Aug. 31, 1937. S. M. GOODER 2,091,779

CAISSON MACHINE

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Fig. 1.

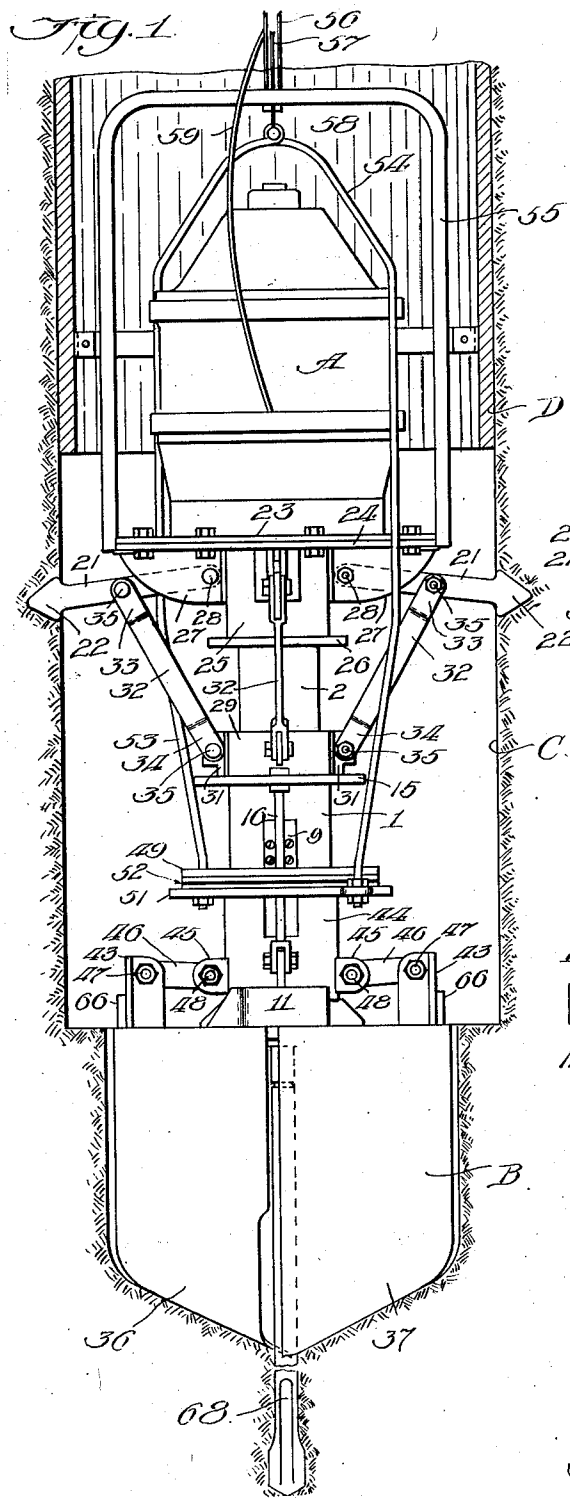
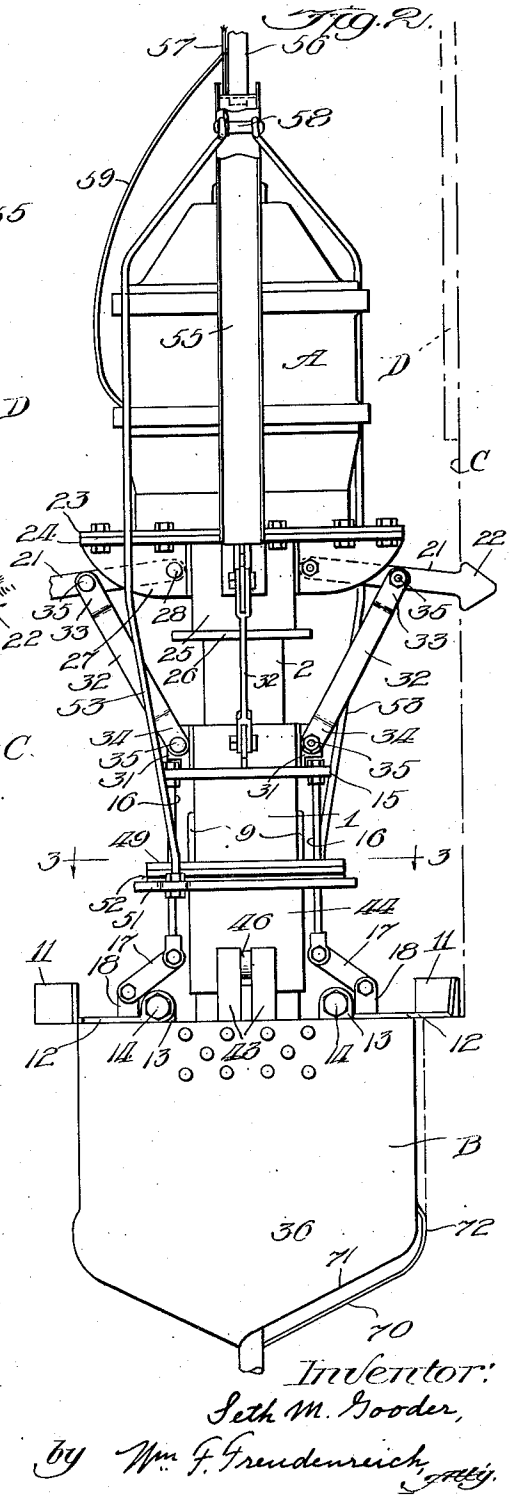


Fig. 2.



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Fig. 3.

