Nov. 1, 1949. K. J. KENNEDY 2,486,479

COMBINATION GRAB-BUCKET AND LIVE BOOM

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Fig. 1.

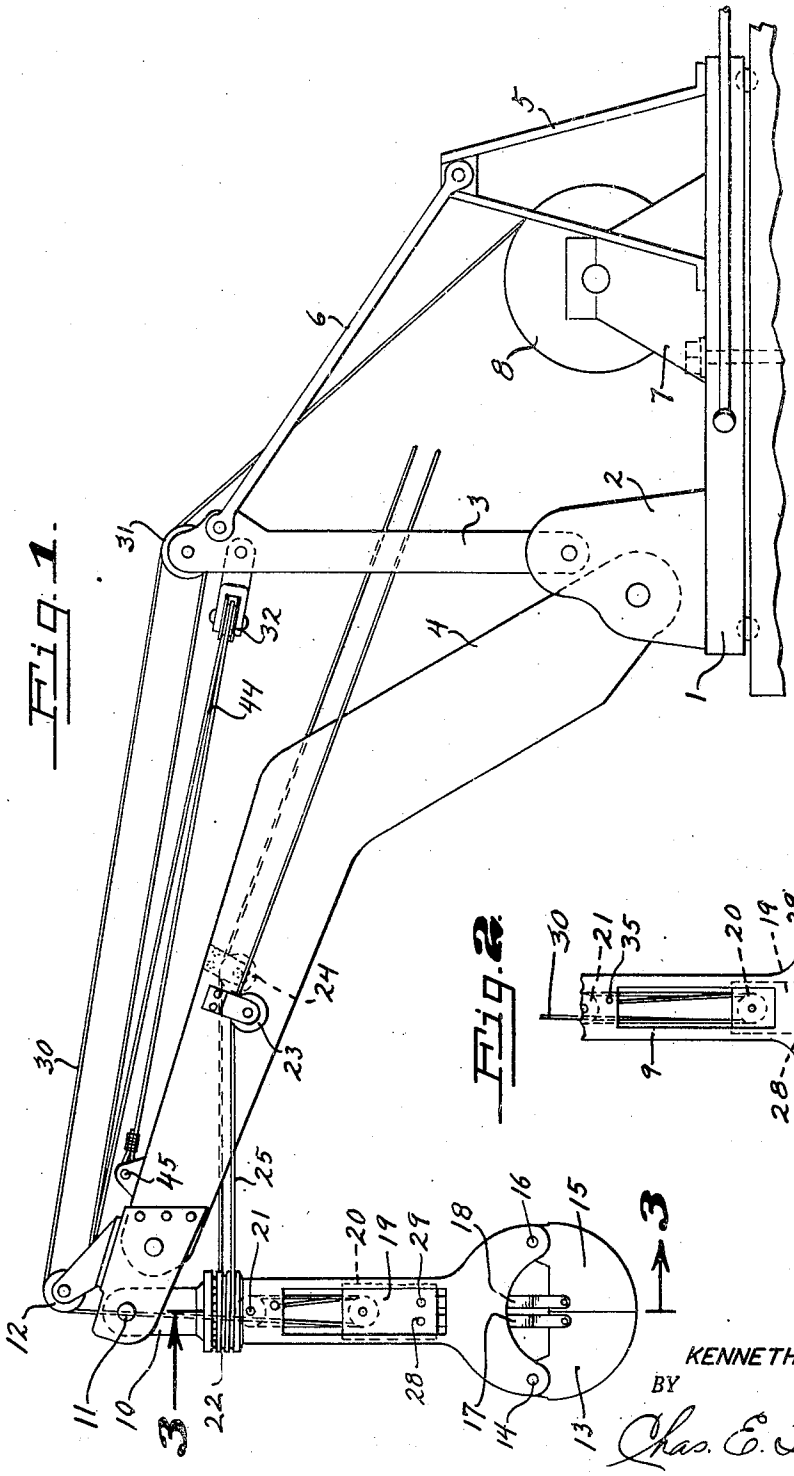



Fig. 2.




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Fig. 3.

