

A. B. CLARK.
 PILE SINKING APPARATUS.
 APPLICATION FILED OCT. 21, 1905.

1,005,693.

Patented Oct. 10, 1911.

2 SHEETS-SHEET 1.

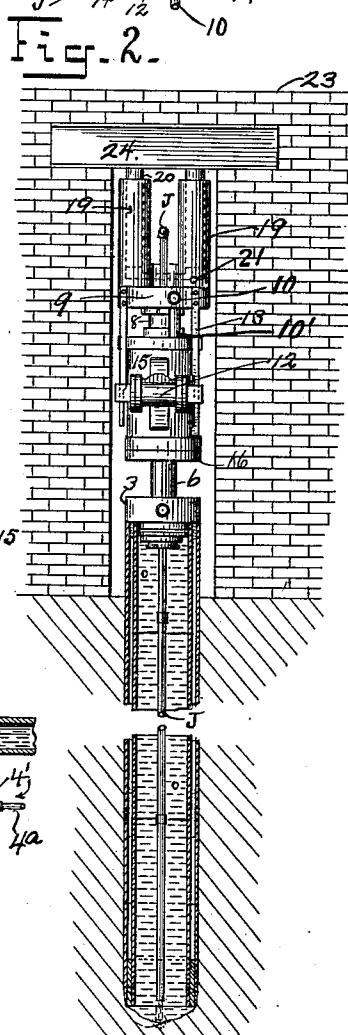
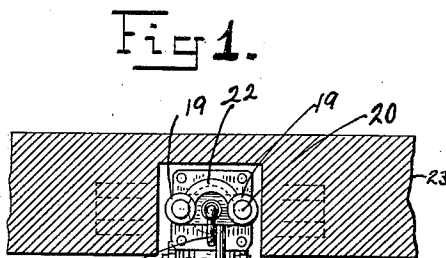
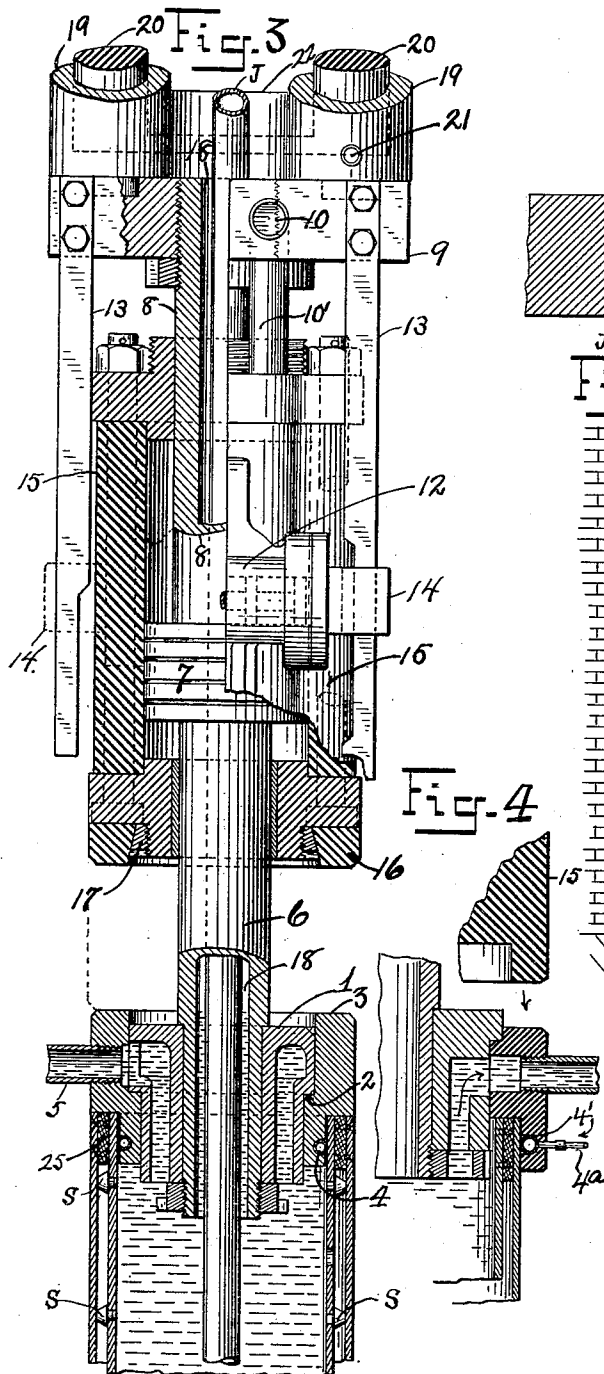


