

No. 868,267.

PATENTED OCT. 15, 1907.

O. HETLESAETER,
EXCAVATOR.

APPLICATION FILED DEC. 10, 1906.

3 SHEETS—SHEET 1.

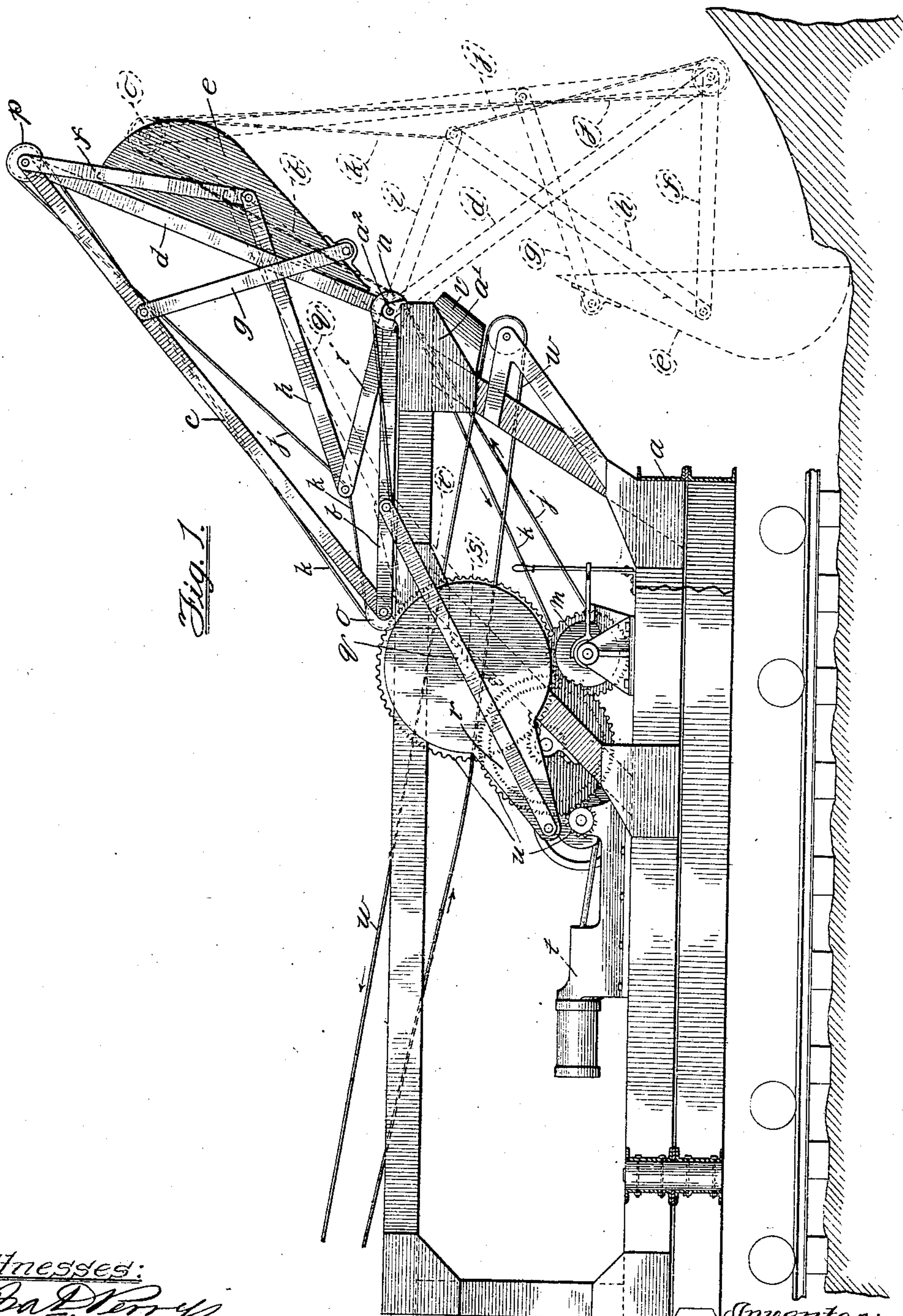


Fig. 1.