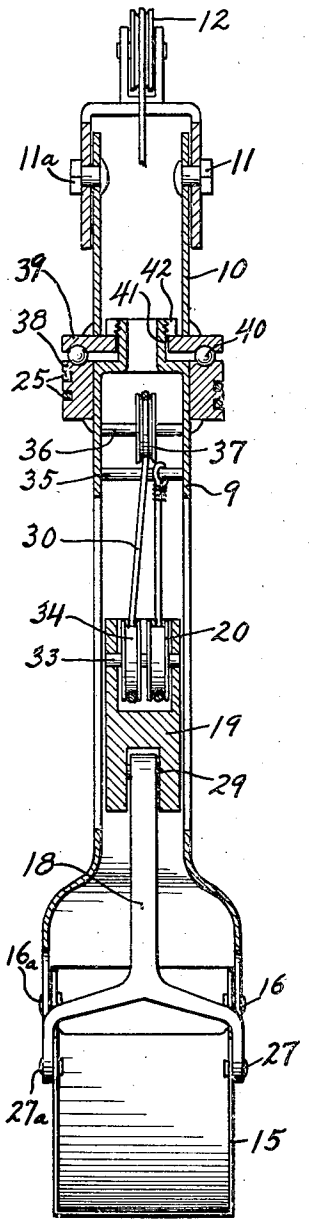



Fig. 5.

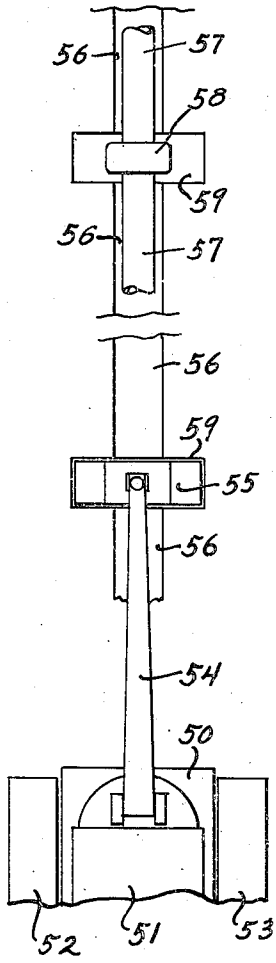
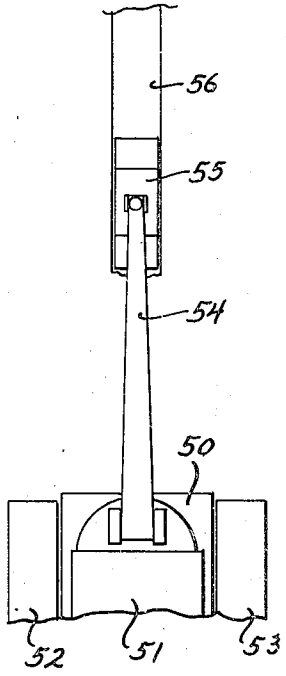



Fig. 4.




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## COMBINATION GRAB BUCKET AND LIVE BOOM

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1 Claim. (Cl. 212—44)

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The present invention relates to excavation equipment, particularly to an improved grab-bucket assembly and more particularly to a grab-bucket assembly of the general type commonly employed in the handling and transfer of gross materials, such as ore, coal and the like, and in excavation work wherein quantities of earth are moved.

In conventional grab-bucket assemblies the grab-bucket or "clam-shell" is formed of two pivoted bucket halves which are suspended from a boom by means of cables or the like, the opening and closing of the grab-bucket and raising and lowering thereof, as well as the raising and lowering of the boom being remotely controlled by an operator. This type of equipment is generally utilized in handling relatively loose or soft materials, particularly sand, gravel, mud, soft earth, and the like. However, when hard earth is to be excavated or relatively precise excavations are to be made, such as trenches or ditches for laying pipelines, for example, power shovels or special ditch-digging equipment is generally employed in preference to the conventional grab-bucket assemblies in consideration of the fact that the latter are generally unsuitable for such purposes.

It is an object of the present invention to provide a grab-bucket assembly, wherein the grab-bucket may be accurately positioned with respect to the surfaces which are to be excavated. A further object is to provide such equipment wherein the grab-bucket is rotatably adjustable with respect to the live boom supporting the same. Another object is to provide an improved grab-bucket operating mechanism whereby fouling of the operating mechanism by the material being handled during loading operations is obviated. A still further object is to provide an improved grab-bucket assembly suitable for precise excavation work and for the excavation of relatively hard materials, in addition to the normal use for conventional equipment of the class described. Another and particular object is to provide a grab-bucket assembly wherein full loading of the grab-bucket is assured.

