(No Model.) 4 Sheets—Sheet 1.

G. W. KING.

EXCAVATOR.

No. 589,565. Patented Sept. 7, 1897.

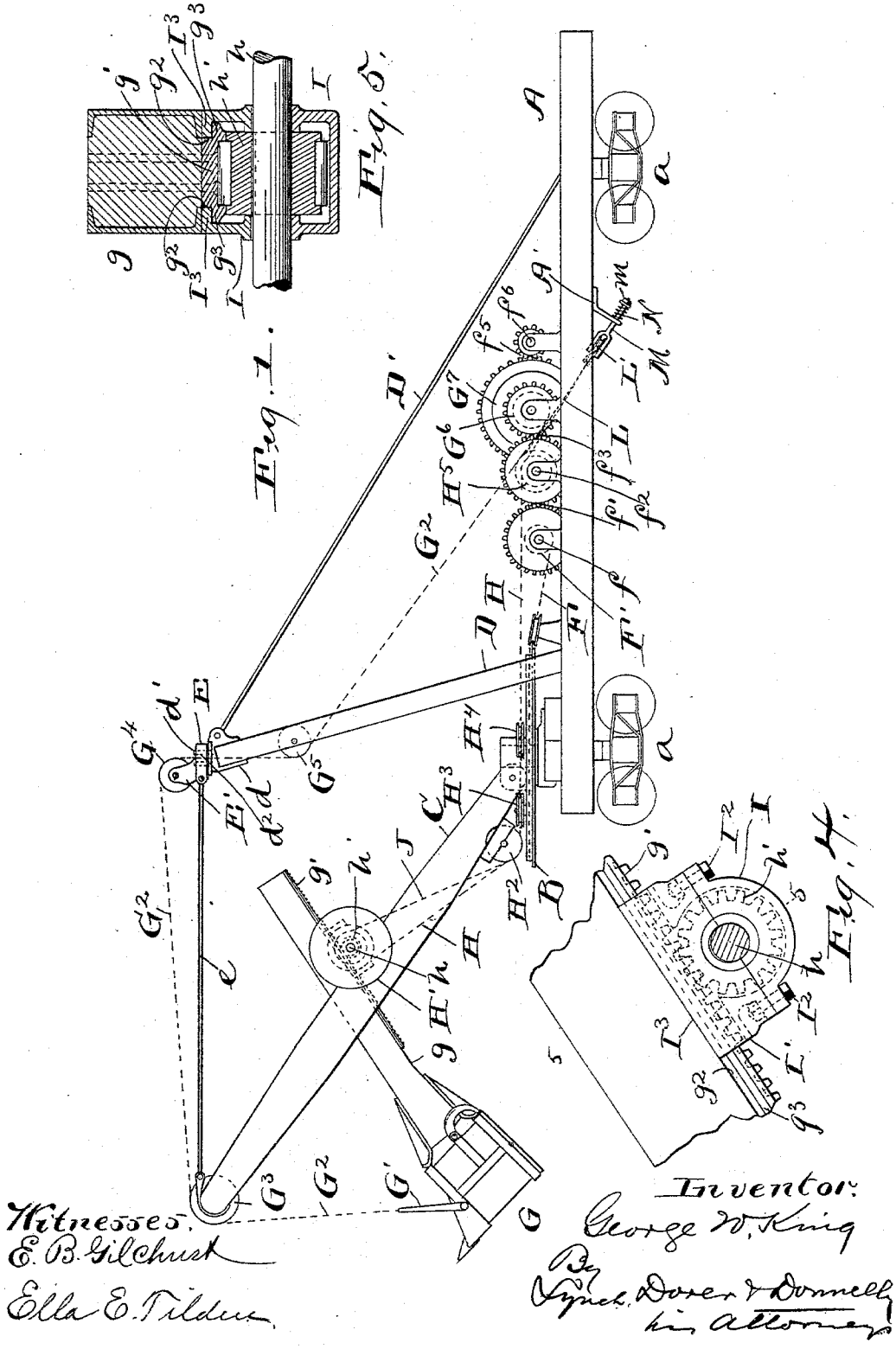


Fig. 1.

Fig. 5.

Fig. 4.

Witnesses:
E. B. Gilchrist
Ella E. Tilden

Inventor:
George W. King
By Wyatt, Dorsey & Donnelly
his attorneys

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(No Model.) 4 Sheets—Sheet 2.

G. W. KING.

EXCAVATOR.

No. 589,565. Patented Sept. 7, 1897.

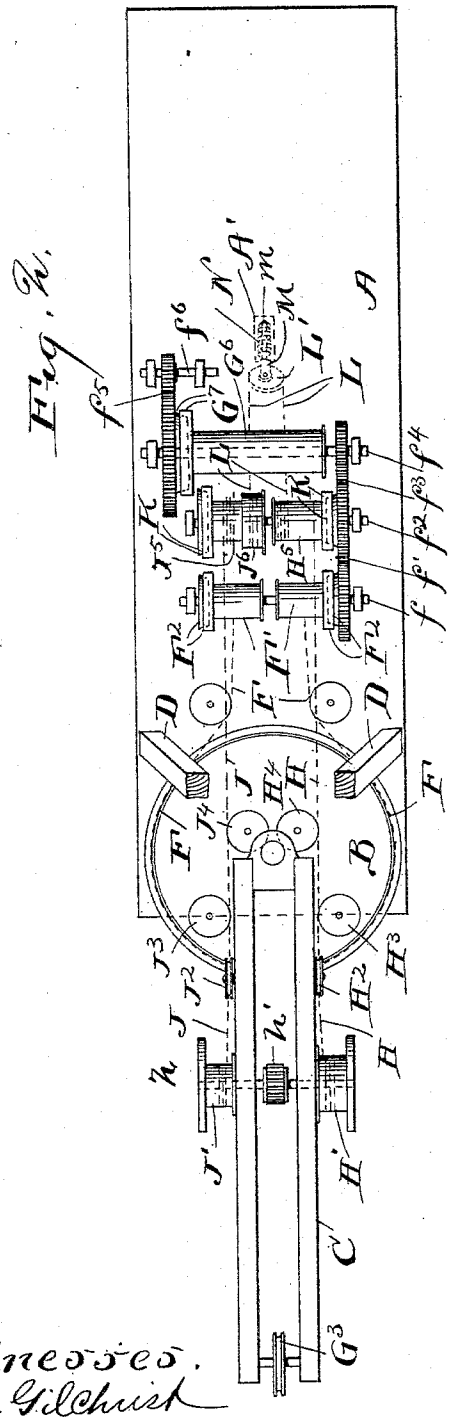


Fig. 2.

