Aug. 23, 1932. J. M. DEALY 1,872,688

APPARATUS FOR THE FORMATION OF CONCRETE PILES IN SITU

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Fig. 1.

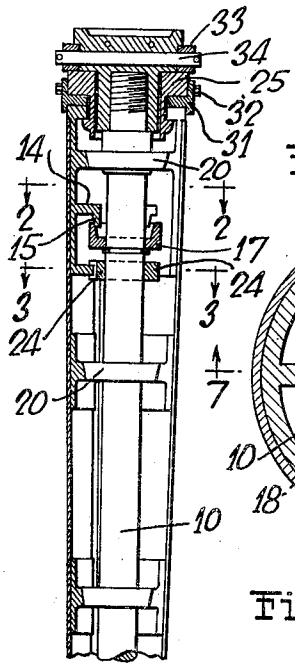



Fig. 5.

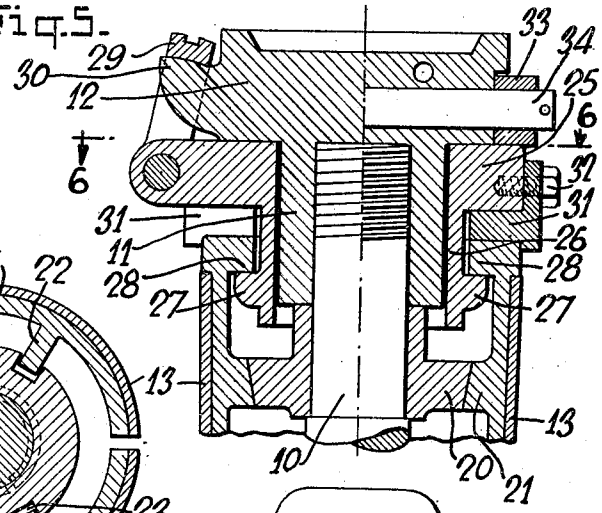



Fig. 3.

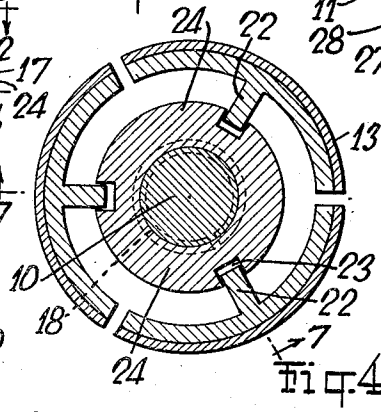



Fig. 4.

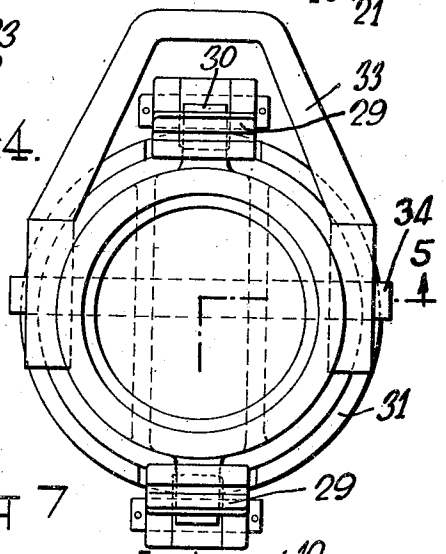
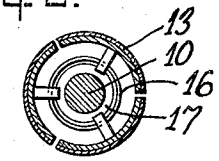



Fig. 2.



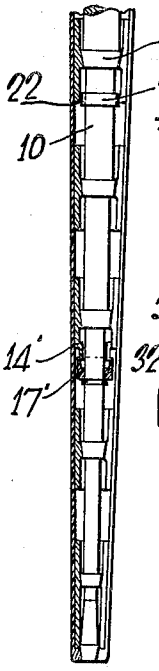




Fig. 6.