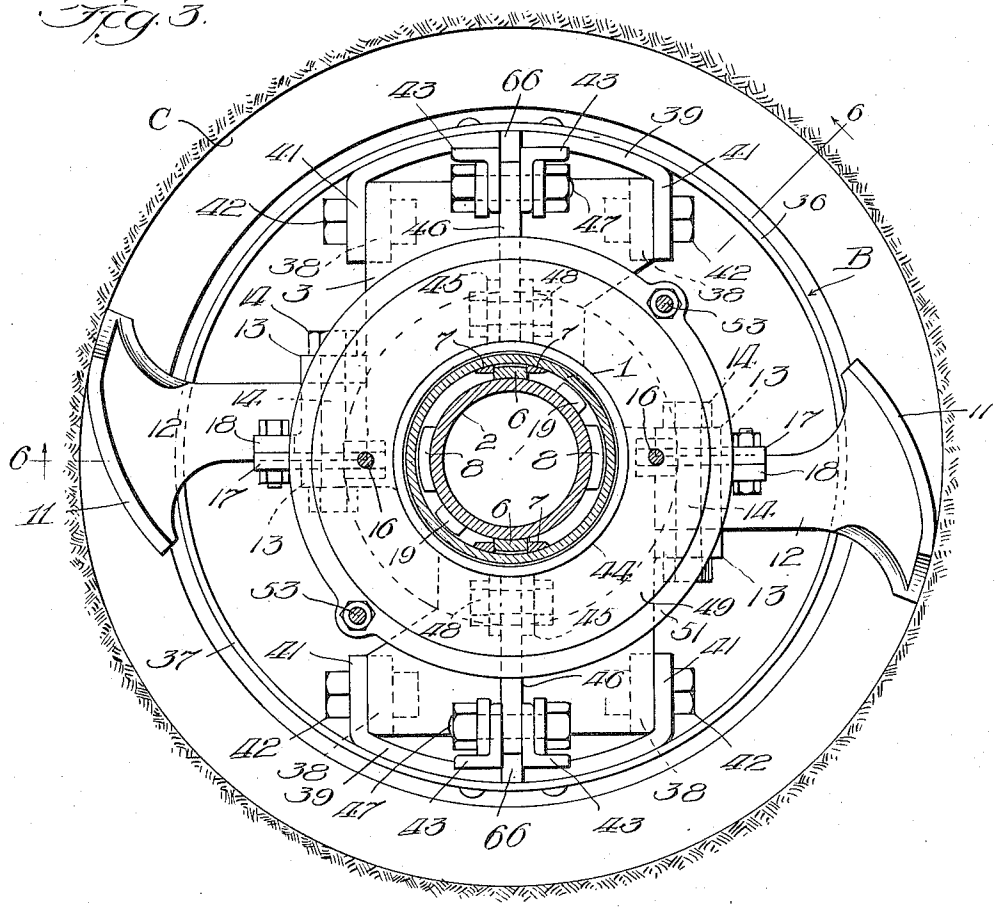
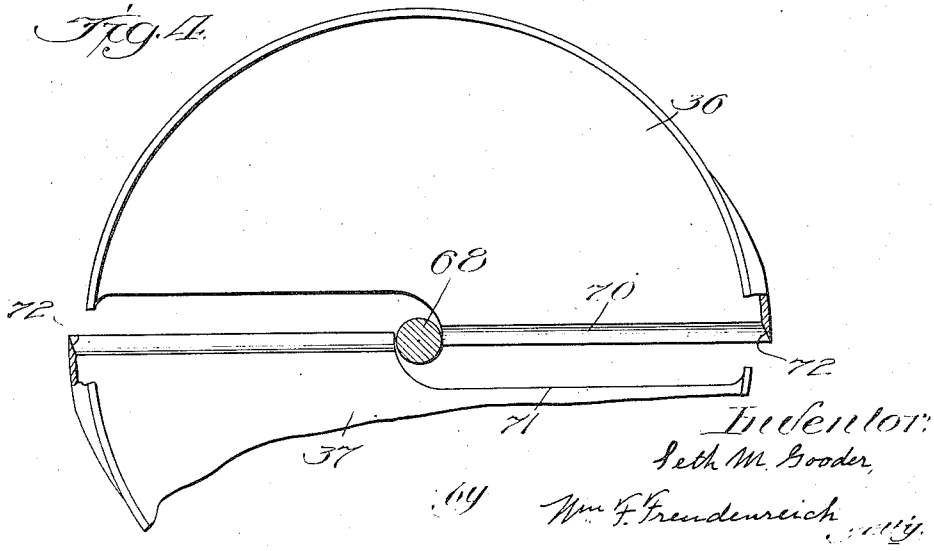


Fig. 4.



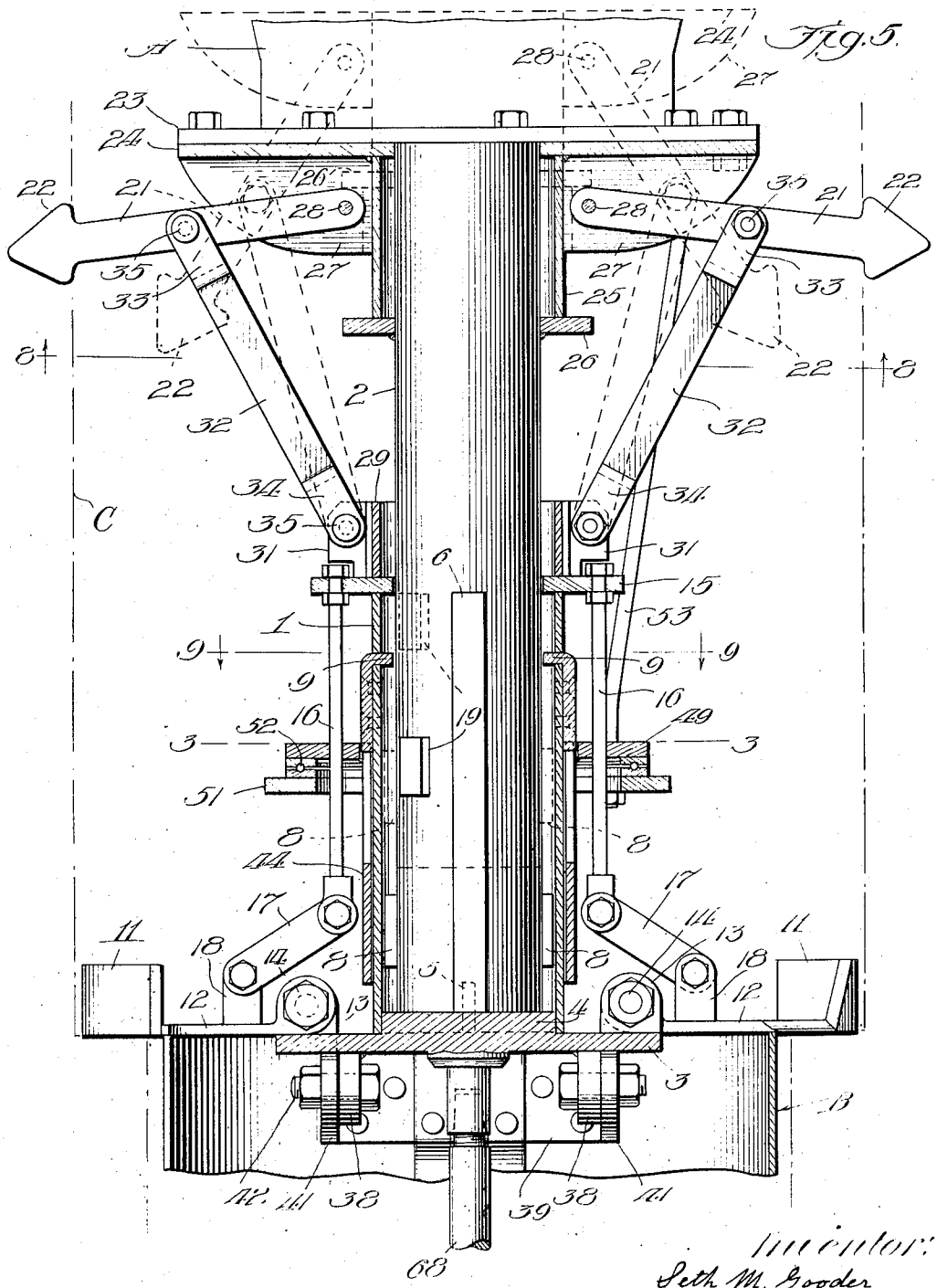
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CAISSON MACHINE