Fig. 4

Witnesses
 E. M. Howl
 H. K. Hume

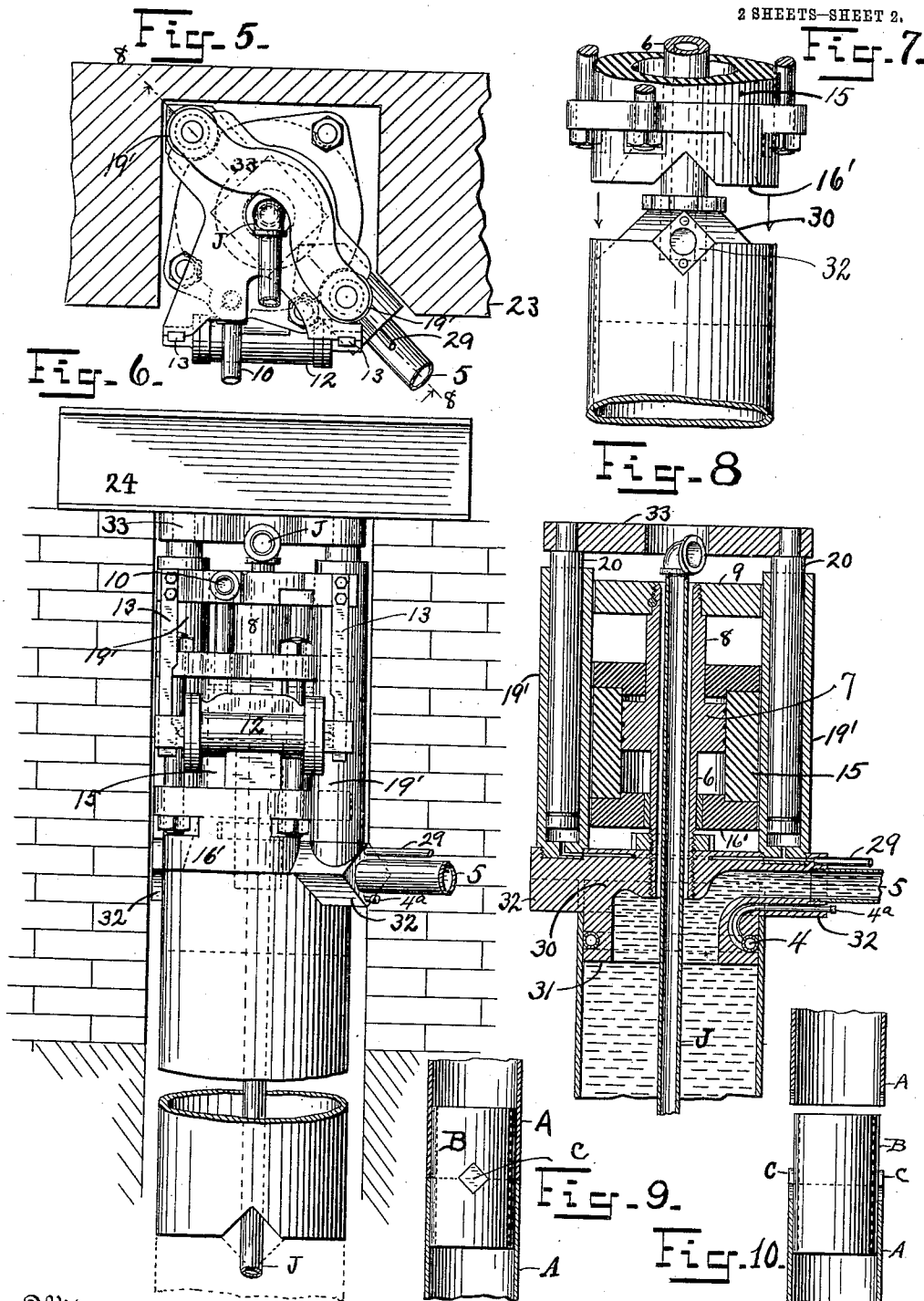
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2 SHEETS-SHEET 2.