Other objects, together with some of the advantages to be derived in utilizing the present invention will become apparent from the following detailed description thereof, taken together with the accompanying drawings forming a part of the specification and wherein:

Fig. 1 is a side elevation of a grab-bucket assembly according to the invention with the grab-bucket shown in closed position.

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Fig. 2 is a fragmentary view of the assembly of Fig. 1, with the grab-bucket shown in open position.

Fig. 3 is an end sectional elevation through 3—3 of Fig. 1.

Fig. 4 is a schematic plan view, showing equipment according to the invention positioned to excavate a tranch or ditch.

Fig. 5 is a schematic plan view of the equipment of Fig. 4 with the grab-bucket positioned to excavate a bell hole in the trench or ditch.

Referring particularly to Figs. 1, 2 and 3, the grab-bucket assembly comprises a base member 1, on which is rigidly mounted support stanchion 2. Live boom 4 and stationary boom 3 are each pivotally mounted on stanchion 2. Brace member 5 is rigidly mounted on base member 1 to the rear of stanchion 2 and serves to secure brace strut 6, which is rigidly secured at opposite ends to the upper end of brace element 5 and stationary boom 3.

Swivel support 10 is pivotally mounted in the end of live boom 4 at 11. Bearing plate 39 is rigidly mounted on the lower end of swivel support 10 and is provided with a hole through the center thereof to receive the upper end 41 of bucket support 9. Sleeve 42 is detachably mounted on the end 41 of bucket support 9 which projects through bearing plate 39 and is of larger diameter than the hole in bearing plate 39, the load of bucket support 9 thus being carried on bearing plate 39. Bearing plate 38 is mounted on bucket support 9 below 41 and is provided with a spiral cable groove, as at 22. The opposing faces of bearing plates 38 and 39 are provided with bearing races to receive ball bearings 40.

Bucket support 9, which serves as a housing for the bucket operating mechanism, is provided with a pulley shaft 36 near the upper end thereof on which is mounted pulley 37. Cable support 35 is also mounted in bucket support 9, as shown. The lower end of bucket support 9 terminates in a yoke, a bucket half 13 being pivotally mounted on one side thereof at 14 and a second bucket half 15 being pivotally mounted on the other side thereof at 16. A weighted pulley block 19 is vertically reciprocable in bucket support 9, being supported by cable 30 as described hereinbelow. Pulley wheels 20 and 34 are mounted in pulley block 19 on pulley shaft 33. Yoke members 17 and 18 are pivotally attached at their upper ends to the lower end of pulley block 19 at 28 and 29, respectively. The yoked end of yoke member 18 is pivotally attached to the top of bucket half

15 at 27 and 27a, yoke member 17 being similarly pivotally attached to bucket half 13 at 26.

One end of cable 30 is secured to cable support 35, the cable passing around pulley wheel 20, pulley wheel 37, pulley wheel 34, thence up through bucket support 9 and the upper end thereof at 41, through swivel support 10, over pulley wheel 12 which is mounted near the end of live boom 4, over pulley wheel 31 which is mounted on the upper end of stationary boom 3 and finally around winch drum 8 which is mounted on winch base 7.

Cable 44 is attached at one end to live boom 4 at 45, passes through pulley wheel 32, which is mounted on stationary boom 3, thence through a second pulley wheel (not shown) in the end of live boom 4, and finally to a winch drum (not shown). This cable is used for the purpose of raising and lowering live boom 4. It will be appreciated, of course, that any suitable conventional system may be employed for the purpose of raising and lowering live boom 4.

Cable 25 leads from a winch drum or other suitable actuating means (not shown) through pulley wheels 23 and 24, which are mounted on opposite sides of live boom 4, and passes around bearing plate 38 in the spiral cable groove provided therein at 22. This cable serves to rotate bucket support 9 about the longitudinal axis thereof and with respect to swivel support 10.

In the operation of the assembly, the grab-bucket is opened by releasing the tension on cable 30, pulley block 19 thereupon being free to move downwardly in bucket support 9. The weight of pulley block 19 bearing on yoke members 17 and 18 acts to pivot bucket halves 13 and 15 outwardly to the open position shown in Fig. 2. The grab-bucket having been previously swiveled by means of cable 25 to the desired position, boom 4 is lowered by means of cable 44 until the grab-bucket is engaging the material to be excavated. The grab-bucket is then closed by means of cable 30 operating to raise pulley block 19. Live boom 4 is then raised to the desired height, pivoted to the desired release point and the grab-bucket opened to discharge the material therein. The pivoting of live boom 4, in this case, is brought about by pivoting base member 1, which is normally mounted on the conventional pivotal tractor mounting.