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Fig. 5.



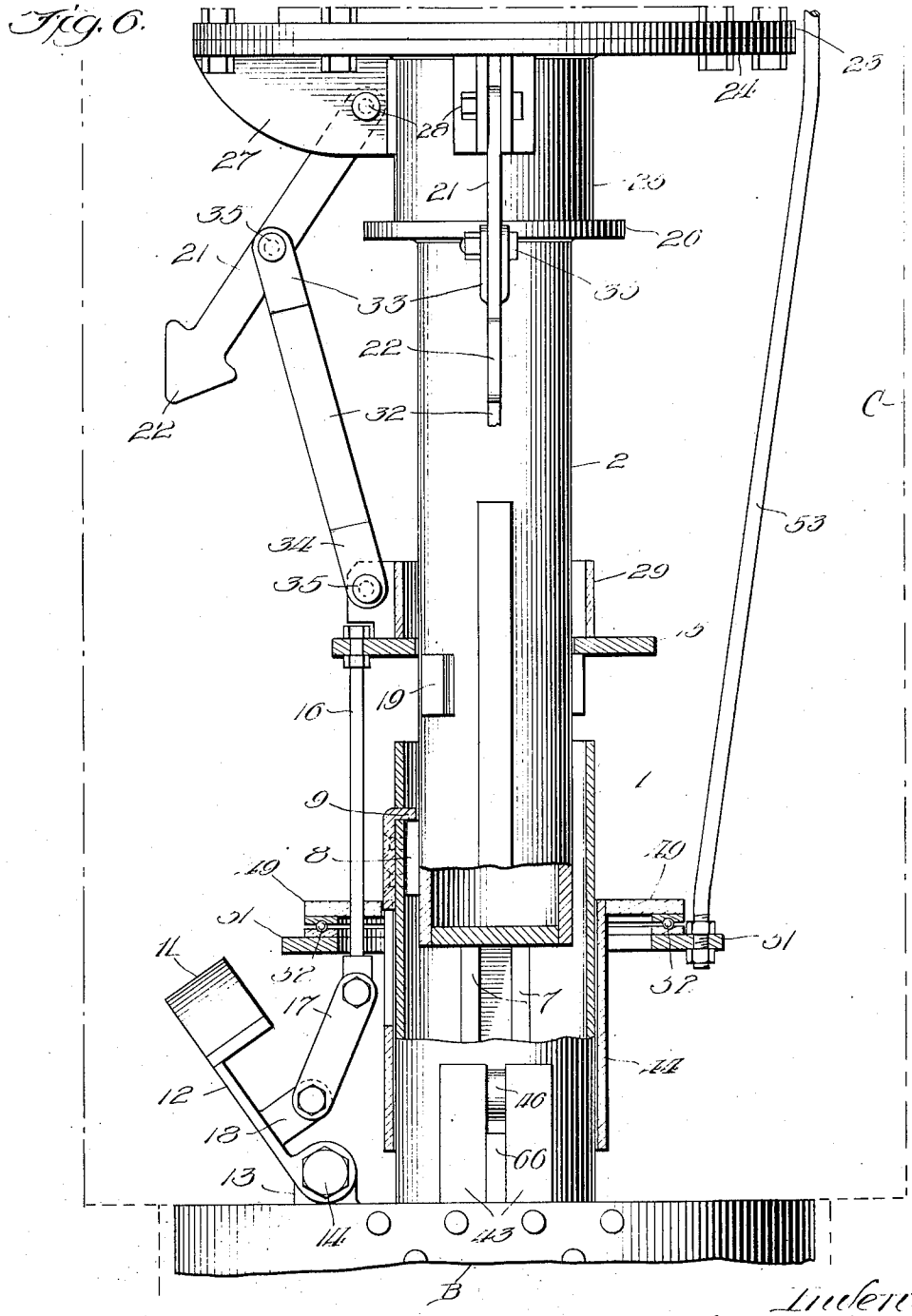
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CAISSON MACHINE

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Fig. 6.



