

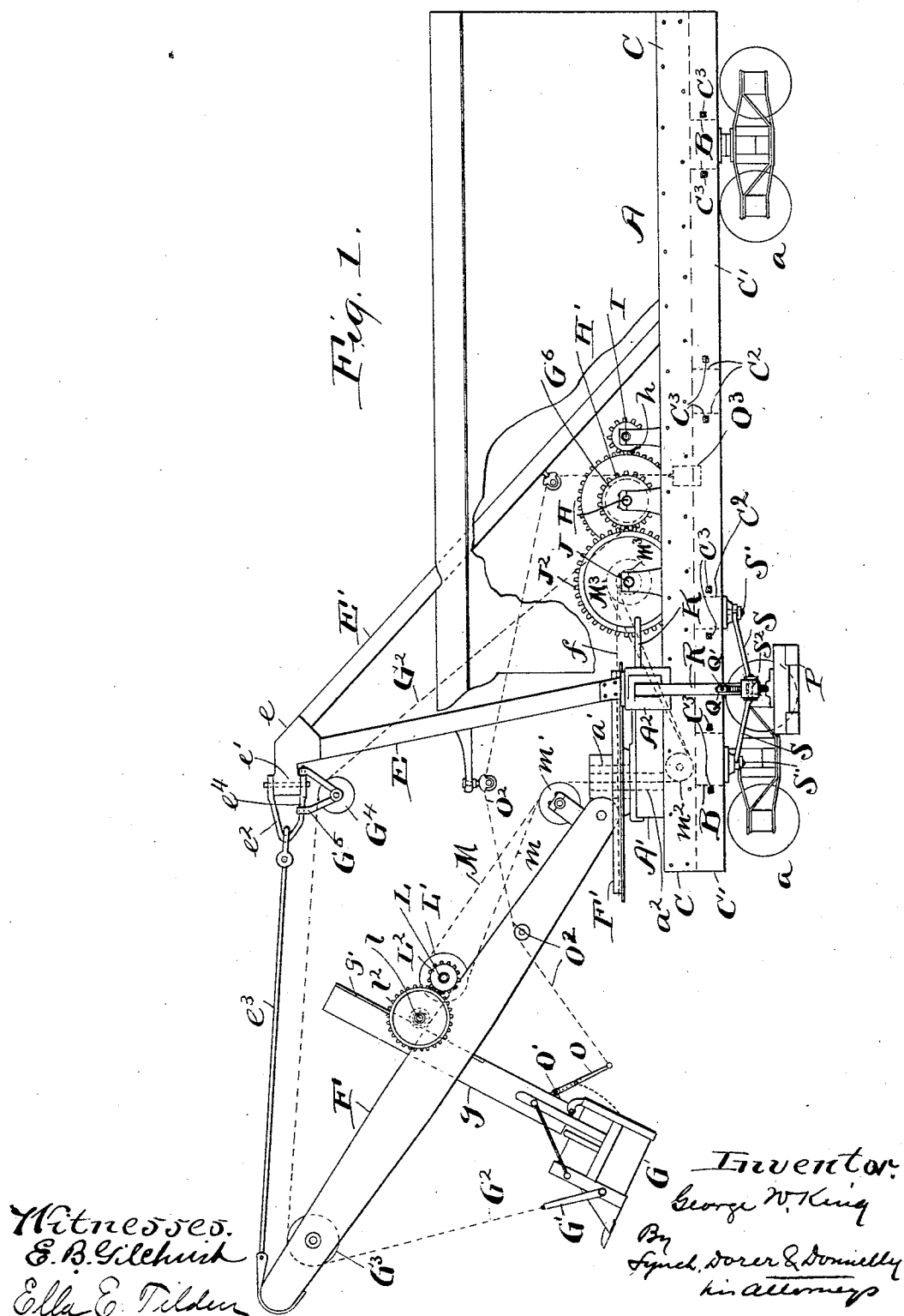
(No Model.)

3 Sheets—Sheet 1.

G. W. KING.
EXCAVATOR.

No. 580,189.

Patented Apr. 6, 1897.



