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PILE DRIVING POINT AND RAM FOR OPEN END PIPE PILES AND H-BEAM BEARING PILES

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Fig. 9

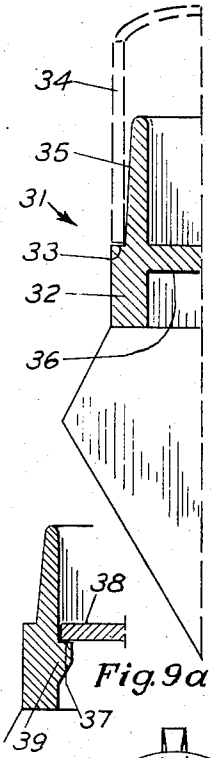
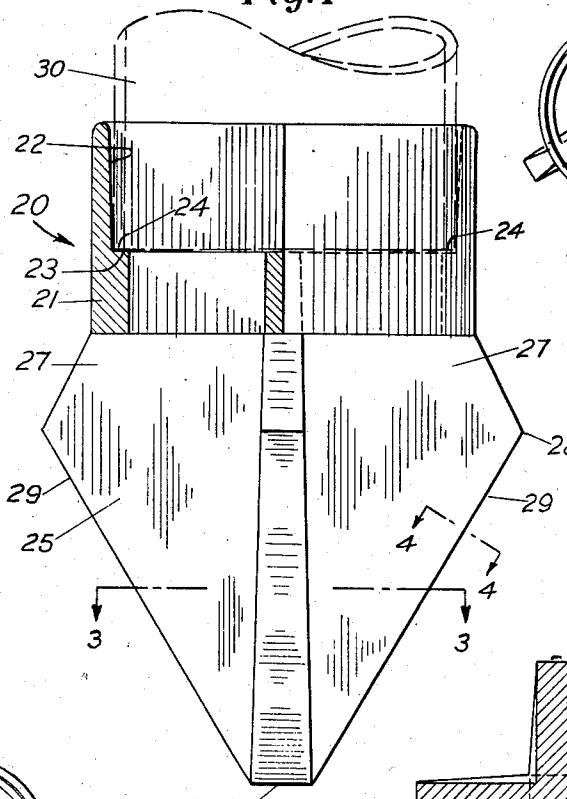