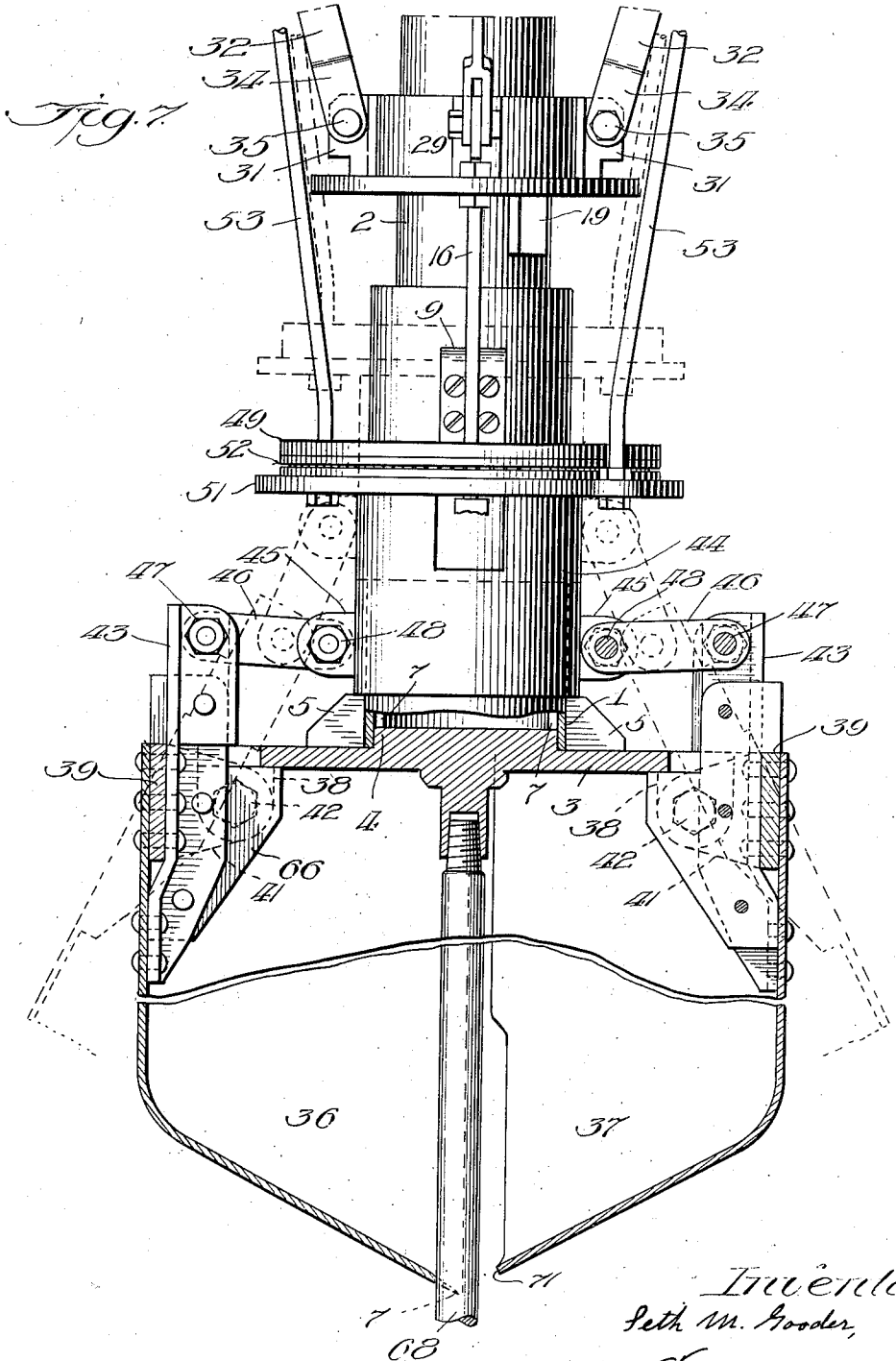
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Fig. 7



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Fig. 8.

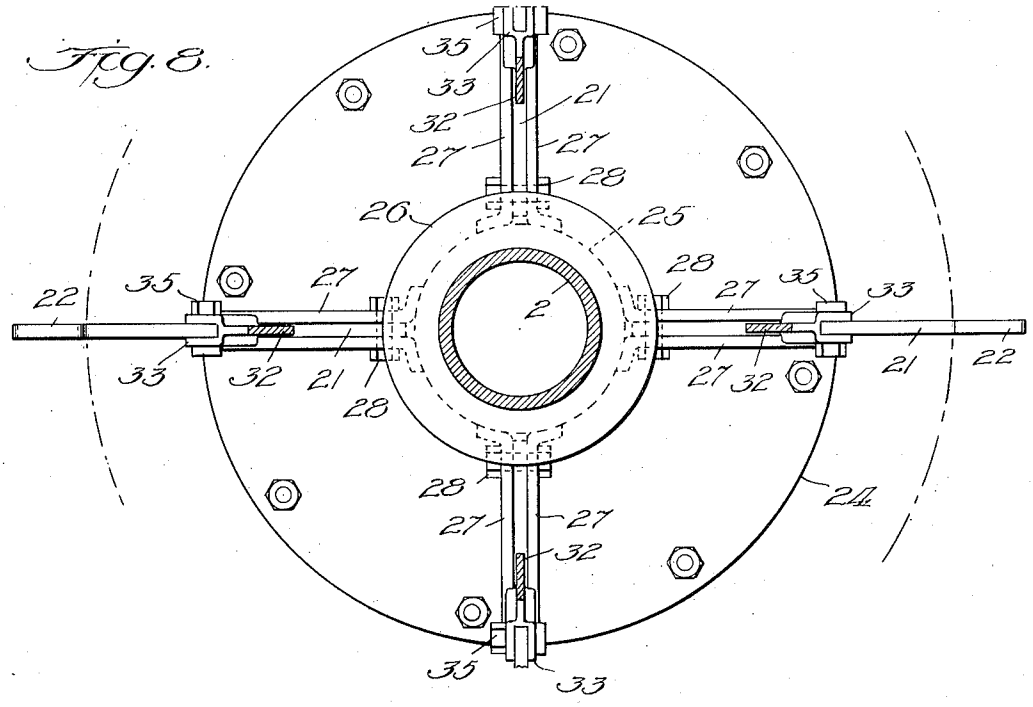


Fig. 9.

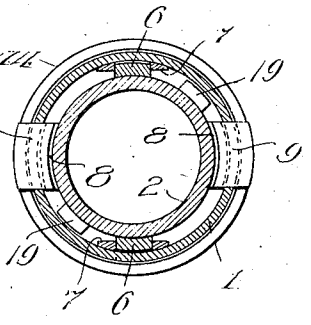
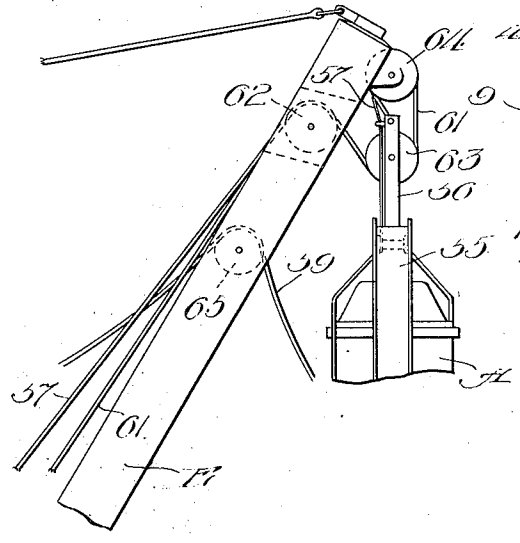


Fig. 10.