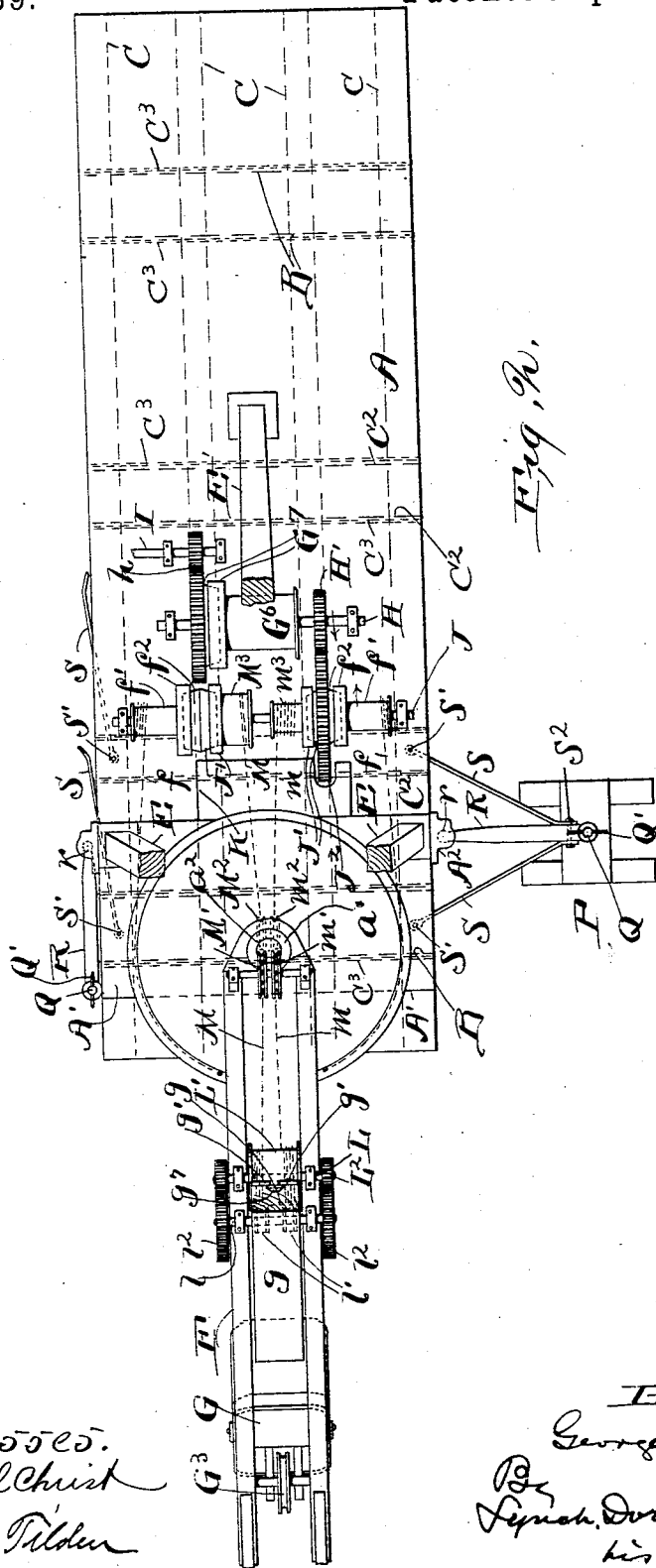
(No Model.)

3 Sheets—Sheet 2.

G. W. KING.
EXCAVATOR.

No. 580,189.

Patented Apr. 6, 1897.



Witnesses:
E. B. Gilchrist
Ella E. Tilden

Inventor:
George W. King
By
Seymour Dorer & Donnelly
his Attorneys

UNITED STATES PATENT OFFICE.

GEORGE W. KING, OF MARION, OHIO.

EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 580,189, dated April 6, 1897.

Application filed March 2, 1896. Serial No. 581,424. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. KING, of Marion, in the county of Marion and State of 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 floor or lower portion of the stationary framework or body portion of the machine and trussing said floor and floor-supports without interfering with the strength of the bolsters over the trucks.

My invention consists also in improvements in bracing the machine externally and laterally, and comprising a brace whose framework is composed of two approximately horizontally-arranged rods or bars pivoted vertically or uprightly at their inner ends to the stationary part of the machine and converging toward and detachably secured at their outer ends to the outer and lower end of a diagonally-arranged bar, whose upper or opposite end is connected with the machine's body portion in such a manner as to render it capable of being swung laterally alongside the machine's body portion.

My invention consists also in employing a peculiar hinged connection between the upper or diagonal member of the brace and machine's body portion that will come apart and release said member from the body portion in case the lower members or supports of the brace break, and thereby avoid other damage to the brace and mutilation of the aforesaid hinge connection.