Fig. 1



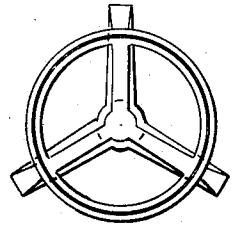


Fig. 7

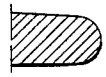


Fig. 4

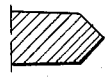


Fig. 5

Fig. 9a

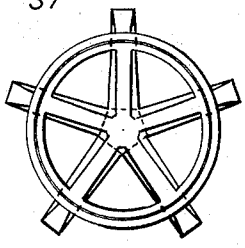


Fig. 8

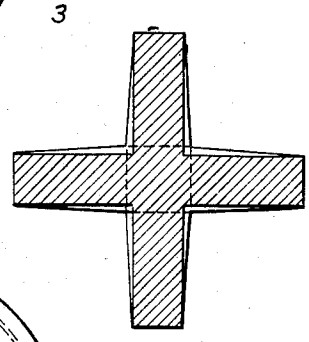


Fig. 3

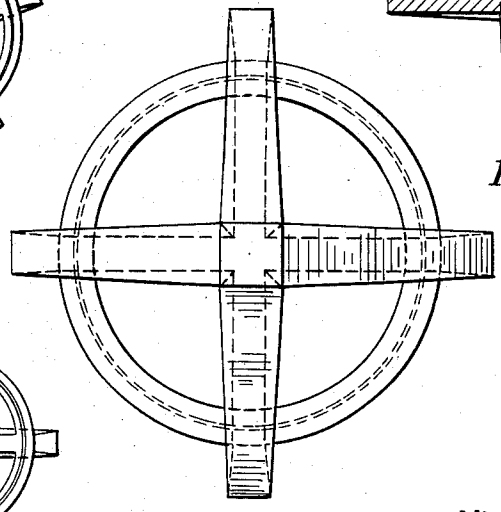


Fig. 2

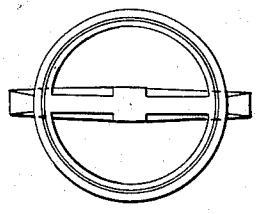


Fig. 6

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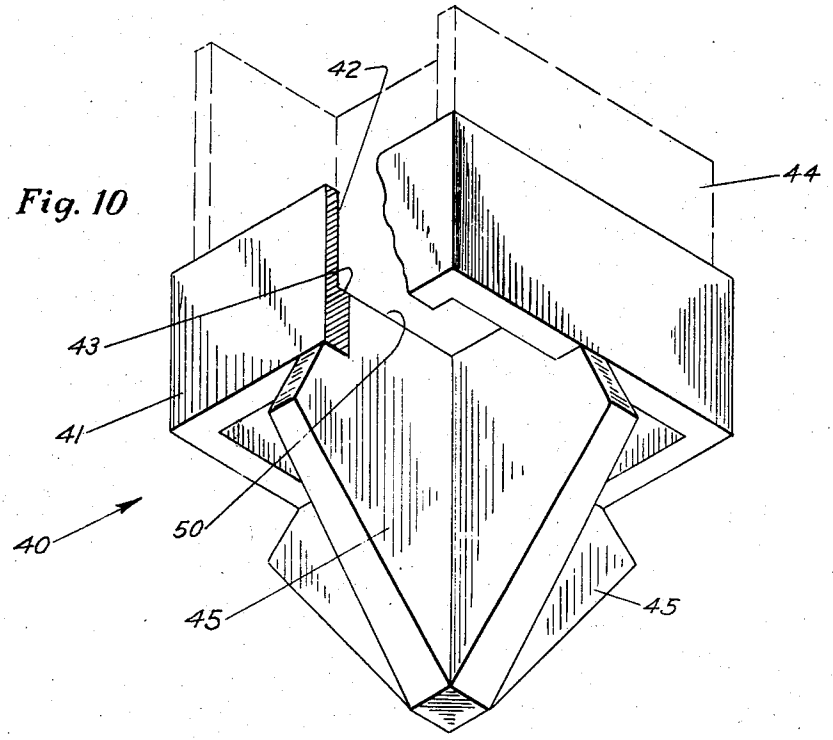
Fig. 10



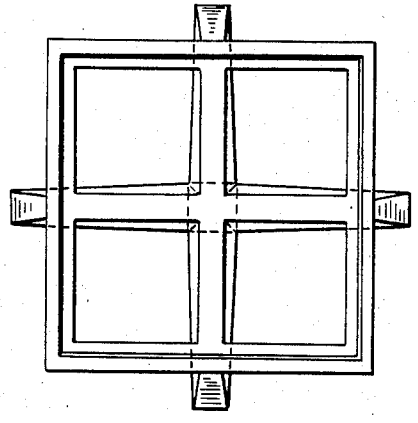


Fig. 11

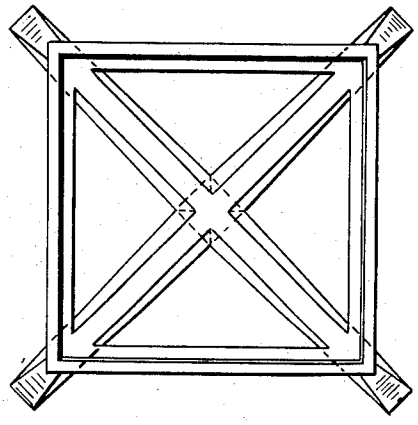


Fig. 12

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PILE DRIVING POINT AND RAM FOR OPEN END PIPE PILES AND H-BEAM BEARING PILES

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Application April 18, 1956, Serial No. 579,011

8 Claims. (Cl. 61—53)

This invention relates to tips or driving points and ram for open-end pipe piles and H-beam bearing piles and is a continuation-in-part of our patent application Serial No. 554,245, filed December 20, 1955.