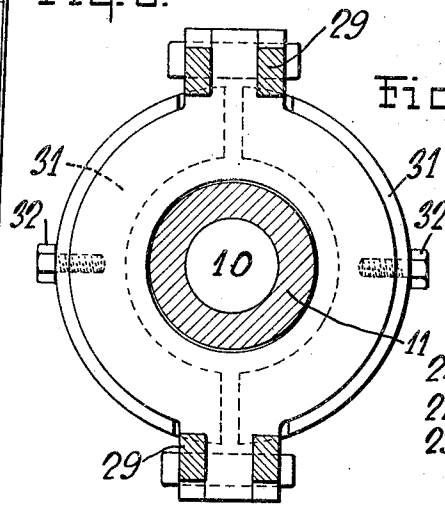
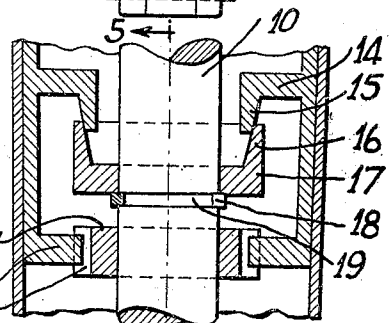



Fig. 7




INVENTOR.
John M. Dealy
BY
Warfield & Watson
ATTORNEYS.

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Fig. 8.

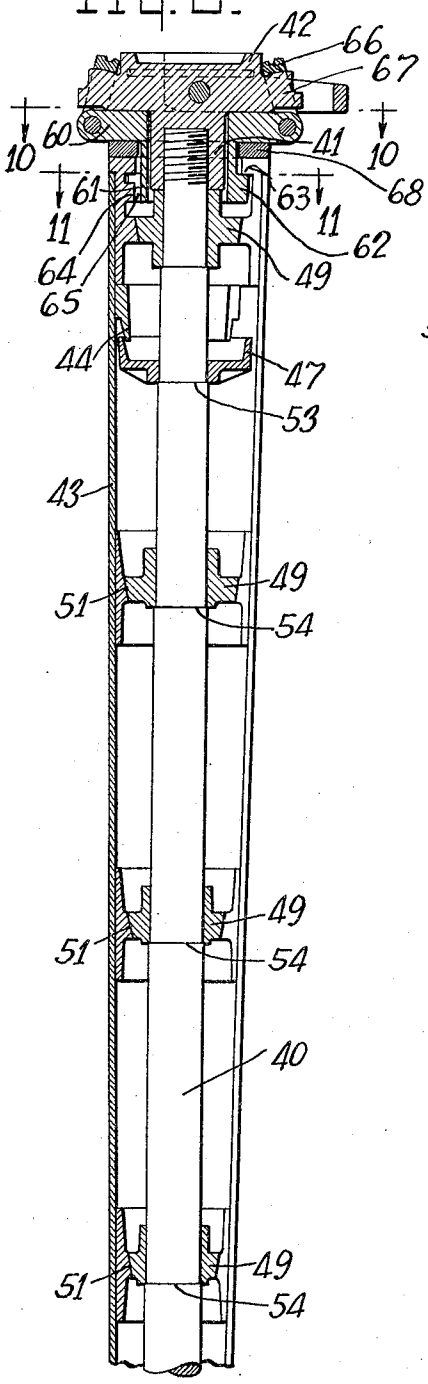



Fig. 9

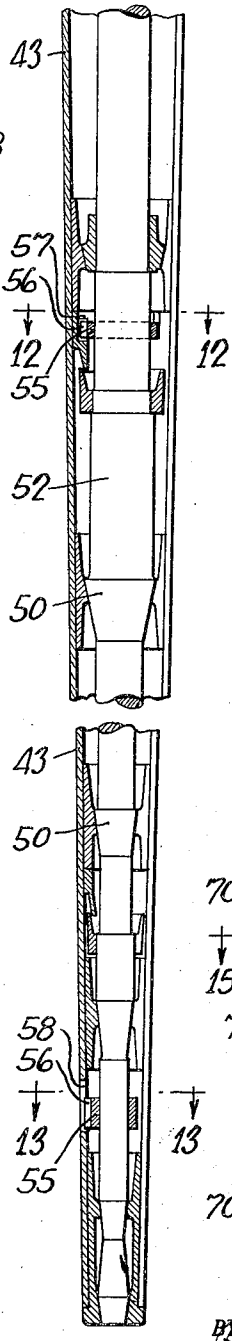



Fig. 10.

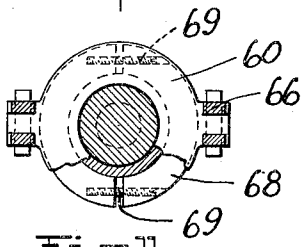



Fig. 11.