Witnesses:

John E. Perry

John H. Nelson

Inventor:

Olaf Hetlesæter

By Cheever & Cox

Attys

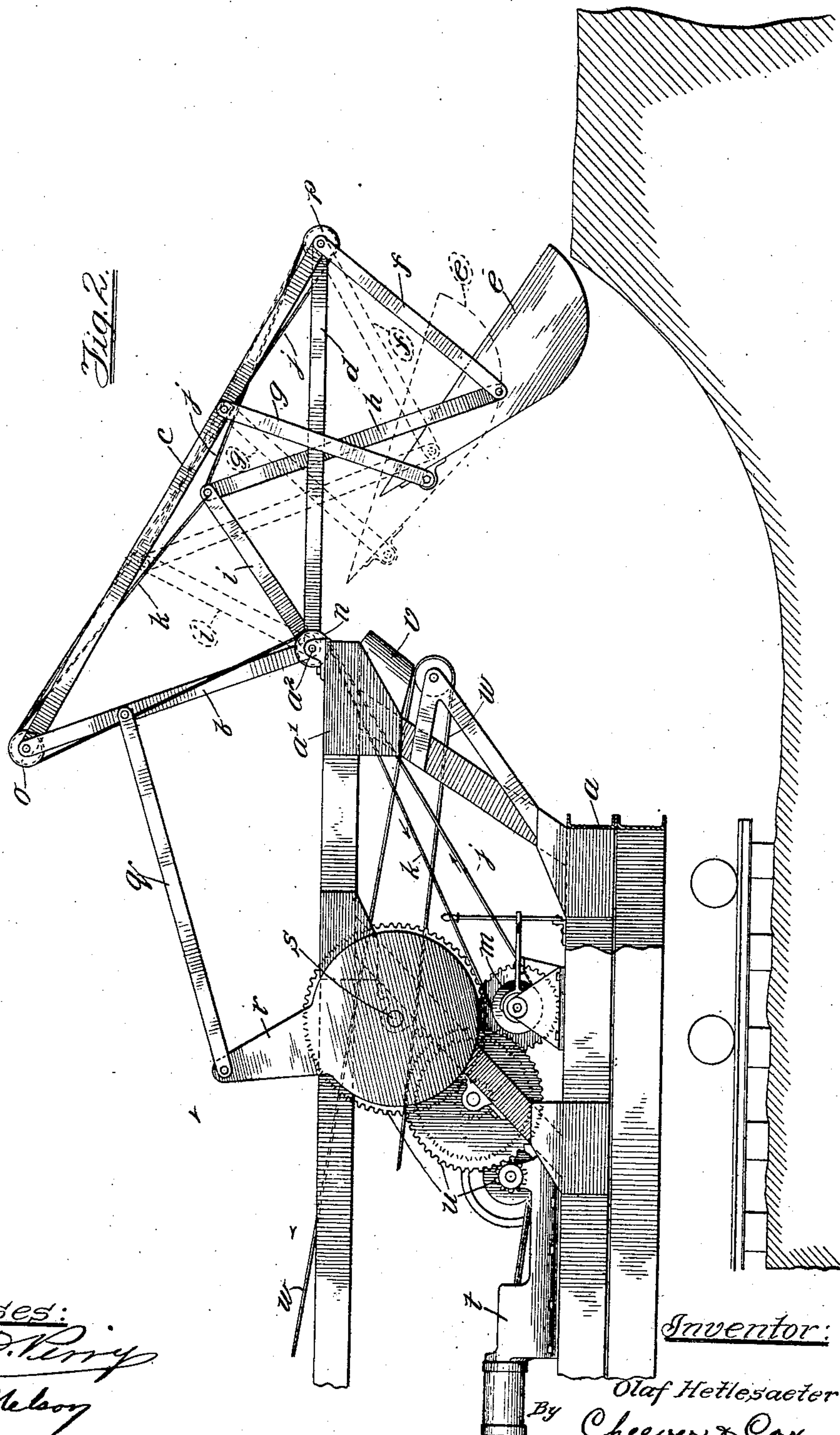
No. 868,267.

PATENTED OCT. 15, 1907.

O. HETLESAETER.
EXCAVATOR.

APPLICATION FILED DEC. 10, 1906.