My invention consists also in improvements in the apparatus employed for feeding the dipper or shovel, and particularly in a novel shovel-feed apparatus capable of slowly and powerfully thrusting or feeding the shovel outwardly in excavating and quickly returning the shovel after excavation.

My invention consists, moreover, in other 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. Fig. 2 is a top plan of portions of the same. Portions are broken away in said figures to more clearly show the construction. Fig. 3 is a front end elevation of the car-floor and shows also the so-called "A-frame," the forward truck, the bolster over said truck, the external jack or brace at one side of the machine in its operative position, and the members of the frame of the brace at the opposite side of machine swung laterally alongside the machine's body portion. Fig. 4 is a top plan of the stationary bracket that bears the upper end of the diagonally-arranged bar of a brace's frame and shows the connection of said bar's end with said bracket. Fig. 5 is a front side elevation relative to Fig. 4. Fig. 6 is a side elevation of a portion of the shovel-arm and shows my improved means for retaining the rack or racks upon said arm in mesh with the pinion or pinions upon a shaft that is borne by the boom and forms a part of the shovel-feed apparatus. Fig. 7 is an elevation, partly in transverse section, on line 7 7, Fig. 6. Fig. 8 is a side elevation of the upper end of the so-called "A-frame" and a vertically and laterally swinging bracket supported from the said frame's head and bearing a sheave that is instrumental in supporting and guiding the hoisting chain or cable.

Referring to the drawings, A represents the body of the car of a steam shovel or excavator embodying my invention. The car is mounted upon two wheeled trucks *a a*, arranged at opposite ends, respectively, of the car.

B designates the bolsters over the trucks. Girders C extend lengthwise of the car and rest upon the trucks. Four girders are shown in the case illustrated and are arranged at suitable intervals between the extremities of the trucks. Each of the two centrally-located girders is composed, preferably, of two channel-bars arranged with their flanged sides vis-a-vis and wood-filling between said bars, as shown in Fig. 3. Each of the two outer girders is composed of a channel-bar at its inner side and an I-beam at its outer side and wood-filling between said beam and bar. Said I-beam is comparatively wide and extends be-

low the girder, as at C', and over the ends of the bolsters, and has its lower inner flange engaging the under sides of the bolsters, as shown in Fig. 3. Any suitable number of cross-beams C² are preferably interposed between the lower portions of the two I-beams at suitable intervals between the bolsters. The I-beams are also preferably connected together by any suitable number of tie-rods C³. It will therefore be observed that the I-beams effectually truss the lower portion of the machine's body portion without interfering with the strength of the bolsters.

The car or body portion at the forward end of the car-body has a forwardly-extending platform A', and E designates the so-called "A-frame," that is mounted upon and suitably secured to said platform, preferably at the platform's rear portion just forward of the car-body. Said frame E is instrumental in supporting the laterally-swinging boom or crane of the machine, and at its upper end is provided with a metallic cap or head e, that embraces the upper end of the A-frame, and the rearwardly and downwardly extending diagonally-arranged bar E', that supports and braces the A-frame in a rearward direction. Cap or head e at its upper end is provided with a horizontally-arranged and forwardly-projecting ear e', that bears the upper pivotal center of the laterally-swinging boom or crane and bears the horizontally-swinging bracket e², that is vertically pivoted at its inner end to said ear and has its axis forming the aforesaid pivotal center. To the outer and forward end of bracket e² is suitably connected the rear end of a rod e³, whose forward end is attached to the upper and outer end of boom F, that projects outwardly and upwardly from and is operatively connected with the suitably-actuated horizontally-arranged turntable F', (shown mounted upon the forward portion of platform B and upon a vertical hollow box or trunnion a', rigid with platform A'.) The boom comprises in the main two bars or beams arranged parallel with each other, as shown in Fig. 2.

G designates the excavating dipper or shovel, g the shovel-arm, and G' the shovel's bail.