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Patented Aug. 31, 1937 2,091,779

UNITED STATES PATENT OFFICE

2,091,779

CAISSON MACHINE

Seth M. Gooder, Deerfield, Ill.

Application July 22, 1936, Serial No. 91,818

14 Claims. (Cl. 255—4)

The present invention has for its object to make it possible to dig caissons by means of a simple, compact machine that need only be lowered as excavation progresses, and requires no long, unwieldy driving shafts or shafts to which joints or sections must be connected from time to time.

In carrying out my invention I preferably employ a bucket of the clamshell type driven directly by an overlying motor which is lowered into the ground along with the bucket; the whole plant being simply suspended from a suitable cable by which it is raised and lowered. The motor must be anchored against bodily rotation while driving the bucket and, usually, retractible plows or reamers are employed at the top of the bucket to enlarge the opening that has been dug by the bucket. The present invention makes provision for anchoring and releasing the motor and for shifting the plows or reamers between idle and working positions, by the mere raising and lowering of the load cable. The present invention also contemplates a simple and novel arrangement for insuring that the bucket remains closed, while being raised and afterwards, and for tripping the bucket to discharge its load whenever and at any point desired.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is an elevation of one of my improved machines located in the bottom of a well, shaft, or caisson that is being dug, the parts of the machine being in excavating positions; Fig. 2 is a view similar to Fig. 1, looking at the machine from a point displaced angularly of the axis of the machine 90° from the point of view corresponding to Fig. 1; Fig. 3 is a section, on a larger scale, taken on line 3—3 of either Fig. 2 or Fig. 5; Fig. 4 is a bottom plan view of a part of a bucket, fragments of the side walls being broken away; Fig. 5 is a view on the same scale as Fig. 3, illustrating in vertical section the parts lying between the lower end of the motor and the upper end of the bucket, the parts being in the positions illustrated in Figs. 1 and 2; Fig. 6 is a view similar to Fig. 5, although more of the parts appear in elevation, showing the relative positions of the relatively movable members after the hoisting cable has been drawn up a short distance preparatory to raising the bucket; Fig. 7 is a view, partly in elevation and partly in section, looking toward the machine from the left-hand side as it appears in Fig. 6, showing the bucket and the mechanism immediately above the same in full lines in the same positions that they occupy in Fig. 6, and in dotted lines in the positions occupied when the bucket is open; Fig. 8 is a section on line 8—8 of Fig. 5; Fig. 9 is a section on line 9—9 of Fig. 5, showing only the telescoped driving shaft and the sleeve for tripping the bucket; and Fig. 10 shows a fragment of the machine and the upper end of a boom or crane from which the same is hung.

Referring to Figs. 1 and 2 of the drawings, A represents a suitable electric motor and B a bucket to be driven thereby. Fixed to the top of the bucket is a driving sleeve 1 of considerable diameter and length. Extending down from the motor is a motor shaft 2 which is telescoped into the driving sleeve and is suitably interlocked with the latter so that the two must rotate together but have capacity for limited relative movements in the lengthwise direction.

As best shown in Figs. 3, 5 and 7, the bucket has at the top a heavy, sturdy cross piece 3 which extends diametrically across the same; this cross piece having at the middle a short upwardly projecting hub 4. The driving sleeve fits over this hub and is welded thereto. Reenforcing fins or gussets 5 are set on edge in the angle between the cross piece or bucket base and the driving sleeve and are welded to both. The motor shaft, which is considerably longer than the sleeve 1, may rest loosely upon the hub 4 and usually does so during the digging operations, thereby imposing the weight of the motor on the bucket to hold and drive the latter downward. The motor shaft is preferably somewhat smaller in diameter than the interior diameter of the driving sleeve, to provide between the shaft and the sleeve an annular space for containing driving connections and various lugs. The motor shaft has thereon a pair of external heavy keys 6 extending lengthwise thereof and located diametrically opposite each other. These keys enter suitable longitudinal keyways in the interior of the driving sleeve. These keyways may conveniently be produced by welding to the interior of the driving sleeve pairs of longitudinal cleats or ribs 7; the elements of each pair being spaced apart just far enough to receive one of the keys on the motor shaft and leave the keys free to slide lengthwise in the keyways thus provided. The motor shaft has thereon, near the lower end

thereof, a pair of oppositely disposed, external lugs 8. These lugs lie below and in vertical alignment with a pair of internal lugs 9 in the driving sleeve. The lugs 9 may be the short arms of angle plates whose long arms lie against the outer surface of the driving sleeve, while the short arms extend through suitable slots in the wall of the driving sleeve. When the motor shaft is raised, the bucket remains stationary until the lugs 8 engage with the lugs 9, whereupon any further upward movement of the motor shaft compels the driving sleeve and, therefore, the bucket, to travel along with the same. The keys 6 are made sufficiently long to insure that they will not be withdrawn completely from their keyways during these relative lengthwise movements of the motor shaft and driving sleeve.

Hinged to the bucket base 3, midway between the ends of the latter and adjacent to the long side edges, are a pair of suitable plow devices or reamers which, in working positions, are adapted to project radially beyond the sides of the bucket. In the arrangement shown, each of these devices comprises a plow member, proper, indicated at 11, and a stem or shank 12. The inner end of each stem or shank fits between a pair of ears 13 integral with the bucket base, and is hingedly connected to such ears by a horizontal hinge pin 14. These plows or reamers are adapted to lie in the positions shown in Fig. 5, while excavating, and to be swung upwardly into idle positions, as indicated in Fig. 6, before the bucket begins to rise, upon the drawing up of the load cable. The shifting of the plows or reamers is effected by the lifting of a floating ring 15 that rests loosely on the upper end of the driving sleeve 1. Depending from and fixed to this floating ring are two vertical rods 16 whose lower ends are connected by links 17 to ears 18 rising from the stems of the plow devices at points between the hinges and the plows proper. Upon moving the floating ring upwardly while the bucket remains stationary, the plows or reamers will be lifted and swung into the release positions illustrated in Fig. 6; in which positions they are retracted far enough not to strike the lower edge of the lagging with which the excavation may have been lined.

