

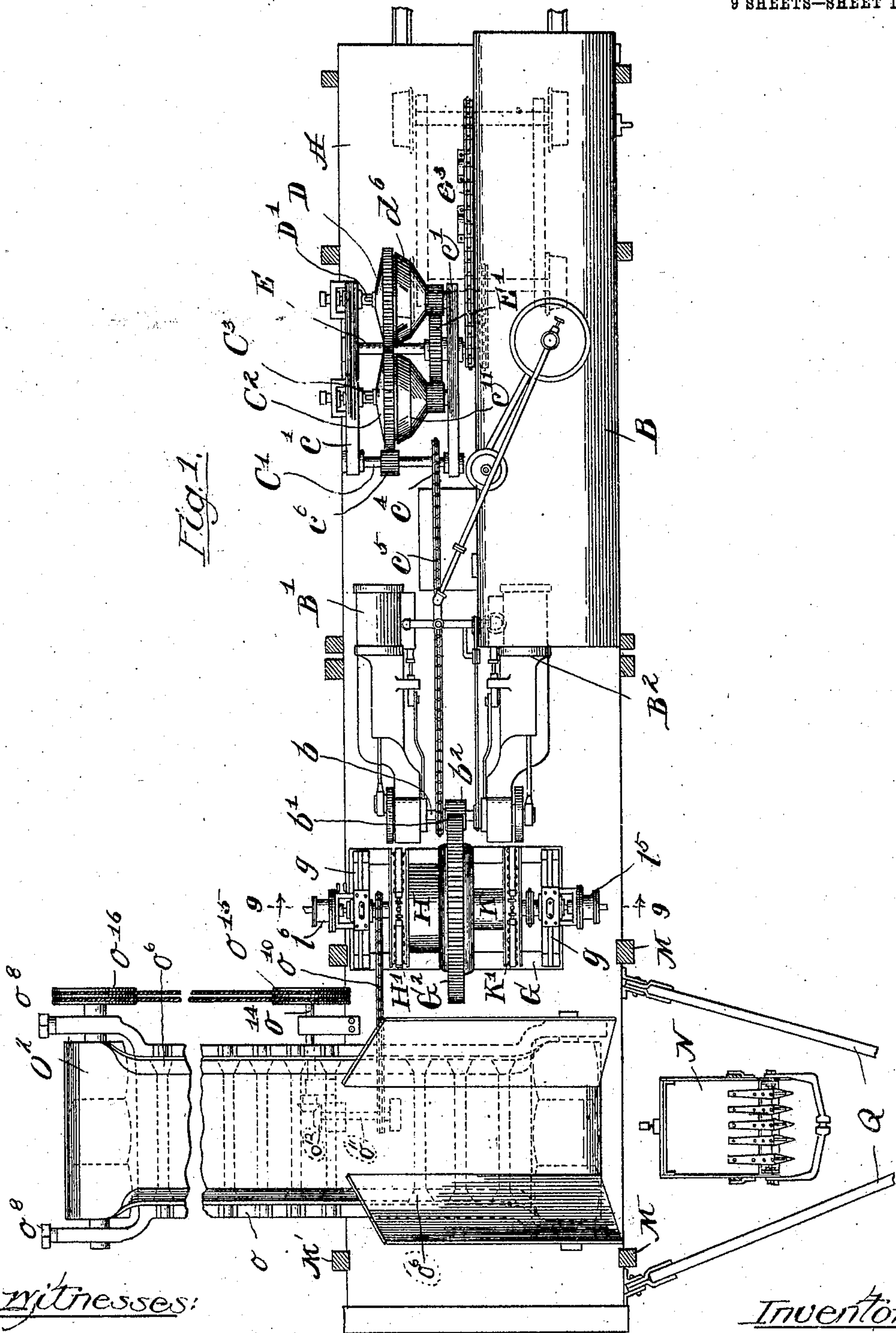
No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 1.



Witnesses:

D. W. Paulschmitt
L. H. Alter

Inventor:

Morton E. Pugh,
By Charles W. Hill
Attorney

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 2.

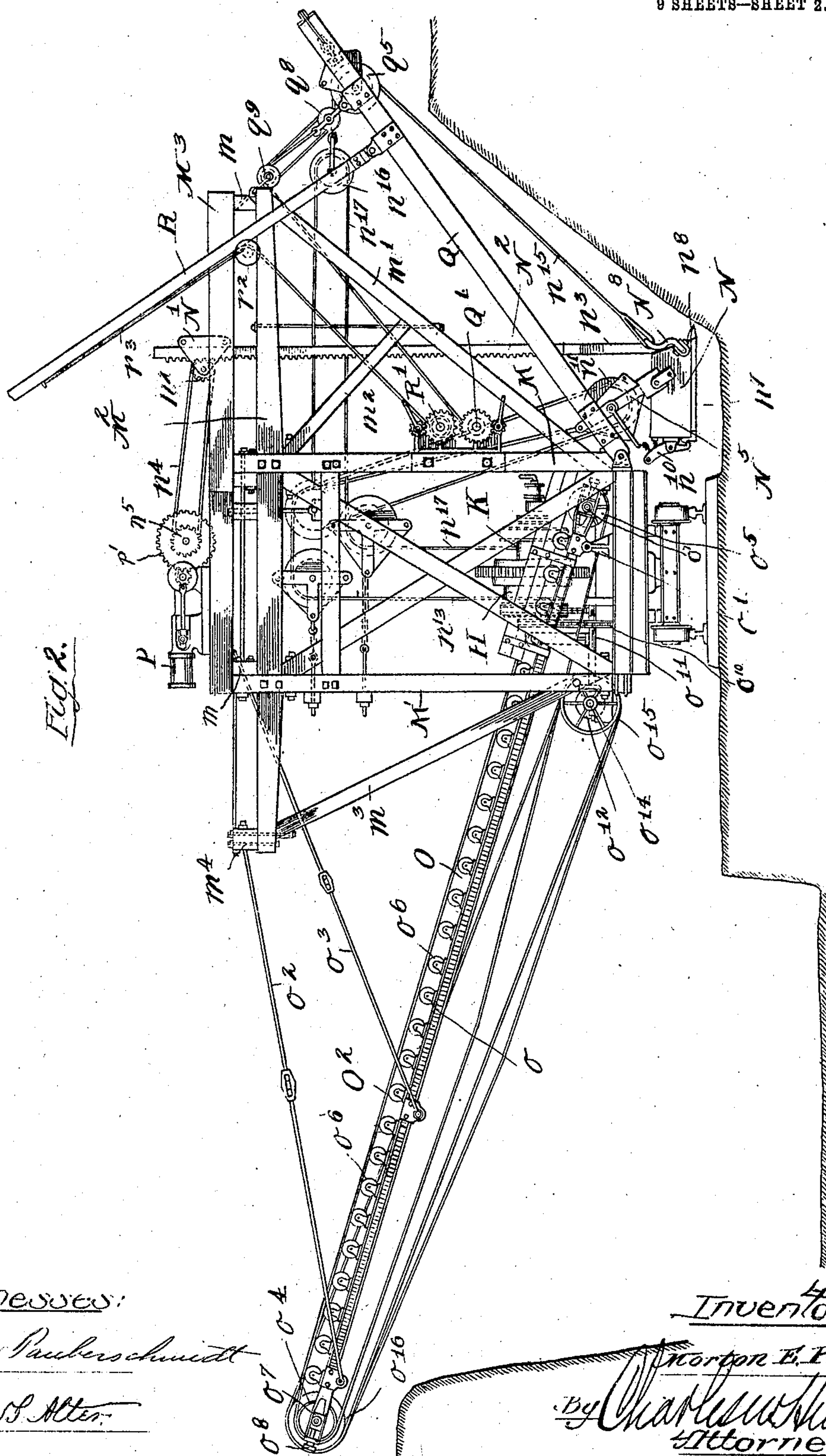


Fig. 2.

Witnesses:

J. A. Pauberschmidt

John S. Allen

Inventor:

Morton E. Pugh

By Charles W. Hill
Attorney.

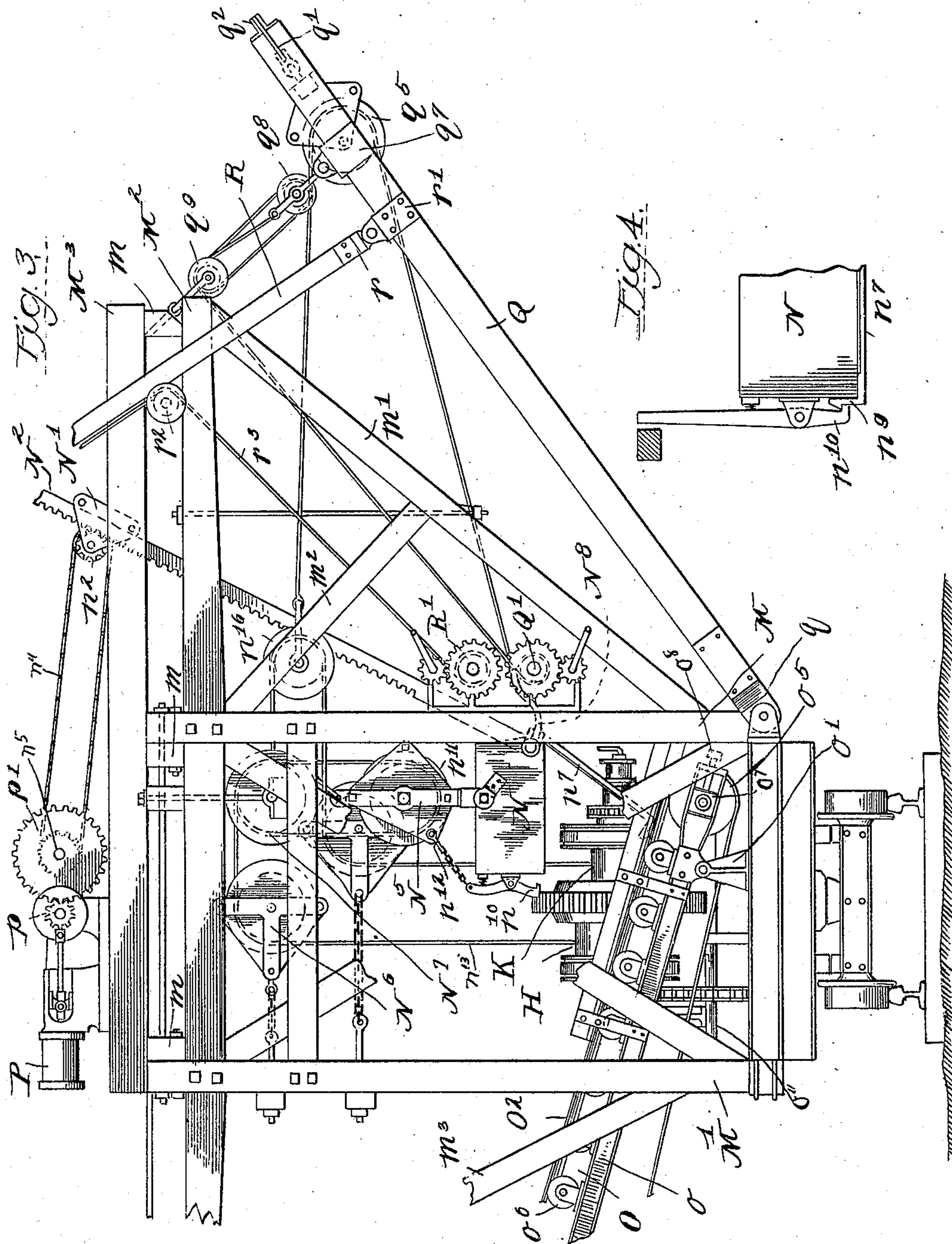
No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 3.



Witnesses:

C. A. Pauberschmidt

Leiter S. Alter

Inventor

Morton E. Pugh

By

Charles S. Pugh
Attorney

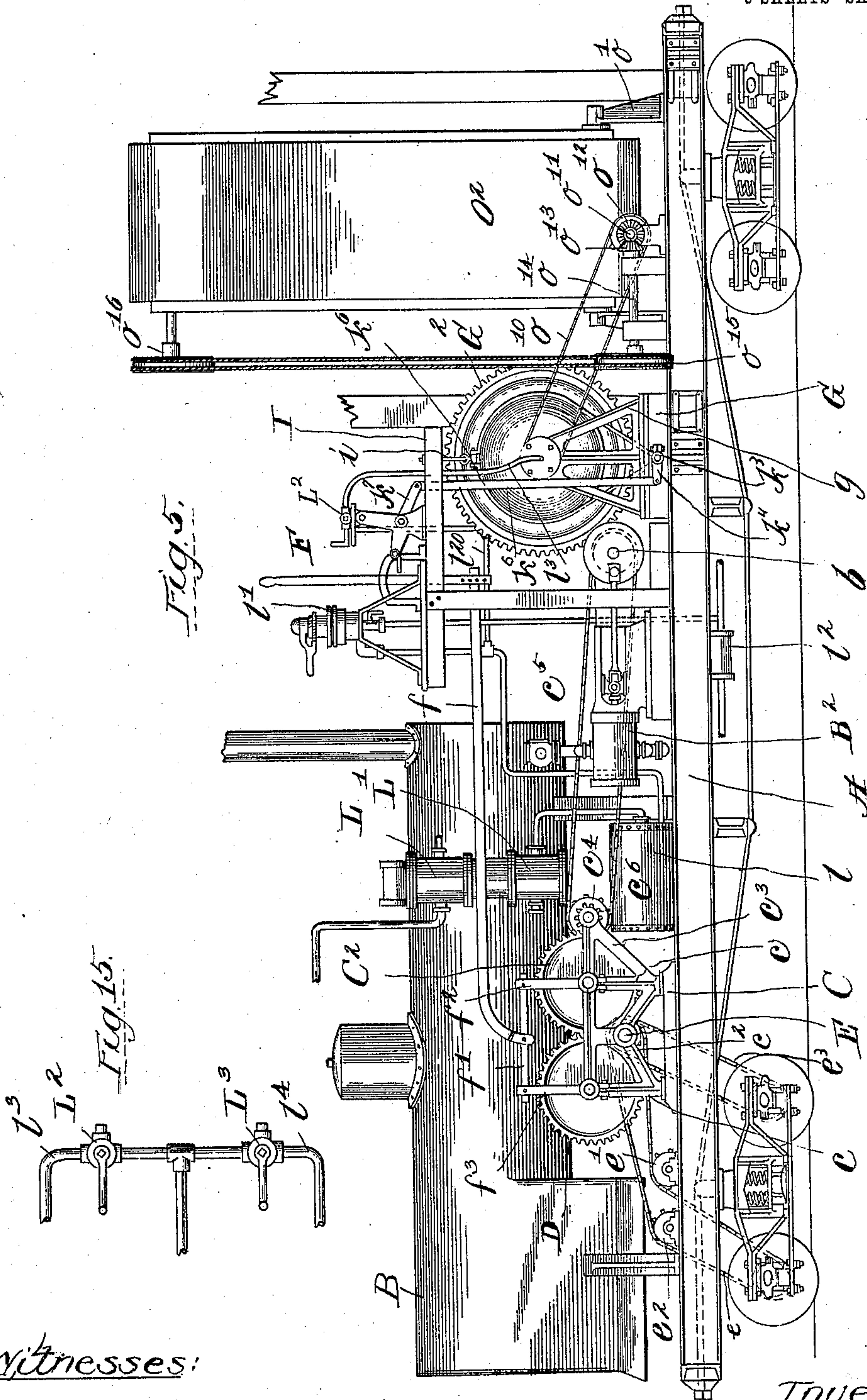
No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 4.