Witnesses
 E. M. Howe
 W. H. Moore

A. B. Clark Inventor
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UNITED STATES PATENT OFFICE.

AMASA B. CLARK, OF NEW YORK, N. Y.

PILE-SINKING APPARATUS.

1,005,693.

Specification of Letters Patent.

Patented Oct. 10, 1911.

Application filed October 21, 1905. Serial No. 283,757.

To all whom it may concern:

Be it known that I, AMASA B. CLARK, a citizen of the United States, residing in the city, county, and State of New York, have
5 invented certain new and useful Improvements in Pile-Sinking Apparatus, of which the following is a full, true, and concise specification.

My invention relates to means for sinking
10 ing piles beneath existing structures, and more particularly to means for sinking tubular piles; and the invention further relates to the formation, construction and relative arrangement of the several me-
15 chanical parts and to combinations and sub-combinations thereof, whereby the principle of the said invention may be effectively carried out, all as will be fully described below the more particularly pointed out in
20 the accompanying claims.

Referring to the accompanying drawings forming a part hereof, and in which like reference characters designate like parts throughout,

25 Figures 1 and 2 are respectively plan and side elevation of one form of my invention in position beneath an existing wall, the pile being shown in section in Fig. 2 as of the double sectional or telescopic type,
30 which said pile is constructed according to the invention disclosed and claimed in another application filed by me July 8, 1905, Serial Number 268,810. Fig. 3 is an enlarged side elevation of the same apparatus
35 with parts broken away in vertical central section; Fig. 4 is a detail of a modification of the follower-block of this apparatus; Figs. 5 and 6 are respectively plan and side elevation of another form of apparatus embody-
40 ing this invention, shown in position and as operating upon a single tube sectional pile according to the pending application above referred to; Fig. 7 is a detail side elevation of the standard, hammer element and
45 pile end, as exhibited in Fig. 6; Fig. 8 is a central vertical section of this apparatus on line 8—8 of Fig. 5, and Figs. 9 and 10 are details illustrating the couplings between the pile sections of the pile of Fig. 6.

50 Referring first to the apparatus shown in Figs 1—3, the reference 1 indicates a base piece or standard which is adapted to rest upon or over the end of the pile to be driven and to support the pile-sinking apparatus
55 thereon. As shown in this form of the invention, this standard is formed as an

annular block with a laterally projecting ledge 2 formed thereon, which rests upon a corresponding interior shoulder on an annular follower block 3, which latter sets directly
60 upon the end or edge of the pile. For use with tubular piles the standard and follower block are of such formation as to close the open end thereof, the follower block being provided with a packing ring 4, if neces-
65 sary, and the standard is cored out or provided with an aperture which affords an escape for the contents of the said pile, through the registering orifice and pipe 5 in the said block. The standard is centrally
70 secured to or formed on a piston rod 6 which supports a piston 7 and also an upward extension 8, formed as an axial extension of said piston rod, and on the end of said extension there is carried a cross-head 9 which
75 serves as the immediate support for a power-actuated expansive instrument presently to be explained. A hammer cylinder 15 surrounds the piston 7 and is adapted to be reciprocated by means of any suitable
80 motive power, such for example as compressed air or steam, which is admitted by the feed pipe 10 on the crosshead through the tube 10' into the valve chest 12 carried by the cylinder at one side thereof. The valve
85 mechanism, which may be of any desired type, admits the fluid pressure alternately to opposite sides of the piston so as to cause the proper reciprocation of the cylinder, and is controlled to this end by means
90 of the properly formed cams on two stationary cam rods 13, the latter being secured to the cross-head 9 and having their lower ends protruded through the eyes 14 at the ends of the reciprocating valve chest.
95

It will be obvious that the valve gearing just described is only one of various means for properly controlling the admission of the motive force to the motor mechanism and that other kinds of gearing may also
100 be employed according to the desire of the maker of the nature of the motive power available. Similarly, the valve chest may be located on the cross-head instead of upon the reciprocating cylinder and the fluid
105 pressure instead of passing through a single tube 10' may pass through a suitable duct formed in the extension or rod 8 and not shown herein. Indeed, the valve chest will be omitted entirely when the motor mechanism
110 is of the so-called valveless type, and the several ports are provided in the piston and

walls of the cylinder. The hammer cylinder 15, which may be formed in the ordinary manner as shown, is preferably provided for sake of economy with a removable striking piece 16, annular in form and secured there-
 5 to by means of a threaded locking ring 17, which screw onto the lower cylinder-head, the engaging contact between the ring and striking piece being conical so as to cause
 10 the latter to bind against the cylinder.

