

No. 832,370.

PATENTED OCT. 2, 1906.

P. FORD.
TUNNEL MINER'S POWER SHOVEL.

APPLICATION FILED DEC. 26, 1905.

4 SHEETS—SHEET 1.

Fig. 8

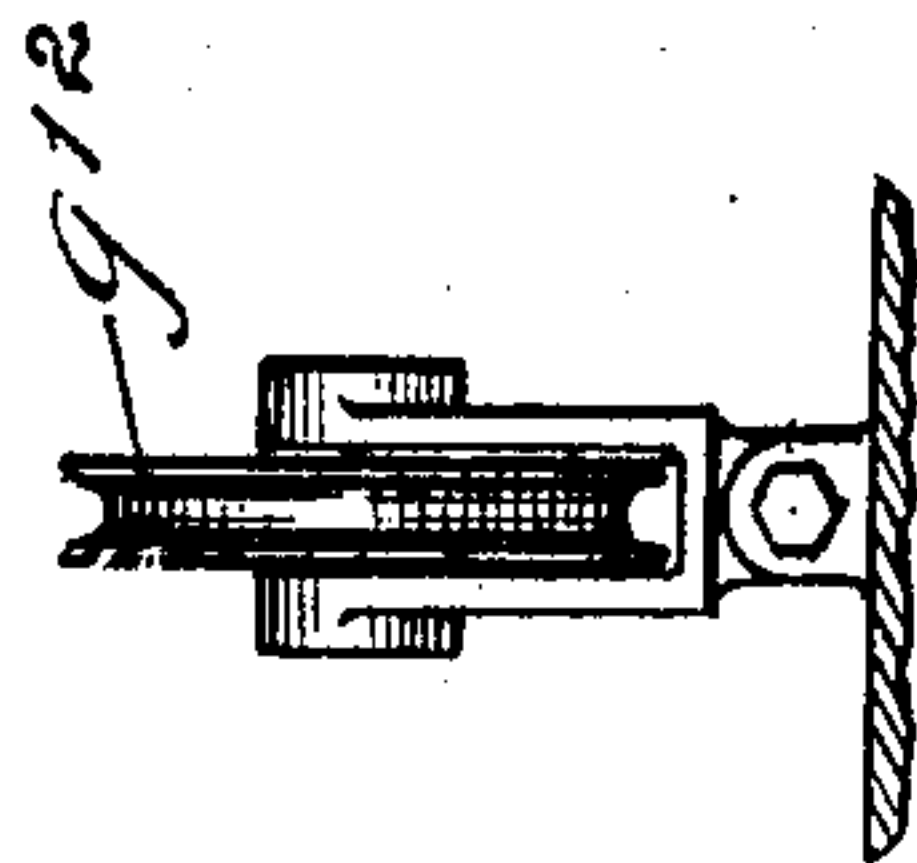
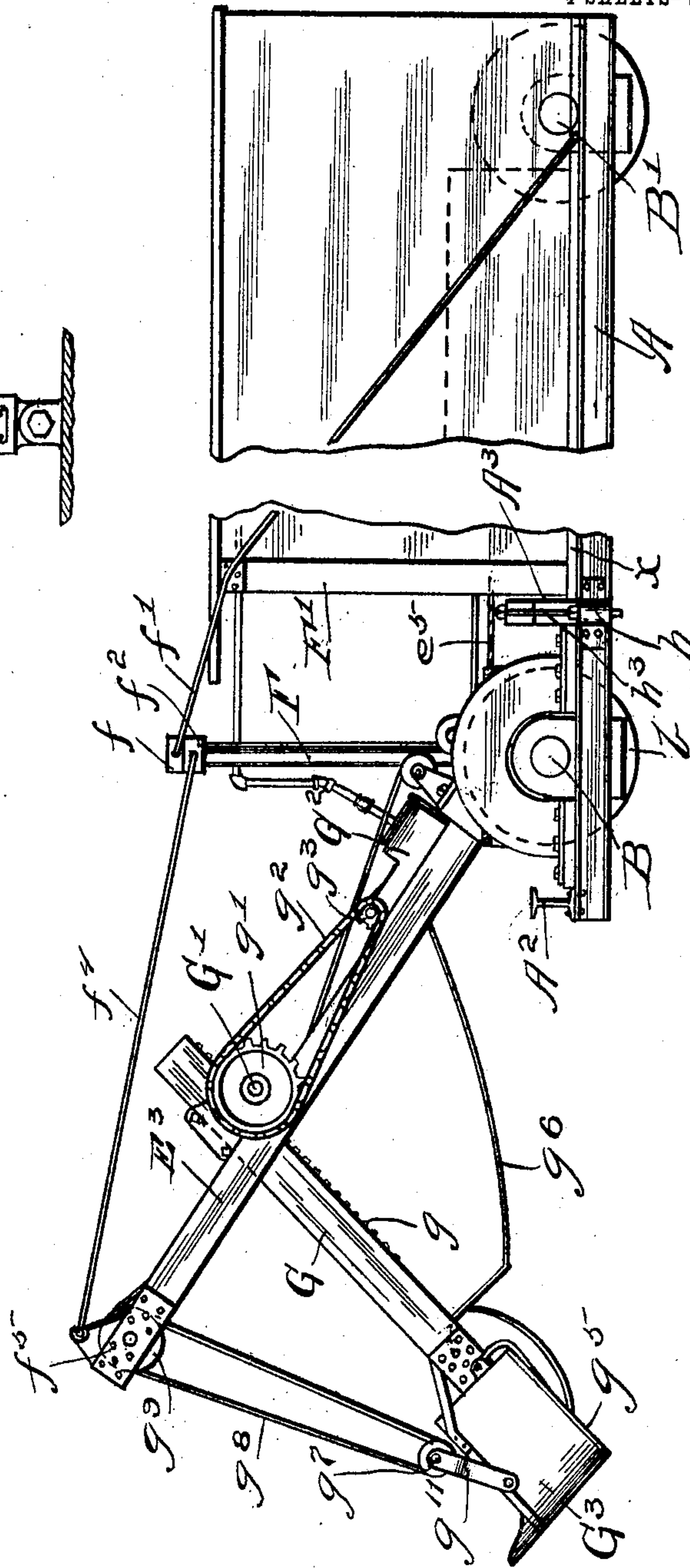