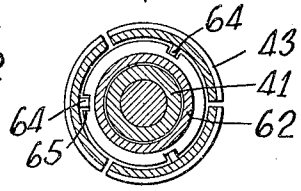



Fig. 12.

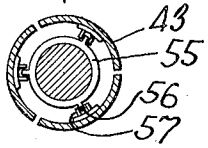



Fig. 13.

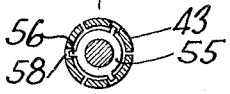



Fig. 14.

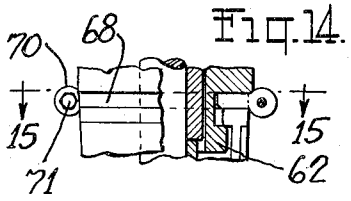
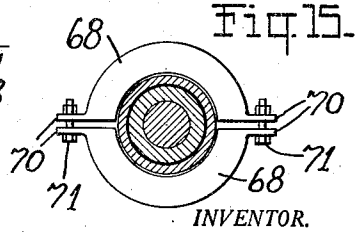



Fig. 15.




INVENTOR.

John M. Dealy

BY Warfield & Watson

ATTORNEYS.

Patented Aug. 23, 1932 1,872,688

# UNITED STATES PATENT OFFICE

JOHN M. DEALY, OF ASTORIA, NEW YORK, ASSIGNOR TO MacARTHUR CONCRETE PILE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

## APPARATUS FOR THE FORMATION OF CONCRETE PILES IN SITU

Application filed November 30, 1929. Serial No. 410,675.

This invention relates to apparatus for forming concrete piles in situ, and, more particularly, to collapsible core constructions adapted for use in the formation of such piles.

In general it is an object of the invention to provide apparatus of the character described which is permanent and sturdy in construction, which can be easily operated, which can be assembled and disassembled with extreme ease, and which will efficiently perform the function for which it is intended.

More particularly it is an object of the invention to provide a collapsible core construction wherein the parts which are subjected to strain are of a particularly sturdy nature, and whereby ease and certainty of operation are secured without the provision of means positively connecting the center-bar and core leaves.

A further object is to provide an improved core head construction.

A more specific object is directed to the provision of improved means for maintaining core leaves in place during operation, while permitting the ready removal of the same when access to the interior of the core is desired.

Another more specific object is to provide improved means for preventing relative rotation of the center-bar and the core leaves.

Another object is to provide a center-bar which is of particularly sturdy construction and which is adapted to distribute evenly the shocks of blows.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a vertical section of the upper and lower ends of one form of collapsible core construction embodying the invention;

Fig. 2 is a horizontal section, looking in the direction of the arrows along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view, looking in the direction of the arrows along the line 3—3 of Fig. 1, and illustrating one means for preventing relative rotation of the center-bar and core leaves;

Fig. 4 is an enlarged top view of the form of apparatus exemplified in Fig. 1;

Fig. 5 is a fragmentary vertical section taken in the direction of the arrows along the line 5—5 of Fig. 4;

Fig. 6 is a horizontal section looking in the direction of the arrows along the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary vertical section, looking in the direction of the arrows along the line 7—7 of Fig. 3;

Fig. 8 is a vertical section of the upper portion of another form of collapsible core construction embodying the invention;

Fig. 9 is a vertical section of the lower portion thereof;

Fig. 10 is a horizontal section taken along the line 10—10 of Fig. 8;

Fig. 11 is a horizontal section taken along the line 11—11 of Fig. 8;

Fig. 12 is a horizontal section taken along the line 12—12 of Fig. 9;

Fig. 13 is a horizontal section taken along the line 13—13 of Fig. 9;

Fig. 14 is a fragmentary view showing a modified form of means for detaching the ring segments; and

Fig. 15 is a horizontal section taken along the line 15—15 of Fig. 14.

The invention in its broader aspects is adapted to be embodied in various forms of collapsible core. The exemplified forms of collapsible core, however, are particularly adapted for sinking into the ground a shell of any convenient form or construction, such as the thin sheet metal shells commonly employed for the formation of concrete piles in situ. It is common practice for such shells to be sunk into the ground by means of a collapsible core, after which the core is withdrawn and the shell filled with concrete.