For use in sinking tubular piles the stationary piston rod 6, piston 7 and the rod 8 are formed hollow so as to provide an aperture 18 from end to end through the entire
 15 motor-driven mechanism and its standard. This aperture is for the reception of a jet-pipe J through which a stream of water may be forced to loosen the soil and facilitate the descent of the pile, the water and soil escap-
 20 ing from the pile through the hollow standard 1 and the lateral escape passage 5, but it is possible, if necessary or convenient, to make the aperture 18 of relatively large diameter so that the contents of the pile can
 25 find their escape through the annular passage surrounding the said jet pipe and overflow at the top of the rod 8, in which case the passage 5 would of course not be necessary. The features of the formation and
 30 location of the jet pipe aperture are fully described and claimed in a copending application filed by me September 5, 1905. With piles not tubular, nor adapted to be
 35 jetted from the interior, these features are manifestly not required.

The tubular rod 8 besides serving to provide an isolated jet pipe aperture through the motor mechanism, serves also as the pressure transmitting support of the cross-
 40 head 9 above referred to. The said cross-head may be integral with the rod if preferred, but is shown herein as connected to it by a threaded engagement and lock nut.

The expansive instrument above referred
 45 to consists of two fluid-pressure jacks having their cylinders 19 mounted on said cross-head at opposite ends thereof, so as not to interfere with the manipulation of the jet-pipe J between them. The cylinders
 50 contain plungers 20 and the fluid pressure for expelling them is introduced at the point marked 21, the two cylinders being in communication through the connecting
 55 bridge 22, which is also curved as shown in Fig. 1 so as to give adequate clearance to the jet-pipe.

In the operation of sinking a pile underneath an existing wall such as shown at 23, a niche is first cut therein, as indicated, and
 60 the header beams 24 are put in place. The first or bottom section of the pile is then placed in the niche directly beneath the overhanging wall and the pile sinking apparatus is placed on the end of the pile, be-
 65 tween it and the header beams. The fol-

lower block should of course be of such diameter that it will rest squarely upon the end of the pile, but as the said block is freely removable, if one block does not fit, another that does, may be readily substituted for it. By introducing hydraulic or
 70 other suitable pressure into the jacks, their plungers are caused to press against the header beams and by acting against this abutment to exert a constant downward
 75 pressure through the standard and interposed follower block upon the pile. Simultaneously with the exerting of this force, the additional force of the motor-driven hammer mechanism, acting in the same
 80 downward direction, may be applied to the pile. At the same time or when needed the jet pipe may be employed in its customary office. The constant force due to the expansion of the jacks may or may not be sufficient of itself to push the pile into the soil,
 85 but in any event its effect is to assist the action of the hammer mechanism and hold it in place, if not to exert an impelling force upon the pile which keeps it constantly in
 90 motion downward. When the first pile section has been sunk to a proper depth, other sections are superposed thereon, successively until a sectional pile has been
 95 formed of sufficient length, whereupon the apparatus and jet-pipe may be removed and a suitable pressure resisting column inserted between the head of the pile and the header beams, such as will adequately support the weight of the wall.
 100

The pile shown in Figs. 2-4, is formed of telescopic sections of pipe, the inner sections overlapping the joints of the outer sections, and being centralized therein by
 105 the spacers S. In order to prevent the water inside the pile from leaking out of the annular space between the sections, a packing 25 may be inserted in said space as shown in Fig. 3.

In Fig. 4 the construction of the follower
 110 block is modified to fit over the outside of the pile instead of inside and the packing ring 4', which is inflatable by means of tube 4^a, also has contact with the outside of the pile. This follower block is of course re-
 115 movable from the standard and therefore interchangeable with others of different size.