G² represents the hoisting chain or cable that is suitably attached at one end to the shovel-bail, thence leads upwardly to and over a vertically-arranged sheave G³, suitably supported from and between the upper end of the two bars or beams composing the boom and having its axis extending transversely of the boom. From sheave G³ cable G² leads rearwardly and approximately horizontally to and over a vertically-arranged sheave G⁴, having its axis parallel with the boom-sheave G³ and supported from a vertically and laterally swinging bracket G⁵, preferably journaled at its upper end upon the arm e⁴ of bracket e². From sheave G⁴ the hoisting chain or cable leads downwardly and rearwardly to and operatively engages a winding-

drum G⁶, that is called the "hoisting-drum," and is loosely mounted upon a shaft H, arranged transversely of and supported within car-body A a suitable distance rearward of the A-frame, and it is obvious that the excavating-shovel is hoisted when the hoisting-cable is wound upon the hoisting-drum, and lowers by gravity when said drum is rendered free to pay out the engaging cable. Shaft H is intergeared at h with a suitably-actuated driving-shaft I, arranged rearward of and parallel with shaft H, and operative connection between the hoisting-drum and the shaft-bearing is controlled by a suitably-operated clutch G⁷. (See Fig. 2.)

The A-frame straddles the rear portion of the turn-table without interfering with the latter's operation, and the space or interval between said table and hoisting-drum-supporting shaft should be large enough to accommodate the location of the suitably-driven shaft J, that is arranged forward of and parallel with shaft H and bears the winding-drums instrumental in swinging the boom and the winding-drums employed in effecting the excavating and return strokes of the excavating-shovel and to further accommodate the location of the suitably-supported operator's stand or platform K, between shaft J and turn-table, and the lever mechanism (not shown) employed in operating the clutches that control operative connection between the different winding-drums and drum-supporting shafts.

Again referring to the means for supporting and guiding the hoisting chain or cable over the turn-table, it will be observed that the axis of sheave-bearing bracket G⁵ is arranged parallel or approximately parallel with the cable-section extending between sheave G⁴ and the boom-sheave G³, and said axis preferably traverses the upper pivotal center of the boom, by which construction and arrangement of parts said section of the hoisting-cable and sheave G⁴ are kept in their proper relative position or alinement in swinging the boom laterally. Fig. 8 shows bracket G⁵ swung laterally into a position it assumes upon swinging the boom laterally and rearwardly in one direction. The journaling of bracket G⁵ upon the adjacent arm of bracket e² dispenses with the employment of a separate piece or member for supporting said bracket G⁵.

The two chains or cables f f' (see Fig. 2) instrumental in swinging the boom laterally in opposite directions, respectively, are suitably attached to the turn-table at opposite sides, respectively, of and in close proximity to the boom, and said cables lead from the table rearwardly to and operatively engage different winding-drums f' f'', respectively, loosely mounted upon shaft J and a suitable distance apart, and it is obvious that the boom is swung laterally in the one or the other direction according as the one or the other of said cables is wound upon the engaging drum. A suit-

ably-operated clutch f^2 is provided for each drum f' for controlling operative connection between the drum and shaft.

Shovel-arm g is shown composed of a single beam, (see Fig. 7,) and upon its rear side is provided with two parallel racks g' g' , arranged a suitable distance apart and longitudinally of the arm. Racks g' g' mesh with two different pinions l' l' , respectively, that are operatively mounted upon a suitably-driven shaft l , arranged horizontally and transversely of and suitably supported from the boom, as shown in Figs. 2 and 7, and it is obvious that the shovel-arm, and consequently the shovel, is thrust or fed outwardly as required to excavate or returned or moved inwardly after excavating, according as said shaft l is rotated in the one or the other direction.

To retain the shovel-arm racks in operative engagement with the aforesaid pinions during the feeding operation of the shovel, and at the same time accommodate the construction of the shovel-arm of a single beam, I provide a yoke or strap g^2 , that is U-shaped and has its central portion straddling the pinion-bearing shaft, as shown very clearly in Figs. 6 and 7, and has its ends terminating in laterally-projecting and external flanges g^3 , suitably secured, preferably removably, by means of bolts and nuts g^4 and g^5 , respectively, to a block or plate g^6 , that easily fits within a recess g^7 , formed within the shovel-arm's rear side between and behind the inner portions of the rack-bars and long enough to accommodate the feed of the shovel. Member g^6 overlaps, therefore, the back sides of the rack-bars.