There are exemplified forms of collapsible cores which are so constructed that certainty and ease of operation are combined with such sturdiness and strength as to insure that each

relatively expensive core will have a long life and also that the various elements of the core construction can be readily separated when desired.

The form of construction particularly exemplified in Figs. 1 to 7, inclusive, comprises a center-bar 10, on the upper end of which there is secured, by means of a tubular stem 11, a driving cap 12 whereby the core may be operated through the medium of suitable driving and withdrawing apparatus, such, for example, as is well known to the art. About the center-bar are arranged a plurality of core-leaves 13, which are separated longitudinally so as to permit the same to be expanded against the inner surface of a shell during driving and to be collapsed when the core is withdrawn. In the present instance these leaves are provided with inwardly extending lugs 14 having downward extensions 15, the outer surfaces of which are inclined upwardly and outwardly and which fit within the similarly-inclined inner surface of the flange 16 of a cup-shaped member 17 suitably carried on the center-bar, and providing socket means. The members 14 and 17 are thus adapted to carry the core leaves on the center-bar, to collapse the leaves when the center-bar is moved upwardly with respect thereto, and while the extensions 15 are within the flange 16, to prevent the removal of the leaves. In the exemplified construction the member 17, which may be suitably secured in place, is firmly held against downward movement on the center-bar by means of a split ring 18 fitting within a groove 19 in the center-bar. Any suitable number of sets of lugs 14 and cup-shaped members 17 may be provided, depending upon the length of the core and the particular conditions under which the same are to be used. In order to press the core leaves into their expanded position the center-bar carries a series of wedge-members 20 having upwardly- and outwardly-inclined surfaces which are adapted to seat against the surfaces of cooperating wedging elements 21 on the core leaves. It will thus be seen that the downward movement of the center-bar will effectuate the expansion of the core leaves against the shell, and that the surfaces of the elements 15 and 16 will regulate this expanding movement and will, upon the upward movement of the center-bar, effectuate the collapse of the core leaves. With a view to providing for smoothness of operation, and to eliminating play between the parts at any point in their movement, inclination of the cooperating surfaces of the members 15 and 16 is preferably made similar to the inclination of the surfaces of the members 20 and 21. In certain instances, and particularly toward the lower end of the core, where practical considerations make it undesirable to form the socket means and the cooperating elements with the surfaces inclined at the same pitch as the surfaces of the wedging elements, the surfaces may be inclined at a different pitch, as indicated at the members 14′ and 17′ in Fig. 1; such members being arranged, if desired, to partake in the support of the core leaves during withdrawal.

With a view to preventing relative rotation of any of the core-leaves with respect to the center-bar, such, for example, as would permit uneven spacing of the core leaves, each leaf is provided with one or more inwardly-projecting lugs 22 each fitting within a slot 23 in an annulus 24 secured to the center-bar; the slots 23 being of sufficient depth to accommodate the lugs 23 when the core leaves are fully contracted.

In order to maintain all of the parts firmly in place during operation there is interposed between the driving cap and the core leaves suitable means whereby the movement of the leaves for the head is so limited as to prevent a movement of the elements 15 out of the cup-shaped member 17, and, accordingly, to prevent the undue expansion of the core leaves. In the present instance, this means includes a wide ring 25 fitting beneath the driving cap and carrying suitable means exemplified at 31 for limiting the movement of the leaves toward the cap. The ring 25 is provided with a tubular stem 26 extending about the stem 11, and an outward extension 27 on this stem fits beneath lips 28 at the top of the member carrying the upper wedging element 20. Pivotally connected to the ring 25 are latch-members 29 arranged to fit over the lugs 30 on the driving cap in such manner that, when the latch-members are in place, movement of the core leaves away from the cap is prevented. It will thus be seen that when the latches 30 are in place the entire structure is so united as to form a unitary core for the driving of a thin metal shell into the ground or for otherwise forming a bore for the reception of the concrete, whereas, when the latches 29 are removed ther is sufficient play between the center-bar and the core-leaves to permit the collapse of the leaves.