Broadly, it is an object of the invention to provide a point to be used with open-end pipe piles and H-beam bearing piles as a tip for same in order to disperse large obstructions such as boulders, to act as a cutter or boulder breaker to clear the way of such obstructions, to prevent clogging of open-end pipes by large boulders and to protect the relatively weak ends of such piles from damage.

It is also an object of the invention to adopt this tip to closed end pipe piles and to mandrel driven shells similar to the tip described in our patent application Serial No. 554,245.

Open-end pipe piles and H-beam bearing piles are generally used only where the intention is to drive piles to rock. The material in the open-end pipe piles is blown out after driving and the pile is inspected. If the open-end pipe pile is not on rock it can be driven down further unless it is damaged. The difficulty in many cases, especially with piles 80 feet long or longer, is that on the way down to bedrock, layers of hardpan and boulders are generally encountered, especially in the region directly overlying rock so that the piles become damaged because of such obstructions. Our tips or points have been designed to overcome these difficulties. Open-end pipe piles are driven at the present time without any tip or point in almost all instances. Occasionally, a steel ring of some harder steel than the pipe itself is welded onto the pipe. Similar condition prevail with H-beam piles. This results in damaged piles, bent or doglegged. Such piles must be rejected resulting in great loss. In the case of open-end pipe piles, large boulders wedge themselves into the pipe which are exceedingly difficult and ofttimes impossible to dislodge or remove. In instances where attempts have been made to remove such boulders, a great deal of time is lost thus greatly increasing the cost. Under such conditions the steel ring welded to the end of the pipe is of no assistance whatever.

We have provided cross-blades on our tips or points so that large boulders cannot enter the pipe while loose material, such as sand, gravel, clay and silt are permitted to pass upward through the pipe. The blades will disperse large boulders, will cut through dense materials and will prevent the pile from being "hung up" before reaching acceptable bearing material or bedrock. Piles heretofore used are "hung up" rather often where the resistance of the material, especially hardpan or decomposed rock is so large that no amount of driving can overcome it. Our tips will attach themselves to bedrock and assure proper seating of the pile and will also protect pipe pile from collapsing or crumpling.

With the H-beam bearing pile, our tip will protect the bottom end of the flanges from collapsing or distortion. This is of great advantage with H-beam piles since no inspection after driving is possible.

When open-end pipe pile is driven, the earth it contains is blown out by compressed air, as heretofore stated, and the pipe is washed with a stream of water. The material around the tip of the pile is also washed leaving a base for concrete larger than the diameter of the pile. This is a distinct advantage since it gives the pile a larger and firmer hold on the underlying rock and greater security against lateral movement. In the case of shorter piles, where only occasional difficulty is met, the tip may be attached to a smaller pipe fitting into the pipe pile and used as a ram or spud inside of the larger pipe to clear it of wedged-in boulders or other material.

Our tips or points save a great deal in cost since the cost of but one ruined pile driven without protection of our point is many times the cost of a tip or point. It is, therefore, evident that our tips or points not only save a great deal in cost but also in time since a ruined pile must be corrected.

For a fuller understanding of the nature and objects of the invention, reference is made to the following detailed description in connection with the accompanying drawings in which:

Fig. 1 is a side elevation view of a four bladed pile tip for an open-end pipe pile, partly in vertical section, the pipe being seated within the collar of the tip;

Fig. 2 is a bottom view of the point or tip shown in Fig. 1;

Fig. 3 is a sectional view taken through line 3—3 of Fig. 1;

Fig. 4 is a partial sectional view of the end or edge of the blade taken through line 4—4 of Fig. 1;

Fig. 5 is a partial sectional view of a modified end or edge of a blade;

Figs. 6, 7 and 8 are top views of two, three and five bladed pile tips for open-end pipe pile, respectively;

Fig. 9 is a vertical sectional partial view of a modified pile tip which is seated within the end of a pipe and can be used as a closed end pile tip;

Fig. 9*a* is a vertical sectional partial view of another modified pile tip which is seated within the end of a pipe and can be used as a closed end pile tip.