Two spur-gears l^2 l^2 (see Fig. 2) are operatively mounted upon shaft l at opposite sides, respectively, of the boom and mesh with pinions L^2 L^2 , respectively, that are operatively mounted upon opposite ends, respectively, of a shaft L , that is arranged parallel with and a suitable distance rearward of shaft l , and is supported from the boom. A winding-drum L' is operatively mounted upon shaft L between the two bars or beams that compose the boom. A suitably-actuated shovel-feed chain or cable M leads over and is adapted to wind upon one end of drum L' in the one direction, and another suitably-actuated shovel-feed chain or cable m leads in under and is adapted to wind upon the opposite end portion of said drum and in the opposite direction, so that when one of said cables is actuated and in the direction required to pay it out from the engaging drum the other feed-cable is wound upon the engaging drum and the shovel is fed in or out, according as said drum is rotated in the one direction or the other.

The two chains or cables M m lead downwardly and rearwardly from drum L' to and over vertical sheaves M' m' , respectively, supported from the lower end of the boom and arranged side by side just forward and at opposite sides, respectively, of the turn-table's

axis, with their axes coincident with each other and extending transversely of the boom. From sheaves M' m' said cables M and m lead downwardly through the hole a^2 , extending centrally through trunnion a' , upon which the turn-table is mounted, and through platform A to and in under the two suitably-supported sheaves M^2 m^2 , respectively, that are arranged side by side below said table and at opposite sides, respectively, and just rearward of the table's axis, and thence cables M and m lead upwardly and rearwardly into operative engagement with different drums M^3 and m^3 , respectively, loosely mounted upon shaft J . A suitably-operated clutch J' is provided for each of said drums for controlling operative connection between the drum and shaft. It will also be observed that drum M^3 is diametrically larger than drum m^3 , and consequently cable M when wound upon its actuating-drum M^3 is more rapidly driven than cable m when the latter is wound upon its actuating-drum, and the arrangement of parts is, furthermore, such that the smaller drum m^3 is instrumental in effecting the excavating stroke or movement of the shovel, and the larger drum M^3 finds employment in returning or inwardly moving the shovel after excavating. It is obvious, therefore, that a slow and powerful thrust is given to the shovel in excavating and a quick return of the shovel after excavating is effected.

Any suitable means, not considered necessary to describe or illustrate in this application, for maintaining the shovel-feed cables under proper tension during the shovel-feeding operation is preferably provided.

I would here remark that shaft J when operated is driven continuously in one direction and is intergeared with shaft H by a pinion H' , operatively mounted upon said shaft H and meshing with a diametrically larger spur-gear J^2 , operatively mounted on shaft J . (See Fig. 2.) The placing of the shovel-feed drums M^3 and m^3 and boom-swinging drums upon a shaft forward of the hoisting-drum shaft is important, because it admits of placing simple lever mechanism (not shown) for operating the clutches provided for said drums within the attendant's convenient reach and also admits of the provision of motion for the boom and shovel-feed slower than the motion employed for hoisting the shovel.

O designates a vertically-tilting lever fulcrumed at its upper end at O' to the shovel-arm in suitable proximity to the hinged end of the hinged bottom of the shovel. Said lever is shown only in Fig. 1 and is instrumental in releasing the shovel-bottom from latch mechanism (not shown) employed to retain the bottom closed. Lever O is operated by a rope O^2 , suitably supported and leading to and over the operator's stand within convenient reach of the operator and engaged by a poise O^3 , that holds said rope under a suitable tension.

The machine's body portion should be ad-

equately braced laterally and externally, especially immediately adjacent to the A-frame. It will of course be understood that an excavator of the character indicated is braced at both sides, and a description of the brace employed at either side of the excavator is therefore considered sufficient. The brace employed comprises a base or foot P, (see Figs. 1, 2, and 3,) arranged to bear upon the ground or supporting surface a suitable distance from the adjacent side of the machine. Said foot or base is borne upon by an upright screw Q, that extends through and engages an upright nut R', (shown in dotted lines,) formed internally of the outer and lower end of the brace-frame's diagonally-arranged bar R. Screw Q at its upper end is provided with suitable means, such, for instance, as a bar Q', extending through it, for turning the same. Bar R at its upper end is vertically journaled within a bracket A², rigidly secured to the machine's body portion adjacent to the A-frame, whereby said bar is capable of being swung laterally. The brace's frame also comprises two approximately horizontally-arranged rods or bars S, vertically pivoted at their inner ends, as at S', to the under side of the machine's body portion and a suitable distance apart, and said bars or rods S S extend laterally of the machine and converge toward their outer ends, where they are detachably secured, preferably by means of a single horizontally-arranged bolt or pin S², to opposite sides, respectively, of the outer end of bar R. The forward lower member S of the brace's frame is pivoted, preferably, to the under side of the bolster over the forward truck, and the rear member S is preferably pivoted to the under side of the cross-beam C², located next rearward of said bolster. It will be observed, therefore, that the framework of my improved brace forms a horizontally-arranged tripod, whose three members are connected at three different points, respectively, to the machine's stationary part below and adjacent to the A-frame, and that by removing the ground-engaging platform or foot from, or releasing it relative to, the screw of the jack or brace the three members of the brace's frame are rendered free to be swung laterally alongside of the machine as a convenience in the transportation or shipment of a machine. The members of the frame of one of the braces are shown swung laterally in Figs. 2 and 3.