It is to be observed that the means at 31 prevent a sufficient upward movement of any leaf with respect to the center-bar to permit the leaf to be removed from the structure. In order to permit the replacement of an individual core-leaf, when for any reason the same is injured, and also the ready inspection and repair of the parts at the interior of the core, there is preferably provided displaceable withdrawal-preventing means consisting in the present instance of a pair of members 31 removably mounted on the ring 25 by means of screws 32, upon the unscrewing of which the members 31 may be slid from between the ring 25 of the core-leaves so as to permit sufficient upward move-

ment of the latter to bring the lower end of the projections 15 above the upper end of the flange 16 and permit the core-leaf to be lifted from the core.

In view of the foregoing, the operation of the construction exemplified in Figs. 1 to 7 will be readily apparent to one skilled in the art. A thin metal shell having been slipped over the core, the latter is suspended above the ground, the core-leaves being held in contracted position by the members 14 and 17, and force is applied to the driving cap. This force is transmitted to the center-bar so as to effect a wedging action between the members 20 and 21 to cause an expansion of the core-leaves. When the latter have been expanded, and the driving cap has been pushed against the ring 25, the latch-members 29 are slipped over the lugs 30, so that the continued application of driving force will press the unitary core and the shell into the ground. When the shell has been driven a sufficient distance into the ground, the latch-members 29 are removed, lifting force is applied to the driving cap 12, and the center-bar drawn upwardly: the wedging action between the inner surface of the flange 16 and the outer surfaces of the projections 15 acting to collapse the core-leaves. Further upward movement of the driving cap and the center-bar will cause the flange 16 to contact with the under surfaces of the members 14 to lift the leaves, with the result that the leaves will be lifted with the center-bar out of the shell, which may then be filled with concrete.

When desired, suitable means, such as the lever 33 mounted on a transverse shaft 34 may be provided to overcome any clamping action between the wedging members 20 and 21 and to initiate the collapsing movement of the core.

The form of construction exemplified in Figs. 8 to 13, inclusive, is generally similar to the form of construction heretofore described, but embodies certain features of construction which are of particular advantage in overcoming various types of operating difficulties and which is of a particularly permanent and sturdy nature.

This construction comprises a center-bar 40 to the top of which there is secured by means of a stem 41 a driving cap 42. About the center-bar are arranged a plurality of independent core-leaves 43 provided with inwardly and downwardly extending lugs 44 adapted to fit within one or another of a plurality of cup-shaped members 47 disposed at suitably spaced points along the center-bar. At other points along the center-bar there are positioned a plurality of wedge members 49 and 50 which are adapted to seat against cooperating wedging elements 51 on the core leaves. As exemplified, the operating surfaces of the members 44, 47, 49, 50 and 51 have a similar pitch. With a view to evenly distributing the driving force in sinking a core and shell, the center-bar is formed, in the present instance, with a varying diameter, the portion 52 thereof, having the largest diameter, being positioned between the ends of the bar, and the sides of the bar being stepped inwardly from time to time toward each of its ends. At the points on the center-bar above the portion 52 where the same is stepped inwardly there are provided shoulders 53 for retaining certain of the cup-shaped members 47 and shoulders 54 for retaining the wedging members 49. During the assembly of the core, the members 47 and 49 may be slipped over the upper end of the center-bar before the cap 42 is screwed on, and readily moved into place and suitably secured there. The wedge members 50 below the portion 52, on the other hand, are formed integral with the center-bar itself.

With a view to preventing relative rotation of the center-bar and the core leaves, the center-bar is provided, in the present instance, adjacent its center with a ring 55 carrying lugs 56, each of which fits between the prongs of a U-shaped member 57 on one or another of the core-leaves and adjacent its lower end with a similar ring, the lugs 56 of which fit within slots 58 in the core-leaves.

Between the driving cap and the core leaves there is inserted a ring 60 having a tubular stem 61 provided with outward extensions 62. These extensions 62 fit beneath lips 63 at the top of the member carrying the upper wedging element 51 which extends above the top of each core-leaf. It is to be observed that, in the present instance, this member is formed with inward lugs 64 which fit into notches 65 in the extensions 62 so as to prevent rotation of the ring 60 with respect to the core-leaves. The ring 60 is provided with pivoted U-shaped latch members 66 adapted to fit over lugs 67 on the driving-cap. Removable means, such as the ring segments 68 which are detachably connected by bolts 69, is provided between the ring 60 and the members 63 so that by removing the same the core leaves may be moved upward a sufficient distance to remove the extensions 44 from the cup-shaped members 47 so that the core-leaves may be separated from the structure.