3 SHEETS—SHEET 2.



Witnesses:
Chas. D. Perry
Jno. H. Nelson

Inventor:
Olaf Hetlesæter
By *Cheever & Cox*
Attys

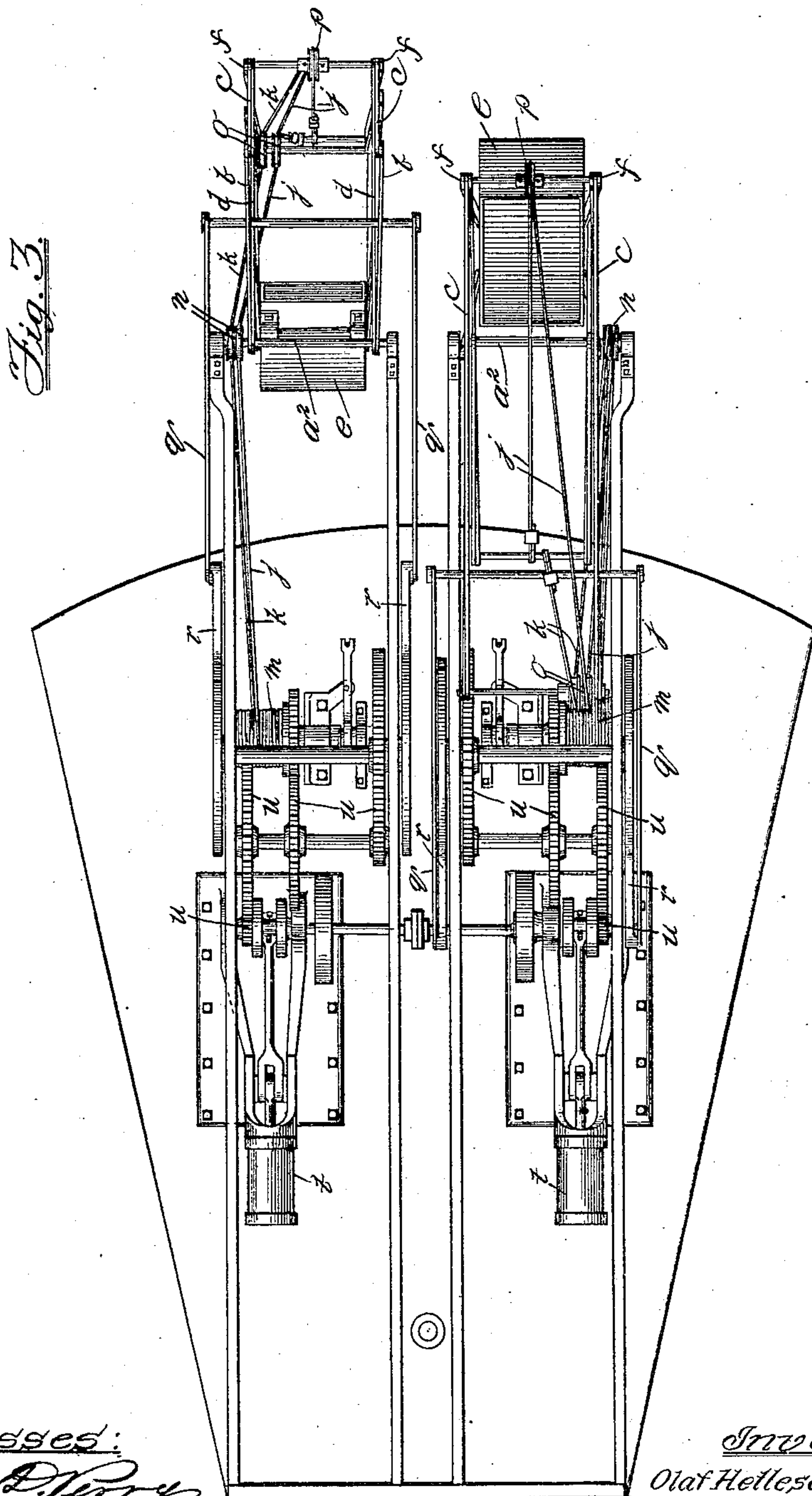
No. 868,267.

PATENTED OCT. 15, 1907.

O. HETLESAETER.
EXCAVATOR.

APPLICATION FILED DEC. 10, 1906.

3 SHEETS—SHEET 3.



Witnesses:
Barth Perry
John Nelson

Inventor:
Olaf Hetlesæter

By *Cheever & Cox*

Attys

UNITED STATES PATENT OFFICE.

OLAF HETLESAETER, OF MILWAUKEE, WISCONSIN.