The hinge connection between the machine's body portion and the upper end of the diagonally-arranged bar R of the framework of the jack or brace consists, preferably, of a vertical cylindrical journal r, (see Figs. 4 and 5,) formed upon the upper end of said bar and seated upon a comparatively narrow shoulder, flange, or rib A³, formed upon bracket A² at the inner and rear sides of said journal. The upper end of bracket A² overhangs the journal, as at A⁴, and the overhanging portion of said bracket is provided

upon its under side with a comparatively shallow recess A⁵, engaged easily by the journal's upper end, and said peculiar hinge connection will, in case the lower members or supports of the brace's frame break, come apart and permit the diagonally-arranged bar immediately to drop or become disconnected from the machine's body portion, and thereby avoid breakage of said bar and the hinge connection.

What I claim is.—

1. An excavator of the character indicated, mounted upon trucks arranged at opposite ends, respectively, of the machine, and having two I-beams arranged at opposite sides, respectively, and longitudinally of the lower part of the body portion and supported from and overlapping the ends of the bolsters over the trucks, and having, furthermore, any suitable number of beams or girders suitably arranged between the two I-beams and resting upon the bolsters, substantially as set forth.

2. The lower part of the body portion of an excavator of the character indicated, consisting of the trucks; bolsters over the trucks; two beams or girders arranged at opposite sides, respectively, of the body portion and resting upon the bolster and composed, partially, of comparatively wide I-beams that extend downwardly over the ends of the bolsters, and have their lower inner flanges extending in under the bolsters; intermediate beams or girders extending between and over and resting upon the bolsters, and the turntable-bearing platform upon the forward portion of said girders, substantially as set forth.

3. The combination of the machine's stationary portion, of an external brace for the same, said brace having its frame composed of three members extending laterally from said stationary portion, said brace members being capable of being swung laterally and hinged or pivoted to said stationary portion independently of each other, and a single bolt or pin detachably securing together the outer ends of said brace members, substantially as set forth.

4. The combination with the machine's stationary portion and an external brace for the same, said brace comprising any suitable number of lower rods or bars extending laterally and outwardly from the lower part of the machine's stationary portion, and a diagonally-arranged bar suitably secured, at its lower and outer end, to the outer end or ends of said lower member or members, and terminating in an upright journal at its upper end, of a bracket suitably secured to the machine's stationary portion and overhanging said journal and provided, at the lower end of the journal, with a comparatively narrow rib or seat bearing the journal, and the bracket's overhanging portion being provided with a recess engaged by the journal's upper end, substantially as shown, for the purpose specified.

5. The combination of the boom, the excavating-shovel, winding-drum suitably supported from the boom, a suitably-actuated cable adapted to wind upon and drive said drum in the one direction, another suitably-actuated cable adapted to wind upon and drive the drum in the opposite direction, and a suitable operative connection between the drum and shovel whereby the latter is fed in the one or the other direction according as said drum is driven in the one direction or the other, substantially as set forth.

6. The combination of the boom, the excavating-shovel, a suitably-supported winding-drum, a suitably-actuated cable operatively connected with said drum and arranged to drive said drum in one direction, another more rapidly-speeded cable operatively engaging and arranged to drive the drum in the opposite direction, and a suitable operative connection between the drum and shovel whereby the latter is fed in the one or the other direction according as said drum is driven in the one direction or the other, substantially as and for the purpose set forth.

7. The combination with the boom, a pinion or pinions suitably supported from the boom, the excavating-shovel having an arm provided with a rack or racks meshing with said pinion or pinions, a suitably-supported drum operatively connected with said pinion or pinions, a suitably-actuated cable leading in under and operatively engaging said drum, and another suitably-actuated cable leading over and operatively engaging said drum, substantially as and for the purpose set forth.

