the forward end portion of the machine.

The main frame or body of the machine is constructed with a base A, comprising a pair of longitudinally-extending spaced sides 1 1, rigidly connected together by transverse frame portions 2 and shown bearing upon the ground-surface and arranged similar to a pair of long sled-runners.

The excavating means comprises a pair of connected reciprocative oppositely-faced excavating-shovels or similar excavating devices B B′, relatively arranged for cutting in opposite directions in alternation and guided to reciprocate transversely to the line of ditch and line of progression of the machine. These shovels are guided by a transversely-arranged guide C, which is adapted to conform to the transverse contour of the trench, as illustrated in Fig. 2, wherein the shovels are understood to have formed a ditch or trench 3, in which the guide C has been lowered to an extent proportional to the depth of the excavation. The guide C is supported by a vertically-movable platform or member D and is provided with extension portions 4 4, which overhang the ground-surface at opposite sides of the trench, so as to permit the shovels to discharge at suitable points. The member D can be raised and lowered by any suitable raising and lowering means. As shown, vertical rack-bars 5 have their lower ends hinged to the member D and their upper ends arranged to engage gears 6 on longitudinally-arranged rotary shafts 7. These shafts are operated from a transversely-arranged rotary shaft 8, Fig. 2, by suitable gearing, a gear member 9 of which is shown in Fig. 1 engaging a bevel-gear 10 on one of the shafts 7. The shaft 8 is shown connected with a lower rotary shaft 11 by a link belt 12 and suitable sprockets therefor, and the shaft 11 is in turn driven from a sprocket or belt wheel on the engine-shaft by a chain or belt 13. The shovels are reciprocated by cable portions E E′ of a cable attached to the shovels and extending in different directions therefrom, the cable portion E being extended to and trained over an idler 15 on the outer end of one of the guide extensions 5, and the other cable portion E′ being extended to and trained over an idler 16 on the other guide extension 4. From these idlers 15 and 16 the cable portions are extended inwardly to elevated idlers supported on elevated portions of the main frame and indicated by dotted lines 17 and 18 in Fig. 1, and from these idlers the two cable portions are extended down, respectively, to winding-drum 19 and winding-drum 20, which are to be driven by the engine in directions to permit one drum to pay out its allotted cable portion while the other drum winds up its allotted cable portion. Any known or suitable mechanical driving connections or devices can be employed, and the engine can be of any suitable or desired type, and hence I have only partially illustrated an engine or motor, as at F.

The upright frame portion A′, which supports the upper shafts and gearing for raising and lowering the transverse guide, is arranged upon the rear portion of base A of the body-frame, and the engine or motor employed is arranged upon a rigid platform 21, which is forward of the upright frame portion A′ and adapted to form a part of the forward portion of the base A of the body-frame.

With this arrangement the transverse guide C is back of the engine and supported by the rear portion of the body-frame. When, therefore, the machine is at work, the rear portions of the runner-like slides 1 of the body-frame will be supported upon the ground-surface at opposite sides of a trench formed by the excavating-shovels, while the forward portions of these slides 1 will be supported upon the ground ahead of the forward end of the trench, and therefore forward of the point where the shovels are engaged in extending the excavation. The weight of the forward portion of the body and the weight of the engine and other devices on the forward portion of the body are thereby sustained by the solid earth forward of the excavation, whereby caving in of the banks is avoided.