EXCAVATOR.

No. 868,267.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed December 10, 1906. Serial No. 347,121.

To all whom it may concern:

Be it known that I, OLAF HETLESAETER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Excavators, of which the following is a specification.

My invention relates to excavators, and is in a general way related to the devices shown and described by me in prior patents, for example Patent No. 649,244 issued May 8, 1900; 649,408, issued May 8, 1900; 659,632, issued Oct. 9, 1900; 665,683, issued Jan. 8, 1901; 665,685, issued Jan. 8, 1901; 667,315, issued Feb. 5, 1901; 669,992, issued Mar. 19, 1901; 669,991, issued Mar. 19, 1901; and others.

The primary object of the invention is, 1st to produce a shovel or excavator capable of operating continuously without the necessity of swinging the bucket arm laterally. 2nd to obtain improvements in the construction of the bucket and the means for suspending and operating the same. 3rd to balance the moving parts by so arranging them that one bucket will be digging while the other is discharging.

I obtain my objects by the mechanism illustrated in the accompanying drawings in which:

Figure 1 is a side elevation showing, in full lines, the bucket elevated to dumping position. In dotted lines the bucket is shown in a lowered digging position. Fig. 2 is a side elevation of the machine showing, in full lines, the bucket in an intermediate digging position and illustrating in dotted lines the possible movement of the bucket relatively to its main supporting member. Fig. 3 is a plan view of a double machine showing two buckets side by side.

To avoid confusion there is shown in Figs. 1 and 2 only a single bucket and bucket support, but in the complete machine, as shown in Fig. 3, the construction of each bucket and bucket support is the same.

Similar letters refer to similar parts throughout the several views.

The device may be mounted upon a car, scow or other suitable support, the mountings in the present illustrations being a railway car *a* having a superstructure *a'* upon which the bucket supports are carried. For convenience of description the car and superstructure may be regarded as stationary.

In the present design, the main bucket-supporting member consists of two parallel panels each consisting of three bars *b*, *c* and *d*, the ends whereof are fastened together in the form of a triangle. The main supporting member thus constitutes a truss which may be of simple design as shown or more complex depending upon the size and requirements of the machine. Said supporting member is pivotally mounted between its ends upon the shaft *a*² mounted upon the stationary superstructure *a'*.

At the forward extremity of the supporting member

is a bucket *e* articulately suspended therefrom by means of two pairs of links *f* and *g* which are pivotally attached to the main supporting member at different points thereon. In the present construction the upper extremity of links *f* are pivoted to the forward extremity of bar *c* while the links *g* are pivoted to said bar at a point somewhat remote from said forward extremity. The lower extremities of links *f* and *g* are pivotally attached to the bucket at different points thereon, and the links *f* and *g* together with the bar *c* and bucket *e*, constitute a closed articulating link work. As a result the bucket is movable relatively to the main supporting member and may be thrust forward and retracted at the will of the operator. The movement of the excavator bucket relatively to the supporting member is accomplished by the thrust bar *h* pivotally attached to the bucket at one end and at the other end pivotally attached to the arc bar *i*. The remaining extremity of the arc bar is pivotally attached at a point fixed with reference to the main supporting member. In the preferred construction said bar *i* is pivoted upon the shaft *a*² herein above mentioned.

The thrusting and retracting of the bucket is accomplished by means of the cables *j* and *k* which are wound in opposite directions around the drum *m*. The outer end of each of said cables is fastened to one of the two members *h*, *i*, preferably at the point of connection between the two. For the proper guiding of said cables a pair of sheaves *n* are mounted upon shaft *a*², a second pair *o* are mounted at the upper or rear extremity of the main supporting member *b*, *c*, *d*, and a third sheave *p* is mounted at the forward or lower extremity of said main supporting member. The cables *j* and *k* lead from drum *m* under the sheaves *n* and over the sheaves *o*, from which point the cable *k* passes directly to the members *h*, *i*, while the cable *j* first passes over sheave *p* and thence to said members *h*, *i*. As a result of this construction, when the drum is rotated in one direction, the bucket *e* will be thrust forward to dig, but when the drum is rotated in the opposite direction, the bucket will be retracted. Inasmuch as the guide sheaves *n* are concentric with the axis of the main supporting member, the rotating of the latter about its axis will not affect the operation of said cables. As the cables *j* and *k* are wound upon the drum in opposite directions, one cable will be paid out the same amount which the other is wound in and consequently the cables will always remain taut and the operator will have complete control over the thrusting and retracting of the bucket. Said drum *m* is controllably operated by clutches as shown.