8. The combination with the boom, a pinion or pinions suitably supported from the boom, the excavating-shovel having an arm provided with a rack or racks meshing with said pinion or pinions, of a suitably-supported drum operatively connected with said pinion or pinions, a suitably-actuated cable leading in under and operatively engaging said drum, and another suitably-actuated cable leading over and operatively engaging said drum, and one of said cables being speeded more rapidly than the other, substantially as and for the purpose set forth.

9. The combination of the boom, excavating-shovel, a suitably-supported and suitably-actuated shaft driven, when operated, continuously in one direction, two drums loosely mounted upon said shaft and differing in size diametrically, a clutch for each of said drums for establishing operative connection between the respective drum and shaft, two cables operatively engaging the different drums, respectively, and mechanism or apparatus establishing operative connection between said cables and the excavating-shovel and so arranged that the cable engaging the diametrically larger drum shall be instrumental in effecting the return stroke of the shovel after excavating, and the other cable shall be instrumental in effecting the shovel's excavating

stroke, substantially as and for the purpose set forth.

10. The combination with the boom, a pinion or pinions suitably supported from the boom, the excavating-shovel having an arm provided with a rack or racks meshing with said pinion or pinions, of a drum operatively connected with said pinion or pinions, a cable leading in under and operatively engaging one portion of said drum, another cable leading over and operatively engaging another portion of said drum, and the arrangement of parts being such that the shovel's excavating stroke or return stroke is effected according as said drum is turned in the one or the other direction, a shaft driven, when operated, continuously in one direction, two drums loosely mounted upon said shaft and operatively engaging the different cables, respectively, a clutch for each of said loosely-mounted drums for controlling operative connection between the drum and shaft, and the clutch-controlled drum engaging the cable instrumental in effecting the shovel's excavating stroke being diametrically smaller than the other clutch-controlled drum, substantially as and for the purpose set forth.

11. A machine of the character indicated having the so-called "hoisting-drum" loosely mounted on a shaft arranged transversely of and suitably supported from the machine's body portion and suitably driven, when operated, continuously in one direction, a clutch for controlling operative connection between said drum and shaft, another shaft suitably supported forward of and arranged parallel and intergeared with the hoisting-drum shaft, the two drums instrumental in feeding the excavating-shovel in opposite directions, respectively, and the two drums employed in swinging the boom laterally in opposite directions, respectively, loosely mounted upon the forward shaft, and a clutch for each of said four last-mentioned drums for controlling operative connection between the respective drum and shaft, substantially as and for the purpose set forth.

12. The combination of the boom capable of being swung laterally and having a lower pivotal center and an upper pivotal center, an excavating-shovel, a sheave supported at a suitable elevation above the boom's lower end and having its axis extending transversely of the boom, another sheave between the pivotal centers of the boom and in close proximity to the boom's upper pivotal center, the suitably-actuated hoisting-cable operatively connected with the shovel and thence leading to and over the boom-sheave and thence to and over the aforesaid sheave, and a vertically and laterally swinging bracket bearing the last-mentioned sheave and having its axis approximately parallel with the hoisting-cable section leading to said sheave from the boom-sheave, substantially as and for the purpose set forth.

13. The combination with the machine's

body portion, a suitably-actuated horizontally-
arranged turn-table, so-called "A-frame,"
the approximately horizontally-arranged rod
suitably connected at one end with the boom,
5 a bracket or yoke connecting the other end of
said rod with, and vertically pivoted to, the
head of the A-frame, and comprising an arm
arranged approximately parallel with said
rod, a sheave-bearing bracket journaled upon
10 said arm, another sheave supported from the
boom at approximately the same elevation as
the first-mentioned sheave, the excavating-
shovel, and the hoisting chain or cable oper-
atively connected with the shovel, thence lead-

ing to and over the boom-sheave, thence rear- 15
wardly to and over the first-mentioned sheave,
and thence downwardly and rearwardly, and
a suitably-actuated winding-drum opera-
tively engaging said cable and located a suit- 20
able distance rearward of the boom, substan-
tially as set forth.

In testimony whereof I sign this specifica-
tion, in the presence of two witnesses, this 13th
day of February, 1896.

GEORGE W. KING.

Witnesses:

HARRY J. BARNHART,
A. E. CHENEY.