A modified form of means for detachably mounting the ring segments 68 is shown in Figs. 14 and 15. In this case the segments carry projections 70 at their ends so as to permit the segments to be detachably connected by means of bolts 71.

The mode of operation of the above-described structure is similar to that of the structure shown in Figs. 1 to 7 and will be readily understood when the same is considered in connection therewith.

Since certain changes may be made in the above construction and different embodi-

ments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interrupted as illustative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Apparatus of the character described, comprising a center-bar, a plurality of core-leaves, means operable by a displacement of said center bar and providing cooperating inclined surfaces on the center-bar and core-leaves respectively for causing the collapse of the core-leaves, and means operable by a displacement of said center bar and providing cooperating inclined surfaces on the center-bar and core-leaves respectively for causing the expansion of the core-leaves, each set of inclined surfaces having a similar pitch.

2. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means operable by a displacement of said center bar and on the center-bar and the core leaves respectively having cooperating inclined surfaces and being arranged to support the core leaves and to exert a collapsing action thereon, and means operable by a displacement of said center bar and on the center-bar and the core leaves having inclined surfaces arranged to exert an expanding action on the core leaves, all of said inclined surfaces having the same pitch.

3. Apparatus of the character described, comprising a center bar, a plurality of core leaves, a cup-shaped member carried by the center-bar having a flange with an inclined inner surface, an element carried by each core leaf and provided with an inclined surface adapted to cooperate with the surface of said cup-shaped member, a wedge carried by the center-bar, and an element carried by each core leaf and provided with an inclined surface adapted to cooperate with the inclined surface of said wedge, each of said inclined surfaces having the same pitch.

4. Apparatus of the character described, comprising a center-bar, a plurality of independent core leaves, means operable by a displacement of said center bar and providing cooperating inclined surfaces on the center-bar and core leaves respectively for causing the collapse of the core leaves, means operable by a displacement of said center bar and providing cooperating inclined surfaces on the center-bar and core leaves respectively for causing the expansion of the core leaves, all of said inclined surfaces having the same pitch, and means to prevent the relative rotation of said center-bar and said core leaves.

5. Apparatus of the character described, comprising a driving cap, a center-bar, a plurality of core leaves removably supported thereon, and means for normally preventing the removal of said core leaves and including means independently interposed between said driving cap and said core leaves adapted to be displaced and when displaced to permit the removal of the core-leaves.

6. Apparatus of the character described, comprising a cap, a center-bar, a plurality of core leaves removably carried thereon, means independently interposed between said cap and said core leaves for preventing the removal of said core leaves, said means including a displaceable member the displacement of which will permit the removal of the core leaves.

7. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the collapse of the core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the expansion of the core leaves, the former means serving to prevent lateral movement of the core leaves when the expanding means is in operative position, means serving normally to prevent relative longitudinal movement of the center-bar and the core leaves beyond said position and including means displaceable laterally from a point above said core leaves to permit said core leaves to be moved relatively of said center-bar beyond said position.

8. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the collapse of the core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the expansion of the core leaves, the former means serving to prevent lateral movement of the core leaves when the expanding means is in operative position, means serving normally to prevent relative longitudinal movement of the center-bar and the core leaves beyond said position and including means displaceable laterally from a point above said core leaves to permit said core leaves to be moved relatively of said center-bar beyond said position, and cooperating means on said center-bar and said core leaves to prevent rotary movement of said core leaves with respect to said center-bar.

9. Apparatus of the character described, comprising a center-bar, a cap at the upper end of the bar, a plurality of independent core leaves, cooperating elements on the center-bar and core leaves for limiting the expansion of the core leaves, said elements being

arranged to permit the withdrawal of said core leaves, and displaceable means interposed between said cap and core leaves for normally preventing the separation of said core leaves.

10. Apparatus of the character described, comprising a center-bar, a cup-shaped member carried thereby, a plurality of independent core leaves, each of said core leaves being provided with an inwardly and downwardly extending element adapted to cooperate with said cup-shaped member for retaining said core leaves and for causing the collapse of the same when the center-bar is moved upwardly, means including said collapsing means for limiting the expansion of said core leaves, removable means for normally preventing the withdrawal of said downwardly extending elements from said cup-shaped member, such withdrawal being permitted upon the removal of said removable means.