Witnesses:

D. A. Pauberschmidt

John S. Allen

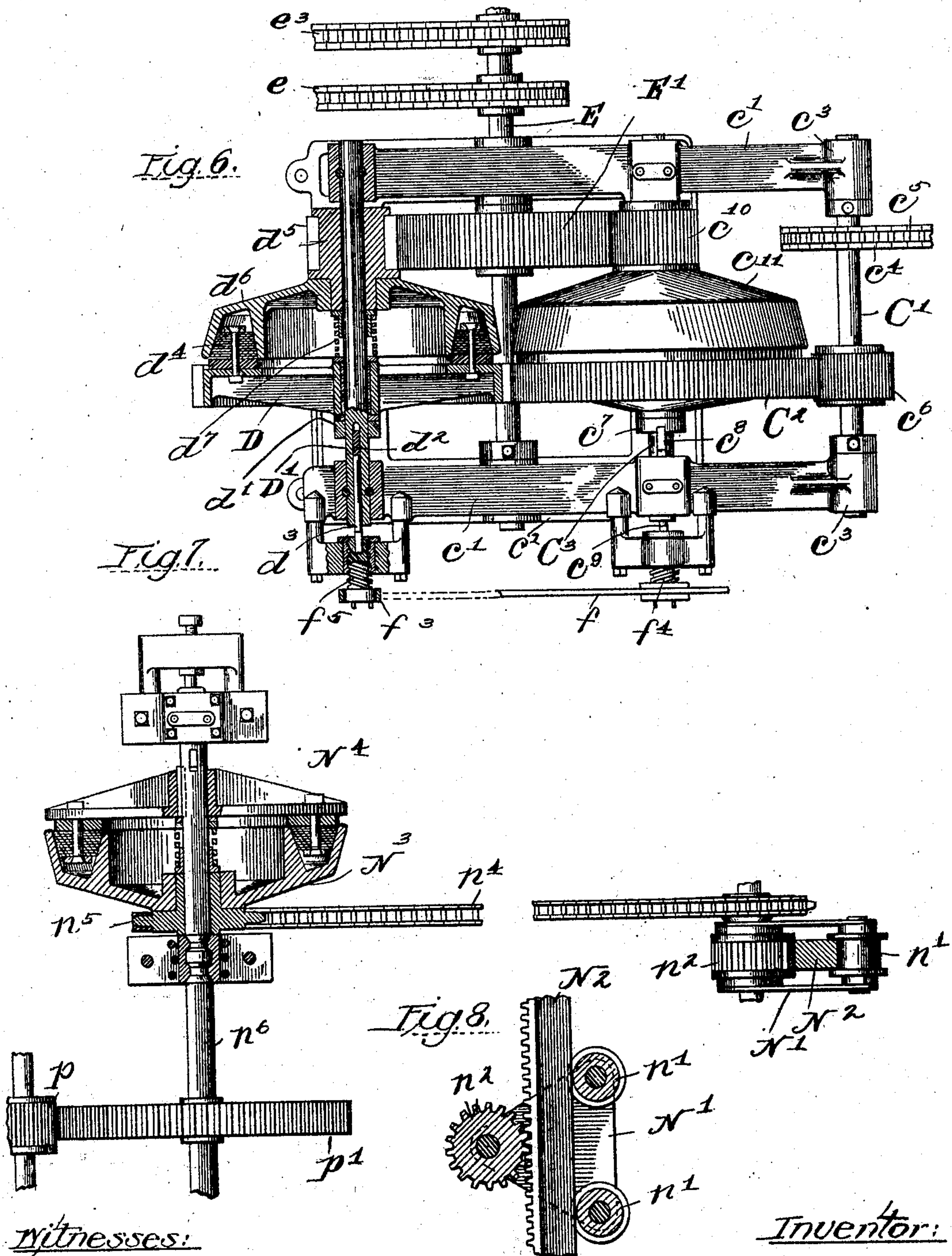
Inventor:

Morton E. Pugh,
By Charles S. Pugh
Attorney

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 5.



Witnesses:

D. A. Pauberschmidt

John S. Allen

Inventor:

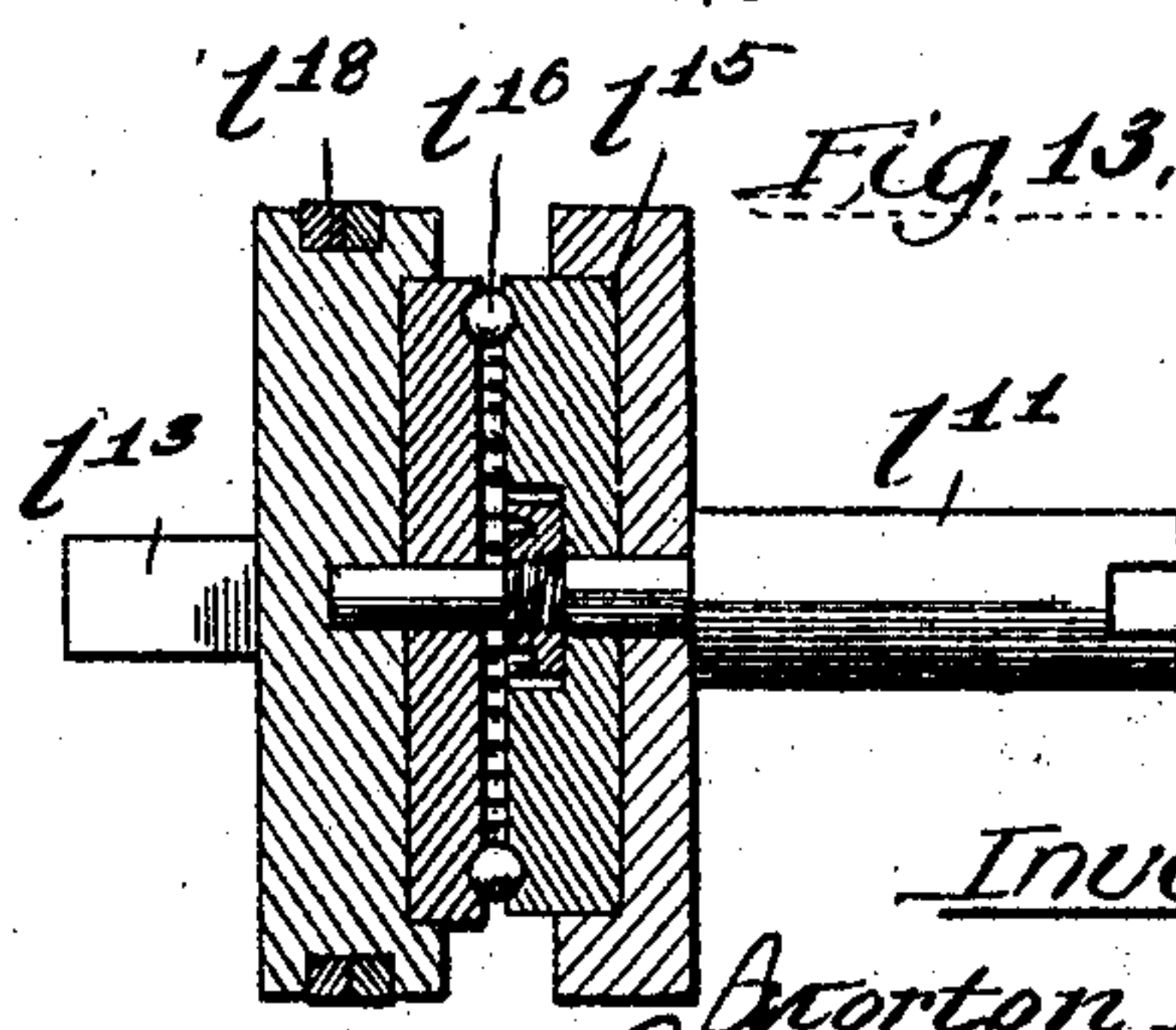
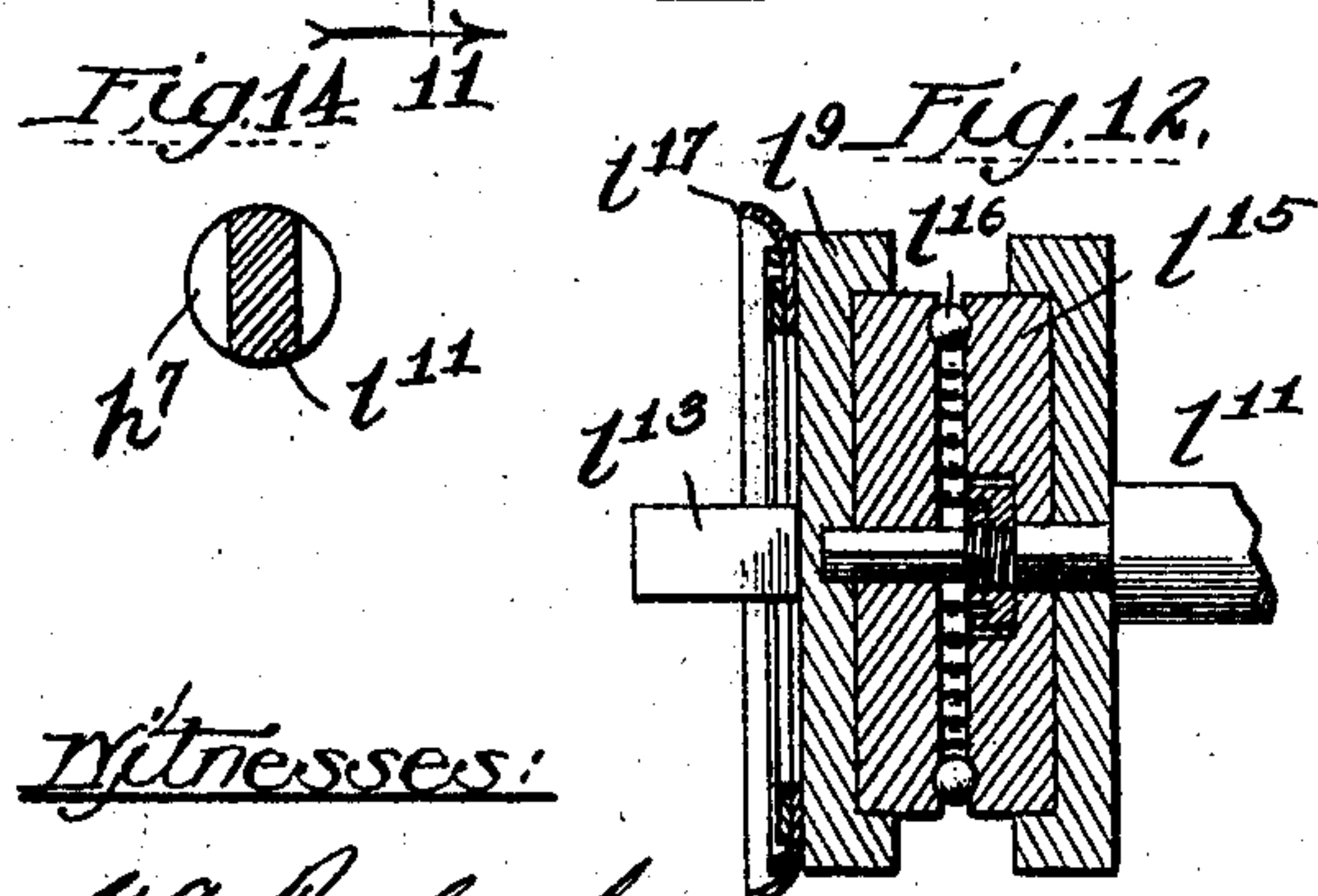
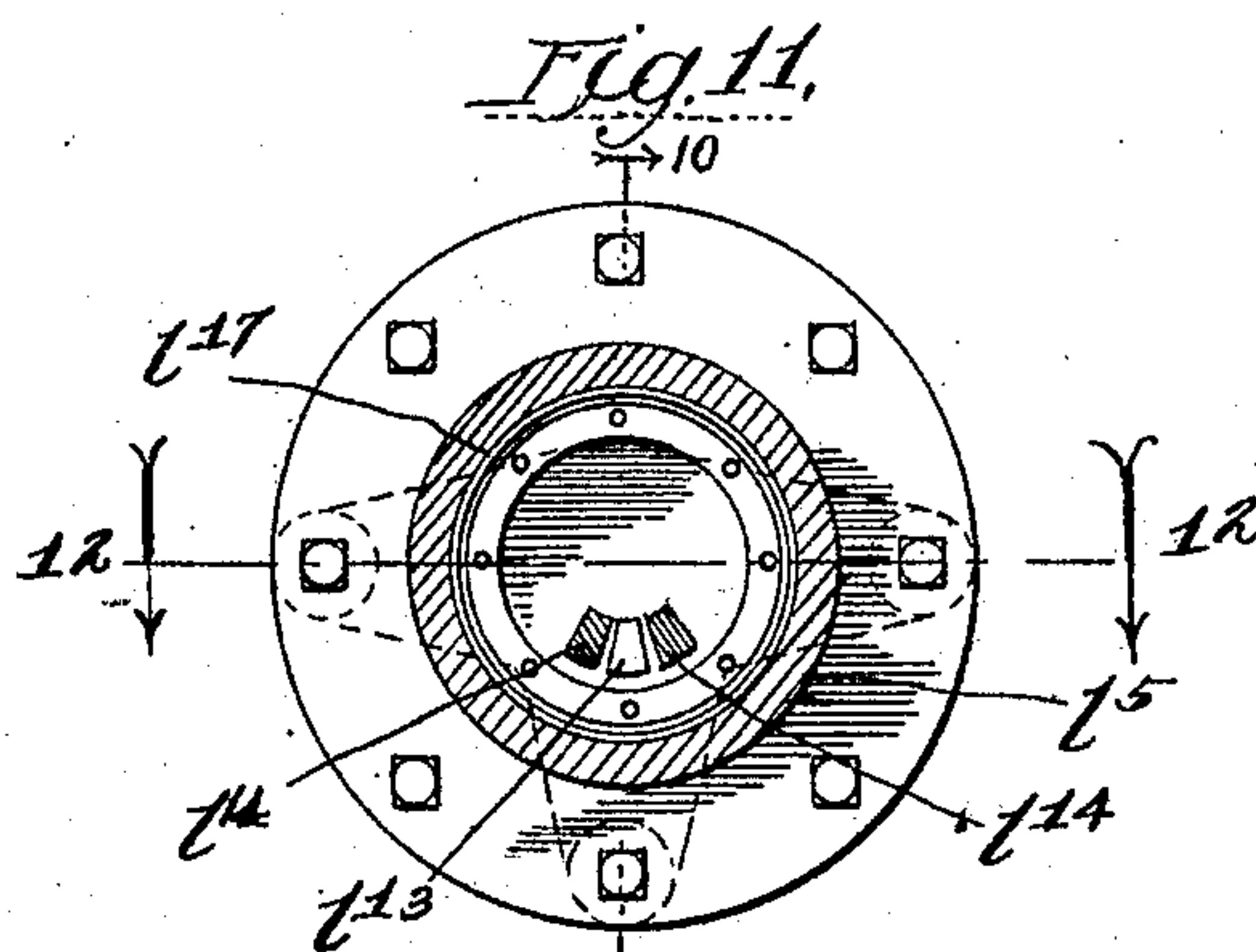
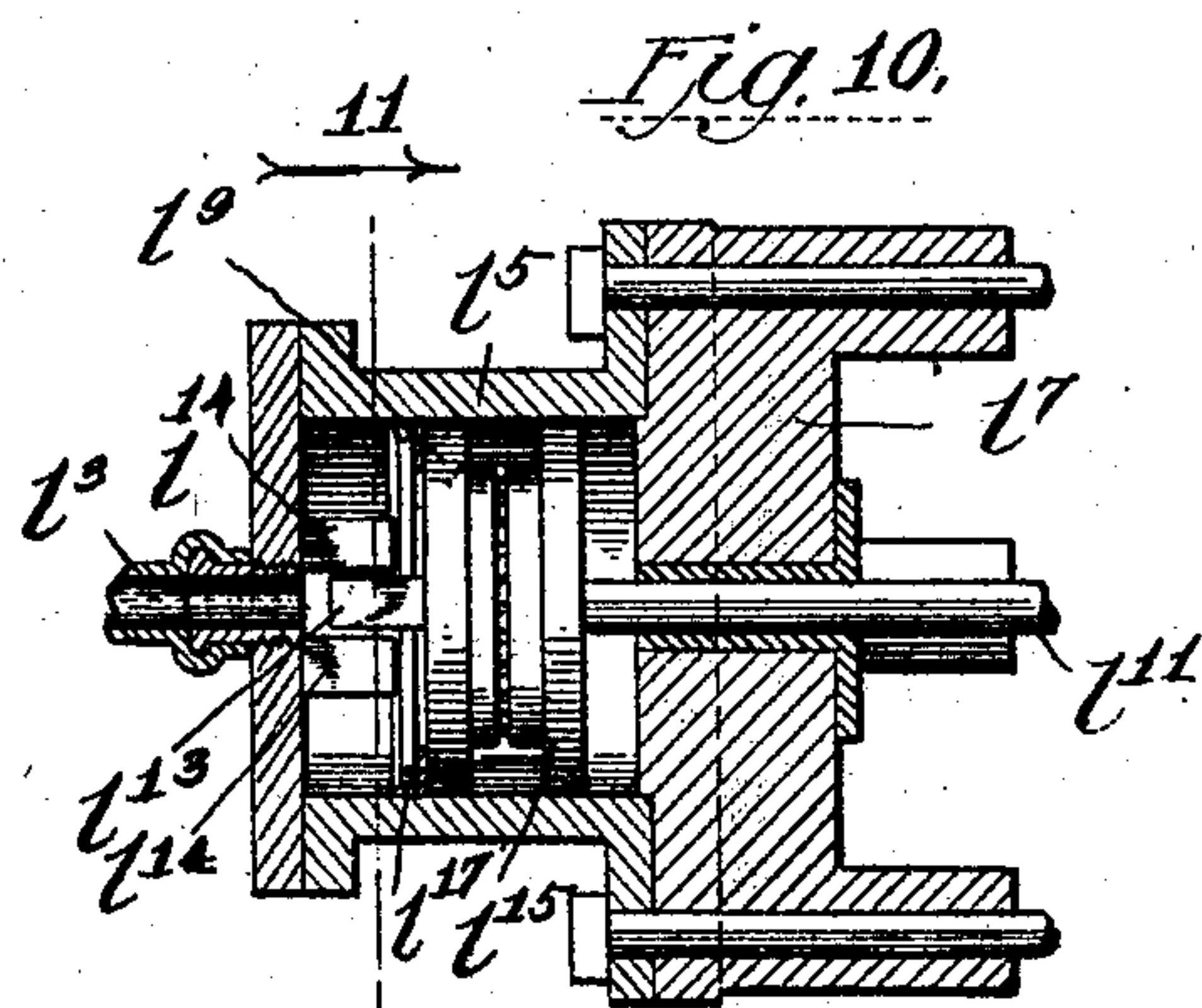
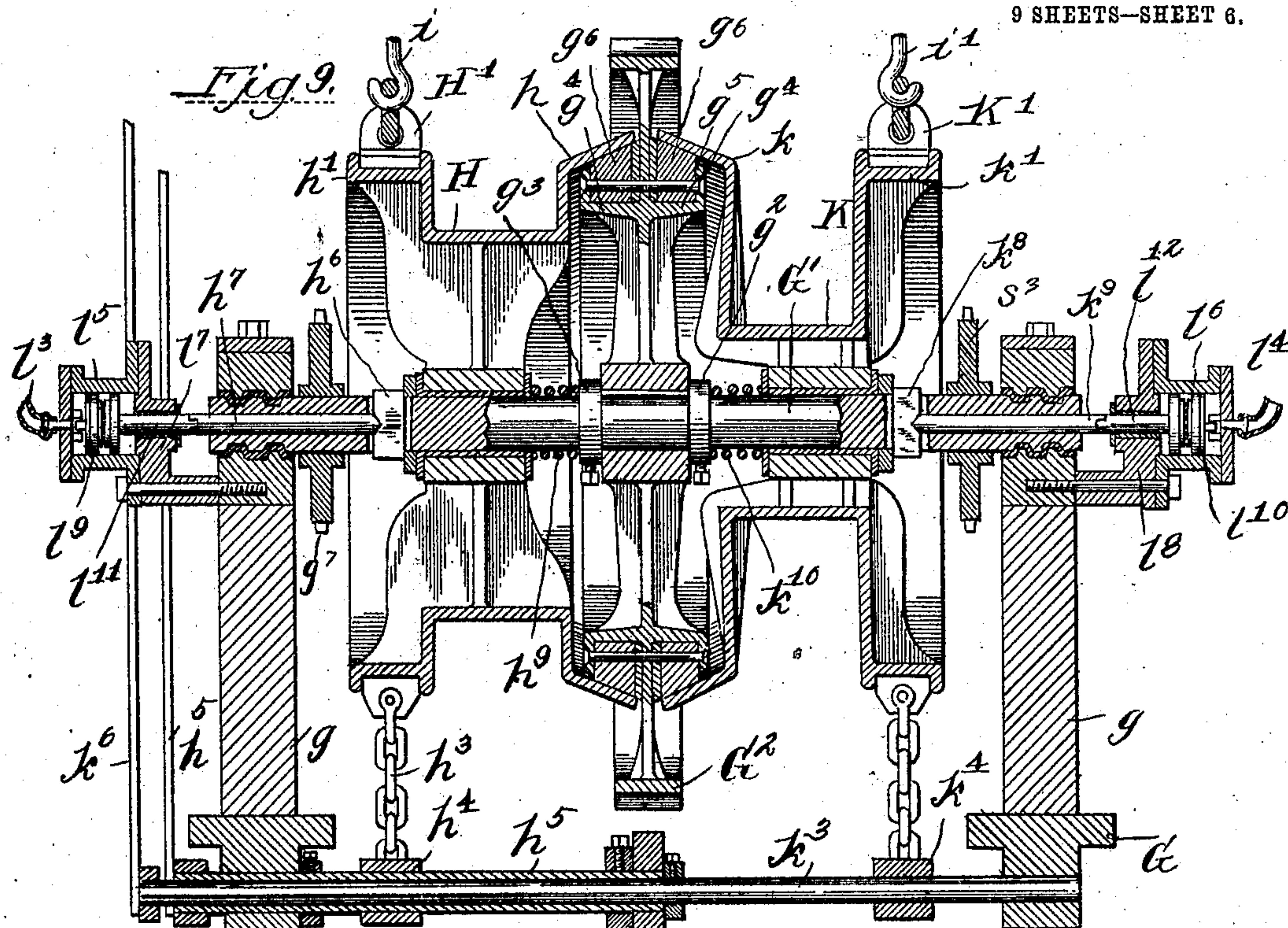
Morton E. Pugh