Fig. 1



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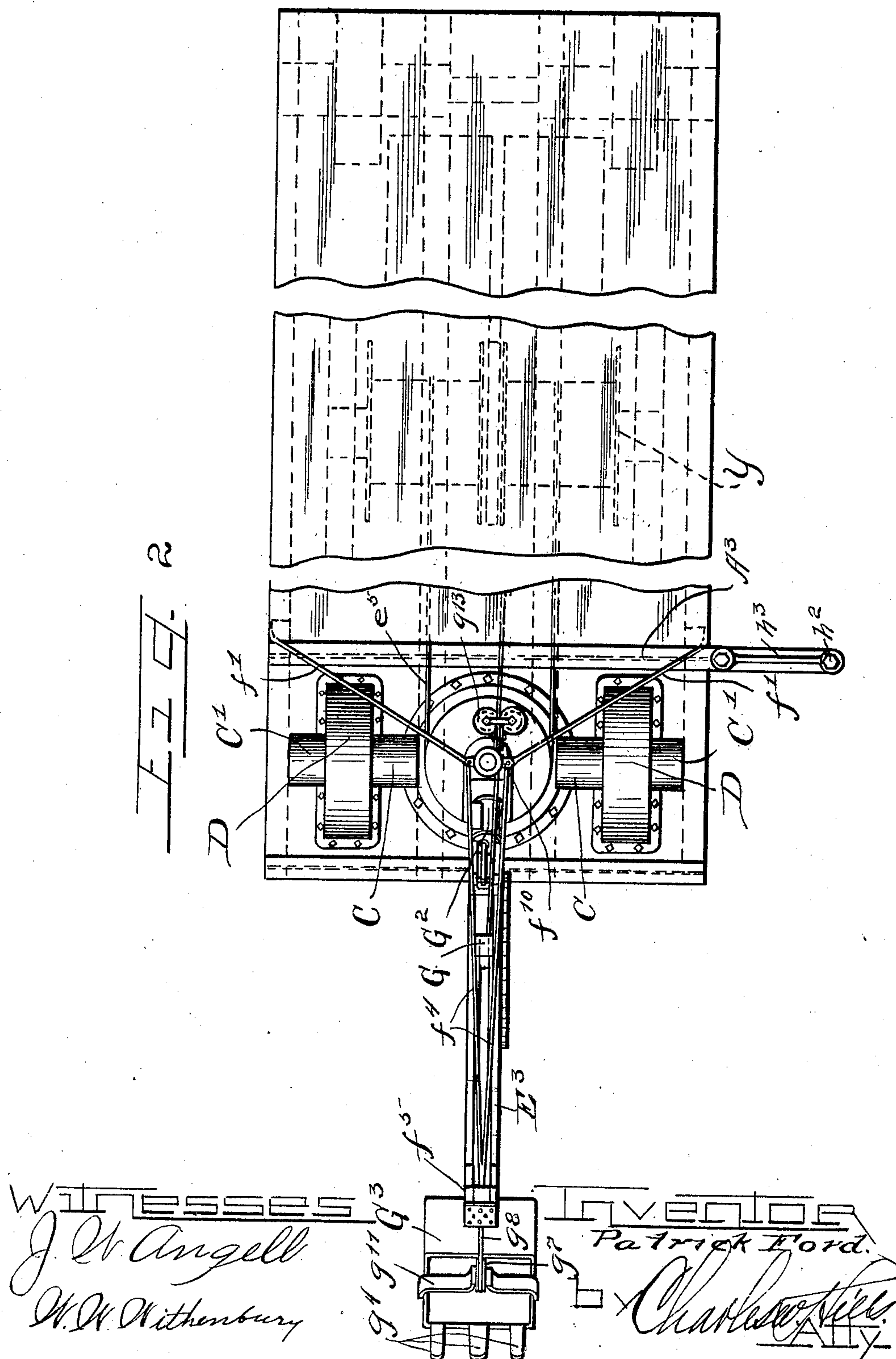
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