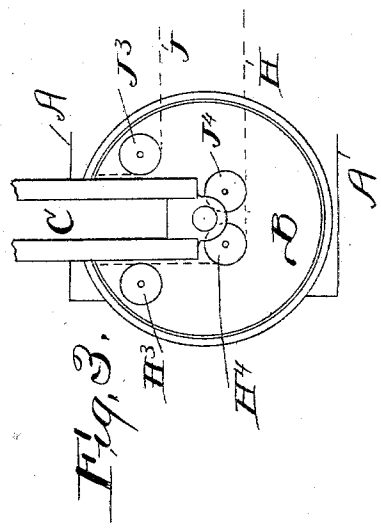


Fig. 3.

Witnesses.
E. B. Gilchrist
Ella E. Tilden

Inventor:
George W. King
By Dyer, Dodge & Donnelly
his Attorneys

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(No Model.) 4 Sheets—Sheet 3.

G. W. KING.

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Fig. 6.

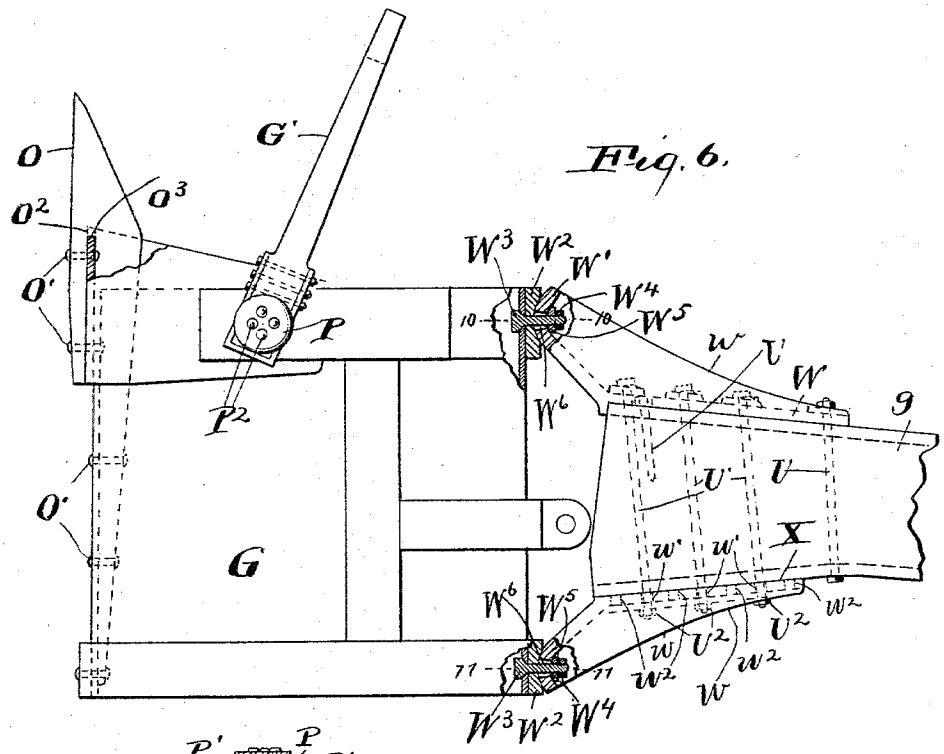
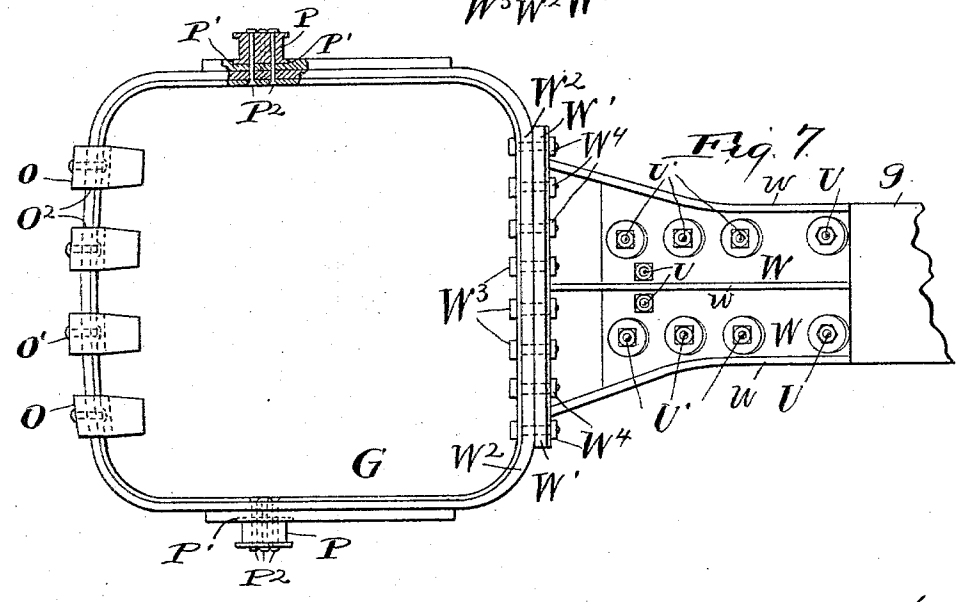


Fig. 7.