By Charles H. Hill
Attorney.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 6.



Witnesses:

G. A. Paulschmidt

Lute S. Alter

Inventor:

Montgomery B. Pugh

By Charles H. Smith
Attorney.

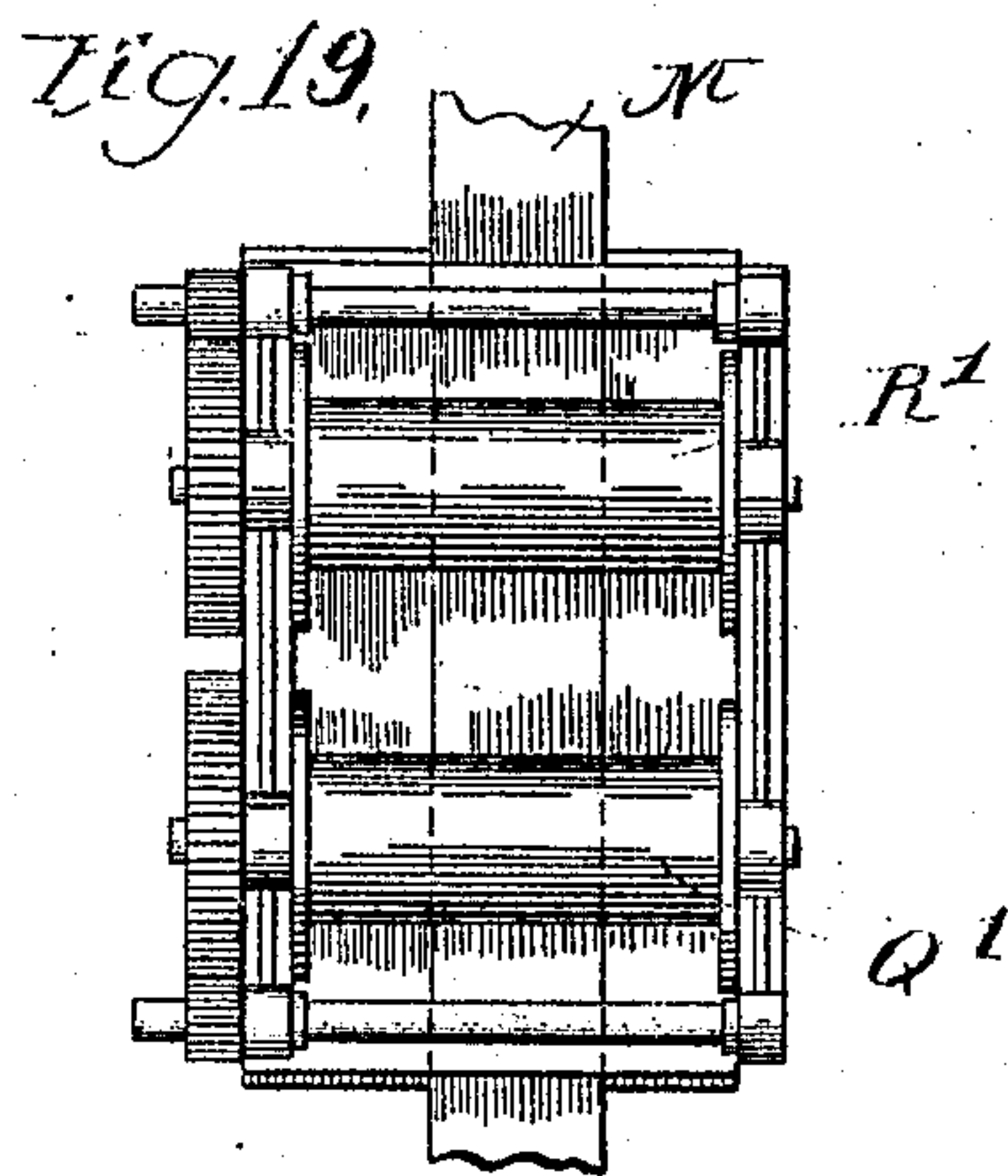
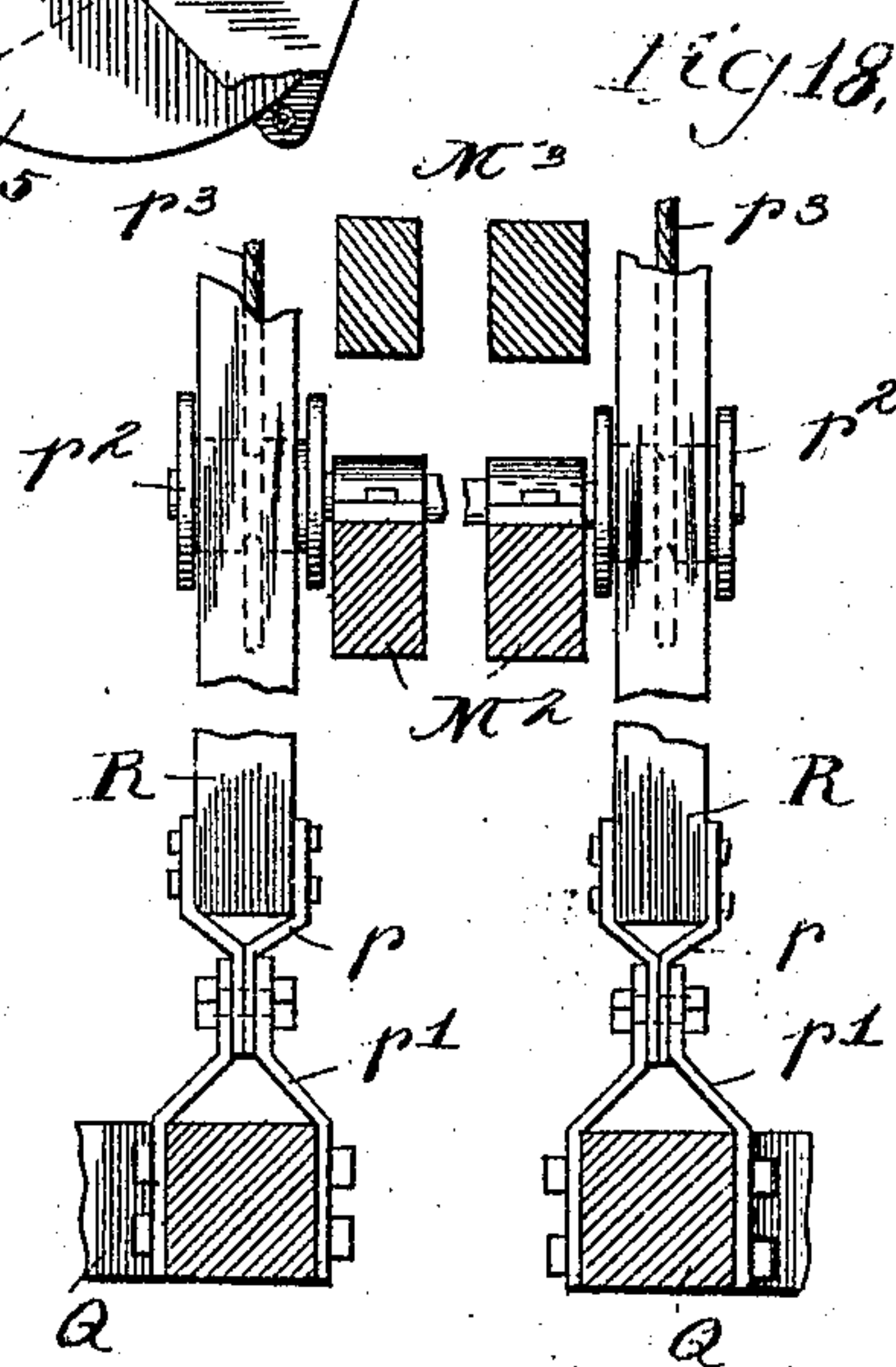
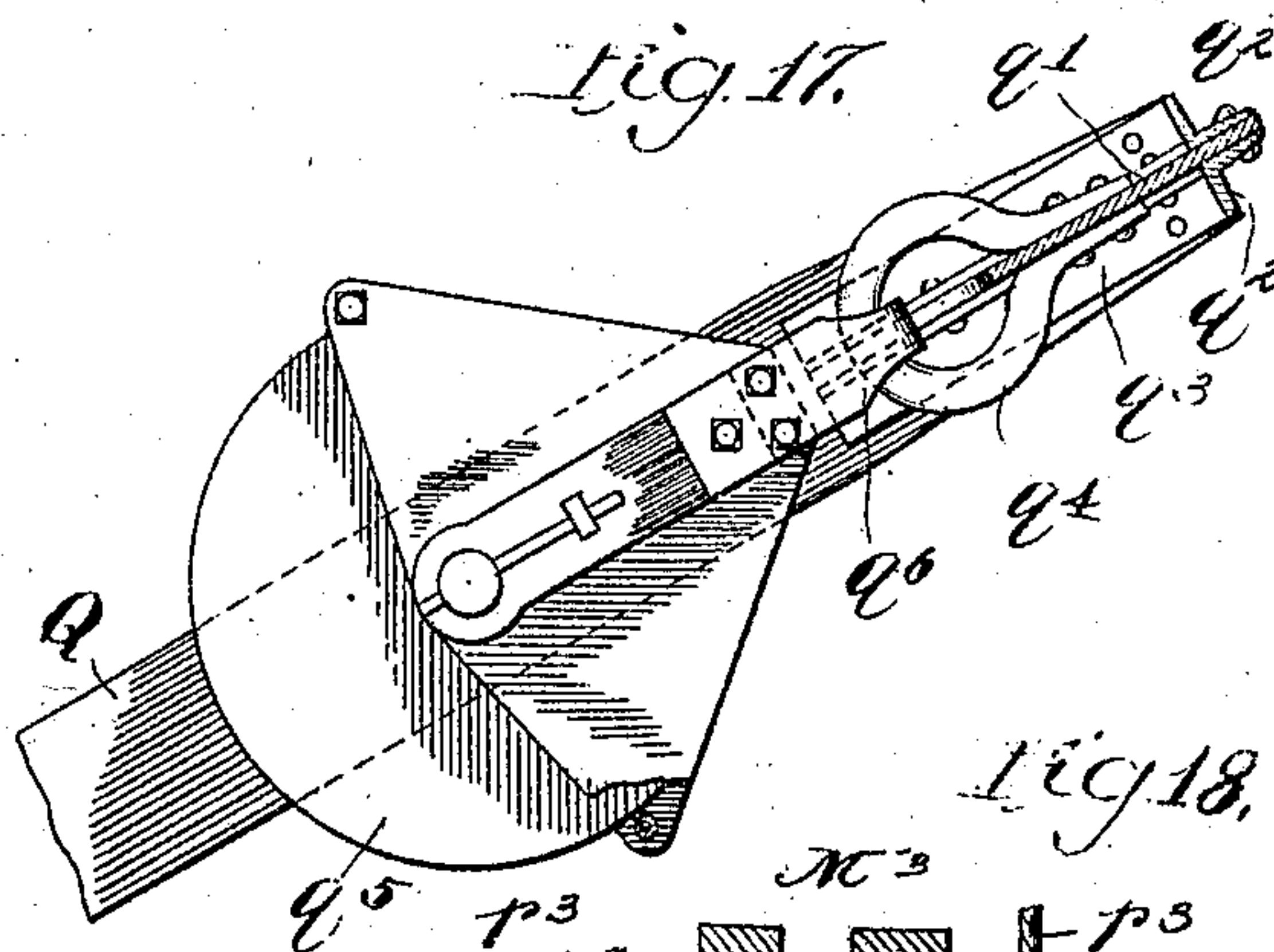
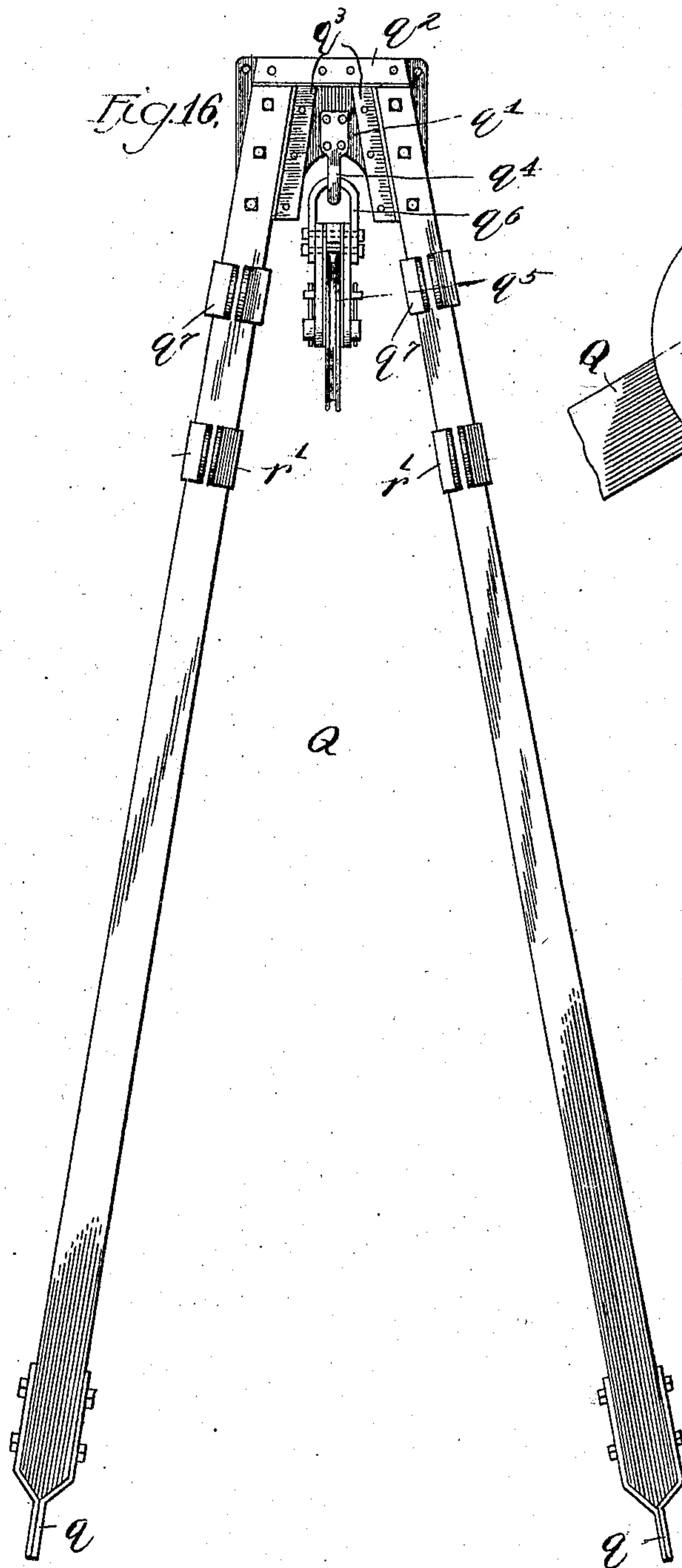
No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 7.