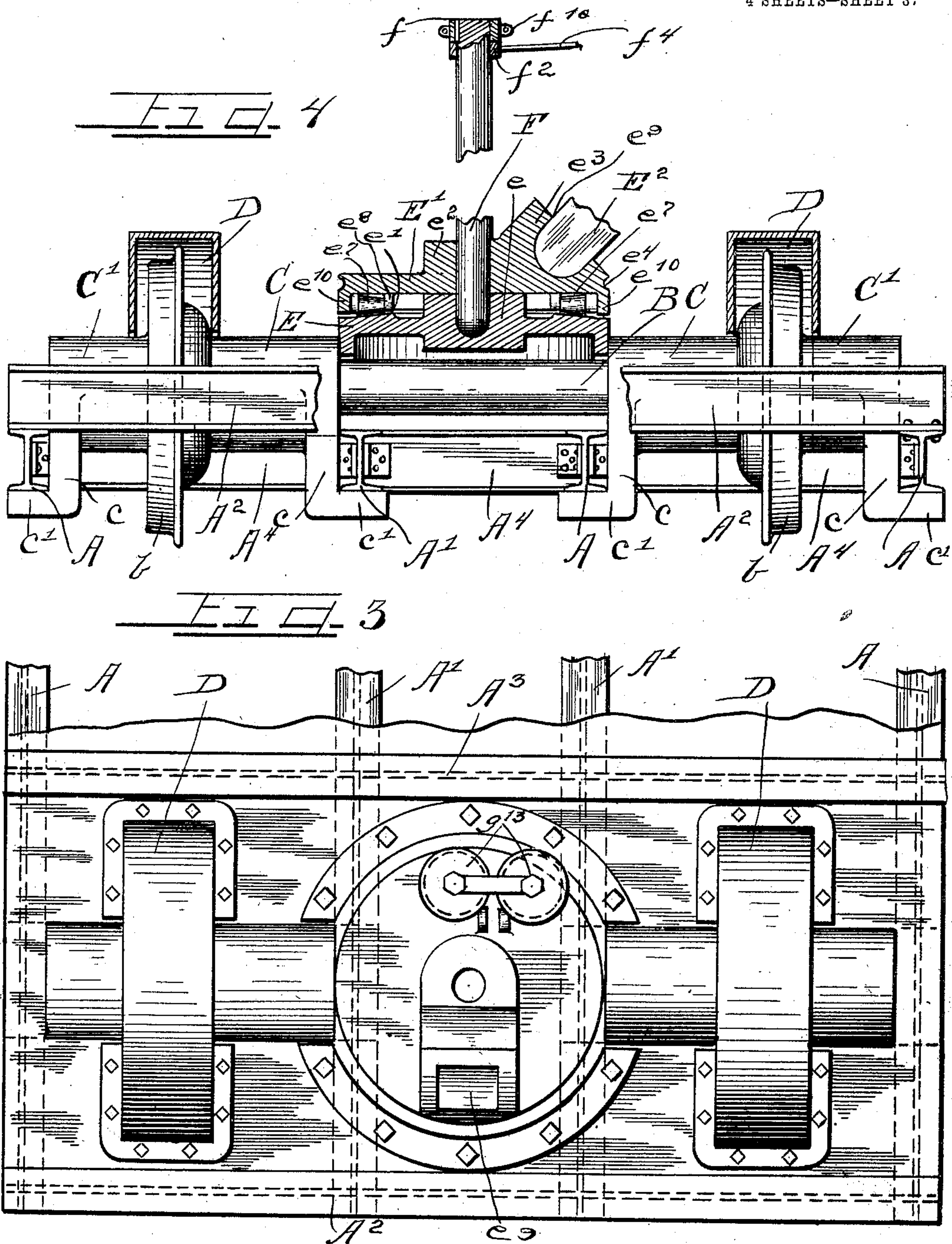
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4 SHEETS—SHEET 3.