Witnesses.
E. B. Gilchrist
Ella E. Tilden

Inventor:
George W. King
By Church, Dorey & Donnelly
his attorneys

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(No Model.) 4 Sheets—Sheet 4.

G. W. KING.

EXCAVATOR.

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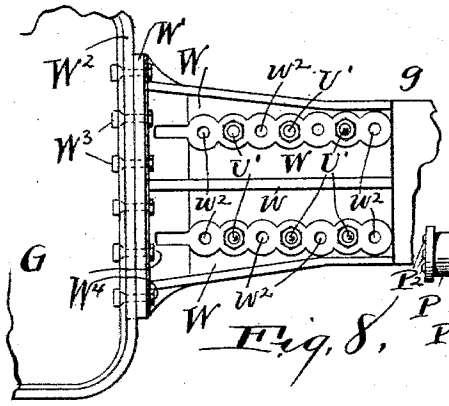


Fig. 8.

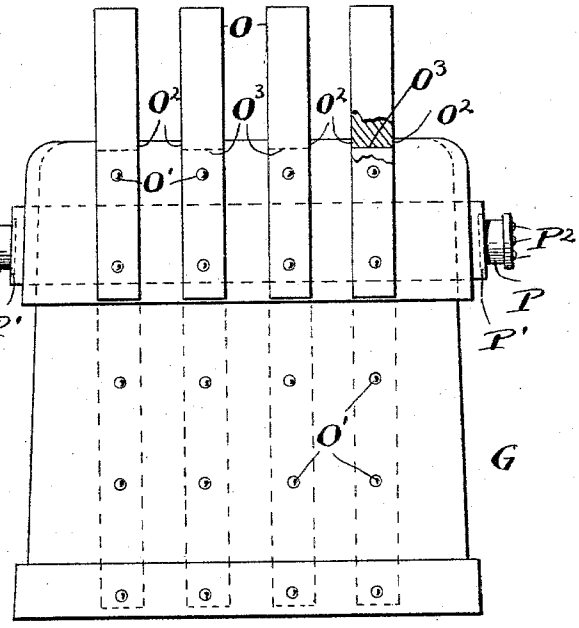


Fig. 9.

Fig. 10.

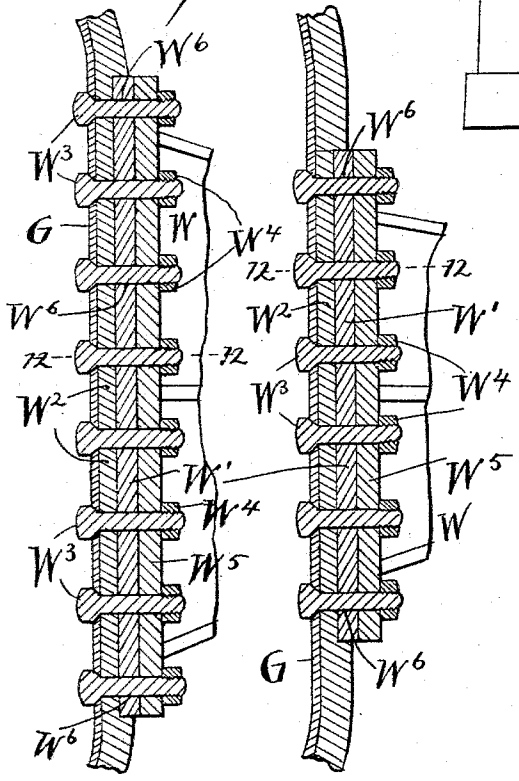


Fig. 11.

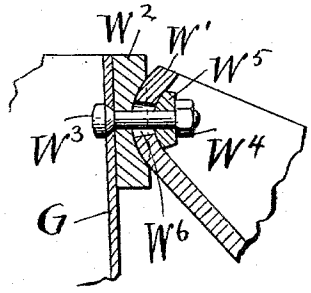


Fig. 12.

Witnesses:
E. B. Gilchrist
Ella E. Tilden

Inventor:
George W. King
By Lynch, Dorer & Dorsett
his Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE W. KING, OF MARION, OHIO.

EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 589,565, dated September 7, 1897.

Application filed March 17, 1896. Serial No. 583,518. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. KING, of Marion, Marion county, Ohio, have invented certain new and useful Improvements in Excavators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in excavators; and it consists, among other things, in an improved construction of the teeth-bearing portion of the excavating dipper or shovel so as to prevent displacement of the teeth during the latter's operation and to prevent, furthermore, shearing of the bolts or rivets employed in securing the teeth in place.

My invention consists also in an improved connection of the bail of the shovel with the shovel's body portion whereby a large wearing-surface is obtained and shearing of the rivets or devices employed in securing the bail-engaged trunnions to the shovel proper shall be avoided, and said trunnions when worn out can be easily replaced.

My invention consists also in such an improved connection between the shovel proper and its arm or handle as to accommodate an adjustment of the shovel proper at different angles or positions relative to the shovel-arm and retain said parts firmly clamped or secured to each other in the desired adjustment.

My invention consists, furthermore, in a novel and meritorious arrangement of the shovel-feed apparatus whereby a slow and powerful movement is communicated to the shovel during the latter's outward or excavating stroke and a more rapid and less powerful motion is transmitted to the shovel upon the latter's return or inward stroke after excavating.

My invention consists, furthermore, in the passage of the two shovel-feed chains or cables side by side over and at opposite sides, respectively, of the axis of the boom-swinging turn-table and in the provision of two horizontal guide-sheaves for each of said cables and so arranged as to avoid material interference with the tension of the cables during the lateral and rearward swinging movement of the boom or crane.