Witnesses:

G. A. Paulschmidt

Lute S. Allen

Inventor:

Morton E. Pugh,

By

Charles H. Hies
Attorney.

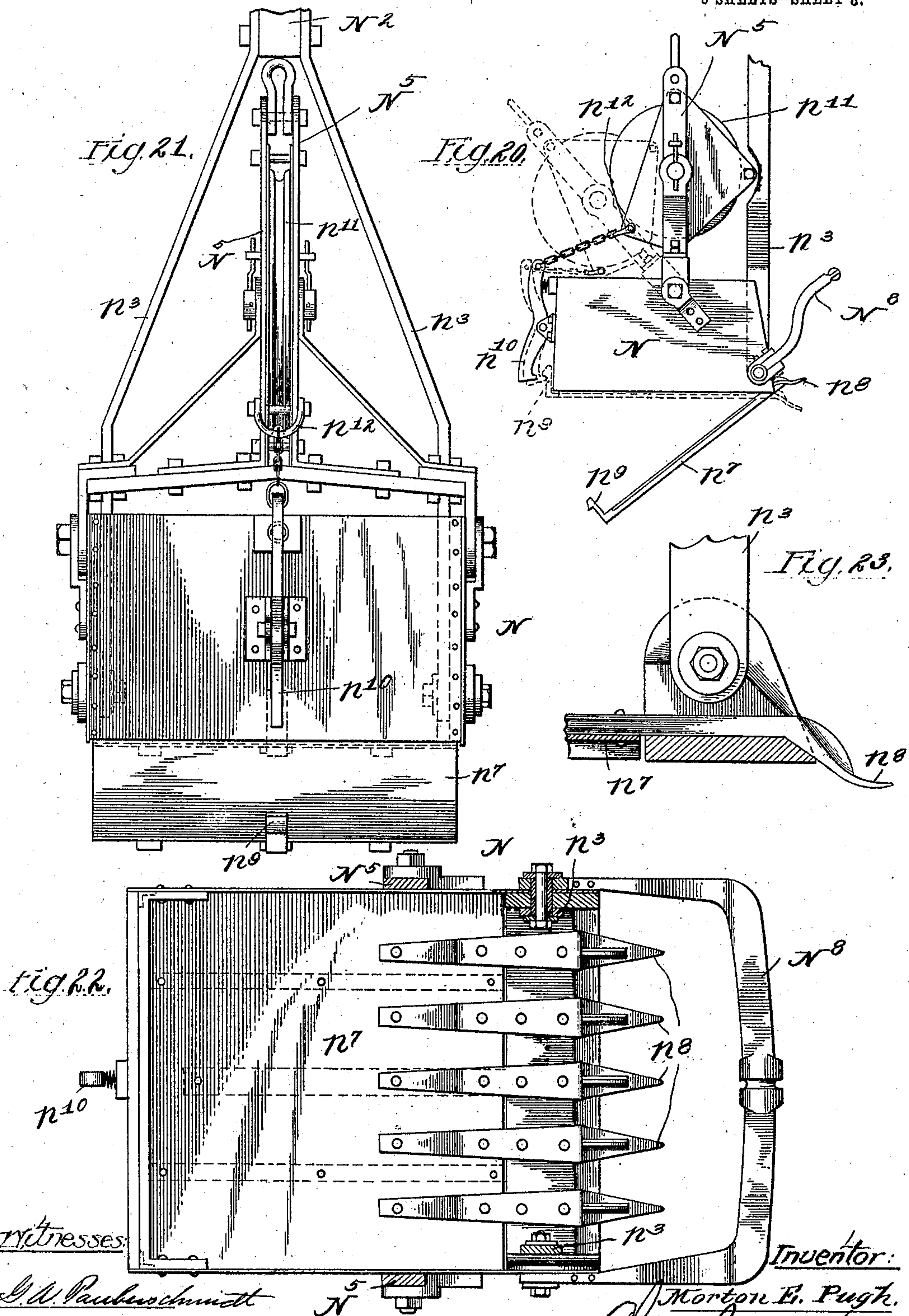
No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH,
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 8.



Witnesses:

D. W. Paulschmidt

John S. Allen

Inventor:

Morton E. Pugh

By

Charles W. Hill
Attorney.

No. 806,288.

PATENTED DEC. 5, 1905.

M. E. PUGH.
EXCAVATOR.

APPLICATION FILED APR. 11, 1904.

9 SHEETS—SHEET 9.

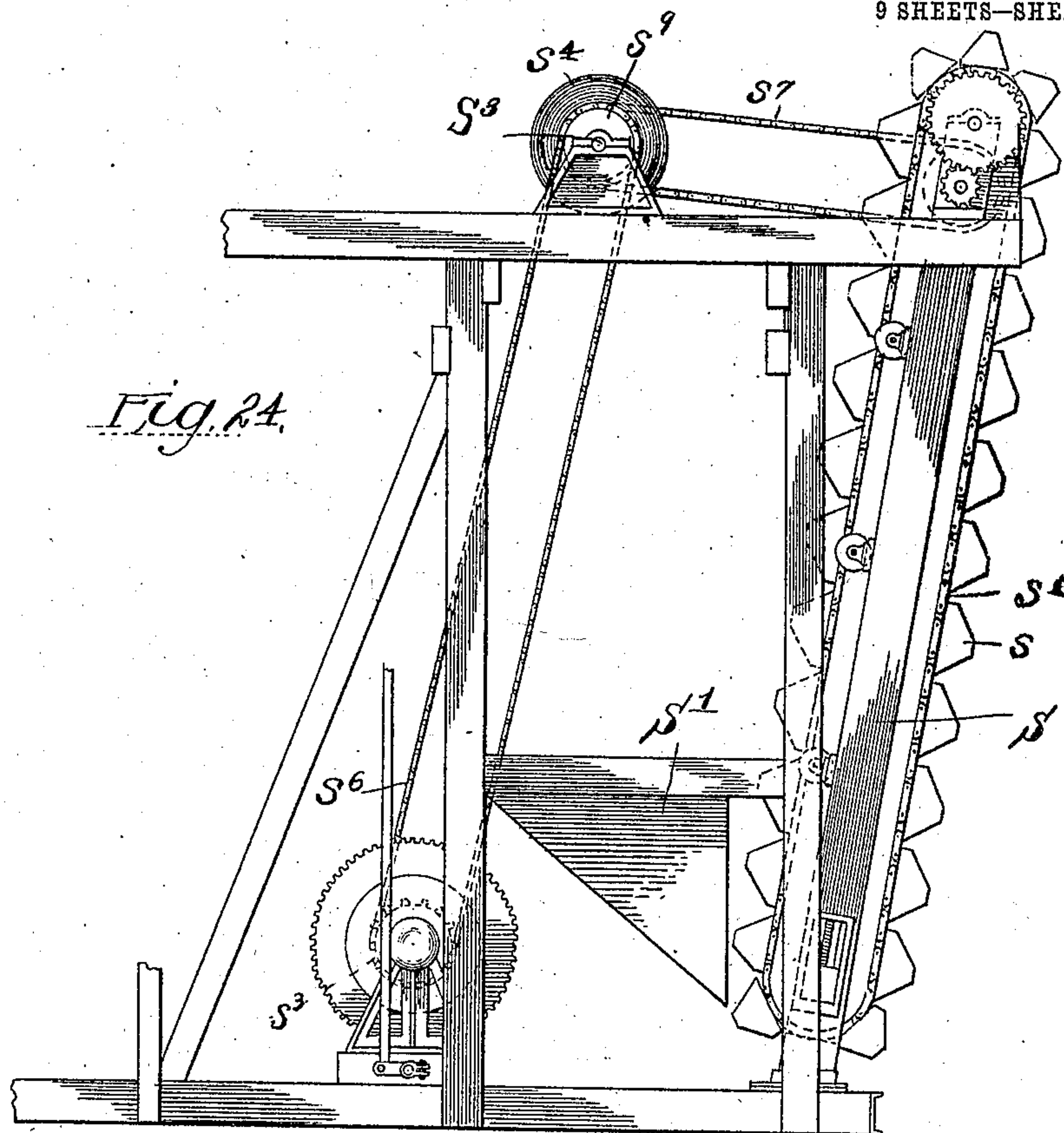
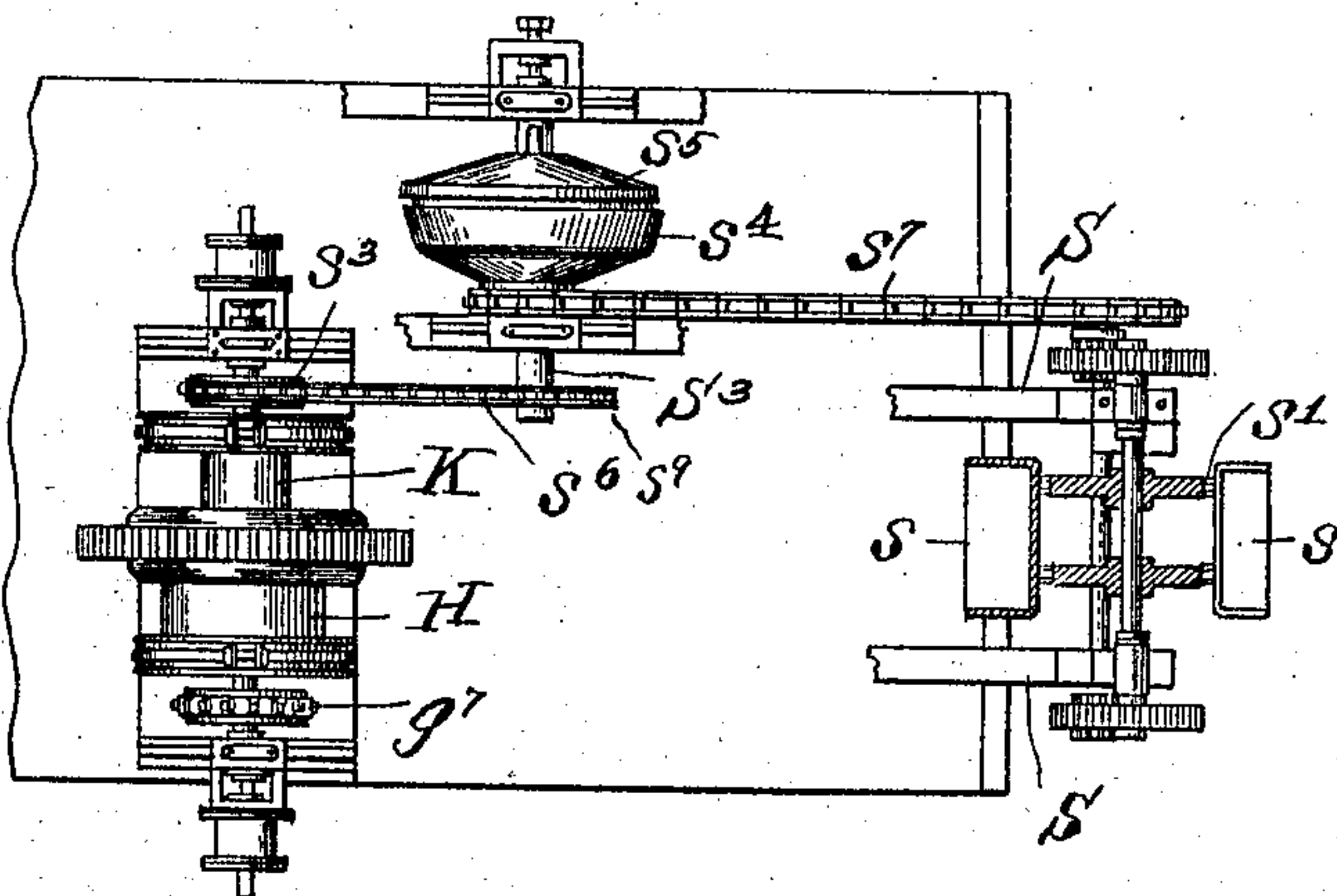