Referring now to Figs. 5-8, the motor mechanism is substantially the same as that previously described, being comprised of
 120 a stationary piston-rod 6, piston 7, and tubular rod 8, and having a valve chest 12 formed in the cylinder 15 and operated by cam rods 13. The standard 30, by which said mechanism is supported, occupies a por-
 125 tion only of the terminal area or upper edge of the tubular pile, so that the rest of the said area or edge is left exposed to receive the impact of the hammer element; thereby the mechanism of this invention is enabled
 130

to rest directly on the pile while operating upon it. The said standard or base is formed with a cylindrical portion 31 which is adapted to extend below the end of the pile and fits therein or thereon either directly or by means of a superposed and interchangeable filler ring not herein shown, and a suitable packing ring 4, inflatable or otherwise, is desirably provided in said lower portion.

The upper portion of the standard is in the form of two opposite lateral projections 32, which are adapted to rest over or upon the end of the pile and support the downward pressure of the apparatus. These projections are capable of assuming a variety of forms, but as shown herein are shaped so as to be serviceable with a special kind of sectional pile, which said pile is fully described and claimed in the application first above referred to, and is also shown in Figs. 9 and 10 herein. It consists of a number of superposed sections A, A of pipe held with their ends in registry by means of interior short pipe sections or unions B overlapping said ends; and the short section B is held in place by means of square lugs C which rest in V-shape notches respectively cut in the ends of said sections A. The lateral projections 32 seat in the notches of the uppermost section of the pile and the stationary piston rod 6 is fastened to the standard 30 by the screw thread joint shown or in any other suitable manner. For tubular piles capable of jetting, the standard is made hollow or apertured so that the contents of the pile can escape laterally to the outside through one of the projections 32 and the piston rod, piston and rod 8 are also hollow to provide a jet-pipe aperture as before. When the packing ring 4 is inflatable, the duct 4^a for inflating the same may also pass through the same projection 32, as shown in Fig. 8. The reciprocating hammer cylinder 15 has its striking piece 16' integral with or fastened to the lower head thereof, and notched, as clearly shown in Fig. 7, to accommodate the lateral projections 32. The cylinder head or its striking piece delivers its blow directly to the end of the pile section on opposite sides of the standard projections and a follower block is not necessary, although one might be employed. On each projection 32, and on diametrically opposite sides of the cylinder, is mounted the cylinder 19' of a fluid pressure jack, the said cylinders being connected at their tops with the cross-head 9 on the rod 8, and the plungers 20 being also united by a pressure plate 33. The fluid pressure for operating the jacks is introduced through the duct 29, in the projection 32, and passes simultaneously into each cylinder. The hammer cylinder 15 is fitted between the jack cylinders 19' so as to be guided thereby and prevented from turning on its axis during its

reciprocation. In operation the apparatus of this form is inserted between the top of the first pile section and the header beams, the same as the form first described, and the expansion of the jacks acting against the abutment exerts a downward pressure on the pile through the lateral projections 32, in obvious manner. The simultaneous operation of the reciprocating hammer element, delivering its blows to the exposed end of the pile as above explained, produces substantially the same effect as that produced by the apparatus of Figs. 1—3. The valve chest 12, the position of which determines the front of the apparatus, is located nearer to one jack cylinder than the other, as shown in the drawings, and the feed pipe 10 is also located on the same side of the cross-head 9 as the valve chest, so that the jack cylinder and the cross-head and presser plate assumes a diagonal position with respect to the front of the apparatus, thereby permitting the same to be inserted and operated in a smaller niche in the wall than would otherwise be the case. It will be observed, however, that neither form of the invention as above described requires a niche of much greater width than the diameter of the pile and that especially in the last described form the height of the niche is reduced to a minimum.

Having described my invention, what I claim and desire to secure by United States Letters Patent, is:—

1. The herein described method of sinking piles, which consists in expanding a suitable instrument between the pile and a fixed abutment to thereby exert a constant downward pressure upon said pile and simultaneously imparting a succession of downwardly directed hammer blows to said pile, substantially as described.

2. In a pile sinking apparatus, the combination of an expansive means adapted to act against an abutment and exert a constant downward pressure upon the pile, with a hammer mechanism adapted to exert a succession of blows against said pile in the same direction.