WITNESSES

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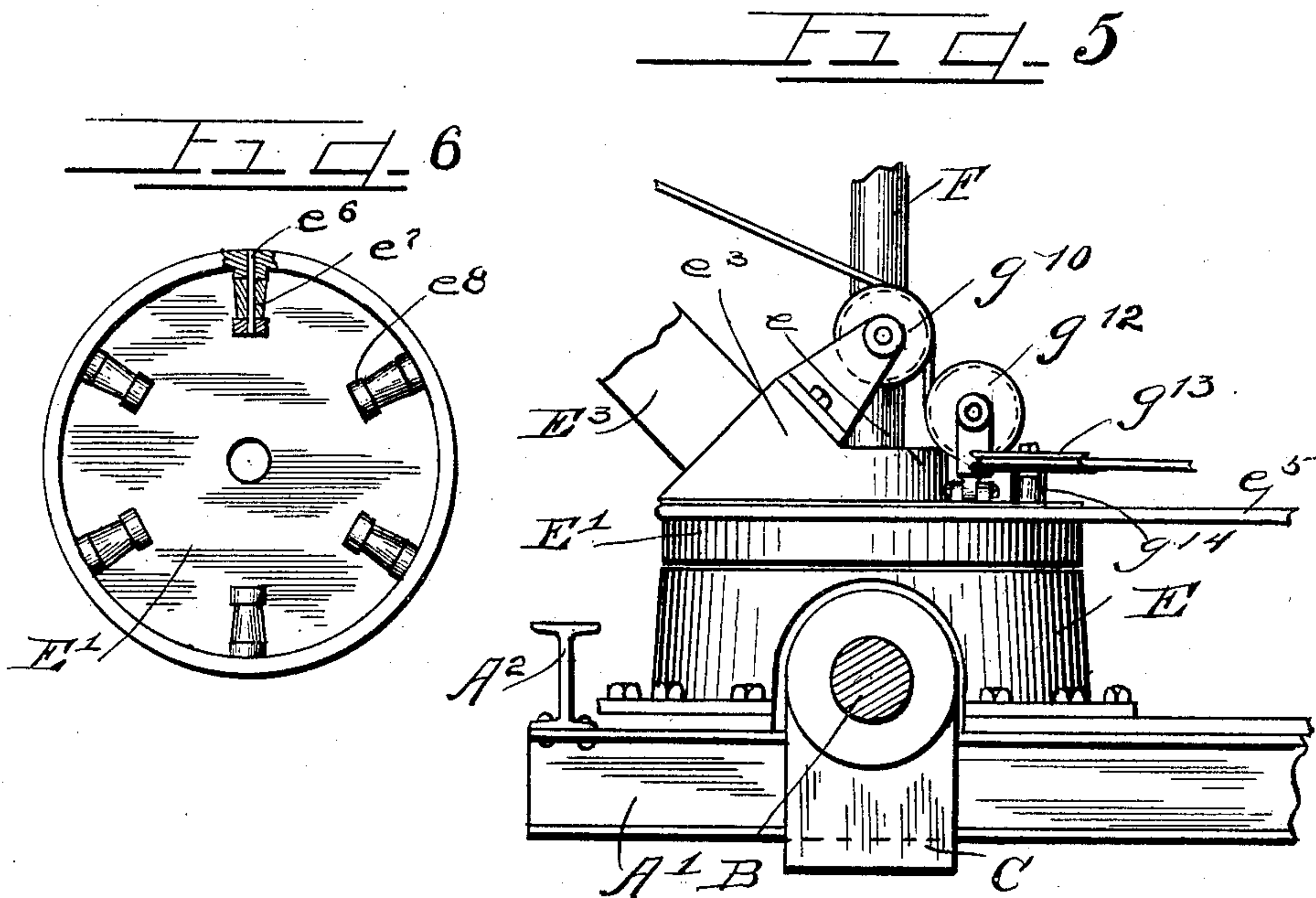