My invention consists, moreover, in certain other novel and meritorious features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a steam shovel or excavator embodying my invention, and Fig. 2 is a top plan of portions of the same. Fig. 3 is a top plan showing the lower portion of the boom swung laterally in the one direction and showing also the two shovel-feed chains or cables and the peculiar arrangement of the sheaves employed in guiding said chains or cables over the table. Fig. 4 is a side elevation of a portion of the shovel-arm and the means employed for retaining the rack upon said arm in mesh with the engaging pinion of the shovel-feed apparatus during the shovel's operation; and Fig. 5 is a section on line 5 5, Fig. 4. Fig. 6 is a side elevation, partly in section, of the excavating dipper or shovel and load-bearing end of the shovel-arm; and Fig. 7 is a top plan of the same, partly in section. In Fig. 7 the shovel-bail is removed. Fig. 8 is a bottom plan of the connection of the shovel proper with the shovel-arm. Fig. 9 is a front side elevation of the forward or teeth-bearing side of the shovel, partly in section. Fig. 10 is an enlarged top plan in section on line 10 10, Fig. 6. Fig. 11 is an enlarged plan in section on line 11 11, Fig. 6. Fig. 12 is a vertical section on lines 12 12, Figs. 10 and 11.

Referring to the drawings, A designates the car or body portion of a steam shovel or excavator embodying my invention. Car A is suitably supported from two-wheeled trucks *a a*, arranged at the forward end and rear end, respectively, of the car. Car A at its forward end supports the horizontally-arranged turn-table B, and C designates the laterally-swinging boom, that extends upwardly and outwardly from and is operatively connected with the turn-table. The table's axis forms the lower pivotal center of the boom, and the latter's upper pivotal center is formed upon the upper end of the so-called "A-frame" or mast D, that is suitably supported from the machine's car or body portion and at its lower end straddles the rear portion of the turn-table. Mast or frame D is suitably supported from the rear by diagonally-arranged rod D', (see Fig. 1,) that is suitably connected

at its upper end with the upper end of the frame or mast and thence extends rearwardly and downwardly and is suitably secured at its opposite end to the car. A metallic cap or head d embraces the upper end of the frame or mast D and terminates at its upper end in a centrally and vertically perforated vertical lug d', that is embraced by the sleeve or collar E, adapted to turn or swing upon said lug and suitably connected by means of a rod e with the upper and outer end of the boom. The axis of lug d' is coincident with the axis of the turn-table, and said axes constitute, as already indicated, the pivotal centers of the boom.

It is obvious that the boom is swung laterally in the one direction or the other, according as the turn-table is rotated or turned in the one or the other direction. F F designate the two turn-table-swinging chains or cables that are attached to the table at opposite sides, respectively, of the boom and thence lead rearwardly to and operatively engage different winding-drums F' F', respectively, that are loosely mounted upon a shaft f, (see Fig. 2,) arranged transversely of and suitably supported from the car or body portion of the machine a suitable distance rearward of the turn-table. Shaft f is rotated, when operated, continuously in one direction and is intergeared at f' with a shaft f^2, that is arranged parallel with and a suitable distance rearward of shaft f and is suitably supported from the machine's body portion. A suitably-operated clutch F^2 is provided for each winding-drum F' for controlling operative connection between the drum and the drum-supporting shaft, and it is obvious that the turn-table is turned in the one direction or the other, according as operative connection is established between the one or the other of said drums F' and their supporting-shaft.

G (see Fig. 1) designates the shovel proper, G' the shovel-bail, and g the handle or arm of the shovel. The hoisting chain or cable G^2 is suitably attached at one end to the shovel-bail, and thence leads upwardly to and over a vertically-arranged sheave G^3, suitably supported from and between the outer ends of the two parallel bars or beams of which the boom is in the main composed. Sheave G^3 has its axis extending transversely of the boom. From sheave G^3 the hoisting chain or cable leads rearwardly and approximately horizontally along and a suitable distance above rod e to and over a vertically-arranged sheave G^4, suitably supported from an upright bracket or member E', rigid with sleeve or collar E. Sheave G^4 has its axis preferably parallel with the axis of the boom-sheave G^3 and is located just forwardly of the upper pivotal center or axis of the boom, and from said sheave G^4 the hoisting chain or cable leads downwardly through hole d^2 in lug d' and through the upper end of the frame or mast D and in line with the boom's axes to and over a vertically-arranged sheave G^5, that is also arranged longitudinally of the machine and is suitably supported from any stationary member of the machine, and preferably from the mast or frame D. From sheave G^5 the hoisting-cable leads downwardly and rearwardly to and operatively engages a winding-drum G^6, called the "hoisting-drum," and loosely mounted upon a shaft f^4, (see Fig. 2,) arranged parallel with and a suitable distance rearward of the shaft f^2, and suitably supported from the machine's body portion, and said shaft f^4 is adapted to rotate continuously in one direction and is suitably intergeared at f^5 with the suitably-actuated and suitably-supported driving-shaft f^6. A suitably-operated clutch G^7 controls operative connection between the hoisting-drum and the latter's supporting-shaft, and it is obvious that the excavating dipper or shovel is hoisted upon establishing operative connection between said drum and shaft and lowers by gravity upon releasing said drum and permitting it to pay out the engaging cable. The arrangement of sheaves G^4 G^5 and the engaging sections of the hoisting-cable hereinbefore described is important, because by said arrangement perfect alinement of said sheave G^4 and the cable-section leading to and from said sheave is maintained and the cable's tension is not interfered with during the swinging of the boom.