11. Apparatus of the character described, comprising a driving cap, a center-bar secured thereto, a plurality of core leaves arranged to have a limited longitudinal movement with respect to the center-bar, cooperating wedging means on the center-bar and the core leaves, a member interposed between said driving cap and said core leaves and arranged to partake in the support of the latter, said interposed member being mounted for longitudinal movement with respect to the center-bar, and latch means pivotally connected with said interposed member for releasably holding the same against said driving cap.

12. Apparatus of the character described, comprising a center-bar, socket means on the center-bar, a plurality of core-leaves each provided with an element adapted to extend within said socket means for retaining the core-leaves, a cap at the upper end of said center-bar, and means interposed between said cap and the upper end of said core-leaves for normally preventing the withdrawal of said downwardly extending elements from said socket means, said interposed means including removable means upon the removal of which said retaining elements may be withdrawn from said socket means.

13. Apparatus of the character described, comprising a driving cap, a center-bar secured thereto, a plurality of independent core-leaves, means for expanding said core-leaves in response to the movement of the center-bar in one direction, means contracting the core-leaves in response to the center-bar in another direction, the latter means being arranged to limit the lateral movement of the core-leaves, means interposed between the driving cap and the core-leaves for retaining said collapsing means in movement-limiting position, said interposed means including displaceable means upon the displacement of which the core-leaves may be moved laterally and removed from the center-bar.

14. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, cooperating wedging members on said center-bar and said core leaves, at least one of the wedging members on the center-bar being arranged to take part in the support of said core leaves, said center-bar provided with a groove beneath said supporting member, and a ring in said groove adapted positively to prevent the downward movement of said supporting member.

15. Apparatus of the character described, comprising a center-bar, a cup-shaped member on said center-bar, a plurality of core-leaves, means on each core-leaf to carry the same on said cup-shaped member, a groove in said center-bar beneath said cup-shaped member, and a ring in said groove adapted positively to prevent downward movement of said cup-shaped member.

16. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, a core leaf supporting member on said center-bar, and means providing a shoulder on said center-bar positively to prevent the downward movement of said supporting member.

17. Apparatus of the character described, comprising a center-bar, a cup-shaped member on said center-bar, a plurality of core leaves, means on each core leaf to carry the same on said cup-shaped member, and means providing a shoulder on said center-bar positively to prevent downward movement of said cup-shaped member.

18. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means spaced along the center-bar and the core leaves to expand and collapse said core leaves in response to downward and upward movement, respectively, of the center-bar relative thereto, means at the top of said center-bar adapted to receive blows of a driving hammer, said center-bar having its greatest diameter at a point intermediate its ends, its periphery being stepped inwardly from said central portion to smaller-diameter portions at its ends.

19. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, wedging means spaced along the center-bar and the core leaves to expand and collapse said core leaves in response to downward and upward movement, respectively, of the center-bar relative thereto, means at the top of said center-bar adapted to receive blows of a driving hammer, said center-bar having its greatest diameter at a point intermediate its ends, its periphery being stepped inwardly from said central portion to smaller-diameter portions at its ends, certain of the stepped portions of the center-bar providing shoulders, certain of said

spaced wedging means being mounted on said center-bar against said shoulders.

20. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, wedging means spaced along the center-bar and the core leaves to expand and collapse said core leaves in response to downward and upward movement, respectively, of the center-bar relative thereto, said center-bar being formed to provide shoulders for supporting certain of the wedging means thereon and for positively stopping the motion of said certain wedging means therepast.

21. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, a wedging member carried by the center-bar, and means on the center-bar providing a shoulder beneath said wedging member to support the same and positively to stop the motion thereof therepast.

22. Apparatus of the character described comprising a center-bar, a plurality of core leaves, a wedging member carried by said center-bar, and an annular shoulder on said center-bar beneath said wedging member to support the same and positively to stop the passage of said member therepast.

23. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means spaced along the center-bar and the core leaves to expand and collapse said core leaves in response to downward and upward movement, respectively, of the center-bar relative thereto, and means at the top of said center-bar adapted to receive blows of a driving hammer, said center-bar having its greatest diameter at a point intermediate its ends, its periphery being stepped inwardly from said central portion to smaller-diameter portions at its ends, the stepped portion of the center-bar upwardly from its central portion providing shoulders for supporting certain of the expanding and contracting means on the center-bar.

24. Apparatus of the character described, comprising a center-bar, a plurality of core leaves separably mounted thereon, cooperating wedging means on said center-bar and said core leaves, an annular member extending about the upper portion of the center-bar and above the upper ends of the core leaves, a driving-cap secured to the upper end of the center-bar, means for releasably connecting said annular member with the driving cap, and a member providing slots with radial sides and members extending inwardly carried by the annular member and the core leaves, respectively, for preventing relative rotation of the last-mentioned members.

25. Apparatus of the character described, comprising a center-bar, a plurality of independent core leaves, cooperating means on the center-bar and core leaves for expanding the leaves, cooperating elements on the center-bar and core leaves for collapsing the leaves, means to limit the relative longitudinal movement of the center-bar and the core leaves, said collapsing means acting to prevent the removal of the core leaves when the same are moved between said limits, said limiting means including detachable spacing means disposed in a path of movement of said core leaves, to prevent the removal of said core leaves except when the spacing means is detached.

26. Apparatus of the character described, comprising a center-bar, a plurality of independent core leaves, cooperating means on the center-bar and core leaves for expanding the leaves, cooperating elements on the center-bar and core leaves for collapsing the leaves, means to limit the relative longitudinal movement of the center-bar and the core leaves, said collapsing means acting to prevent the removal of the core leaves when the same are moved between said limits, said limiting means including detachable spacing means which when detached permits the removal of said core leaves, said detachable spacing means including ring segments detachably secured one to another.

27. Apparatus of the character described, comprising a center-bar, a plurality of core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the collapse of the core leaves, means providing cooperating inclined surfaces on the center-bar and core leaves for causing the expansion of the core leaves, the former means serving to prevent lateral movement of the core leaves when the expanding means is in operative position, means serving normally to prevent relative longitudinal movement of the center-bar and the core leaves beyond said position and including means displaceable laterally from a point above said core leaves to permit said core leaves to be moved relatively of said center-bar beyond said position, and cooperating means on said center-bar and said core leaves to prevent rotary movement of said core leaves with respect to said center-bar, said center-bar providing shoulders for supporting certain of said surface-providing means on said center-bar.

28. Apparatus of the character described, comprising a center-bar, a cap at the upper end of said bar, a plurality of core leaves, means providing cooperating inclined surfaces on said center-bar and core leaves for causing the collapse of said core leaves from an expanded position, means serving normally to prevent relative longitudinal movement of said center-bar and said core leaves beyond said expanded position extending in part horizontally between said leaves and said cap, and including a plurality of elements disposed annularly about said center bar, and means releasable for retaining said elements in place whereby upon the release

of said releasable means said elements may be radially removed out of the path of the vertical movement of said core leaves for permitting the removal of said core leaves relatively of said center-bar beyond said expanded position.

29. Apparatus of the character described, comprising a center-bar, a cap at the upper end of said bar, a plurality of core leaves, means providing cooperating inclined surfaces on said center-bar and core leaves for causing the collapse of said core leaves from an expanded portion, and means serving normally to prevent relative longitudinal movement of said center-bar and said core leaves beyond said expanded position extending in part horizontally between said leaves and said cap, and including a plurality of elements disposed annularly about said center-bar, and releasable bolts for retaining said elements in place whereby upon the release of said releasable bolts said elements may be radially removed out of the path of the vertical movement of said core leaves for permitting the removal of said core leaves relatively of said center-bar beyond said expanded position.

30. Apparatus of the character described, comprising a center bar, a plurality of core-leaves, means providing cooperating inclined surfaces on the center bar and core-leaves, respectively, for causing the collapse of the core-leaves and adapted to be operated by a force, the application of which thereafter advances said apparatus, and means providing cooperating inclined surfaces on the center bar and core-leaves, respectively, for causing the expansion of the core-leaves and being adapted to be operated by force, the application of which thereafter lifts said apparatus.

In testimony whereof I affix my signature.

JOHN M. DEALY.