The upward movement of the floating ring is brought about by a pair of lugs 19 on the motor shaft at some distance above the lugs 8. Normally the lugs 19 lie well below the floating ring as shown in full lines in Fig. 5. When the motor and its shaft are raised, the lugs 19 engage with the under side of the ring 15, as shown in dotted lines in Fig. 5, while the lugs 8, as also shown in dotted lines, still lie well below the lugs 9 on the driving sleeve. At the time the lugs 19 engage with the floating ring, the lugs 8 must still travel up a distance great enough to permit the floating ring to retract the plows before the lugs 8 engage with the lugs 9 and the bucket starts to lift.

During the preliminary upward movement of the motor and its shaft, prior to the lifting of the bucket, I also cause suitable anchoring means for preventing bodily rotation of the motor to be released. These anchoring means are shown as taking the form of four sturdy arms 21. These arms have wide, flat heads 22 at their outer ends; these heads standing on edge. The arms are hinged at their inner ends to means carried by the motor or driving shaft or both, so as to be capable of swinging about horizontal axes. In the arrangement shown, there is bolted to the base 23 of the motor a stiff plate 24 that forms a flange around the upper end of a short sleeve 25 surrounding the shaft. The lower end of the sleeve 25 rests upon a ring or collar 26 surrounding and welded or otherwise fixed to the motor shaft. There are four pairs of radial plates 27 arranged in the form of gusset plates in the angle between the plate 24 and the sleeve 25; the plates 27 of each pair being spaced apart far enough to receive between them one of the anchoring arms 21. The inner ends of the anchoring arms are connected to these plates by hinge pins 28, each passing through one of the arms and through both of the plates between which that arm lies.

The parts are so proportioned that when the anchoring arms stand almost horizontal, the heads thereon will be embedded in the earth or clay surrounding the well or shaft C that is being excavated. Since the heads are relatively thin, the weight of the motor is sufficient to drive them downward through the earth or clay whenever the weight of the motor comes upon them. However, since the areas of the heads of the anchoring arms in radial planes is considerable, the torque of the motor is not great enough to drive them through the earth or clay in a circumferential direction. In other words, the anchoring devices act in the manner of knife blades that slice through the soil to permit the motor to feed down, but constitute anchoring plates of considerable area that prevent them from being pushed around in a horizontal plane. By locating the anchoring arms between pairs of supporting plates, each arm is backed up and reenforced by one of the plates beside it, regardless of the direction in which the motor is running, and therefore an anchoring structure that is quite rigid may be had without making any of the parts thereof unduly heavy.

Whenever the bucket is to be raised, the first effect of lifting the motor and its shaft is to pull the anchors out of the surrounding soil; this occurring before the lugs 19 engage with the floating ring 15. This permits me to employ the floating ring to assist in expanding the anchoring means when the excavating unit is lowered into the bottom of the well or shaft. In the arrangement shown, there is a sleeve 29 surrounding the motor shaft and resting on the floating ring. This sleeve has an internal diameter considerably greater than that of the motor shaft. Projecting radially from the periphery of the sleeve 29, and spaced 90° apart, are four vertical vanes or ears 31. Between each of the vanes or ears 31 and the corresponding anchoring arm is a link or strut 32. Each link or strut has at its upper end a jaw 33 which embraces the corresponding anchoring arm, and at its lower end a jaw 34 which embraces the corresponding vane or ear 31. Pins 35, passing transversely through the jaws 33 and 34, and through the elements engaged in the jaws, connect the struts or links both to the anchoring arms and to the sleeve 29.

By the time that the motor shaft has been lifted high enough to bring the lugs 19 into engagement with the floating ring 15, the anchoring arms have been drawn down into the positions shown in dotted lines in Fig. 5. Since the lugs 19 are fixed in relation to the motor base, subsequent upward movement of the motor and its shaft have no effect on the anchoring means, although it does result in swinging the plows or reamers into their idle positions as heretofore explained. When the unit is lowered into the

well or shaft, however, the motor continues to move downward after the floating ring has been brought to rest through the striking of the bucket on the bottom of the excavation. At the moment when this occurs, the anchoring arms are in the positions indicated in dotted lines in Fig. 5. However, as soon as the downward movement of the sleeve **29** is halted, the struts **32** serve as supports about the upper ends of which the anchoring arms must rock as the motor continues to travel downward. In other words, the upper ends of the struts constitute fulcrums about which the anchoring arms are rocked due to the continued downward movement of the inner ends of the arms which are pinned to the motor frame or housing. As the inner ends of the anchoring arms swing down, the outer ends must swing upward, thereby embedding their heads in the surrounding soil. In order that there shall be no interference with the expansion of the anchoring means, the lagging that lines the well or shaft and which is indicated at D in Fig. 1, must terminate a sufficient distance above the bottom of the excavation to allow full freedom of movement of the anchoring arms.

The bucket is preferably of the type which may be locked in its closed position, so that it will remain closed until intentionally opened after having been raised above the ground. In the arrangement shown, as heretofore stated, the bucket is of the clamshell type, being composed of two halves **36** and **37**. Each half of the bucket is hinged at its upper end to one end of the bucket base **3**. As best shown in Figs. 5 and 7, the member **3** has at each end a pair of downwardly projecting ears **38**, spaced far apart. Each half of the bucket has riveted to the inner side of the same, at the top, a heavy plate **39**, the ends **41** of which are bent laterally so as to embrace one of the pairs of ears **38**. Each end flange **41** is secured to the adjacent ear **38** by means of a bolt **42** which serves as a hinge pin. Consequently, the two halves of the bucket may swing from and toward each other about parallel axes lying adjacent to the ends of the base member **3**. Each of the hinge plates **39** has two parallel upright pieces or small posts **43** rising therefrom above the top of the member **3**. Loose on the driving sleeve **1** and normally resting on the vanes or gusset plates **5**, is a short sleeve **44**. This sleeve has two pairs of ears **45** projecting radially therefrom at diametrically opposed points. A short link **46** extends between each pair of upright posts **43** and one of the pairs of ears **45**; the link lying at one end between the posts and at the other end between one of the pairs of ears **45**. Suitable, horizontal bolts **47** and **48** secure the links to the uprights or posts **43** and the ears **45**, respectively.