The shovel-arm is preferably made solid and composed of a single beam or timber snugly interposed between the flanged sides of two channel-bars, as shown more clearly in Fig. 5, and is provided upon its back or under side with a rack g', rigidly secured to and arranged longitudinally of said side of the shovel-arm. Rack g' meshes with a pinion h', that is operatively mounted upon a shaft h, suitably supported from and arranged transversely of the bars or beams composing the boom, and it is obvious that the shovel is thrust or fed outwardly as required to excavate or moved or fed inwardly after its excavating-stroke, according as said shaft h is rotated in the one or the other direction.

To retain the shovel-arm rack in mesh with the engaging pinion during the feed of the shovel and at the same time accommodate the employment of a solid shovel-arm and necessitate the use of one pinion and one rack only and at the same time afford a lubricant-receiving or oiling chamber for said gearing, I provide a box or case that incloses said gearing and is loosely mounted upon the pinion-bearing shaft. Said case is composed, preferably, of two sections, an outer section I and an inner section I', to which the outer section is removably secured by bolts I^2 (see Fig. 4) and that is provided with two internal flanges I^3 I^3, (see Fig. 5,) formed at opposite sides, respectively, of the rack and easily engaging parallel grooves or recesses g^2 g^2, respectively, with which the shovel-arm is provided at opposite sides, respectively, of the rack. Said recesses or grooves extend longi-

tudinally of and parallel with the rack and are formed, preferably, between the shovel-arm and flanges g^3 g^3, formed upon opposite sides, respectively, and extending longitudinally of the rack.

The two shovel feed chains or cables H and J employed in feeding the shovel in opposite directions, respectively, are suitably connected at one end with winding-drums H′ and J′, respectively, (see Fig. 2,) that are operatively mounted upon shaft h at opposite sides, respectively, of the boom. Cable H passes in under drum H′ and leads rearwardly and downwardly from said drum to and in under a vertically-arranged sheave H^2, also arranged longitudinally of the boom and supported from the latter's lower end. The cable J passes over drum J′ and leads rearwardly and downwardly from said drum to and in under a vertically-arranged sheave J^2, that is also arranged longitudinally of the boom and supported from the latter's lower end. Sheaves H^2 and J^2 are arranged, furthermore, at opposite sides, respectively, and a suitable distance forward of the boom's axial line. From sheaves H^2 and J^2 cables H and J lead rearwardly between and to and over the two horizontally-arranged sheaves H^3 and J^3, respectively, that are supported from the turn-table at opposite sides, respectively, and a suitable distance forward of the table's axis, and thence cables H and J lead rearwardly to and are engaged by the two sheaves H^4 and J^4, respectively, that are supported from the turn-table and arranged horizontally between the cables and at opposite sides, respectively, and just rearward of the table's axis, and thence cables H and J lead rearwardly to and over different winding-drums H^5 and J^5, respectively, that are loosely mounted upon the intermediate shaft f^2 that, as already indicated, is rotated continuously in one direction and is intergeared at f^3 with the hoisting-drum bearing-shaft. A suitably-operated clutch K is provided for each of said drums H^5 J^5 for establishing operative connection between the drum and the latter's supporting-shaft, and cable H is actuated in the direction required to effect the excavating-stroke of the shovel, or cable J is actuated in the direction required to return or inwardly feed the shovel after excavating, according as operative connection is established between said shaft and drum H^5 or drum J^5. It will be observed that cable J is paid out by the engaging drum J^5 while cable H is being wound upon drum H^5, and vice versa; that cable J is paid out by drum J′ when it is wound upon drum J^5, and vice versa; that cable H is paid out by drum H′ while it is wound upon drum H^5, and vice versa; that the portions of drums H^5 and J^5, upon which cables H and J are wound, respectively, have the same or approximately the same diameter; that cables H and J are therefore driven at the same speed, or approximately so, by said drums H^5 and J^5, and that by the transmission of motion to the shovel in effecting the shovel's excavating-stroke, through the medium of the drum H′, that is diametrically larger, as already indicated, than the drum J′, through whose medium motion is communicated to the shovel in effecting the latter's return stroke after excavating, is accommodated a slow and powerful movement of the shovel in excavating and a rapid return movement of the shovel after excavating. It will also be observed that by the construction and arrangement of winding-drums hereinbefore described the hoisting-drum is mounted upon one shaft; that the shovel feed-drums are mounted upon another shaft, and that the boom-swinging drums are mounted upon a third shaft, by which arrangement of parts the boom-swinging drums or the shovel-feed drums or the hoisting-drum can be speeded as desired independently of the speeding of the remaining drums.

L (see Figs. 1 and 2) designates a tension chain or cable, whose opposite ends engage, respectively, the inner end of drum H^5 and the inner diametrically-enlarged portion J^6 of drum J^5. Cable L leads from one of said drums downwardly and rearwardly to and over a sheave L′, suitably supported from the one end of a bolt or rod M, that extends through a bracket A′, rigid with the car-body, and is provided with a spiral spring N, confined upon said rod or bolt between the bracket and a nut m, mounted upon the screw-headed shank of the bolt rearwardly of the bracket and instrumental in adjusting the tension of the spring. The spring N acts to retain the tension-cable taut, and said cable is adapted to take up any slack in either one of the shovel-feed cables when said feed-cable is paid out by its engaging tension-cable-engaging drum. It is obvious that because drum H′ is larger diametrically than drum J′ drum J^5 is rotated slower than drum H^5 during the feeding of the shovel, and that the diametrical enlargement of the tension-cable-engaging end of drum J^5 and the correspondence in diameter of said enlargement with drum H′ are therefore necessary in order to maintain the tension-cable in a taut or operative condition.