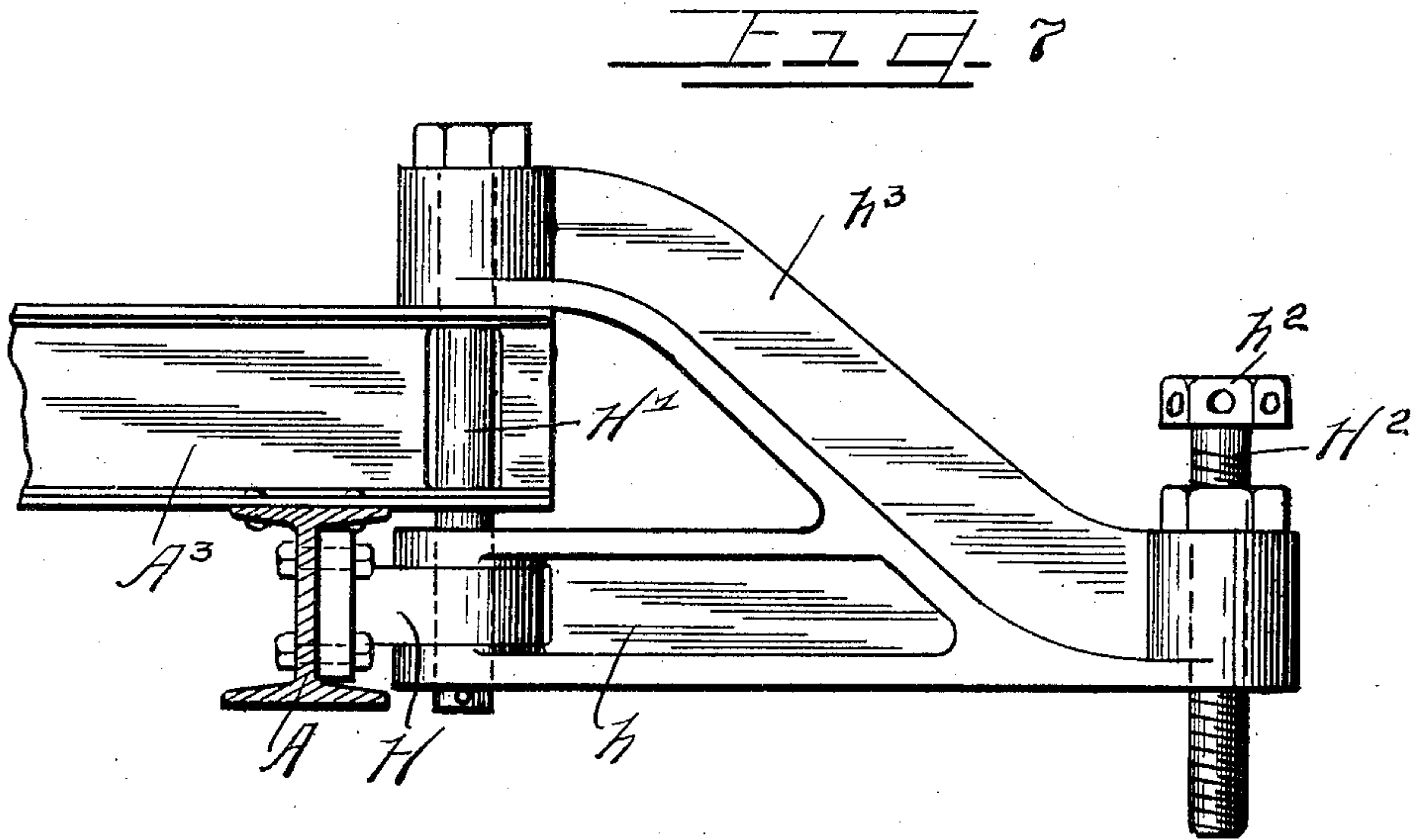
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