Means shown for advancing the machine comprises a couple of shoes G, arranged one at each side of the forward portion of the machine. In Fig. 1 the shoe G is connected by a two-membered toggle H with the upper portion of a standard 22, arranged upon the forward portion of the body-frame and suitably braced. The lower arm or member 23 of the toggle has its lower end pivotally attached to the shoe G, and the upper arm or member 24 of the toggle has its upper end pivoted upon the upper portion of the standard 22. The upper toggle-arm 24 is rigid with a sector-gear 25, which swings with said arm and which is operated by a pinion 26 for the purpose of swinging the arm in a direction to straighten the toggle, the bending action of the latter being permitted or caused by a reverse movement on the part of pinion 26. The pinion 26 is fixed on a rotary shaft 27, extending through a bearing in or on standard 22 and having its inner end provided with a sprocket or belt wheel 28, which is connected by an endless chain or belt 29 with a sprocket or belt pulley 30, fixed on a transverse shaft 31. This shaft 31 can be connected with and disconnected from a rotary power-driven shaft by a clutch 32. The shoe and toggle and devices for supporting and operating the toggle at the side of the machine shown in Fig. 1 are duplicated at the opposite side of the machine and designated by corresponding reference-numerals, and hence a description of these devices at one side will answer for both sets. The shoe G (shown in Fig. 1) is also connected with the standard 22 by a spring 33, which extends back from the latter, the shoe at the opposite side of the machine being also connected with the standard at such side by a like arrangement of spring. The shoes, toggles, and adjuncts form "walking" devices, the body-frame being raised by straightening the toggles, so as to relieve it from bearing heavily upon the ground or a track thereon, whereby the body will then pitch forward and again bend the toggles when the latter are released, and the shoes will be again drawn forward by the springs. The shoes G are also ahead of the end of the trench, and hence ahead of the transverse guide and excavating devices.

Obviously a machine of this character involves considerable resistance to power applied for turning it to the right or left, as may be desired. To overcome such difficulty, the body of the machine is provided at its forward end with a forwardly-projecting extension-frame I, provided with an axle K, having inclined steering-wheels L, arranged in upwardly-converging planes. The axle K is pivoted to the lower end of a king-bolt 34. (Illustrated by dotted lines in Fig. 3 and further illustrated, partly in elevation and partly in longitudinal section, in Fig. 5.) The king-bolt extends from the axle upwardly through the bolster 35, to which it is attached by an ordinary swivel connection. Longitudinally-arranged side bars 36 have their forward ends bolted to the transversely-arranged bolster 35, the rear ends of the bars 36 being suitably secured to a transversely-arranged bar 37, whereby the bars 36 and 37 and the bolster 35 form the rectangular frame I, which projects forwardly from the forward end of the body-frame of the machine. The side bars 36 of the frame I are hinged upon a bearing on the main frame by a transversely-arranged horizontal pivot 38, which, as best shown in Fig. 6, extends through and beyond the side bars 36 of the frame I and has its projecting ends journaled in bearings 39 on the longitudinally-arranged frame-bars 40, which project forwardly from the platform 21, the rear end portions of said bars 40 being securely bolted down upon the said platform. The frame I can tilt about the axis of the transversely-arranged pivot-rod 38, the latter being about midway between the front and rear ends of said tilting frame. To the rear cross-bar 37, forming the rear end portion of the tilting frame I, is hinged an upright rod 41, said rod being thus hinged at its lower end, as at 42. The rod 41 extends upwardly through an upright frame M, which is secured and supported upon the forward end of the platform 21, said frame being constructed with suitable sides 44 and with an upper transverse portion 45, which is provided with the opening 43, as illustrated in Figs. 4 and 5. The rod extends above the frame or bearing M and is provided at a point above said frame with a shoulder 46, which, as shown, is formed by a nut arranged for adjustment upon the upper threaded end portion 47 of the rod. A coil-spring 48 is arranged about a portion of the rod 41 and is confined between the shoulder 46 on the rod and an abutment formed by the upper portion of the upright frame M. The rear end portion of the frame I is supported by the spring 48, which forms a spring-cush-

ion adapted to yield when the steering-wheels run over an obstruction and rise to an extent to raise the forward end of the tilting frame I. The axle can be swung horizontally in either direction by steering means, such as a wheel 49, secured upon the upper end of a rotary shaft 50 on the front platform, said shaft being provided with a worm 51, arranged between the upper and lower portions of a bearing 52 on the platform 21 and engaging a worm-wheel 53, Fig. 5, on a transversely-arranged rotary shaft 54, the shaft 54 being provided with end wheels or pulleys 55, which connect with end portions of the axle by cables 56. As illustrated in Figs. 4 and 6, one of said cables passes over one of the pulleys 55, while the other cable passes under the opposite pulley 55, and in this way when the shaft 54 is turned one cable will wind, while the other cable will unwind.