The main supporting member, *b*, *c*, *d*, is rotated about shaft *a*² by means of the connecting rod *q* which is pivotally attached to the main supporting member, preferably at the bar *b* thereof. Said connecting rod

is operated by means of the crank *r* which is rigidly secured to the master shaft *s*. Said master shaft is connected to and operated by the engine *t* or other suitable power device the connection being made

5 through suitable reduction gearing *u*.

The bucket *e* above referred to is open front and rear in order that it may dig at the forward edge and discharge by gravity at the rear edge. With this purpose in view, the bucket, when viewed from the side, is

10 made deep in the middle and shallow at the ends, although the shape of the bucket may be variously altered to suit different conditions.

Although the means for receiving and carrying away the excavated material is not especially concerned

15 with my present invention an advantageous construction is to provide a receiving hopper *v* at a convenient point in the superstructure *a'*, and beneath it mount a belt conveyer *w* for transporting the material to the rear.

20 In operation, starting with the parts in dumping position shown in full lines Fig. 1, the operator sets the power device *t* in motion in such direction as to rotate the main supporting member *b*, *c*, *d*, about shaft *a*² to lower the bucket. At the same time or thereabouts he

25 sets the drum *m* in motion to thrust the bucket downward and outward, the parts finally reaching some such position as that shown in dotted lines Fig. 1. The continued rotation of crank *r* finally reverses the motion of the main supporting member and elevates the bucket.

30 During the elevating of the bucket the operator may either thrust the bucket farther into the bank or may hold the drum still so that the forward edge of the bucket will merely rotate about shaft *a*² as a center or, in case an obstruction is met with, he may retract the

35 bucket to clear such obstruction. When the digging action is complete the main supporting member is brought back approximately to the position shown in full lines Fig. 1, and in the present design in order to facilitate dumping the bucket should also be fully

40 retracted, as shown. By reference to Fig. 1 it will be seen that the bucket when in dumping position is practically inverted compared to its lowest digging position; and by reason of the shape of the bucket the contents

45 are readily discharged by gravity over the rear edge of the bucket. Consequently no time is consumed in waiting for a bucket door to be closed and opened as is frequently the case in other excavators of this general type. It will be seen that after the operator has started

50 the engine it can run continuously, as the bucket and its supporting member will be automatically raised and lowered; he needs only to thrust the bucket in for digging or retract it for dumping.

I have so far described the construction and operation of a single bucket and its supporting means, which are

55 completely operative in themselves; but in order to increase the capacity of the machine and also neutralize, to a certain extent, the strain set up in the machine during the operation thereof, I place a plurality of buckets side by side as shown in plan in Fig. 3. Each

60 bucket has its own supporting member operated by its own connecting rods *q* and cranks *r*. With the multiplex machine the parts are so connected (preferably by connecting the engine shafts together as shown in Fig. 3) that when one bucket is digging the other

65 will be discharging. This not only gives double

capacity to the machine but the strains are to a certain extent balanced against each other; for it will be noted that with a two-bucket machine, as shown, the cranks *r* will be 180 degrees apart, and the bucket-supporting members will be rotating in opposite directions about

70 their axes.

Although I have shown but two buckets it is obvious that a greater number could be employed side by side in which case the cranks *r* instead of being operated

75 180° apart, would be operated at other angles equidistantly, for example, if three buckets were employed the cranks would be operated 120° apart, while if four buckets were employed they would be operated 90° apart.

What I claim as new and desire to secure by Letters 80 Patent is:

1. In an excavator, the combination of a main supporting member pivotally supported upon a horizontal axis, means for rotating it about its axis, a bucket, links for suspending said bucket from the main supporting member, a thrust bar for controlling the position of the bucket

85 relatively to said main supporting member an arc bar pivoted at one end to said thrust bar and at the other end to the axis of the main supporting member and means for operating said thrust bar. 90

2. In an excavator, the combination of a main supporting member pivotally supported upon a horizontal axis, means for rotating it about its axis, a bucket, links for suspending said bucket from the main supporting member, a thrust bar for controlling the position of the bucket