PATRICK FORD, OF CHICAGO, ILLINOIS.

TUNNEL-MINER'S POWER-SHOVEL.

No. 832,370.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed December 26, 1905. Serial No. 293,431.

To all whom it may concern:

Be it known that I, PATRICK FORD, 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 Tunnel-Miners' Power-Shovels; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in power-shovels, and more particularly to a shovel adapted for use in constructing tunnels or in mining.

Heretofore in constructing rock and other tunnels steam-shovels have not been used, as the restricted height does not afford sufficient space for the boom and to swing the shovel. In consequence the "muck," consisting of the shattered rock and other debris excavated, is removed by hand by muckers or pit men, who load the same into cars for removal. This is necessarily an expensive operation, owing to the confined space and the fact that the material is frequently in such shape and condition as to be very difficult to handle, and a large number of men are always required.

The object of this invention is to so construct a steam or power shovel of large capacity sufficiently low as to be capable of use in a heading not more than nine feet in height and also to operate in laterally-restricted spaces, thus permitting debris or muck to be removed as readily as in an open cut and necessitating the employment of only the usual shovel-crew.

It is a further object of the invention to afford a strong, simple, and economical construction of such a nature that the weight thereof is not only all suspended below the truck-axles, but as near the track as possible.

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

In the drawings, Figure 1 is a side elevation, broken centrally, of a device embodying my invention. Fig. 2 is a fragmentary top plan view of the same. Fig. 3 is an enlarged top plan view of the front end of the car and showing the revolving platform for the crane. Fig. 4 is a similar enlarged fragmentary end elevation showing the table and

the hoods for the front track-wheels in section. Fig. 5 is an enlarged side elevation of the revolving crane-table, showing the car-axle in section. Fig. 6 is a bottom plan view of the revolving table, showing the anti-friction-rollers in section. Fig. 7 is an enlarged side elevation of the supporting-jack. Fig. 8 is an enlarged detail of one of the line-pulleys.

As shown in the drawings, the frame of the shovel-car is constructed, as shown, wholly of structural steel and comprises two side and two center sills A A', which, as shown, are each suspended on the front and rear axles B and B' on outer and inner hangers C C'. Said hangers, as shown, each comprise a tubular casting of large size fitted to and affording a bearing on the axle and in which said axles are journaled both at the projecting extremities and also at the inner sides of the wheels, and, as shown, each hanger comprises in addition to the tubular bearing portion C C', supported on the shaft or axle, a downwardly-extending bracket c, which extends to near the road-bed and alongside of the sill A or A', to be supported thereon, and is provided at its lower end with horizontally and laterally directed bracket or extension c' of a length corresponding with the width of the flanges of the I-beam sills, as shown in Fig. 4, and to which said sills are rigidly bolted. An I-beam A² is rigidly bolted across the front ends of the side and center sills, as shown in Figs. 1 and 4, slightly in advance of the front wheels, and a corresponding I-beam A³ is bolted at the rear of said front wheels and channel or I beam cross-sills are rigidly secured between said longitudinal sills, as indicated by A⁴ in Fig. 4. Similar cross-sills A⁴ are fitted between said side and center sills at the rear of the beams at convenient distances along the length of the car, which are not shown. A floor or plank of any suitable material covers the platform, and secured thereon are hoods D, of sheet metal, covering each of the front wheels b. Centrally between said wheels and between the tubular bearings for said hangers is the revolving table for the boom. Said table, as shown, comprises a circular pedestal or base E, rigidly bolted to the platform and frame and directly above the center sills. This, as shown, comprises a casting notched at its sides to fit over the axle without contacting the same. At its top

said base is provided with a central hub e , provided with a central cylindric socket therein and provided near its periphery with an outwardly and downwardly inclined circular track e^2 , as shown in Fig. 4, upon which the revolving table e^2 is supported. Said revolving table comprises, as shown, a casting and provided at the front side thereof with an upwardly - extending boss e^3 , provided with socket e^9 therein, as shown in Figs. 3 and 4, to receive the inner end of the boom E^3 . Said revolving table is provided in its periphery with a groove e^4 to receive an operating-cable e^5 to revolve the same and driven from any suitable source of power supported on the rear end of the car and, as shown, is provided with a downwardly-directed peripheral flange e^{10} , which is apertured radially at intervals and in which engages the short shafts e^6 of antifriction conical rollers e^7 , which run on said inclined track e' of the base. Lugs e^8 , integral with the under side of the revolving table receive the inner ends of the shafts e^6 , as shown in Figs. 4 and 6. Said revolving table is centered upon the base by means of a cylindric steel mast F , which extends therethrough and into the socket in the hub of said base, as shown in Figs. 4 and 5, and on which said revolving table is free to turn. Said mast, as shown, is provided on its top with a cap f , rigidly secured thereto, and on which on opposite sides thereof are integral apertured lugs f^{10} . Stay-rods f' are secured in said lugs and obliquely to and around the top of uprights or posts F' , which affords one of the means for supporting the cab or house, which is rigidly braced, to stand the stress caused by the weight of the shovel and its load. Said stay-rods f' extend from the outer side of said posts rearwardly and downwardly and are rigidly engaged to the side sills near the rear end thereof.