Referring, lastly, to the construction of the excavating dipper or shovel, I would remark that the shovel proper is provided, preferably, upon its forward side with any suitable number of forwardly-projecting teeth O, adapted to cut into the place of excavation and thereby facilitate the excavating operation, and said teeth are suitably secured to the forward side of the shovel proper by means of bolts or rivets O′. To prevent lateral displacement of the teeth and shearing of the teeth-securing devices by the lateral strain upon the teeth during the excavating operation, I form lateral bearings for said teeth at the forward extremities of the forward side of the shovel proper, as shown very clearly in Figs. 6 and 9, by fitting the teeth

over the shovel's forward side into notches or recesses O^2, formed in the forward or upper edge of said side of the shovel proper—that is, each shovel-tooth is provided with a shoulder O^3, engaging the inner end wall of the respective tooth-receiving notch or recess in the shovel, and the opposing side walls of said recess are engaged by opposite sides, respectively, of the tooth and thereby afford an efficient lateral bearing for the tooth sufficient to avoid or prevent shearing of the rivets or securing devices during the excavating operation.

I will also remark that opposite ends of the shovel-bail are connected with opposite sides, respectively, of the shovel, and each end of the bail is journaled in any approved manner upon the centrally and circumferentially reduced portion of a comparatively large cylindrical trunnion-forming block P, (see Figs. 6, 7, and 9,) that at its inner end engages a recess P′, formed in the adjacent side of the shovel. Each block or trunnion P is rigidly secured to the shovel by several rivets P^2, extending longitudinally through the trunnion and through the respective shovel side. The construction of the shovel-trunnions of separate pieces removably seated within recesses formed in and riveted to the shovel proper not only effectually prevents the trunnions from shearing off the securing-rivets by the lateral strain to which said trunnions are subjected during the shovel's operation, but also facilitates the replacement of said trunnions when they are worn out.

To render the shovel proper capable of being vertically tilted or adjusted at different angles or positions relative to the shovel-arm and firmly and positively secured in the desired adjustment, I provide two plates W W, (see Figs. 6, 7, and 8,) one whereof engages and is secured to the forward or upper side of the shovel-arm and the other whereof engages and is secured to the lower or back side of the arm. Both of said plates extend beyond the load-bearing end of the shovel-arm and engage the shovel proper. At least one and preferably both of said plates, as shown, afford bearing for a slide formed upon the shovel proper, and one of said plates—the one attached to the under or back side of the arm—is adjustable longitudinally of the arm. In the case illustrated a segmental flange W′ is rigidly formed upon each of said plates, and the convex side of said flange faces the shovel proper and affords bearing for the outer or concave side of a slide or member W^2, rigidly formed upon the shovel proper, and bolts W^3, arranged at suitable intervals widthwise of the shovel, extend through said mutually-engaging members and have their heads engaging the inner side of the concave member, and nuts W^4 are mounted upon the bolts at the outer or concave side of the flange. Said nuts and bolts are instrumental in firmly clamping the respective mutually-engaging members, and consequently the shovel proper and shovel-arm together, and a washer-forming plate W^5 (see also Figs. 10, 11, and 12) is shown interposed between the nuts and segmental flange, and said plate or washer upon its inner side has the convexity required to fit the concavity in the flange, and the bolt-holes in the flanges are elongated in the direction required to accommodate the vertical tilting or adjustment of the shovel proper at different angles or positions relative to the shovel-arm.

Any suitable number of bolts U rigidly secure the forward or upper plate W to the shovel-arm, and both plates W are preferably ribbed longitudinally, as at *w*.

Any suitable number of bolts U′ are instrumental in securing both plates W to the shovel-arm, and two series of bolts U′ are preferably provided at opposite sides, respectively, of ribs *w*. Bolts U′ have their heads engaging the outer side of the upper plate and have their shanks extending through the shovel-arm and through holes *w′* in the lower plate, (see Fig. 6,) and nuts U^2, mounted upon said bolt-shank at the outer side of said lower plate, are instrumental in securing said plate in the desired adjustment. The lower plate is provided with other bolt-holes w^2, arranged in line and equidistant from the different bolt-holes *w′*, respectively, so as to accommodate the securing of said plate by the same bolts and nuts U′ and U^2, respectively, in its different longitudinal adjustments. It is obvious that upon removing nuts U^2, partially withdrawing bolts U′, and loosening nuts W^4 the lower plate W is rendered free to be adjusted longitudinally of the shovel-arm, and the shovel proper is rendered free to be tilted vertically or adjusted at a different angle to the shovel-arm, and the parts are secured in the desired adjustment by reapplying said bolts and retightening said nuts.

The bearing X, (see Fig. 6,) formed upon and longitudinally of the load-bearing end of the shovel-arm for the longitudinal adjustable or lower plate W, has such trend that an adequate bearing between said adjustable plate and shovel-arm is obtained in any adjustment of the shovel proper.

Excavating-shovels of the character indicated are of course provided with a hinged bottom whose construction and operation need not be described or shown in this application, because it forms no part of the subject-matter of the application.

What I claim is—

1. The combination with the excavating-shovel's forward side having notches or recesses formed at its upper edge at suitable intervals, of teeth bolted or riveted to said side and occupying the aforesaid notches or recesses, substantially as and for the purpose set forth.

2. In an excavator, the excavating-shovel having each of its bail-bearing sides provided exteriorly with a cylindrical recess and

having cylindrical bail-engaging trunnions snugly fitted into said recesses, and several rivets extending longitudinally through said trunnions and through the trunnion-bearing sides of the bucket.

3. The combination of the shovel-arm; a plate arranged at the forward or upper side, and secured to the load-bearing end, of said arm; another plate arranged at the back or under side, and secured to said end, of the arm; the shovel proper attached to said plates and adjustable at different angles to the arm in a vertical plane, and means for securing the shovel in the desired adjustment, substantially as and for the purpose set forth.

4. The combination with the shovel proper and shovel-arm, of a plate arranged at the forward or upper side of and secured to the arm, another plate arranged at the lower or back side of and secured to the arm, an arc-shaped slideway formed upon one of said plates and arranged up and down and facing the shovel proper, a slide engaging said slideway and rigid with the shovel proper, means for securing the slide in the desired adjustment upon the slideway, and the other plate being adjustable longitudinally of the arm, substantially as and for the purpose set forth.