95 relatively to said main supporting member an arc bar pivoted at one end to said thrust bar and at the other end to the axis of the main supporting member, and cables for moving said thrust bar relatively to the main supporting member. 100

3. In an excavator, the combination of a main supporting member pivotally supported upon a horizontal axis, means for rotating it about its axis, a bucket links for suspending said bucket from the main supporting member, said links being pivotally attached at one end to said

105 bucket and at the other end to said main supporting member, a thrust bar independent of said main supporting member for controlling the position of the bucket relatively to said main supporting member an arc bar pivoted at one end to said thrust bar and at the other end to the

110 axis of the main supporting member, and means for operating said thrust bar. 115

4. In an excavator, the combination of a main supporting member pivotally supported upon a horizontal axis, means for rotating it about its axis, a bucket, links for suspending said bucket from the main supporting member, said links being pivotally attached at one end to said bucket and at the other end to said main supporting member, a thrust bar independent of said main supporting member for controlling the position of the bucket

120 relatively to said main supporting member an arc bar pivoted at one end to said thrust bar and at the other end to the axis of the main supporting member, and cables for moving said thrust bar relatively to the main supporting member. 125

5. In an excavator, the combination of a horizontal shaft; a main supporting member pivoted thereon; means for rotating said supporting member about its shaft; a bucket; a pair of links pivoted at one end to said bucket and at the other said main supporting member; a second pair of links one of which is connected to the said shaft and the other to the bucket, said last mentioned links being also pivotally connected together; and cables for moving said second pair of links relatively to the main supporting member. 130

6. In an excavator, the combination of a bucket; a main supporting member and an arc bar having coincident horizontal axes of rotation; and three links all pivotally connected to said bucket, one of said links being pivoted to said arc bar and the remaining two of said links being

140 pivoted to said main supporting member.

7. In an excavator, the combination of a bucket; a main supporting member and an arc bar having coincident horizontal axes of rotation; three links all pivotally connected to said bucket, one of said links being pivoted to said arc bar and the remaining two of said links being pivoted to said main supporting member and a mechanically driven connecting rod attached to said main supporting member for rotating the same about its axis.

8. In an excavator, the combination of a bucket; a main supporting member and an arc bar having a coincident horizontal axes of rotation; three links all pivotally connected to said bucket, one of said links being pivoted to said arc bar and the remaining two of said links being pivoted to said main supporting member; a connecting rod attached to said main supporting member for rotating the same about its axis, a crank for operating said connecting rod, a power device, and a reduction gear interposed between said power device and said connecting rod, substantially as described.

9. In an excavator, the combination of a main supporting member pivotally mounted upon a fixed support; a bucket; a pair of links for supporting said bucket upon said main supporting member; said links being articulately fastened to different parts of said main supporting member, and to different parts of said bucket; a thrust bar connected at one end to said bucket for thrusting and retracting the same; means for controlling the path of motion of the other end of said thrust bar and a cable also connected to said thrust bar for operating it.

10. In an excavator the combination of a main supporting member pivotally mounted upon a fixed support; a bucket; an articulately closed link-work for suspending said bucket from the main supporting member; a thrust bar connected at one end to said bucket for thrusting and retracting the same; an arc bar for controlling the path of motion of the other end of said thrust bar, said arc bar having a pivotal point fixed with reference to said main supporting member; and means for operating said thrust bar.

11. In an excavator the combination of a pivotally supported main supporting member; a bucket, and two distinct sets of articulating links, one set for suspending the bucket from said main supporting member, and the other set for moving the bucket relatively to said main supporting member; and means for operating said second set of links.

12. In an excavator the combination of a pivotally supported main supporting member; a bucket; and two distinct sets of articulating links, one set for suspending the bucket from said main supporting member, and the other set for moving the bucket relatively to said main supporting member; a power device and a cable for operating said second set of links, said cables leading from said power device to said second set of links by way of the forward extremity of said main supporting member, and said cable also leading from said power device to said second set of links by way of the rear extremity of said power device for the purpose described.

13. In an excavator the combination of a main supporting member rotatable about a fixed horizontal axis; means for rotating it about its axis; a bucket; open back and front for digging at one edge and discharging over the other; articulating links for suspending said bucket from said main supporting member; and means for moving said bucket forward and backward upon its links relatively to said main supporting member, whereby when the bucket is lowered by the rotation of the main supporting member and thrust forward relatively thereto said bucket will dig at its forward edge, and when the bucket is raised by the rotation of said main supporting member and retracted relatively thereto said bucket will by gravity discharge over its rear edge.