Normally, when free to do so, the two halves of the bucket swing together, bringing the links **46** into position in which their inner ends lie at a slightly lower level than do their outer ends. Consequently, the links **46** normally serve as struts between the sleeve **44** and the parts **43** of the bucket, to prevent the bucket from opening. Since the inner ends of the links or struts are slightly below the outer ends, any thrusts may have downward components, but cannot exert end upward force tending to raise the sleeve **44** and thus permit the bucket to open. However, if the sleeve itself be lifted, relatively to the bucket, the two halves of the bucket are unlocked and may be positively swung apart. The sleeve **44** may be actuated in any suitable manner. In the arrangement shown, it has on the upper end thereof a surrounding horizontal flange **49**. Underneath this flange lies a ring **51** and between the ring and the flange is a suitable anti-friction bearing which may comprise a series of balls **52** arranged in suitable runways. The ring **51** is carried on the lower ends of a pair of rods **53** that constitute the arms, or extensions thereof, of a yoke **54** whose closed end is above the motor and which straddles the motor. The sleeve **44** must revolve with the bucket but, by providing the swivel connection between the rods **53** and the flange on this sleeve, these rods and the yoke of which they form a part may stand still as does the motor housing, while the motor is running.

When it is desired to open the bucket, the yoke **54** is pulled up, raising the sleeve **44** and tripping the locking means for the bucket. Thus, in Fig. 7, the parts are shown in full lines with the bucket closed and in dotted lines with the bucket open.

What I have heretofore described is a complete excavating power plant that need only be lowered and be supplied with power to excavate to any desired depth; the entire unit being raised above the ground whenever the bucket has become full, and the locking means for the bucket being then tripped to dump the load. Actually, therefore, all that is needed in addition to the unit itself is a suitable cable for sustaining the weight of the plant, and a power cable. The unit may be suspended from a boom or crane, so that after it has been raised above the ground, it may be swung to any desired unloading point before dumping, and may thus dump directly into a truck, railway car, or other vehicle, if desired. When used in this way, it is of advantage to employ another cable for tripping the load, whereby the tripping may be done by an operator without leaving his seat after he has brought the bucket to the point where its load is to be dumped.

As shown in Figs. 1 and 2, the motor is set in a cradle **55** of which the base member **23** forms a part. This cradle is suspended from a hanger **56**. A small cable **57** is fastened to an eye **58** at the upper end of the tripping yoke **54**. Power is supplied to the motor through a power cable **59**.

In Fig. 10 I have shown the unit suspended from a boom or crane E, the cable **57**, and a cable **61** passing over coaxial pulleys **62** on the boom, over a pair of coaxial pulleys **63** on the hanger, and up over a pair of coaxial pulleys **64** at the extreme upper end of the boom. The cable **61** extends down and is fastened to the upper end of the hanger **56**, whereas the tripping cable **57** extends down beside the hanger **56** and through the top member of the cradle **55** to the yoke **54**. The power cable **59** runs over a single pulley **65** on the boom and down to the motor.

As heretofore stated, the two halves of the bucket are so proportioned and hung that they tend normally to remain in or assume their closed positions as indicated in Figs. 1, 2 and 7. This follows because the bulk of the weight of each half lies outwardly from its hinge axis so that the lower ends always tend to swing in and bring the centers of gravity directly below the hinge axes. I prefer to provide suitable stops to limit the closing movements of the bucket halves. This may conveniently be accomplished by providing the vertical wall of each half of the bucket with a central internal brace **66** whose upper end forms a square shoulder **67** which strikes against the under face of the bucket base **3** when the bucket is closed.

The bottom of the bucket has the general shape of an inverted, rather flat cone through the apex

of which projects a leader drill bit **68**. The meeting edges of the two halves or shells are spaced apart sufficiently to permit soil to enter freely. One sloping, bottom edge **70** of each bucket half or shell constitutes a cutting edge which lies at a lower level than the similar edge which simply trails and does not cut. As best shown in Figs. 2 and 4, the cutting edges are continued upwardly, as at **72**, along the vertical portions of the bucket walls; those vertical portions having thereon cutting edges being bulged outwardly somewhat so as to project radially beyond the adjacent, opposed trailing edges. This construction causes the bucket to act in the manner of an auger enlarged somewhat in diameter toward the lower end, whereby the upper part of the bucket serves simply as a large hollow stem which is also a container for the material excavated by the auger element.

While the bucket is drilling a hole, the plows or reamers **11** are acting to enlarge the diameter of the hole; the plows or reamers being shaped to turn the material excavated by the same inwardly so that it will drop into the open top of the bucket. Thus excavating material enters the bucket from both the bottom and the top, and the filling progresses much more rapidly than if it depended solely on the auger action of the bucket proper.

It is believed that the operation of the machine has been rather fully explained in connection with the description of the features of construction. Briefly stated, however, the operation is as follows: assuming the machine to be suspended above the earth as in Fig. 10, and bucket tripping cable to have been slackened, the bucket will have assumed a closed condition and the sleeve **44** will have dropped down so as to hold it closed. The bucket is hung from the motor shaft by its lugs **9** that rest on the lugs **8** on the shaft, as indicated in Fig. 6; and the plows are swung up and the anchoring devices retracted, as also shown in Fig. 6. When the bucket strikes the bottom of the excavation, it comes to rest, but the motor and its shaft continue their downward movement, causing the plows or reamers to be swung out and the anchoring devices to be expanded and penetrate the soil at the sides of the excavation; the parts being now in the positions illustrated in full lines in Fig. 5. The current may now be turned on to set the motor in operation. Thereupon, the bucket will be rotated and soil will enter the same from the bottom and through the top. As the bucket bores its way into the earth, the downward thrust thereof comprises the weight of the entire plant, including the bucket itself and the heavy motor. Consequently, excavating may be done rapidly. Because of the loose connection between the motor and the bucket, it is evident that the bucket may be entirely relieved of the downward pressure due to the weight of the motor, if desired; for if the paying out of the load cable ceases, the motor no longer descends, and the bucket may continue its downward course under its own weight until the slack has been taken up between the bucket and the motor shaft. Whenever the bucket becomes full, the entire plant or machine is simply raised above the ground and, after it has been carried to the dumping point, the bucket is caused to open and discharge its load.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. An excavating machine comprising a bucket, a motor above the bucket, means between the motor and the bucket to suspend the bucket from the motor and cause it to be rotated by the latter, expansible means to engage the walls of a well or shaft and anchor the motor against bodily rotation therein, and means for lowering said machine bodily into the earth and automatically expanding said anchoring means when the bucket touches bottom.