Rotatably engaged on the mast is a collar f^2 , as shown in Figs. 1 and 4, and rigidly engaged thereto at their inner ends are tie-rods f^4 , one on each side of the same, which extend forwardly and are rigidly secured to the head-frame f^5 of the boom E^3 , and thus support the outer end thereof from the mast. The boom, as shown, comprises parallel beams rigidly connected together at their outer ends by said head-frame f^5 and at their inner ends seated in the socket e^9 in the revolving table and extending between said beams is the dipper-stick G . This is provided, as is usual, on the under side thereof with a rack-bar g , extending the entire length and which engages on a pinion (not shown) secured on the shaft G' , journaled transversely of the boom. Said shaft G' is driven by a motor G^2 , carried on the boom and which may be operated by compressed air from the air-pipe which supplies the drills. A sprocket-wheel g^3 is secured on the driving-

shaft of said engine or motor, and a sprocket-chain g^2 is trained around said sprocket-wheel and a sprocket-wheel g' on the pinion-shaft G' . A dipper G^3 of any suitable kind is rigidly secured on the end of the dipper-stick, and long strong steel bars are rigidly secured on the nose thereof and parallel therewith and afford strong teeth to assist in lifting the rock. Said dipper is provided with a dumping-bottom g^5 , opened by a trip-line g^6 , leading back from the revolving platform, as usual.

A sheave g^7 is secured on the front side of the bucket by means of a suitable stirrup g^{11} , and a cable g^8 is trained around the same and through a suitable sheave g^9 in the head-frame of the boom and thence leads rearwardly and downwardly through suitable sheaves g^{10} and g^{12} , secured on the revolving table, and thence between guide-pulleys g^{13} , journaled on standards g^{14} on said table to a suitable drum Y . (Shown in dotted lines in Fig. 2.)

As shown, a jack is secured on the side of the car near the front end thereof to support the same against the swing of the dipper in dumping. For this purpose, as shown, a bracket H is rigidly bolted on the side sill A below the beam A^3 , the end of which projects beyond said bracket and the side of said sill and is provided with a vertical aperture therethrough to afford a bearing for a vertical shaft or pivot-bolt H' , which extends therethrough. A jack-arm h , slotted at its inner end to receive said bracket and apertured to receive said bolt, is provided at its outer end with a vertical internally-threaded aperture therethrough in which is threaded the jack-screw H^2 , having an enlarged head h^2 thereon, which, as shown, is angular to permit engagement by a suitable wrench and is also provided with apertures therethrough, as is usual, to receive a bar, whereby said jack may be set up or released. Extending upwardly from the outer end of said arm h is an integral bracing-arm h^3 , which fits over the end of the beam A^3 and through which also the pivot-bolt extends.

The operation is as follows: The low construction and slight inclination of the boom (usually about eleven feet in length) enables the shovel to operate in headings no more than nine feet in height with the dipper-stick and dipper less than eight feet long. This permits the boom to swing with the dipper and the dipper to be operated with a space never before possible for power-shovels, though of course the dipper may have large capacity. The cab on said car is constructed very strongly, but of slight height to permit the operator to work therein, and owing to the low frame of the car affords ample room for all necessary machinery, which of course serves as a counterweight for the shovel. The mast being non-rotatable is

short and the weight of the boom, the dipper, and its load is carried back by stay-rods to the sides and the rear end of the car. The frame of the car inasmuch as the longitudinal sills of the car are hung on the axles but below the same is greatly stiffened by the beams $A^2 A^3$, rigidly bolted to the longitudinal sills at the front end of the frame, and inasmuch as the shovel in tunneling and like operations works near one of the walls or ribs of the tunnel or mine it is necessary to swing the shovel laterally of the car in but one direction, or on that side on which the receiving-car is located. For this reason a jack is required on but one side of the car, though of course one may be provided on each side, if desired. In the construction shown the jack is capable of swinging forward to afford an obliquely forward reach to a point nearly opposite the end of the front axle and may be swung against and secured to the side of the car when not in use. The relatively long reach of said jack insures rigidity of support for the side of the car against the swing of the dipper.

Obviously details of construction may be varied without departing from the principles of my invention.

I claim as my invention—

1. A power-shovel embracing a car having its platform below the axle, a swinging boom extending forwardly therefrom at a slight upward inclination and a dipper having a short dipper-stick operated from said boom, means swinging said boom and a motor on the boom for actuating the dipper.

2. A shovel-car of the class described embracing a steel frame suspended on but below the axles of the car, a low revolving table thereon at its front end, a short vertical mast secured therein, a relatively short boom supported at its inner end on said table and at its outer end on said mast, and having a slight upward inclination and comprising substantially parallel bars affording a space therebetween, a relatively short dipper-stick therein extending upwardly between the bars forming the boom, a motor mounted on the boom and operative connections between the same and the dipper-stick acting to adjust the same as to height.