5. The combination with the shovel proper and shovel-arm, of a plate arranged at the forward or upper side of and secured to the arm, another plate arranged at the lower or back side of and secured to the arm, arc-shaped slideways formed upon the forward ends of said plates, and arranged up and down and facing the shovel proper, slides engaging said slideways and rigid with the shovel proper, means for securing the slides in the desired adjustment, and one of said plates being adjustable longitudinally of the arm, substantially as and for the purpose set forth.

6. The combination of the shovel proper and shovel-arm; a plate arranged at the forward or upper side, and secured to the load-bearing end, of the arm; another plate arranged at the lower or back side, and secured to said end, of the arm; an arc-shaped slideway formed upon one of said plates and arranged up and down and facing the shovel proper; a slide formed upon the shovel proper and engaging said slideway; means for securing the slide in the desired adjustment upon the slideway; the other plate being adjustable longitudinally of the arm and having a suitable connection with the shovel proper, and the arm's side engaged by said last-mentioned plate having such trend that an adequate bearing for said plate is obtained in the different adjustments of the shovel proper, substantially as and for the purpose set forth.

7. The combination with the shovel proper and shovel-arm, a plate arranged at the forward or upper side of and suitably secured to the arm, another plate arranged at the lower or back side of and suitably secured to the arm, one of said plates being adjustable longitudinally of the arm, of a mutually-engaging segmental flange and correspondingly-concave member instrumental in connecting together each of the aforesaid plates and shovel proper and having a common axis extending widthwise of the shovel proper, one of said mutually-engaging members being formed upon the respective plate and the other being formed upon the shovel proper, and means for clamping said mutually-engaging members together, substantially as and for the purpose set forth.

8. The combination with the shovel proper and shovel-arm, a plate arranged at the forward or upper side of and suitably secured to the arm, another plate arranged at the back or under side of and suitably secured to the arm; one of said plates being adjustable longitudinally of the arm, of a mutually-engaging segmental flange and correspondingly-concave member instrumental in connecting together each of the aforesaid plates and shovel proper and having a common axis extending widthwise of the shovel proper, one of said mutually-engaging members being formed upon the respective plate and the other being formed upon the shovel proper, bolts and nuts instrumental in rigidly clamping together said mutually-engaging members, said bolts extending through said mutually-engaging members, and the bolt-holes in the member formed upon the respective plate being elongated in the direction required to accommodate the adjustment of the shovel proper concentrically of the aforesaid axis, substantially as and for the purpose set forth.

9. The combination of the shovel-arm, a plate arranged at the forward or upper side of and secured to the arm, another plate arranged at the back or under side of and secured to the arm, the shovel proper attached to said plates and adjustable at different angles to the arm in a vertical plane, nuts and bolts arranged at intervals longitudinally of the arm for securing one of said plates to the arm, and said last-mentioned plate having bolt-holes engaged by said bolts and having other bolt-holes arranged in line with and equidistant from the different occupied bolt-holes, respectively, substantially as and for the purpose set forth.

10. The combination of the shovel-arm, a plate arranged at the forward or upper side of the arm, another plate arranged at the back or under side of the arm, the shovel proper attached to said plates and adjustable at different angles to the arm in a vertical plane, nuts and bolts arranged at intervals longitudinally of the arm and instrumental in securing both of said plates to the shovel-arm, and one of the aforesaid plates having other holes arranged in line with the holes engaged by said bolts, substantially as and for the purpose set forth.

11. The combination of the shovel-arm, a plate at the forward or upper side of the arm, another plate at the lower or back side of the

arm, the shovel proper attached to said plates and adjustable at different angles to the arm in a vertical plane, nuts and bolts arranged at intervals longitudinally of the arm and instrumental in securing both of said plates to the arm, one of the aforesaid plates having other bolt-holes arranged in line with the holes engaged by said bolts, and other bolts or devices independently securing the other plate to the shovel-arm, substantially as set forth.

12. The combination with the boom, a suitably-actuated shaft supported from the boom, a pinion operatively mounted upon said shaft, the excavating-shovel having an arm provided with a rack arranged longitudinally of the arm and meshing with the aforesaid pinion, and provided furthermore with two grooves or recesses arranged at opposite sides, respectively, of the rack, of the oil reservoir or shell embracing the pinion and journaled upon the aforesaid shaft, and provided with flanges engaging the aforesaid recesses, substantially as set forth.

13. The combination with the boom, a pinion suitably supported from the boom, the excavating-shovel having an arm provided with a rack meshing with said pinion, two drums operatively connected with the pinion, and two suitably-actuated cables engaging the different drums, respectively, substantially as and for the purpose set forth.

14. The combination with the boom, a shaft suitably supported from the boom, the excavating-shovel operatively connected with said shaft, two drums operatively connected with said shaft and one of said drums being diametrically larger than the other, a suitably-actuated cable operatively engaging the larger drum, another suitably-actuated cable operatively engaging the smaller drum, and the arrangement of parts being such that the larger drum is instrumental in effecting the excavating stroke of the shovel, and the smaller drum is employed in effecting the return stroke of the shovel after excavating, substantially as and for the purpose set forth.

15. The combination of the machine's body portion; a shaft suitably supported from said body portion and rotating, when operated, continuously in the one direction; two winding-drums loose upon said shaft; a clutch for each drum for controlling operative connection between the drum and shaft; the boom; the excavating-shovel; a shaft on the boom; means establishing operative connection between the boom-shaft and shovel, so that the shovel is fed in the one direction or the other, according as the boom-shaft is rotated in the one or the other direction; two drums operatively mounted upon the boom-shaft, and two cables operatively connecting the different boom-shaft drums, respectively, with the different clutch-controlled drums, respectively, substantially as and for the purpose set forth.