14. In a multiplex excavator having a plurality of buckets each suspended separately the combination with a stationary support, and a power device thereon, of a plurality of main bucket-supporting members mounted on said stationary support and rotatable about a horizontal axis; a bucket for each of said bucket-supporting members; means for movably suspending said buckets from their supporting members; and means for moving said buckets

relatively to their supporting members, said main bucket-supporting members being connected to and rotated by said power device, and differing from each other in phrase, substantially as described.

15. In an excavator, the combination with the stationary support of plurality of main members pivotally supported thereon; a bucket for each of said members; links for articulately suspending a bucket from each of said main members; means for moving the buckets relatively to their main supporting members; a power device having cranks set at different angles; and a connecting rod from each crank to a main member for rotating the latter about their pivots, substantially as described.

16. In an excavator, the combination with the stationary support of a plurality of main members pivotally supported thereon; a bucket for each of said members; links for articulately suspending the bucket from each of said main members; other links for moving the buckets relatively to their main supporting members; means for operating the last mentioned links; a power device; cranks thereon and connecting rods from said cranks to said main members, said cranks being set at different angles, substantially as described.

17. In an excavator, a bucket oscillatory about a fixed axis, and means for rotating said bucket about its axis through an arc less than a complete circumference and automatically reversing the direction of rotation of said bucket.

18. In an excavator, a bucket oscillatory about a fixed axis, and a continuously operating power device for rotating said bucket about its axis through an arc less than a complete circumference and automatically reversing the direction of rotation of said bucket.

19. In an excavator, the combination of an axle, a main supporting member pivoted thereon; a bucket on said main supporting member and means for continuously and automatically reciprocating said main supporting member back and forth for raising and lowering the bucket whereby the bucket remains always upon the same side of said axis both in raising and lowering instead of completing a circle about said axle.

20. In an excavator, a pivoted main supporting member, a bucket mounted thereon and movable relatively thereto, a crank and connections between said crank and main supporting member whereby the continuous rotation of said crank in the same direction produces a forward and back movement of said main supporting member.

21. In an excavator, the combination of a link-suspended bucket, a main supporting member and a mechanically driven connecting rod attached to said main supporting member for swinging the same about its axis.

22. In an excavator the combination of a link-suspended bucket, a main supporting member, a thrust bar independent of said main supporting member, and a crank-operated connecting rod attached to said main supporting member for swinging the same about its axis.

23. In an excavator, the combination of a main supporting member, pivoted upon a fixed horizontal axis; a bucket open back and front for digging at one edge and discharging over the other edge and connected to said supporting member; and means for vibrating said supporting member continuously back and forth about said axis through an arc of less than 360°.

24. In an excavator, the combination of a main supporting member pivoted upon a fixed axis; a bucket open back and front for digging at one edge and discharging over the other edge and articulately connected to said supporting member; and continuously operating means for swinging said supporting member back and forth through an arc less than 360°.

25. In an excavator, the combination of a main supporting member pivoted upon a horizontal fixed axis, means for swinging the same continuously forward and back about its axis through the same arc of a circle; the arc being less than 360°; a bucket open back and front for digging at one edge and discharging over the other, articulating links for suspending said bucket from said main supporting member; and means for moving said bucket forward and backward upon its links relatively to said main supporting member, whereby when the bucket is lowered by the move-

ment of the main supporting member and thrust forward relatively thereto said bucket will dig at its forward edge, and when the bucket is raised by the return movement of said main supporting member and retracted relatively thereto said bucket will be gravity discharged over its rear edge.

26. In an excavator, the combination of a main supporting member, pivoted upon a fixed axis; a bucket adjustably mounted thereon, and means for vibrating said supporting member continuously back and forth through the same arc of a circle which arc is less than 360° .

27. In an excavator, the combination of a main sup-

porting member oscillatory about a fixed axis; a bucket adjustably mounted thereon; means for oscillating said supporting member back and forth through the same portion of a revolution and automatically reversing the direction of motion of said main supporting member. 15

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

OLAF HETLESAETER.

Witnesses:

HOWARD M. COX,
C. J. CHRISTOFFEL.