3. In a pile sinking apparatus, a motor-driven hammer mechanism provided with a standard or base adapted to rest upon the pile, combined with an expansive instrument supported by said standard and adapted to act against a fixed abutment to exert a downward pressure on said pile.

4. A pile sinking apparatus comprising a fluid pressure jack and a motor-driven hammer mechanism, united to exert their energies in the same direction and a single supporting standard therefor adapted to rest upon the pile.

5. A pile sinking apparatus comprising a motor-driven hammer mechanism and an expansive instrument located in parallel re-

lation to and by the side of said hammer mechanism, said instrument being adapted to expand against an abutment and exert its energy in the same direction as said hammer mechanism.

6. In a pile sinking apparatus, a motor-driven hammer mechanism and an expansive instrument adapted to be expanded against an abutment to exert a downward pressure on the pile, in combination with a single supporting standard for said mechanism and instrument adapted to rest upon the end of the pile and provided with a channel or aperture leading into the interior of said pile.

7. In a pile sinking apparatus, a motor-driven hammer mechanism comprising a stationary piston, a reciprocating cylinder, and means for supporting said stationary piston upon the pile, in combination with an expansive instrument supported by said means and adapted to expand against an abutment and exert a downward pressure upon the pile.

8. A motor-driven hammer mechanism comprising a stationary piston and piston rod, and a reciprocating cylinder surrounding the same, in combination with a standard on the base of said rod adapted to rest upon and within the end of a tubular pile, whereby said cylinder is held in position to impart its energy to the end of the pile.

9. A motor-driven hammer mechanism, comprising a standard adapted to rest upon the pile, a piston rod mounted on said standard and provided with a downwardly extending piston, and a reciprocating cylinder surrounding the latter, in combination with an upward extension on the other side of said piston and a cross-head secured to said extension.

10. In a motor driven hammer mechanism a piston and piston rod, means for mounting one end of said rod upon the end of the pile as a support for the said piston, in combination with a hammer cylinder surrounding said piston and means for introducing fluid pressure alternately into said cylinder on opposite sides of said piston.

11. A motor driven hammer mechanism comprising a stationary piston rod and a base therefor adapted to rest in a recess formed in the end of a tubular pile, in combination with a piston on said rod and a hammer cylinder surrounding said piston.

12. A motor driven hammer-mechanism comprising a hollow support adapted to rest upon a portion of the terminal area of a pile, motor mechanism surrounding said support and a hammer, actuated thereby, adapted to act against the remainder of said area.

13. A motor-driven hammer mechanism for sinking tubular piles, comprising a standard adapted to support said mecha-

nism upon and maintain the same in alignment with the pile, said standard being provided with a portion resting upon or over the end of said pile and having another portion extending into the interior thereof.

14. In a motor-driven hammer mechanism for sinking tubular piles, a standard or base for supporting said mechanism on the pile upon which it operates, said standard comprising lateral projections adapted to rest in recesses or notches in the end of the pile and having a part below said projections located within the said tubular pile.

15. In a motor-driven hammer mechanism, a standard for supporting the same on the pile upon which it operates, comprising lateral projections which are adapted to rest upon the end of a pile, in combination with the hammer element of said mechanism formed to act on opposite sides of said projections.

16. In a motor-driven hammer mechanism for tubular piles, the combination of a supporting standard therefor having a part extended below the pile for lateral support thereon and a lateral projection adapted to rest on the end of the pile, with a reciprocating hammer element adapted to impart its energy to the end of said pile and recessed to accommodate said projection.

17. In a motor-driven hammer mechanism for tubular piles, the combination of a supporting standard therefor having a part within the pile and projections adapted to rest in a notch in the end thereof, with a reciprocating hammer element adapted to impart its energy to said pile on opposite sides of said projections.

18. In a motor-driven hammer mechanism for tubular piles, a supporting standard therefor having a part adapted to extend below the top of the pile and a part adapted to rest over the edge thereof, the said standard being apertured to provide a communication with the interior of said pile.

19. In a motor-driven hammer mechanism for tubular piles, a supporting standard therefor having a part adapted to fit within and close the end of the pile and a part adapted to rest over the edge thereof, the said standard being apertured vertically and laterally to provide ingress and egress passages to the interior of the pile.