Fig. 10 is an isometric view, partially cut away, of a modified four bladed pile tip for use with H-beam bearing piles, showing the blades used crosswise;

Fig. 11 is a top view of the point or tip shown in Fig. 10; and

Fig. 12 is a top view of a modified point or tip showing the blades used diagonally.

Referring to Figs. 1 to 5 of the drawings, numeral **20** represents a four bladed pile driving tip or point for open-end pipe piles, made preferably of cast steel but may be made of other material, such as cast iron, or other metals or alloyed metals. The upper end has a collar **21**, the inside wall **22** of which is slightly tapered outwardly at its inner circumference. The circumferential shoulder **23** is adapted to receive the end **24** of an open-end pipe pile **30**. Below collar **21** there are four blades or cutters **25**, each blade being in the form of about half a spear pointing downwardly. The distal blade end **26** is thicker than the upper blade end **27** at the collar **21** tapering gradually from the bottom or distal end **26** to the upper blade end **27**. The blades **25** are preferably of uniform size and the extreme edges **28** of each blade extend outwardly beyond the outer circumference of the collar **21**. For a ten inch pipe pile, we prefer to have a thickness of about 2 inches at the bottom **26** of the blade or at the point and about 1 inch in thickness at the upper portion of the blade **25** where it meets the collar **21**. The collar **21** is preferably about one-half inch thick above the shoulder **23** and about 1 inch thick

at its lower portion. Of course, the thickness of the tapering blades **25** and the collar **21** will vary depending upon the diameter of open-end pipe to be driven and the character of the metal used. The blade end **26** may be blunt as shown, or may be pointed, as shown in Fig. 5. The outer edges **29** may be square as shown in Fig. 3 or rounded, as shown in Fig. 4, or may be pointed, as shown in Fig. 5. The blades **25** also taper outwardly towards the vertical medial line, that is the blades **25** are somewhat thicker in the center than at the outer edges, as best shown in Figs. 2 and 3.

The collar **21** and blades **25** are preferably cast integrally. It is preferable to weld the pipe **30** to the tip **20** so that the tip or point **20** becomes an integral part of the pile. The tip or point **20** can also be readily adapted for closed end piles by casting or welding a horizontal steel plate **36** or **38** upon shoulder **23**.

The tapered inner wall **22** permits the end of pipe **30** to slide into the top opening until the end **24** of pipe **30** is properly seated.

It is evident that when the tip or point **20** is fastened or welded to smaller diameter pipe than the pipe to be driven, and the pipe to which the tip is fastened is of extra heavy wall thickness, such combination may then be readily used as a ram or spud, inside of larger pipe driven as a pile and can then be extracted.

Referring to Figs. 6, 7 and 8, these driving tips or points are similar in all respects to the four bladed pile driving tip of Figs. 1 to 5, except that such tips are for two, three and five blades, respectively. Such tips or points are used in the same manner as the tip shown and described in Figs. 1 to 5.

Referring to Fig. 9, this tip **31** is also very much like the tip of Figs. 1 to 5, except that the collar **32** has an outer circumferential shoulder **33** with the upper collar portion **35** tapered inwardly to fit inside the pipe pile **34** so that the pipe **34** can slide down the tapered collar portion **35** to the shoulder **33** and be somewhat wedged therein because of the taper. The shoulder **33** is wide enough to accommodate the thickness of pipe **34**. It is then preferable to weld the collar **32** and the pipe **34** together to insure that the tip will not become dislodged from the pipe when it is driven into the ground.

The tip **31** shown in Fig. 9 may be used for both open-end pipe pile or closed end piles since tip **31** has an integrally formed plate **36** closing the vertical opening of the collar **32**. When used for open-end pipe piles, plate **36** is omitted in casting.