The inclination of the steering-wheels L permits them to take a firm hold in the ground, and thereby avoid side slip, and, as hereinbefore mentioned, the weight of the forward portion of the body-frame, including the engine and the steering devices, will be upon the ground ahead of the trench. The runners or sides 1 of the body-frame can, if desired, be supported upon planks or other tracks laid upon the ground at opposite sides of the trench-line, it being observed that to thus lay tracks for a ditching-machine and in many instances greasing such tracks is an old and well-known expedient.

What I claim as my invention is—

1. In a trenching-machine, a body-frame; a transversely-arranged and vertically-adjustable guide supported upon the rear portion of the body-frame, and reciprocating excavating devices directed in their movement transversely to the line of trench by said guide, which latter conforms to the transverse contour of the trench formed by the reciprocating excavating devices; an engine or motor supported upon the forward portion of the body-frame; power-transmitting connection between the engine and the excavating devices; front steering-wheels upon a horizontally-swinging axle and means for adjustably swinging the latter; the forward portion of the body-frame which supports the engine and which is provided with said axle for the steering-wheels being extended forward of the transverse guide and excavating devices to extend over the ground ahead of the end of a trench which is being extended by the excavating devices.

2. In a trenching-machine, a body-frame; a transversely-arranged and vertically-adjustable guide supported upon the rear portion of the body-frame, and reciprocating excavating devices directed in their movement transversely to the line of trench by said guide, which latter conforms to the transverse contour of the trench formed by the reciprocating excavating devices; an engine or motor supported upon the forward portion of the body-frame; power-transmitting connection between the engine and the excavating devices; inclined front steering-wheels arranged upon a horizontally-swinging axle and set in upwardly-converging planes, and means for adjustably swinging the axle; the forward portion of the body-frame supporting the engine and provided with the steering-wheels being extended forward of the transverse guide and excavating devices to extend over the ground ahead of the forward end of a trench which is being extended by the excavating devices.

3. In a trenching-machine, excavating devices and means for reciprocating the same transversely to the line of trench; a transverse guide for the excavating devices conforming to the transverse contour of trench formed by the excavating devices; a body-frame supporting the transverse guide upon its rear portion; an engine supported upon the forward portion of the body-frame; power-transmitting means between the engine and the excavating devices; and walking devices comprising shoes arranged alongside the forward portion of the body-frame whereon the engine is supported; toggles having lower members hinged to the shoes and upper members pivoted at higher points to bearings on the body-frame, said toggles being arranged to bend in directions forwardly from the rear portion of the body-frame which carries the transverse guide and excavating devices; means for operating the toggles, and means for drawing forward the shoes when the toggles are bent forward.

4. In a trenching-machine, a body-frame; a transversely-arranged guide; transversely-reciprocating excavating means directed by said guide; an engine mounted upon the body-frame forward of the excavating devices; a tilting member supported upon the forward portion of the body-frame and provided at its forward end portion with inclined steering-wheels; a spring device forming an elastic cushion opposed to the down tilt of the portion of the tilting member in rear of the axis about which it tilts; a transversely-arranged rotary shaft provided with pulleys; cables extending from the pulleys to an axle supported by the steering-wheels and fitted to the tilting frame; and an upright rotary operating-shaft connected with the transversely-arranged pulley-shaft for actuating the latter.

HANS J. BENTSON.

Witnesses:
CHAS. G. PAGE,
OTTILIE C. FREIBERG.