Fig. 25.



Witnesses:

J. W. Pauchurchman

Lute S. Alter

Inventor

Morton E. Pugh,

By Charles W. Hill
Attorney.

UNITED STATES PATENT OFFICE.

MORTON E. PUGH, OF CHICAGO, ILLINOIS.

EXCAVATOR.

No. 806,288.

Specification of Letters Patent.

Patented Dec. 5, 1905.

Application filed April 11, 1904. Serial No. 202,492.

To all whom it may concern:

Be it known that I, MORTON E. PUGH, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Excavators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of the specification.

This invention relates to excavators, and more particularly to that class set forth in my prior invention, "Excavating-machine," patented to me on the 18th day of May, 1897, No. 582,683, and in which the material excavated was adapted to be delivered inwardly from the excavator and to any desired point.

With excavators of the class described it has heretofore been difficult to hold the shovels in to their work. This is especially true where the material excavated is a coarse gravel or other substance offering considerable resistance to the advance of the shovel. To secure the best results, it is of course necessary to fill or approximately fill the shovel at each trip. As such devices have heretofore been constructed it has been necessary to constantly employ one or more men on the bank to aid in filling and closing the shovel or dipper and another to release the load when in dumping position. In the use of some steam shovels and excavators heretofore devised the shovel-car remains stationary and usually is blocked or jacked up at its sides while working into the bank and is not adapted to move along the track to a new position while the bucket is dumping, thereby necessitating stopping the excavator when it is desired to take up a new position and losing considerable time.

The object of this invention is to provide an automatically-operating automobile excavating-conveyer of great strength and durability so constructed as to automatically fill and dump the bucket or dipper and to economize in the labor in operating the same and which is capable of being propelled along its track into position to receive the next bucketful while the bucket is traveling to and from its dumping position.

It is also an object of this invention to provide an improved operating means for the construction adapted to insure propelling means and a positive drive both for the ex-

cavator and conveyer and to enable the same to be at all times in immediate control of a single operator, if desired.

The invention consists of the matters hereinafter described, hereinafter more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is a top plan view, partly in horizontal section, of a device embodying my invention. Fig. 2 is an end elevation showing the bucket in position to begin the cut. Fig. 3 is an enlarged end elevation similar to that shown in Fig. 2 and showing the shovel or bucket in position to dump on the conveyer. Fig. 4 is an enlarged fragmentary detail for a part of the tripping mechanism for the bucket. Fig. 5 is a fragmentary side elevation of the device with the excavating mechanism omitted. Fig. 6 is an enlarged fragmentary top plan view of the propelling mechanism for the car and is shown partly in horizontal section. Fig. 7 is a detail of a part of the operating mechanism for the bucket or dipper conveyer. Fig. 8 is a vertical section of the guides and the pinion for the handle. Fig. 9 is an enlarged sectional detail taken longitudinally of the main winch-shaft, illustrating the construction of the operation of the winches. Fig. 10 is an enlarged longitudinal section taken on line 10 10 of Fig. 11, illustrating details of the pneumatic cylinders. Fig. 11 is a section taken on line 11 11 of Fig. 10. Fig. 12 is a longitudinal section of the piston in one of the air-cylinders. Fig. 13 is a similar section showing a modified form of the packing therefor. Fig. 14 is a sectional view of the end of the piston-rod. Fig. 15 is a fragmentary view of the operating-valves for controlling the admission of air to the cylinders. Fig. 16 is a plan view of the A-frame for the bucket or dipper. Fig. 17 is an enlarged fragmentary section of the same, showing the gin-block and fastening therefor. Fig. 18 is a fragmentary view of means for forcing the A-frame downwardly. Fig. 19 is a front elevation of the double winch for operating the A-frame. Fig. 20 is a side elevation of the dipper or bucket and a part of the operating means therefor. Fig. 21 is an enlarged rear elevation of the bucket or dipper. Fig. 22 is a top plan view of the same. Fig. 23 is a detail illustrating the construction of the front or nose of the bucket or dipper. Fig. 24 is a fragmentary side elevation of an elevator

conveyer adapted for use in connection with my invention. Fig. 25 is a reduced plan view of the operating or driving means therefor.

As shown in said drawings, the invention
 5 embraces a flat or other suitable car A, provided with operating mechanism adapted to propel the same in either direction and provided with a strong superstructure or frame,
 10 from which is supported and operated a dipper, shovel, or bucket excavator N, adapted to excavate the bank at the side of the car and to deliver its contents upon a conveyer O, supported usually at the other side of the car and delivering the material received from
 15 the excavator laterally, and, if desired, into a car or other means for transportation conveniently located beneath its end. Both the excavator and conveyer are operated by driving mechanism supported upon the car and are
 20 provided with controlling mechanism adapted to enable the operator to control perfectly all parts of the device from a central point. Said car A may be of any ordinary or preferred construction capable of affording sufficient
 25 rigidity of platform or deck to serve as a rigid foundation for the mechanism carried thereon. Supported on said car and as shown at one side and at one end thereof is a steam-boiler B, which, as shown, is of the ordinary
 30 locomotive type, but may be of any preferred construction. A pair of horizontal twin hoisting-engines (indicated by B' and B'') are connected at quarters in a familiar manner with the main driving-shaft *b*. Secured on said
 35 main driving-shaft are a sprocket-wheel *b'* and a pinion *b''*. At the rear or driving end of the car and positioned slightly in advance of and above the truck is a driving mechanism comprising a pedestal or base C,
 40 adapted to be rigidly bolted or otherwise secured upon the deck of the car. Uprights or standards *c*, extending upward therefrom, and those on each side of said frame are rigidly connected by an upper frame member *c'*,
 45 which may be integral with said side frame member or bolted thereto, as preferred. Also rigidly connected with the side frame members or uprights are a central and a forwardly projecting bracket *c''* and *c'''*. Journaled transversely of the car in said forwardly-projecting
 50 bracket *c'''* is a shaft C', having a sprocket-wheel *c''* thereon in alinement with the sprocket-wheel *b'* on the main driving-shaft of the engine, and which is connected therewith by a sprocket-chain *c''*, communicating
 55 the drive thereto. Rigidly secured on said shaft C' is a pinion *c''*, which meshes with a large driving-gear C'', journaled upon a shaft C³, journaled above the forward standards *c*
 60 of the frame, and which meshes with a corresponding gear D, journaled on a shaft D' above the upright *c* at the rear of said frame. Each of said gears is free to turn upon its shaft C³ and D', respectively, and at the outer side
 65 thereof is provided a collar *c''* and *d''*, respec-

tively, which bears against the hub of said gear and is provided in its outer face with a slot registering with a longitudinal slot in the shaft and in which is inserted a sliding key *c''* and *d''*, respectively. Against each of said
 70 keys bears a thrust-rod *c''* and *d''*, slidably seated in an axial aperture in the respective shafts, and at the outer end of which is the operating means adapted to force either of
 75 said thrust-rods inwardly, thereby sliding the gear inwardly on the shaft. On the inner face of each gear is provided a friction, which is shown as built up of friction-paper, rawhide, or other suitable material. That on the
 80 gear D only is shown and is indicated by *d''*. Rotatively secured on the shafts C³ and D' are the pinions *c''* and *d''*, respectively, on the outer end of which is rigidly secured a friction *c''* *d''*, each provided near its periphery
 85 with an inwardly-tapering groove adapted to receive the built-up frictions of the respective gears. Secured on each of the shafts C³ and D' and bearing against the inner adjacent faces of said friction-disk and said gear are the
 90 strong pushing-springs *d''*, acting normally to hold said gears out of engagement with said friction-disk. (That on the shaft D' only is shown and indicated by *d''*.) Journaled in the
 95 middle brackets *c''* of said frame is a shaft E, upon which is rigidly secured a geared driving-wheel E', meshing on its opposite sides with the pinion *c''* and *d''*, and on the inner end of the shaft approximately over the center of the car are provided sprocket-wheels,
 100 over which is trained a sprocket-chain *e*, which is led over suitable idlers *e'* and *e''*, as shown in Fig. 5, to a sprocket-wheel on the rear truck-axle of the car A. A corresponding
 105 sprocket-chain *e''* extends downwardly through the floor of the car and is served about a sprocket-wheel secured on the front axle of said car-truck. Means are provided for sliding either one of said gears C² or D inwardly into engagement with its friction, thus enabling the car to be moved in either direction
 110 without reversing the engine. Said actuating means, as illustrated in Figs. 5 and 6, comprise a lever F, pivoted upon the operating-table platform I, and at the lower end of which is pivoted a connecting-rod *f*, which leads
 115 rearwardly and is secured to a horizontal connecting-bar *f'*, the ends of which are engaged on the upwardly-directed actuating-levers *f''* and *f'''*, the lower ends of which are secured upon the screw-jacks *f''* and *f'''*. Said screw-jacks operate in axial alinement with the
 120 respective shafts C³ and D' and are respectively right and left threaded and at their inner ends bear against the thrust-rods *c''* *d''*, so that when the lever is shifted in one direction the gear
 125 C² is forced inwardly into engagement with its friction, thereby driving the shaft E, and propels the car in one direction, while the reversal of said lever acts to release the pressure of the gear C², permitting the same to
 130

move out of engagement with its friction, and forces the gear D into engagement with its friction, reversing the direction of the drive of the car. If preferred, pneumatically-operating means for actuating and reversing the drive of the car may be employed, such as hereinafter described with reference to the winches.

Secured in advance of the engine and transversely the car are winches, or, as shown, a double winch, for operating the bucket or shovel, hereinafter more fully described. Said winch, as shown, comprises a base or bed G, provided with uprights or standards g at each end thereof adjacent the sides of the car and upon which is journaled a horizontal shaft G', rigidly secured upon which in position to mesh with the pinion b² on the main driving-shaft is a driving-gear G². A collar g² and g³ is rigidly secured to the shaft on each side of said gear. Secured on each side the spider of said gear intermediate the hub and rim is a laterally-directed concentric flange g⁴, each provided at its outer edge with an outwardly-directed flange g⁵. Said flanges afford a channel adjacent the web of the gear, within which is rigidly secured by bolting or other suitable means a rim g⁶ of friction material of any desired kind. Said frictions are shaped to afford outwardly-tapering or conical frictions, one on each side of said gear. Said shaft at its ends is grooved where journaled on the bearing and afford a thrust-bearing from the shaft, and journaled on said shaft on each side of the gear are the drums H and K, respectively, slidably journaled on said shaft. Said drums are each provided with a peripheral flange h k, complementary with and adapted to engage, respectively, the frictions g⁶ on the gear, and at the outer end of each drum the diameter is increased, as shown, and a peripheral groove h' k' is afforded, adapted to receive the straps H' K' of a strap-brake. Said straps are normally supported free from the friction-faces of the drum on hooks i i', engaged to the operating-platform I, positioned above the engine and winch. Journaled in the base G of the winch-frame parallel with the shaft G' is a shaft k³, on which is secured a crank-arm k⁴, connected, by means of a chain or in any suitable manner, with the lower ends of the brake-straps, as shown in Figs. 5 and 9. At the outer end said arm is connected with a vertical operating-lever k⁶, which extends through the platform I and at its upper end is pivotally connected with a lever k⁷, adapted to be operated in any desired manner to force the lever k⁶ downwardly, bringing the brake-straps into positive bearing with the friction brake-surface on the end of the drum. The straps of the brake H' are connected at their lower end by means of a chain or the like k³ with a crank k⁴, rigidly secured on a sleeve k⁴, through which the shaft k³, before described, extends. On the outer end of said sleeve is

provided a lever k⁵, similar to the lever k⁶ and similarly actuated to bring the brake on the drum H into operation independently of the operation of the brake on the drum K. Each of said drums is movable longitudinally of the shaft into positive engagement with the frictions on the gear G², independently of the other, and, as shown, a longitudinal slot is provided in each end of said shaft adjacent the outer ends of each drum, and a key or wedge block k⁶ and k⁸, respectively, is secured in each and bears against the outer end of the hub of each of said drums. A thrust-rod k⁷ k⁹ is seated in an axial bore in each end of the shaft and bears at its inner end against said key or wedge block. At the outer end of each thrust-rod means are provided adapted to force the same inwardly, thereby moving the friction of the corresponding drum inwardly, bringing the friction-disk thereon into positive engagement with the friction on said gear, as shown in Fig. 9, in which both of the drums are shown in position to be driven by the gear. Any desired means may be used to actuate said drums. As shown, however, a motor L and an air-pump L' of any desired type are provided, and connected with the pump is a main pressure-tank l, which is connected, by means of a pipe, with an engineer's valve l' of any desired type, mounted on the operating-platform I. Said valve is piped to control the brake of the car, the tank l² of which is indicated below the car. A pipe l²⁰, also in open communication with the main pressure-tank, connects in valves L² and L³ adjacent the engineer's valve l' and is connected, by means of a pipe l³ l⁴, with a pneumatic cylinder l⁵ and l⁶, supported upon suitable brackets l⁷ and l⁸ at each end of the shaft G'. Said cylinders are in alinement with said shaft, and within each is a piston l⁹ and l¹⁰, the piston-rod l¹¹ and l¹² of which bears against the respective thrust-rods k⁷ and k⁹ in the ends of the said shaft, so that when air is admitted to either of the cylinders its piston acts to force the thrust-rod inwardly, jamming the friction of the drum on said end of the shaft into positive bearing with the friction upon the gear.