2. An excavating machine comprising a motor having a depending vertical shaft, a bucket mounted on the lower end of said shaft so as to be rotatable therewith while having a limited movement lengthwise of the shaft, an anchoring means for the motor, and means controlled by relative vertical movements between the motor and the bucket to apply and release the anchoring means.

3. An excavating machine comprising a motor having a depending vertical shaft, a bucket mounted on the lower end of said shaft so as to be rotatable therewith while having a limited movement lengthwise of the shaft, plow or reamer devices mounted on the bucket for movements between idle positions and working positions in which they project beyond the sides of the bucket, and means controlled by relative vertical movements between the motor and the bucket to move the plows or reamers from one position to the other.

4. In an excavating machine, a rotatable bucket having an upwardly-projecting driving sleeve, a motor above the bucket having a shaft extending down into said sleeve, said motor shaft having thereon a longitudinal key and the driving sleeve having thereon a keyway in which said key is slidably fitted, a peripheral lifting projection on the motor shaft, an internal projection on the interior of the driving sleeve directly above the projection on the shaft, said projection being so spaced in the vertical direction that the motor shaft must travel up a substantial distance from its lowermost position in the driving sleeve before exerting a lifting effort on the bucket, and means to lower the machine as a unit into the earth in making an excavation.

5. An excavating machine comprising a motor having a depending vertical shaft; a bucket mounted on the lower end of said shaft so as to be rotatable therewith while having a limited movement lengthwise of the shaft, a radially expansible anchoring means for the motor surrounding said shaft, and means controlled by relative vertical movements between the motor and the bucket to expand and contract said anchoring means.

6. An excavating machine comprising a motor having a depending vertical shaft, a bucket mounted on the lower end of said shaft so as to be rotatable therewith while having a limited movement lengthwise of the shaft, reamer means on the bucket expansible radially beyond the latter, and means controlled by relative vertical movements between the motor and the bucket to contract said reamer means during the first part of an upward movement of the motor shaft relatively of the bucket.

7. An excavating machine comprising a motor having a depending vertical shaft, a bucket mounted on the lower end of said shaft so as to

be rotatable therewith while having a limited movement lengthwise of the shaft in order that the motor may be lifted through a predetermined distance before picking up the bucket, plow or reamer devices mounted on the bucket for movements between idle positions and working positions in which they project beyond the sides of the bucket, and means controlled by relative vertical movements between the motor and the bucket to move the plows or reamers from the working position to the idle position during the first of the upward movement of the motor through said predetermined distance.

8. In an excavating machine, a rotatable bucket having an upwardly-projecting driving sleeve, a motor above the bucket having a shaft extending down into said sleeve, said motor shaft having thereon a longitudinal key and the driving sleeve having thereon a keyway in which said key is slidably fitted, a peripheral lifting projection on the motor shaft, an internal projection on the interior of the driving sleeve directly above the projection on the shaft, said projection being so spaced in the vertical direction that the motor shaft must travel up a substantial distance from its lowermost position in the driving sleeve before exerting a lifting effort on the bucket, reamer means on the bucket, retracting means for said reamer means including a member normally resting on the upper end of said sleeve, and a second projection on the motor shaft lying below said member a distance less than the aforesaid distance when the motor shaft is in its lowermost position, and means to lower the machine as a unit into the earth in making an excavation.

9. An excavating machine comprising a bucket, a motor above the bucket, driving connections between the motor and the bucket for rotating the latter, means for lowering said machine bodily into the earth in making an excavation, and expansible means to anchor the motor against bodily rotation in a well or shaft into which the machine is lowered, said means including arms having at their outer ends flat, blade-like elements set on edge, and adapted to cut their way through the soil in which they are embedded, when the weight of the motor is imposed upon the same.

10. In an excavating machine, a rotatable bucket having an upwardly projecting driving sleeve, a motor above the bucket having a shaft extending down into said sleeve, said shaft and said sleeve being keyed together so as to compel them to rotate in unison while permitting them to move relatively lengthwise of each other, plows or reamers associated with said bucket, a member normally resting on the upper end of said sleeve and loosely surrounding the motor shaft, means connecting said member to said plows or reamers to retract the latter when said member is lifted above the sleeve, external lugs on the motor shaft and an internal lug on said sleeve, the parts being so proportioned that when the motor is lifted one of the lugs on the shaft engages with said member and raises it to retract the plows or reamers and thereafter another lug on the shaft engages with the lug on the sleeve and causes the bucket to rise with the motor.

11. An excavating bucket comprising a horizontal base member, two half shells hinged at their upper ends to the ends of said base member, said base member having a stem rising from the middle thereof, a sleeve surrounding and slidable on said stem, each of said half shells having an arm or post projecting upwardly above the hinge joint and above said base member, and a link between each of said arms or posts and said sleeve, the inner ends of said links lying at a lower level than their outer ends when said sleeve is resting on said base member.

12. An excavating machine comprising a bucket, a motor support above and adapted to rest on said bucket, a motor carried by said support, connection between said support and the bucket to permit limited relative vertical movements between the same and cause the bucket to revolve with the motor, and anchoring means controlled by said relative vertical movements to anchor said support against rotation in a well or shaft while permitting the motor and its support to move downward with the bucket in making an excavation.

13. An excavating machine comprising a bucket, a motor above the bucket and having a vertical depending shaft, connecting means between said shaft and said bucket to connect the same together for rotary movements while permitting relative vertical movements between a position in which the weight of the motor is borne by the bucket and an upper position, and means to anchor the motor to the surrounding wall of a wall in which an excavation is being made so as to hold the motor against rotation while permitting it to move downwardly and continue to exert a pressure on the bucket while the bucket is being driven.

14. An excavating machine comprising a bucket, a motor above the bucket and having a vertical depending shaft, connecting means between said shaft and said bucket to connect the same together for rotary movements while permitting relative vertical movements between a position in which the weight of the motor is borne by the bucket and an upper position, and means to anchor the motor to the surrounding wall of a well in which an excavation is being made so as to hold the motor against rotation while permitting it to move downwardly and continue to exert a pressure on the bucket while the bucket is being driven, and means automatically to disengage said anchoring means when the motor is raised relatively to the bucket.

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