With the grab-bucket in the open position shown in Fig. 2, it will be seen that the weight of bucket support 9, pulley block 19, swivel support 10 and live boom 4 may be placed on the grab-bucket, if desired, and in this manner the grab-bucket may be forced into relatively hard and unyielding materials. Furthermore, if necessary or desirable, the grab-bucket may be actually driven into the material which is to be excavated by repeatedly raising and dropping live boom 4 with the grab-bucket open. Further, it will be noted that with the grab-bucket open, regardless of whether the material being excavated is of soft or hard, wet or dry nature, there is no possibility of fouling the pulley wheels or cables utilized in opening and closing the grab-bucket, as these operative parts are entirely contained within the body of the bucket support 9 and considerably above the top of the grab-bucket, and such operative parts in combination comprise a rigid means of connection or system of coupling between the grab-bucket and the live boom, thereby abrogating the likelihood that the grab-bucket will capsize or tilt upon forcefully striking the earth—a not uncommon occurence during operating of conventional type cable-suspended grab-bucket equipment.

The present grab-bucket assembly has particular utility in excavating operations requiring a greater or lesser degree of accuracy in positioning the grab-bucket with respect to the excavation. For example, in digging ditches or trenches for pipelines and the like, the grab-bucket assembly is readily positioned, as shown in Fig. 4, a base member 51 (equivalent to base member 1 of Fig. 1) being pivotally mounted on the body 50 of a tractor provided with self-laying tracks at 52 and 53. Live boom 54 carries grab-bucket 55 which is pivotally and rigidly attached thereto in the manner of the assembly shown in Figs. 1, 2 and 3. Grab-bucket 55 may be swiveled to the position shown in Fig. 4, i. e. with the bucket halves opening and closing along the axis of the trench 56 which is to be excavated, regardless of the relative position of the remainder of the assembly.

At intervals along the length of pipeline and similar trenches, it is often necessary to provide "bell holes," i. e. excavations, as at 59, Fig. 5, which are perpendicular to the longitudinal axis of the trench 56. The bell holes are necessary to permit workmen in laying the pipe 57 to make the necessary welded or bolted connections 58 between adjacent lengths of pipe. With the present grab-bucket assembly, the bell holes are easily and accurately excavated, the grab-bucket being rotated by means of the swivel connection between the bucket support and the live boom to the desired position without changing the position of the tractor or the live boom. The rapid and accurate positioning of the grab-bucket made possible by the present construction greatly speeds and facilitates the completion of excavations of diverse dimensions.

Particular advantages derived in utilizing grab-bucket assemblies in accordance with the present invention include, in addition to the accurate positioning of the grab-bucket described above, the insurance that the grab-bucket will be completely filled each time owing to the positive crowding action attained with the rigid bucket support and the obviation of the difficulty commonly encountered with conventional grab-bucket assemblies wherein the operating mechanism for the grab-bucket is often fouled by the material being excavated, particularly in those instances wherein soft or muddy material is being excavated.

It will be appreciated, of course, that various mechanical equivalents known to those skilled in the present art may be substituted for many of the mechanical elements of the present invention which are set forth for the purpose of illustrating the principles involved and that the size and general configuration of the various parts of the present grab-bucket assembly may be varied as desired within the spirit and scope of the invention as set forth in the appended claim.

I claim:

In excavating equipment the combination comprising a stanchion support, a rigid boom and a live boom each independently pivotally secured to the said stanchion support, means of raising and lowering said live boom, a pair of bucket halves, a rigid coupling connecting the said bucket halves to the said live boom comprising a hollow rigid bucket support having a linear portion terminating in a yoke member and to which latter member is pivotally attached the said bucket halves, swivel means capable of in-

dependent operation provided as a part of the said rigid coupling, a weighted and vertically reciprocal pulley block slidably mounted within and guided by the walls of the said linear portion of the said bucket support and spaced above said yoke member, flexible means in said linear portion of said bucket support for reciprocating said pulley block, and rigid link members connecting said bucket halves and said reciprocal pulley block together.

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