As shown, a circular head l¹⁵ is rigidly secured on each piston-rod and is provided with a concentric groove therein corresponding with a groove in the piston-head l⁹ and l¹⁰, affording therewith a ball-face adapted to receive the antifriction-balls l¹⁶. On the outer side of each piston-head l⁹ l¹⁰ is provided an angular projection l¹³, which engages between angular inwardly-directed studs l¹⁴ l¹⁴ on the head of the cylinder and which holds the piston-head from rotation. This construction permits the rotation of the thrust-rod and head l¹⁵ with the shaft G' when the drum is operated by the piston. Each of said piston-heads is provided with hydraulic or pneumatic packing (indicated by l¹⁷ in Fig. 12) or, if preferred, by the usual packing-rings l¹⁸, as shown

in Fig. 13. Means are provided for throwing said frictions out of engagement when the air-pressure is released, comprising a powerful spring h^9 and h^{10} , respectively, which engage
 5 against the collars g^2 and g^3 on each side of the gear and against the inner end of the hubs of said drums, acting when the pressure is released from the piston to immediately slide the drum on the shaft sufficiently to separate
 10 the frictions.

Supported on the front end of the car in advance of the winch is an upright frame comprising posts M and M' on the respective sides of the car, which are connected at the top in
 15 any desired manner, both longitudinally and transversely of the car, to afford a rigid support and are rigidly braced transversely of the car to afford rigid support for the bucket, shovel, or dipper N and the conveyer O during operation. Rigidly secured at the top of
 20 said frame and bolted through the posts M and M' is a transverse beam M^2 , which is of a length much greater than the width of the frame and projects at each end beyond the same, as shown in Figs. 2 and 3, affording a
 25 boom on each side the car. As shown, said beam projects a greater distance from the bucket or dipper side of the machine than on the conveying side thereof. A beam M^3 is secured above and parallel with the beam M^2
 30 and a like distance on the excavating side of the machine, and at their outer ends said beams and at intervals in their length are rigidly secured together by means of beams m , extending longitudinally of the car. Said beams M^3
 35 are at a level with the top of the frame, and supported thereon and upon other transverse members (not shown) is a floor upon which is supported an engine P, adapted to be supplied
 40 with steam from the boiler B and which operates a part of the excavating mechanism, as hereinafter described. Oblique struts or braces m' extend from the foot of the post to the outer extremities of beams M^2 and are
 45 connected at their middle with a diagonal brace m^2 , rigidly secured on the frame at the junction of the post M with said beam M^2 . In a like manner a diagonal brace m^3 extends from the foot of the post M' and is rigidly
 50 secured on the projecting end of the beam M^2 on that side of the frame. Ordinarily two of said beams M^2 M^3 are provided, which extend parallel with each other and the ends of which are connected with the transverse beams m
 55 and m^4 , as shown in Fig. 2, rigidly bolted each to each.

Hinged at the excavating side of the car and at the foot of the upright M is an A-frame Q, comprising beams of the requisite length
 60 provided at their lower ends with an apertured strap q , adapted to engage in complementary fittings secured on the side of the car to afford the hinge. Said beams converge at their outer ends and are connected by means
 65 of a metallic plate q' , which, as shown, is fit-

ted into longitudinal slots in the end of said beams and rigidly bolted in position. Angle-bars q^2 are bolted transversely at the ends of said beams to said plate, and corresponding
 70 angle-bars q^3 are fitted against said plate and the inner side of each beam and rigidly secured in position by means of bolts which extend through the webs of said angle-bars and said plate and through the flanges and said
 75 beams, respectively. A loop or eye of metal q^4 is rigidly secured centrally on said plate q' by riveting or the like and receives the clevis q^6 of a gin-block q^5 , which may be of any preferred construction, but which, as shown,
 80 has a metal housing thereon provided with means of any desired kind to prevent the line becoming fouled when slack. Metal clips q^7 are rigidly bolted on each of the beams of the A-frame adjacent the gin-block or in any
 85 point near the upper ends thereof and are connected by block and tackle in any suitable manner with the beam m . As shown, sheaves q^8 q^9 are used, through which a line is rove in any suitable manner and from which the line
 90 passes inwardly to a winch Q', supported on the post M, and which, as shown, is a hand-operated winch adapted to adjust the end of the A-frame as to height without interfering with the operation of the remainder of the
 95 mechanism. Said A-frame is held rigidly in its adjusted position by means of thrust-beams R, as shown, two in number, provided at their ends with apertured metallic straps r , bolted thereon, which are hinged in complementary
 100 straps r' , secured to the beams of the A-frame. Said thrust-bars extend upwardly and inwardly above the A-frame, and at a point intermediate their ends each rests upon a flanged pulley r^2 , journaled transversely on the beams
 105 M^2 , as shown in Fig. 18. A line r^3 is secured at the end of each thrust-bar and extends downwardly between the same and said pulleys r^2 , as shown in Figs. 2 and 18, and is led inwardly to the hand-winch R', similar to the
 110 winch Q', and which, as shown, is supported in the same frame therewith and supported on one of said uprights M. When strain is brought on said lines r^3 , any desired amount of downward pressure can be applied to the
 115 A-frame, thereby acting to hold the same rigidly from lifting during the operation of the machine.

Pivotaly secured between the parallel projecting ends of the beams M^2 M^3 is a frame or housing N', having journaled therein one
 120 above the other the flanged pulleys or rollers n' . Journaled on the inner side of said housing at equal axial distances from said rollers is a pinion n^2 . A rack-bar N², slidably engaged between said pulleys n' and the pinion
 125 n^2 , meshes with the latter and extends downwardly and is provided with metallic strap n^3 on each side at its lower end, forming a yoke, the ends of which pivotaly engage at the front end of said bucket N. Said pinion n^2 ,
 130

which actuates the rack-bar and bucket or dipper vertically, is driven by a sprocket-chain n^4 , which is carried around the sprocket-wheel n^5 , rotatably secured on a shaft n^6 , as shown in Figs. 2, 3, and 7. A friction-disk N^3 , similar to the disks heretofore described, is driven by a complementary friction N^4 , feathered on said shaft n^6 . Said friction N^4 is actuated longitudinally of the shaft into engagement with said friction-disk N^3 in any suitable manner at the will of the operator. The engine P drives a pinion p , which meshes with a gear p' , rigidly secured on said shaft n^6 , thereby driving the same, and when the frictions are in engagement acts to depress the bucket or dipper. When said frictions are out of engagement, said dipper and the rack-bar handle therefor move downwardly by gravity, the sprocket-wheel n^5 rotating freely upon its shaft.

Said bucket or dipper N comprises, as shown, a body formed of plates of metal affording the sides and the rear wall thereof and which may be of any desired width or thickness or of any capacity. The rear end of the bucket or dipper is rigidly braced at the angles by angle-bars, affording a very rigid construction. The bottom n^7 of the bucket is hinged at the front ends of the same on the yoke-arms n^3 , and rigidly bolted, riveted, or otherwise secured on the projecting front edge or lip of said bucket are strong forwardly and downwardly extending teeth n^8 , adapted to engage in the bank, and which are carried rearwardly for a considerable distance along the bottom of the bucket, as shown in Fig. 22. The bottom of said bucket is also strengthened by longitudinal bars of any suitable structural metal. (Shown in dotted lines in Fig. 22.) At its rear end the bottom is provided with an upwardly-projecting arm n^9 , provided with an outwardly-projecting shoulder at its upper end. Said shoulder is adapted to engage a spring-controlled lever-detent n^{10} , pivoted on the rear end of the bucket, so that as the teeth at the front end of the bucket engage in the bank and the pressure thereon causes the bottom of the bucket to close said lip or shoulder is engaged by the detent n^{10} , which holds the bottom of the bucket in a closed position until the load is discharged into the conveyer. As shown, a bail N^5 is pivoted on the side walls of the bucket near the middle thereof, and a sheave n^{11} is journaled therein. A clevis n^{12} is connected with said bail, and a chain or other flexible connection extends rearwardly and engages with the upper end of the lever-detent n^{10} , as shown in Figs. 2, 3, and 21, said chain being of sufficient length to permit the same to remain slack when the bucket is in loading position, with the bail inclined rearwardly, but acting to release the detent when the bail assumes a vertical position with respect to the bucket. Sheaves N^6 N^7 are secured in the top of the

frame near the center thereof, about which and the sheave n^{11} a cable n^{13} leads to the drum H of the winch, so that operation of said winch acts to elevate said bucket or dipper and swing the same inwardly to dumping position, as shown in Fig. 3. The bail N^5 now assumes a vertical position with respect to the bucket, thereby releasing the detent n^{10} , permitting the bottom of the bucket to swing downwardly, dumping the contents into the conveyer O . Means are provided for drawing said bucket into the bank, comprising a forwardly-directed bail N^8 , secured on the same pivot, whereby the yoke-arms n^3 are engaged thereon and at the middle of which is connected a line n^{15} , which extends upwardly through the gin-block q^5 at the top of the A -frame and inwardly toward the frame, and a pulley n^{16} is engaged at the end of said line and the fall thereof is taken to the winch-drum K , whereby the operation of said winch acts to draw the bucket or dipper forwardly and upwardly along the bank, filling the same.

The conveyer O , as shown, is a continuous belt conveyer, supported upon said frame for the excavator on the opposite side thereof. Said conveyer-frame comprises parallel beams, channel-bars, or other suitable structural material o , which are pivoted near their inner end on an upwardly-extending bracket or standard o' , supported on the car. The outer end of said frame is supported on the laterally-extending ends of the beams M^2 upon stay-rods o^2 and o^3 , connected with the beams m m^4 and each, as shown, provided with a suitable turnbuckle or other means for adjusting the same as to length and to hold the frame of the conveyer at all times properly supported in alinement. Suitable driving drums or pulleys are journaled at the outer and inner end of said frame, indicated by o^4 and o^5 , respectively. Disposed along the length of said conveyer-frame are closely-arranged transverse rollers o^6 , which, as shown in Fig. 1, are of a greater diameter at the end than in the middle, said end portions being conical and inclined inwardly. A continuous conveyer belt or apron O^2 is stretched around the drums or pulleys o^4 and o^5 , and owing to the large conical ends of said rollers o^6 the upper surface of the conveyer is dished or concave transversely, acting to hold the material thereon during its ascent to the delivering end thereof. Means are provided at both ends of the conveyer for adjusting the tension of the apron or belt O^2 , comprising movable boxes o^7 for the shaft of said pulleys adapted to be shifted longitudinally of the frame by means of the adjusting-screws o^8 . A hopper is provided at the inner or lower end of the conveyer, the bottom of which is formed by said belt or apron and into which the material from the dipper or bucket falls when discharged. Said conveyer is driven, as shown, from the sprocket-wheels q^7 on the shaft G' of the operating-winch,

which, as shown in Fig. 5 and in dotted lines in Fig. 1, is connected by a sprocket-chain o^{10} with a corresponding sprocket-wheel of a counter-shaft o^{11} , on the end of which is secured a beveled pinion o^{12} , which meshes with a corresponding pinion o^{13} , secured on a shaft o^{14} , extending transversely of and beneath the same and on the end of which is secured a driving-pulley o^{15} , in alinement with a corresponding pulley o^{16} on the driving-shaft at the outer end of said conveyer, over which is trained any suitable flexible driving means. As shown, however, a cable-drive is used.

While usually it is desired to deliver the excavated material laterally of the car to a car to be loaded or to provide a fill or for other purposes, it sometimes occurs that it is desirable to deliver and elevate the material off the end of the car and longitudinally thereof. For this purpose an additional conveyer acting to deliver the material longitudinally of the car is provided, and when the apron of the lateral conveyer is disconnected said conveyer is adapted to receive the contents of the dipper or bucket when dumped. For convenience of illustration the longitudinal conveyer is omitted from Figs. 1, 2, 3, and 5 and illustrated in Figs. 24 and 25, though obviously both conveyers may conveniently be and, in fact, actually are frequently operated from the same car. Said longitudinal conveyer, as shown, comprises an upright frame of any suitable structural material S , supported on the excavating end of the car and inclined outwardly and at its top supported on top frame members of the excavator-frame. A bucket conveyer is shown, comprising a plurality of buckets s , secured upon the sprocket-chains s' in close proximity with each other and trained over sprocket-wheels at the upper and lower ends of said upright. A hopper S' , adapted to receive the material from the dipper, is provided, which is substituted for the hopper O and is positioned to fill said buckets, as shown in Fig. 24. Said conveyer S is driven from the sprocket-wheel s^3 on shaft G' of the winch adjacent the drum K , the sprocket-chain being trained around said sprocket-wheel and driving to a sprocket-wheel upon a counter-shaft S^3 , as shown in Fig. 25, which is identical with the friction-drive illustrated in Fig. 7, heretofore described. A sprocket-chain s^6 leads upwardly to the top of the frame to a sprocket-wheel s^9 , secured upon the counter-shaft S^3 , from whence the drive is directed, by means of a chain s^7 , to a sprocket-wheel journaled at the upper end of the supporting-frame S and from whence the conveyer is actuated. If preferred, the counter-shaft S^3 may be omitted, and the drive may be directed to the counter-shaft at the upper end of the frame S , as shown in Fig. 25.

The operation is as follows: The machine being self-propelled travels under its own motive power to the desired point of opera-

tion and ordinarily is operated by providing parallel tracks upon one of which the machine moves along the face of the excavation (usually a gravel bank) and on the outer of which tracks the cars to be loaded are placed, said tracks usually extending for the entire length of the bank to be operated upon. The operator standing upon the operating-platform I is enabled by means of the engineer's valves and the operating-lever, all within convenient access, to operate the entire mechanism, both to start and stop the engines in propelling the car and to actuate, regulate, and control the excavating and conveying means at will. This enables the operator to move the excavator under its own power along the track to a new position, while the shovel or bucket is moving to or from filling position and while dumping, thereby obviating delays when shifting the position of the excavator along the excavation. Inasmuch as the conveyer is driven from the sprocket-wheel g^7 upon the continuously-revolving shaft G' , said conveyer is in constant operation while excavating, and the attention of the operator can be given mainly to the filling of the dipper or bucket and the moving of the machine from a loaded car to the next empty car to be filled. The dipper or bucket operates as follows: The A -frame Q is first rigidly secured at the desired angle of inclination and proximity with the bank to enable the dipper or bucket to be most effectively filled. The said bucket swings outwardly and downwardly by gravity, but is, however, at all times held under perfect control. The friction-clutch controlling the drum H , to which the hoisting-line leads, is released just before the dipper or bucket reaches the bottom of the cut or bank, and the drum K is thrown into operation, thereby drawing the bucket into and up the bank. The teeth n^8 on the front end of the bottom n^7 act to close the bucket as said bucket is drawn along the bank. The bucket is thus quickly filled with the gravel or other material to be excavated. As the bucket moves outwardly it is obvious that the bail n^3 is inclined rearwardly, thus bringing no stress whatever upon the detent n^{10} and permitting the same to hold the bottom of the bucket in closed relation. When the bucket is filled, the drum H is actuated and the drum K released or partly released, though held at all times under control, thus enabling the bucket in a horizontal position to be swung inwardly supported on the pulleys or sheaves N^6 and N^7 , said rack-bar N^2 sliding upward through the casing or frame therefor and permitting the bucket to swing inwardly to its dumping position. The dumping is obviously accomplished automatically, inasmuch as the inward swing of the bucket or dipper soon brings the bail N^5 to a vertical position, as shown in Fig. 3, thus pulling the upper end of the detent inwardly and releasing the bottom of the bucket, there-

by permitting the contents to fall upon the apron or belt O^2 of the conveyer, which operating continuously delivers the load on the opposite side of the machine from the excavator. The operation now is repeated. Appropriate drums being released while the other is actuated causes the bucket or dipper to swing downwardly, or both of them being partially released the position of the center of gravity of the bucket and rack-bar N^2 is such to cause the bucket to swing outwardly sufficiently to clear the side of the machine and to descend to loading position. Obviously had the conveyer S been used instead of the conveyer O substantially the same result would have been obtained except that the material would have been delivered at the end of the car instead of laterally thereof.