16. The combination of the machine's body portion; a shaft suitably supported from said body portion and suitably rotated, when operated, continuously in one direction; two winding-drums mounted loosely upon said shaft; a clutch for each drum for controlling operative connection between said drum and the shaft; the boom; a pinion suitably supported from the boom; the excavating-shovel having an arm provided with a rack meshing with said pinion, the two pinion-driving drums operatively connected with said pinion and differing in size diametrically, two cables operatively connecting the different pinion-driving drums, respectively, with the different clutch-controlled drums, respectively, and the arrangement of parts being such that the larger pinion-driving drum shall be instrumental in effecting the excavating stroke of the shovel, and the other pinion-driving drum shall find employment in effecting the return stroke of the shovel after excavating, substantially as and for the purpose set forth.

17. The combination of the excavating-shovel and two suitably-supported drums operatively connected with and adapted to feed the shovel in opposite directions, respectively, a suitably-supported shaft suitably rotated in the one direction, two drums loose upon said shaft, a clutch for each of said loosely-mounted drums for controlling operative connection between the drum and shaft, two cables operatively connecting the different first-mentioned drums, respectively, with the different clutch-controlled drums, respectively, and a tension-cable connected, at opposite ends, with the different clutch-controlled drums, respectively, substantially as and for the purpose set forth.

18. The combination with a suitably-supported shaft rotating, when operated, continuously in one direction, two drums loose upon said shaft, a clutch for each drum for controlling operative connection between the drum and shaft, the excavating-shovel, two cables engaging different drums, respectively, and such operative connection between said cables and the shovel as will adapt the drums to propel or actuate the shovel in opposite directions, respectively, and will cause one of said drums to pay out the engaging cable more rapidly than the other drum during the feeding operation of the shovel, of an enlarged end or drum formed upon one of said drums, and a tension-cable connected, at one end, with the diametrically-enlarged drum end or drum and connected, at its opposite end, with the other winding-drum, substantially as and for the purpose set forth.

19. The combination with two suitably-supported drums instrumental in feeding the shovel in opposite directions, respectively, a suitably-supported shaft suitably rotated in one direction, two drums loose upon said shaft and one of said drums having a diametrically-larger end, a clutch for each of said loosely-mounted drums for controlling operative connection between the drum and shaft, a cable operatively connecting the smaller shovel-feed drum with the clutch-

controlled drum that has the diametrically-larger end, another cable operatively connecting the larger shovel-feed drum with the other clutch-controlled drum, of a tension-cable connected, at one end with the diametrically-larger end of the clutch-controlled drum having said end, and connected at its opposite end with the other clutch-controlled drum, substantially as and for the purpose set forth.

20. The combination of the machine's body portion; a shaft supported from said body portion and suitably driven, when operated, continuously in one direction, two drums mounted loosely upon said shaft and having equal or approximately equal diameters except that one of said drums has a diametrically-enlarged end; a clutch for each drum for controlling operative connection between said drum and the shaft; the boom; a pinion supported from the boom; the excavating-shovel having an arm provided with a rack meshing with said pinion; two drums operatively connected with said pinion and adapted to drive the pinion in opposite directions, respectively, and said pinion-driving drums differing in size diametrically; two cables operatively connecting the different pinion-driving drums, respectively, with the different clutch-controlled drums, respectively, and a suitably-guided tension-cable connected at one end with the diametrically-enlarged portion of the one clutch-controlled drum and suitably connected at its other end with the other clutch-controlled drum, all arranged and operating, substantially as shown, for the purpose specified.

21. The combination of the turn-table, the boom operatively connected with said table, a pinion supported from the boom, the excavating-shovel having an arm provided with a rack arranged longitudinally of the arm and meshing with said pinion, two drums operatively connected with the pinion, two vertically-arranged sheaves arranged at opposite sides, respectively, of and supported at or near the boom's lower end, a pair of horizontal sheaves arranged between the vertically-arranged sheaves and table's axes a distance apart equal or approximately equal to the distance between the vertically-arranged sheaves, another pair of horizontal sheaves arranged just rearward of and at opposite sides, respectively, of the table's axes, and the two suitably-driven shovel-feed chains or cables operatively connected with the different drums, respectively, and guided over the turn-table by the aforesaid sheaves, substantially as shown, for the purpose specified.

22. The combination with the suitably-actuated and suitably-supported horizontally-arranged turn-table, the boom operatively connected with said table, a pinion suitably supported from the boom, the excavating-shovel having an arm provided with a rack arranged longitudinally of the arm and meshing with the aforesaid pinion, two drums differing in size diametrically and operatively connected with said pinion and located at opposite sides, respectively, of the boom, two vertically-arranged sheaves arranged at opposite sides, respectively, of and suitably supported at or near the boom's lower end, a pair of suitably-supported horizontal sheaves arranged between the vertically-arranged sheaves and table's axis a distance apart equal, or approximately equal, to the distance between the vertically-arranged sheaves, and another pair of horizontal sheaves arranged just rearward of and at opposite sides, respectively, of the table's axis, and the two suitably-actuated shovel-feed chains or cables operatively connected with the different drums, respectively, and suitably guided over the turn-table by the aforesaid sheaves, in a manner substantially as shown, for the purpose set forth.

23. A machine of the character indicated, having the hoisting-drum loosely mounted upon one shaft, the two shovel-feed drums loosely mounted upon another shaft suitably driven continuously in one direction, and the two boom-swinging drums loosely mounted upon a third shaft rotating continuously in one direction, and a clutch for each of said drums for controlling operative connection between the drum and the shaft supporting it, substantially as and for the purpose set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 20th day of February, 1896.

GEORGE W. KING.

Witnesses:
FRANK A. HUBER,
S. C. BOWEN.