3. A shovel-car embracing the combination with the axles and track-wheels of a structural-steel frame suspended on and below the axles, with the side and center sills near the track, transverse structural beams rigidly bolted on said side and center sills of the frame and one of the same extending beyond the side of the car, a jack secured thereto and to the side sill and adapted to swing outwardly at an angle of the car to support the swing of the dipper.

4. In a machine of the class described a car embracing the axles and track-wheels, a low-hanging structural frame suspended on

the axle and near the track, a source of power on said frame, a revolving table on the front end thereof, a mast secured thereon and braced laterally and rearwardly, a boom having but slight inclination supported on said mast and the revolving table, a dipper operated by the boom and a motor carried on the boom for actuating the dipper and a jack secured on the side of the frame and adapted to swing outwardly from the car.

5. In a machine of the class described the combination with the track-wheels and their axles of tubular bearing members supported on the axle on each side of each wheel, depending brackets thereon, a horizontal transversely-directed arm on each but slightly above the track, side and center sills, rigidly secured on said arms, cross-sills rigidly bolted therebetween, a structural beam parallel with the front axle one on each side of the front wheels, bolted upon said side and center sills, a laterally-projecting end on one of the beams and a swinging jack pivotally engaged to a side sill and the end of the beam, a revolving table on said car and a boom and a dipper actuated therefrom.

6. In a power-shovel the combination with the track-wheels and axle of depending brackets on said axles on each side of said track-wheel, structural-steel side and center sills rigidly supported on said brackets but slightly above the track, cross-sills rigidly uniting the same, transverse beams, bolted upon the side and center sills one on each side of the front wheels, a revolving table, a base therefor straddled over the front axle and rigidly bolted to the frame and embracing an inclined upper face affording a circular track, a centrally-socketed hub, a vertical metallic mast secured in the socket a revolving table secured on said base by the mast, roller-bearings journaled on the under side of said revolving table and registering on said track on the base, a socketed boss on the upper side of said revolving table, means connecting said revolving table with a source of power and adapted to rotate the same, a boom having one end seated in the socket, in the revolving table and its outer end supported on the mast at a low elevation, a dipper carried on the boom and a motor for actuating the dipper.

7. In a machine of the class described the combination with a structural-steel frame but slightly above the track of track-wheels and axles from the latter of which the frame is supported, a low base or pedestal straddled over the front axle and rigidly bolted to the frame and affording an outwardly and downwardly inclined top having a centrally-socketed hub, a revolving boom-table journaled on said base, a vertical metallic mast affording the connection between the same, roller-bearings between said table and pedestal, a boom supported at its inner end on said re-

volving pedestal and at a low elevation at its outer end on said mast, a short dipper-stick extending through said boom and of less than the elevation of the outer end of the boom, a
 5 rack on the outer side thereof, a pinion journaled on the boom for engagement with said rack, a motor carried on the boom for driving the pinion and actuating the dipper, operative connections for rotating the table, to
 10 swing the boom and a dipper and tackle connecting the outer end of the boom and the dipper for supporting the same to dumping position.

8. In a car of the class described the combination with the track-wheels and the axles of sleeves secured on the axles one on each side of each wheel, depending hangers integral with the sleeve at the end remote from the wheel, oppositely-directed horizontal
 20 arms on the lower ends of said hangers, side and center sills secured to and supported thereon near the track, cross-sills binding said longitudinal sills together and transverse beams rigidly bolted on said longitudinal sill one on each side of the front wheels and extending above and across the longitudinal sills, a platform on the frame, metallic
 25 guards for each wheel and excavating mechanisms supported on the platform.

30 9. In a device of the class described the combination with a frame of axles journaled therein, a platform suspended below said axles, a base carried on said frame above the forward axle and having a track thereon, a

revolving table supported on said base and a 35 dipper carried on said table.

10. In a device of the class described the combination with a car having its platform below its axles, of a centrally-socketed base thereon, a table rotatively engaged on said 40 base, a short vertical mast thereon, a boom supported on the table and said mast, a dipper-stick therein, a dipper on said stick, a cable connected with said dipper and extending over the boom, a drum carried on the frame 45 and adapted to receive said cable and guide-pulleys on said table adapted to direct the cable upon the drum when the table revolves.

11. In a device of the class described the combination with a car having its platform 50 suspended below its axles, of a base supported above the forward axle and provided with a track thereon, a table on said base, rollers journaled on the under side thereof and adapted to move on said track, a boom on 55 said table, a dipper carried thereon, a hoisting-cable connected with said dipper, guide-pulleys for said cable, a drum and a motor carried on the boom and adapted to operate said dipper. 60

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

PATRICK FORD.

Witnesses:

C. W. HILLS,
 WM. C. SMITH.