Obviously the vertical adjustment of the A -frame Q may be regulated as preferred by releasing the winch R' and actuating the winch Q' to adjust the A -frame to a desired point, then setting up the winch R' to bring the thrust-bar into positive bearing position with the side members of the A -frame rigidly holding the same from lifting under the upward pull of the cable n^{15} .

While I have described the frame from which the excavator and conveyer are actuated as provided with two beams M^2 , obviously, if preferred, but one may be used. So, too, it is evident that the rack-bar N^2 of the dipper or bucket may be omitted, if preferred, and other types of buckets or excavators may be employed than that herein described and, if preferred, the bucket or dipper may operate at the end of the car. Obviously, too, each and every of the drums and winches may be operated pneumatically from the operator's platform, as well as the several engines or motors, and other means for actuating said winches may be employed, if preferred. Any preferred type of pulleys, sheaves, drums, or other operating mechanism or structural material may be employed without departing from the principle of this invention.

I claim as my invention—

1. In a machine of the class described, a bucket comprising a body open at the front end, a bottom hinged at the front end thereof, forwardly-projecting teeth on the front end of said bottom, hoisting means at the top of the bucket, a detent operatively connected therewith and adapted to hold the bottom in closed position when filled, and means acting automatically to release said bottom when in dumping position.

2. In a device of the class described, a horizontally-operating bucket open at the front, a bottom hinged at said front end, a detent acting normally to hold the bottom closed, means operated by the movement of the bucket to its dumping position acting to release the detent and means carried on the bucket adapted to apply pressure thereon when filling.

3. In a machine of the class described, a horizontally-operating scoop or bucket, a bottom hinged at the front end of the bucket, teeth thereon projecting beyond the hinge and adapted to automatically close the bucket by engagement in the material to be excavated, a hoisting-bail on which said bucket is supported in advance of the center, an outhaul-bail carried on the nose of the bucket, a detent or latch acting to hold the bottom closed and means actuated by the movement of one of said bails with respect to said bucket adapted to release said detent.

4. In a machine of the class described, a scoop or bucket, a bottom hinged at the front end thereof and projecting in advance of the hinge and acting to close the bottom when in operation, a detent acting to hold the bottom closed, a hoisting-bail hinged in advance of the bucket's center, an outhaul-bail hinged on the nose of the bucket and means operated from the hoisting-bail acting to release said detent when at dumping position.

5. A bucket of the class described, comprising continuous sides and a connecting rear end wall, a bottom hinged at the mouth of bucket, projecting teeth on said bottom acting to close the bottom while filling, a hoisting-bail pivoted to the side walls in advance to the center, a detent operatively connected therewith and acting to engage and hold said bottom closed, means applying downward pressure at the front end of the bucket in filling and operative connections between the hoisting-bail and said detent acting to release the detent when the bucket is swung inwardly upon said hoisting-bail.

6. In an excavator, a bucket having a bottom hinged near its front end, downwardly-curved teeth thereon projecting beyond the mouth of the bucket, a hoisting-bail pivotally connected with the bucket in advance of the center, a detent pivoted upon the rear ends of the bucket and adapted to engage the bottom when closed and a flexible connection between the said detent and hoisting-bail acting to release the former by movement of the latter with respect to the bucket.

7. In a machine of the class described, a horizontally-operating bucket or scoop comprising parallel side walls and a connecting rear wall, a bottom hinged at the front ends of the bucket, a projecting downwardly-inclined lip thereon acting to close the bottom by the pressure of the material excavated, a detent carried on the bucket and adapted to hold the bottom closed, a hoisting-bail pivotally engaged to the walls and operatively connected with said detent and adapted to release the same from the bottom when the bucket swings rearwardly thereon, means for drawing the bucket into the material to be excavated and power-operated means acting to hold the front end of the bucket down during filling.

8. In a machine of the class described, the

combination with hoisting mechanism of a bucket supported therefrom comprising a scoop open at the top and front end, a rearwardly and downwardly opening bottom thereon, a levered detent acting to hold the bottom of the bucket closed, a hoisting-bail pivoted intermediate the ends of the bucket, a flexible connection between said bail and said detent and of a length to release the detent only when the bucket swings rearwardly upon said bail, power-operated means acting to force the nose of the bucket into the cut, said hoisting means acting to raise and carry said bucket to the dump in a horizontal position and to release said detent by the relative movement of the hoisting-bail and the bucket.

9. In a machine of the class described, the combination with the hoisting mechanism of a vertically-movable handle, a motor acting to force said handle downwardly, a bucket having a hinged rearwardly-opening bottom and pivotally engaged at its mouth with said handle, means acting to hold said bottom closed during operation and means operated by the hoisting mechanism acting to release the bottom when in dumping position.

10. In a machine of the class described, the combination with hoisting mechanism of a pivotally-supported bucket, a rearwardly-opening bottom hinged at the mouth thereof, a forwardly-projecting lip on said bottom adapted to engage in the material to be excavated, power-operating means acting to draw the bucket into the cut and to partly support the same when moving to dumping position and means operating by the hoisting mechanism acting to release the bottom at dumping position.

11. A bucket of the class described having an open mouth and top, continuous side walls and a rear end thereon, a bottom hinged at the mouth of the bucket, a projecting downwardly-inclined cutting-lip thereon, longitudinal bars rigidly secured to and connecting the cutting-lip and bottom, downwardly and forwardly inclined points thereon projecting beyond the lip and an outhaul-bail pivotally engaged at said lip and means attached thereto acting to draw the bucket into the cut.

12. In a machine of the class described, a bucket, a hoisting-bail secured thereon in advance of the center, a bottom hinged at the front end of the bucket and comprising a relatively broad bar upturned at its ends to afford attaching-ears, downwardly-inclined teeth secured on and projecting beyond the lip each continuous with a rearwardly-directed bar, a sheet-metal bottom riveted to said bars, stiffening-bars beneath the same, a detent at the rear end of the bottom adapted to engage the same in closed position, a forwardly-directed outhaul-bail and a handle secured to the bucket on the pivot for the bottom and means for releasing the bottom detent operated by the inward swing of the bucket when loaded.

13. An excavator-bucket comprising continuous side and rear walls, a bottom hinged at the front end thereon between the side walls and comprising a bar of metal, beveled downwardly on its front edge to afford a cutting-lip, upturned ends on said bar affording ears for pivotal attachment with the side of the bucket, a metallic plate connected with said bar at its rear side affording the remainder of the bottom, downwardly-turned projecting teeth riveted to said transverse bar and bottom, a hoisting-bail and a downwardly-acting thrust bar or handle pivotally secured on the same pivot with the bottom.

14. The combination with a supporting-frame of a laterally-directed support thereon, a hoisting-sheave within the frame, an outhaul-sheave at the end of said support, an excavating-bucket having an open end and top, a hinged rearwardly-opening bottom therein, a hoisting-bail secured on the bucket in advance of the center, a sheave therein, an outhaul-bail on the nose of the bucket, lines connecting said hoisting-sheave with the hoisting-bail and the outhaul-sheave with the outhaul-bail and simultaneously and independently operated, hoisting means to which said lines are engaged acting to fill the bucket, to elevate and to move the same in a horizontal position to the dump and automatically-operated means for releasing the bottom.

15. The combination with an excavator bucket or scoop having an open end and top of a bottom hinged at the open end or mouth and opening rearwardly, a hoisting-bail centrally secured on said bucket, an outhaul-bail secured at the month of the bucket, means acting normally to hold said bottom in closed position while excavating and hoisting independently and simultaneously operating hoisting mechanisms, one engaged to the outhaul-bails acting to draw the bucket into the cut, the other to the hoisting-bail, both of said hoisting mechanisms acting conjointly to elevate and swing the bucket to dump in approximately a horizontal position and means operated by the movement of the bucket to dumping position, acting to release the bottom.

16. The combination with a supporting-frame of a projecting support thereon, hoisting-sheaves within the frame, an outhaul-sheave on said support, an excavating-bucket having an open end and top, a hinged rearwardly, opening bottom therein, a hoisting-bail secured on the side walls thereof in advance of the center, a sheave, an outhaul-bail on the nose of the bucket, lines connecting said hoisting-sheaves with the hoisting-bail and the outhaul-sheave with the outhaul-bail simultaneously and independently operated, hoisting means to which said lines are respectively engaged acting to fill said bucket and elevate the same in a horizontal position and to carry the same to dumping position, a hop-

per adapted to receive the contents of the bucket and a conveyer affording a part of the hopper.

17. The combination with an excavator-
5 bucket having an open end and top of a bottom hinged at the mouth of the bucket and opening rearwardly, a centrally-secured hoisting-bail, an outhaul-bail on the nose of the bucket, means acting to hold said bottom in
10 closed position while excavating, hoisting mechanisms, one connected with the outhaul acting to draw the bucket into the cut, the other of said hoisting mechanisms connected with the hoisting-bail and acting to elevate the
15 bucket and swing the same to dumping position, both hoisting mechanisms acting conjointly to carry the bucket horizontally to the dump, means operated by the movement of the bucket acting to release the bottom and a
20 conveyer adapted to receive the contents of the bucket.

18. A combination with a supporting-frame of an A-frame hinged thereon, a rigid beam projecting over the A-frame, a winch acting
25 to vary the elevation of the end of the A-frame, a thrust-bar engaged on the A-frame and projecting upwardly and means acting to secure said thrust-bar in adjusted position thereby rigidly securing the A-frame from
30 lifting.

19. The combination with a support of an A-frame pivoted thereon, a thrust-bar secured on the A-frame and extending upwardly, means for rigidly securing the thrust-bar to the support thereby holding the A-frame from lifting, an outhaul operated from the end of the A-frame and a bucket adapted to be filled thereby.

20. In an excavator, the combination with a
40 supporting-frame of an A-frame hinged thereto and adjustably connected with the support at its top beam, rigid adjustable means acting to hold said A-frame from lifting, a bucket operated in part from said A-frame, hoisting
45 means engaged on said bucket and acting with said A-frame to elevate the same in horizontal position and a conveyer adapted to receive the contents of the bucket.

21. In a machine of the class described, the
50 combination with a self-propelled supporting-frame, of a hopper thereon, a conveyer leading therefrom to a point of delivery, an A-frame hinged to the supporting-frame, means adjustably connecting the end thereof with
55 the frame, a bar engaging the A-frame near its outer end and acting to hold the same from lifting, a bucket-hoisting means engaged centrally thereon and adapted to lift the same in horizontal position and to swing the same to
60 the frame, an outhaul-bail on the bucket operated from the extremity of the A-frame whereby the bucket is drawn into the cut, a power-operated handle pivoted on the nose of the bucket and pivotally and slidably engaged
65 in said frame and acting to hold the nose of

the bucket down while filling and automatic means operated by the inward swing of the dipper acting to release the contents at a predetermined point.

22. The combination with self-propelled
70 support of an A-frame pivotally engaged thereon and adjustably engaged with the top of the support, a thrust-bar connected with the A-frame and slidably engaged on the support and acting to hold the A-frame from lifting
75 and a bucket operated in part from the end of the A-frame.

23. The combination with a supporting truck or car of an upright frame supported
80 thereon laterally-projecting beams on said frame, a conveyer extending on one side of the frame, an A-frame hinged at the other, means adjusting the extremity of the A-frame as to height, a dipper pivoted to swing beneath the
85 A-frame, a rearwardly-opening bottom hinged at the front end of the dipper, a handle connected with the nose of the dipper and pivotally engaged on the beam above the A-frame and acting to press the dipper down into the
90 cut, one or more power-winches carried upon the car and acting to draw the dipper into the cut and to elevate the same in horizontal position and swing the same inwardly to dump into the conveyer, and means operated by the
95 hoisting means acting to dump the contents of the dipper.

24. The combination with a supporting-frame of an A-frame hinged thereto, a projecting beam above the A-frame, block and tackle connecting the A-frame therewith, a
100 winch for operating said tackle, a rigid bar hinged on each of the A-frame members and projecting upwardly at an angle therewith, a roller over which said bars extend, a line fastened to the upper end of each bar and also
105 carried over said roller and a winch with which said line is connected whereby downward pressure may be applied upon the A-frame.

25. A combination with a supporting truck
110 or car of driving mechanism therefor, a frame supported on said truck and extending upwardly and laterally, a motor at the top of the frame, a pinion driven thereby, a rack-bar in engagement with said pinion and actuated
115 thereby, a friction-clutch adapted to drive said pinion, a dipper pivoted at the lower end of said rack-bar and adapted to be forced downwardly thereby, operative mechanism adapted to draw the dipper outwardly from the car
120 in filling the dipper and hoisting mechanism adapted to elevate the same, both said mechanisms acting jointly to carry the dipper inwardly in a horizontal position and automatic means for dumping the dipper.
125

26. A railway-excavator comprising a car or the like, mechanism supported thereon for driving the car in either direction, a bucket operated from the car and adapted to work in
130 a horizontal position, an adjustable outhaul

A-frame for the bucket-sheaves thereon, a line rove through the sheaves and connecting the bucket with said winch whereby the bucket is drawn outwardly in filling, means adapted to hold said **A**-frame from lifting during the filling operation, hoisting-sheaves whereby the bucket is lifted and in a horizontal position and is carried inwardly in dumping, a detent acting to hold the bucket closed and means operated at the limit of the inward movement to dump the bucket.

27. A railway-excavator comprising a hopper, a conveyer fed therefrom, a horizontally-operating bucket, a dumping-bottom therein, hoisting means adapted to elevate the bucket when full and carry the same to dumping position, means connected with the hoisting mechanism acting to dump the contents of the bucket and operative connection between the conveyer and the shaft of the hoisting mechanism acting to drive the same continuously.

28. In a machine of the class described the combination with a car of means for driving the same forwardly or backwardly, an upright frame supported on said car comprising posts rigidly braced one with respect to the other, one or more transverse beams rigidly secured approximately at the top of the frame and extending laterally beyond the same and at the ends rigidly braced thereto, an **A**-frame supported beneath the extremity of one of said beams, means engaged on said beam acting to hold said **A**-frame from lifting and vibration and a conveyer supported at its receiving end upon the car and extending oppositely from the **A**-frame and adjustably supported from the other extremity of said transverse beam or beams.

29. In an excavator a pivoted **A**-frame, a horizontally-operating bucket, a hinged bottom therein, outhaul mechanism acting to draw the bucket outwardly in filling, hoisting means acting to elevate the bucket horizontally when full and carry the same to dumping position, means connected with the hoisting mechanism, acting to dump the contents of the bucket, a conveyer adapted to receive the dump and operative connection between the conveyer and the hoisting mechanism acting to drive the same continuously.

30. In a machine of the class described the combination with a car of means for driving the same forwardly or backwardly, an upright frame supported on said car, comprising one or more transverse beams at the top of the frame and extending laterally beyond the same and rigidly braced thereto, an **A**-frame supported on the car beneath one of said beams and adjustably connected near its extremity with one of said beams and thrust-bars slidably engaged on said beam and connected with and acting to hold said **A**-frame from lifting and vibration.

31. In a machine of the class described the combination with a supporting-frame of hoist-

ing and outhaul mechanisms carried thereon, a bucket, a dumping-bottom hinged at the mouth thereof, a projecting lip on said bottom adapted to close the bottom automatically when filling, a sheave secured at a distance from the outhaul mechanism, a line rove there-through and secured at the mouth of the bucket and on the outhaul mechanism, a hoisting-sheave secured on the bucket near the center thereof, lines connecting the same with the hoisting mechanism whereby said bucket is adapted to be drawn outwardly by the outhaul mechanism in filling and when filled to be elevated and supported from its middle and front end on both of said mechanisms approximately horizontally and moved to its dumping position, means operated by the movement of the bucket acting to dump the contents, said hoisting mechanism and outhaul mechanism adapted to act either simultaneously or independently.