20. In a motor-driven hammer mechanism for tubular piles, a standard for supporting the same upon the pile having a part adapted to fit within and close the end of said pile and a lateral projection adapted to rest upon the edge thereof, the said standard being provided with an aperture or passage leading from the interior of the pile, through said lateral projection, to the exterior thereof.

21. In a motor driven hammer mechanism for tubular piles the combination of a base

or standard adapted to rest on the end of the pile and a packing interposed between said base and pile.

22. In a motor-driven hammer mechanism for tubular piles, a standard for supporting the same upon the pile comprising an inner part adapted to fit within and close the end of the pile and lateral projections adapted to rest upon the edge thereof, in combination with an inflatable packing on said inner part and a channel formed in one of said lateral projections through which said packing may be inflated.

23. In a pile sinking apparatus, the combination of a motor-driven hammer mechanism and a standard to support the same on the pile, having a part extending within the pile and a lateral projection resting upon the edge of the pile, with a fluid pressure jack mounted on said projection at the side of said mechanism.

24. In a pile sinking apparatus, the combination of a motor-driven hammer mechanism, a fluid pressure jack, and a single standard upon which the same are mounted and by which they are supported upon the pile, said standard being provided with a fluid pressure supply port for the said jack.

25. In a pile sinking apparatus, a motor-driven hammer mechanism and a standard by which the same is supported upon the end of a pile, in combination with fluid pressure jacks located on said standard on opposite sides of said mechanism.

26. In a pile sinking apparatus, a pair of fluid pressure jacks and a motor-driven hammer mechanism located between them, in combination with a common standard for said jacks and mechanism, adapted to rest on the end of a pile.

27. In a pile sinking apparatus, a pair of fluid pressure jacks and a motor-driven hammer mechanism located between them, in combination with a valve mechanism for said hammer mechanism located at the side thereof and nearer to one of said jacks than to the other.

28. In a pile sinking apparatus, a standard adapted to rest upon the pile, a motor-driven hammer mechanism supported by said standard, in combination with fluid pressure cylinders on said standard at opposite sides of said mechanism, a cross-head joining the upper portions of said cylinders and plungers working in said cylinders.

29. In a tubular pile sinking apparatus, the combination of a standard adapted to rest upon the end of a pile, with an expansive instrument and a motor-driven hammer mechanism supported by said standard and adapted to exert their energies in the same

direction, said mechanism and standard being provided with an aperture from end to end thereof leading into the interior of the pile.

30. In a pile sinking apparatus, a standard, a motor mechanism supported on said standard and a hammer element reciprocated thereby, in combination with a cylinder on said standard with which said hammer element has sliding engagement and a plunger working in said cylinder.

31. In a pile sinking apparatus, a standard, a stationary piston supported thereon, side cylinders on said standard having plungers therein, and a cross-head for said cylinders, in combination with a reciprocating hammer cylinder surrounding said piston and having sliding engagement with said side cylinders.

32. In a motor driven hammer mechanism for tubular piles, a central support therefor adapted to support said mechanism upon the pile and comprising a closure for the end of said pile and a hole through said closure leading from the interior of the pile to the exterior thereof.

33. In a motor-driven hammer-mechanism, a central support provided with a standard adapted to rest on the marginal portion of the pile, a reciprocating hammer surrounding said central support having an extended striking surface adapted to act on said marginal portion at the side of said support.

34. The combination with a tubular pile of a motor driven hammer mechanism having a central support engaging the end of said pile and an annular hammer surrounding said support.

35. The combination with a tubular pile, of a motor driven hammer mechanism and a support therefor, said mechanism and support being mutually organized each to engage a portion of the edge of said tubular pile.

36. A motor driven hammer mechanism adapted for sinking tubular piles and comprising a supporting standard adapted to be supported in less than the entire terminal area of said tubular pile on opposite sides thereof whereby the remainder of said area is exposed to the impact of said hammer mechanism.

In testimony whereof, I have signed my name to the specification in the presence of two subscribing witnesses.

AMASA B. CLARK.

Witnesses:

H. G. KIMBALL,
OSCAR W. JEFFERY.