32. In a machine of the class described the combination with outhaul mechanism and hoisting mechanism of a supporting-frame, hoisting-sheaves located in said frame, outhaul-sheaves secured at a distance therefrom, a bucket having a dumping-bottom, a line secured at the mouth of the bucket and rove through said outhaul-sheave and attached to the outhaul mechanism, a line attached near the middle of the bucket and rove through the hoisting-sheaves and connected with the hoisting mechanism, means for operating said hoisting mechanism and outhaul mechanism independently and also simultaneously whereby the bucket or scoop is drawn into the cut toward the outhaul-sheave in filling and is supported on both the hoisting mechanism and outhaul mechanism approximately horizontally to the dump and means acting to release the bottom to drop the contents of the bucket at a predetermined point.

33. The combination with a car, a motor and mechanism adapted to drive the car in either direction of hoisting mechanism and outhaul mechanism driven by the motor, a substantially horizontally operating bucket connected with said mechanisms, a dumping-bottom therein adapted to close in filling, a detent holding the same closed, means carried on the nose of the bucket acting to hold the same down in filling, the outhaul mechanism acting to fill the bucket and both the mechanisms acting to elevate and carry the bucket to the dump and means for releasing said detent.

34. In a machine of the class described the combination with hoisting mechanism and outhaul mechanism of a bucket actuated by the outhaul in filling and means under the control of the operator acting to support the bucket in approximately horizontal position, both on the hoist and the outhaul mechanisms when moving to dumping position and means operatively connected with the hoist adapted to dump the contents of the bucket.

35. A combination with power - winches adapted to be operated independently and also simultaneously of a motor driving the same, an outhaul operated by one of the winches, a hoist operated by the other, a bottom-dumping bucket to the mouth of which the outhaul is engaged and to approximately the middle of which the hoist is engaged, means conjointly with the outhaul, acting to fill the bucket, said outhaul and hoist acting simultaneously to elevate and support the bucket horizontally and carry the same to dumping position and automatically-operating means acting to release the bottom when dumping the contents.

36. A combination with a car of hoisting and outhaul mechanisms thereon, a bucket connected with both mechanisms, a hinged bottom therein, the outhaul acting to draw the bucket into the cut in filling and both mechanisms supporting the bucket in moving to the dump.

37. A combination with a car of hoisting and outhaul mechanisms thereon, a bucket, a hinged bottom therein, the outhaul mechanism acting to draw the bucket into the cut and power-operated means acting therewith to hold the nose of the bucket down while filling, both mechanisms supporting the bucket horizontally to the dump.

38. In a machine of the class described, the combination with a supporting-frame and a hopper of a conveyer affording a part of the hopper and comprising a continuously-driven belt or apron, concave rollers beneath and supporting the apron and adjusting-rods rigidly secured at the head of the frame and adapted to support and hold the conveyer in alignment and means adapted to deliver the material to be conveyed into the hopper.

39. A combination with a car of an upright frame thereon, a projecting beam at the top of the frame and rigidly braced thereon, a hopper, a belt conveyer extending from and forming a part of the hopper and embracing a plurality of concave rollers, over which the belt passes and adjusting-rods connected with said conveyer and in said beam respectively and acting to support the same in alinement and at a desired angle of inclination and a horizontally-operating bucket operated from the car and acting to deliver material to the hopper.

40. The combination with a car of means acting to propel the same in either direction, a power-winch thereon, a supporting-frame, a projecting beam rigidly secured at the top thereof, a conveyer extending beneath the beam and comprising a frame an operating-drum at each end thereof, a continuous belt trained about said drums, transverse concave rollers on said frame acting to support the upper lap of the belt, stay-rods connecting the conveyer-frame with the said beams, a hopper supported upon the car above the conveyer and a horizontally-operated and dump-

ing-bucket actuated from the winch and adapted to fill the hopper.

41. In a machine of the class described the combination with a continuously-driven conveyer of a dipper excavator adapted to operate in conjunction therewith, means adapted to operate the dipper and deliver the contents to the conveyer, a clutch mechanism connected therewith and means controlling said clutch mechanism.

42. In a machine of the class described the combination with a continuously-driven conveyer and means for driving the same, of a bucket, a hoist and an outhaul-winch for operating the same, pneumatically-operative means acting to control said winches whereby that for the outhaul operates in filling the bucket and that for the hoist and the outhaul operates conjointly in elevating the same and carrying the same inwardly in position to dump upon the conveyer and means operated by the inward movement of the bucket acting to drop its contents.

43. In a machine of the class described, a conveyer and a bucket adapted to deliver its contents thereto, power-operated winches operating said bucket, one actuating the outhaul therefor and both winches actuating the hoist and dump, and pneumatically-operated means for controlling the action of said winches and adapting the same for conjoint and also independent operation.

44. In a machine of the class described, a conveyer and a bucket adapted to deliver its contents thereto, power-operated winches operating said bucket one actuating the outhaul therefor and the other conjointly therewith actuating the hoist and dump, pneumatically-operated means controlling the action of said winches and adapting the same for conjoint and also independent operation, and brake mechanism adapted to hold one of said winches while the other is in operation.

45. The combination with a car and its truck of a motor supported on the car, a winch driven thereby comprising a central gear, a friction-clutch on each side thereof, each comprising a part of the gear and a drum provided with a friction-face adapted for engagement therewith, pneumatically-operated means adapted to move one or both of said drums longitudinally with the shaft into engagement with the friction on the gear, a brake for each drum adapted for simultaneous and also independent operation, an excavator-bucket and tackle connecting said drums with said bucket, one adapted to actuate the outhaul of the bucket in filling, the other acting conjointly with the outhaul mechanism to elevate and move the bucket to dumping position and a conveyer adapted to receive the material from the bucket.

46. In a machine of the class described, the combination with a car of a motor thereon, a pinion driven thereby, a winch comprising a

shaft, a gear rigidly secured thereon, a rotatable drum on each side of the gear, a friction-clutch afforded by a part on each drum and a part on the gear, adapted for mutual engagement, pneumatically-operated means adapted to move either or both of said drums into driving relation with said gear, a friction-brake for each drum, an excavator-bucket, outhaul and hoisting means operated from the respective drums one acting to fill the bucket, the other acting conjointly therewith to elevate and move the bucket horizontally to dumping position, automatic means for dumping the bucket and an operating-platform at which point the means for operating and controlling the drums and the bucket and the motor and the movement of the car are adapted to be controlled by a single operator.

47. In a machine of the class described, a winch comprising a continuously-driven shaft, a driving-wheel rigidly secured thereon, a rotatable drum on each side of said driving-wheel and movable longitudinally on the shaft, a friction-clutch afforded in part by said wheel and by a part on each drum, whereby either or both of said drums may be operated simultaneously, pneumatic means operating at the end of the shaft to move said drums on their shaft into engagement with the driving-wheel and one or more wheels on said shaft.

48. In a machine of the class described, the combination with a car of a motor thereon means connected therewith adapted to propel the car, a double winch operated from the motor, pneumatically - controlled clutches adapted to control the operation of the winches, an excavator-bucket and means operated by the winches to fill and dump the same and continuously-operating conveying mechanism driven from the winch-shaft and adapted to convey the excavated material from the dump.

49. In a machine of the class described, the combination with a car and its truck of continuously - operating motor thereon, driving and reversing mechanism supported on the car and operatively connected with the axles of one of the trucks and comprising two continuously - driven intermeshing gears operatively connected with the motor, a friction-clutch on each gear, a rotative shaft and means adapted to be driven from either gear and sprocket-wheels on said shaft connected by chains with sprocket-wheels on the axles, and means actuating said clutches one to propel the car, the other to reverse the same.

50. In an excavating-machine of the class described the combination with the motor, the operating-winches and the brakes therefor, of means for propelling the car in either direction, controlling mechanism therefor, a brake for the car, an excavator-bucket actuated from the winches, a motor and means operated thereby to apply pressure on the bucket when filling and means for controlling said motor

and an elevated platform positioned to admit of unobstructed view of the work and upon which accessible to a single operator all the operating and controlling means are carried.

51. In a machine of the class described, an operating-platform positioned above the operating mechanism and operating levers and valves arranged thereon and connected with the mechanism to be controlled and positioned to be under the control of a single operator.

52. In a machine of the class described comprising a car, a steam engine and boiler thereon, a driving and reverse mechanism for the car comprising non-rotative shafts intermeshing and continuously-revolving gears thereon, a friction-clutch for each gear, a pinion on each, a rotative shaft for driving said gears, a rotative shaft between the gears, a gear thereon meshing with the pinions for the clutches, sprocket-wheels on said shaft operatively connected with sprocket-wheels on the car-axles.

53. In a machine of the class described a car, an engine and boiler thereon, a propelling mechanism driven thereby comprising a driving-shaft having a pinion thereon driven by the engine, intermeshing continuously-rotative gears, one of which intermeshes with the pinion and carried on non-rotative shafts, a slidable friction clutch and pinion on each shaft, a driven shaft, a gear thereon meshing with the clutch-pinions, sprocket-wheels on the driven shaft and on the truck-axles and driving-chains connecting the same whereby the car may be driven either forwardly or rearwardly without reversal of the engine and operative means adapted to throw either clutch in action.

54. A device of the class described comprising a frame, a driving-shaft journaled therein, means for operating said shaft, an excavator carried on said frame, independently-operative winches driven by said shaft adapted to fill the excavator and carry it to and from dumping position, a reversible-speed mechanism, means connecting the same with the car-axle and means for driving said speed mechanism and shifting the car while the excavator is in operation.

55. In an excavator of the class described, the combination with a frame of a rotative shaft therein, means for rotating the same, operating mechanism slidably secured on the shaft, a part thereof affording a clutch adapted for engagement with the driving means, pneumatically - operating mechanisms acting to force the same longitudinally of the shaft and into engagement with the driving mechanism, an excavator-bucket and cables operatively connecting said bucket with said clutch.

56. In an excavator, a supporting-frame, a dipper carried thereon, a continuously-rotative shaft journaled in said frame, a driving-wheel rigidly secured thereon, a drum rotatively engaged on the shaft and slidable lon-

gitudinally thereof, means operatively connecting said drum with said dipper, parts on said driving-wheel and drum affording a friction-clutch when engaged and pneumatically-operated means acting longitudinally of the shaft to actuate the friction-clutch.

57. In an excavator, a supporting-frame, a rotative shaft journaled therein, a driving-wheel rigidly secured thereon, a drum rotatively engaged on the shaft and slidable longitudinally thereof, parts on said driving-wheel and drum affording a friction-clutch when engaged, pneumatically-operated means acting longitudinally of the shaft to engage the friction-clutch, a lever-controlled brake acting to engage said drum, an excavator-bucket carried on said frame and means operatively connecting said drum with said bucket.

58. In an excavator, a frame, a bucket thereon, a motor carried on said frame, a rotatable shaft journaled on the frame, a driving-wheel thereon operated by the motor, laterally-disposed friction-surfaces on each side of the wheel, a drum on each side thereof rotatable on the shaft and movable longitudinally thereof, a friction-surface on each drum adjacent said driving-wheel and complementary with the friction-face thereon, a band-brake for each drum, pneumatically-operative means acting longitudinally of the shaft to force either or both of said drums into operative relation with the driving-wheel, a spring engaged on each side of said driving-wheel and bearing against the respective drums acting normally to hold the same out of engagement with the driving-wheel, a thrust-beam on said bucket and cables on said drums and connected with said thrust-beam and said bucket.

59. In an excavator, a frame, a bucket thereon, carrying means for said bucket adapted to force it into the cut and carry it to and from dumping position, a hollow shaft journaled in said frame, a driving-wheel rigidly secured on said shaft, laterally-disposed means on each side thereof affording a part of a friction-clutch, a drum on each side of said wheel affording the other members of said clutches and engaged to said carrying means and pneumatically-operated means adapted to operate said clutches and control the movement of the bucket.

60. In an excavator the combination with excavating means of a winch comprising a rotative shaft, a rigidly-secured driving means thereon, a friction-surface on each side of the driving-wheel, a drum on each side of the driving means and rotatably secured upon the shaft and movable longitudinally thereof, a spring acting to hold the same normally at its outer limit of its movement, a friction-surface on each drum adapted to engage that on the driving means, a cylinder in axial alinement with shaft, a piston-head therein, a piston-rod connected therewith and extending axially into the shaft through an end bore in the shaft and

means engaged thereby acting to force the drum into engagement with the driving means, said piston and piston-rods being adapted to rotate with the shaft.

61. In a machine of the class described, the combination with a rotative shaft of driving means thereon, a drum rotatably and slidably secured on the shaft, a clutch formed by a part of the drum and part of the driving means, a cylinder in axial alinement with the shaft, a piston movable therein and comprising a rotative movable head and a non-rotative follower, an antifriction-bearing between the piston-head and follower, a piston-rod engaged to the piston-head and extending in an axial bore with the shaft, a transverse key at the end of said bore the ends of which bear against the hub of the drum and pipe connection with the outer end of the cylinder whereby fluid-pressure is admitted to force the piston and the drum inwardly into engagement with the driving-wheel and a spring interposed between the driving means and the drum acting to hold said parts normally out of engagement.

62. In a machine of the class described, a winch comprising a rotative shaft, a geared driving-wheel rigidly secured thereon, a drum rotatively secured on the shaft on each side of the geared driving-wheel, a friction-clutch afforded by parts on said driving-wheel and said drums springs acting to hold said drums normally out of engagement with the driving-wheel, pneumatically-operated means adapted to force the drum independently and also simultaneously into engagement with the driving-wheel, a band-brake for each drum, a shaft journaled in the winch-frame, a crank-arm thereon adapted to actuate a brake for one of the drums, a sleeve secured on said shaft and operatively engaged to actuate the other of said brakes.

63. In a machine of the class described, the combination with a rotative shaft of driving means thereon, the drum rotatably and slidably secured on the shaft, a clutch formed by a part of the drum and part of the driving means, a cylinder in axial alinement with the shaft, a piston movable therein and comprising a rotative piston-head and a non-rotative follower, an antifriction-bearing between the piston-head and follower, a piston-rod engaged to the piston-head and extending in an axial bore with the shaft, a transverse key at the end of said bore, the ends of which bear against the hub of the drum, pipe connection with the outer end of the cylinder whereby fluid-pressure may be admitted to force the drum inwardly into engagement with the driving means and a spring interposed between the driving means and the drum acting to hold said parts normally out of engagement; said pipes leading from said cylinders to an operator's platform and valves therein admitting the fluid-pressure to either of said cylinders at the will of the operator.

64. A self-propelled excavator of the class described, a conveyer thereon and means adapted to move the excavator along the dump under its own power while the shovel is traveling to and from the conveyer.

65. A railway-excavator comprising a self-propelling car, a power-operated shovel or bucket thereon and operating mechanism adapting the car to be propelled to dumping position simultaneously with and independently of the movements of the bucket or shovel.

66. In an excavating-machine, a car, propelling means on said car, a power-operated shovel on said car, mechanism adapted to operate said shovel in filling and in delivering

its load, an operating-station on said car and mechanism thereon adapted to permit an operator propelling the car along the dump while the shovel is in motion.

67. In a railway-excavator, a car-propelling mechanism thereon, side-operating excavating mechanism adapted to deliver the material excavated across the track of the car when the car is in motion and at rest.

In witness whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

MORTON E. PUGH.

Witnesses:

W. W. WITHEBURY,
HJALMAR S. RUDD.