Fig. *9a* shows a modification of Fig. 9 in that an inner shoulder **37** is employed to receive a steel plate **38**. The wall **39** is somewhat thickened below the plate **38** creating the shoulder **37**. The plate **38** may be inserted when desired for use with a closed end pile and may be welded to the tip as well as to the end of the pipe pile. It is possible to use the tips of Figs. 9 and *9a* for both open-end pipe pile and closed end piles.

Referring to Fig. 10, numeral **40** represents a four bladed pile driving tip for an H-beam bearing pile **44**. This tip is in most respects like the tip of Fig. 1 and the same description would apply, except that the collar **41** is substantially square. This inside wall **42** is also slightly tapered outwardly. The blades **45** extend upwardly within the collar **41** to the shoulder **43** so that the lower end of the H-beam pile rests upon the shoulder **43** and the top edge **50** of the blades **45**. In Fig. 11, the blades **45** are crosswise and in the modification, Fig. 12, the blades are positioned diagonally to the frame or collar **41**. The tapered inner wall **42** permits the lower end of the H-beam pile to slide into the top opening until it is properly seated. It is preferable to weld the tip **40** to the end of the H-beam pile so that the tip **40** becomes an integral part of the pile. Of course, it is evident that two, three and five or more blades can also be used with the substantially square collar **41** in a manner similar to Figs. 6, 7 and 8, except for the square collar. The blades **45** may also have the rounded edges of Fig. 4 or the pointed edges of Fig. 5.

It is also obvious that the cross blades need not necessarily be of the same width.

It should be noted that in all the forms shown the tip will disperse large boulders and permit looser material to pass through and upward (except for the closed forms when plates like **36**, **38** are used); will clear the way of obstructions for the pile; will cut through dense material and prevent "hung up" piles; the cross members will stop large boulders from entering pipe and thus prevent clogging of pipe; will protect pipe or H-beam from collapsing or crumpling; will attach itself to bedrock and assure proper seating; will result in large savings and when material in pile is cleaned out a broader base is assured for concrete around the tip which can be adapted both to open-end pipe piles or to shells of various kinds.

The driving points for the open-end pipe pile and the H-beam bearing pile can be made to accommodate the different standard sizes of pipe and H-beams now being used, and it is evident that the sizes and thicknesses of the points will vary with the size of the pipe and H-beams used and the character of the metal used for the points.

It is obvious that various changes and modifications may be made in the details of construction and arrangements of parts without departing from the general spirit of the invention.

We claim:

1. A pile driving point having a tip for an open-end pipe pile, said point comprising a hollow collar open at opposite ends and a multiplicity of identical blades disposed substantially parallel to the axis of said collar, said collar having an upper portion and a shoulder for seating said pipe pile, said blades intersecting one another below said shoulder, said blades being integral and angularly disposed to one another and having their extreme opposed edges sloping from the lower outer edge of said collar outwardly and downwardly to an outer edge beyond the outer wall of said collar and then tapering downwardly and inwardly toward said tip of said driving point, the length of said blades above said extreme outer edge being substantially less in length than the length of said blades below said extreme outer edge, each of said blades being symmetrical about a radial axis and being uniformly thickened from its upper to its lower end, said blades terminating in a blunt point.

2. The pile driving point set forth in claim 1, wherein said shoulder extends around the inner circumference of said collar and said upper portion tapers upwardly and outwardly above said shoulder.

3. The pile driving point set forth in claim 1, wherein said collar extends around the outer circumference of said shoulder and said upper portion tapers inwardly and upwardly above said shoulder.

4. A pile driving point and ram having a tip for open or closed end pile, said point comprising a hollow collar and a multiplicity of identical blades disposed substantially parallel to the axis of said collar, said collar having an outer circumferential shoulder for seating an open end pile and a bottom for seating a closed end pile, said blades intersecting one another below said shoulder, said blades being integral and angularly disposed to one another and having their extreme opposed edges sloping from the lower outer edge of said collar outwardly and downwardly to an outer edge beyond the outer wall of said collar and then tapering downwardly and inwardly toward said tip of said driving point, the length of said blades above said extreme outer edge being substantially less in length than the length of said blades below said extreme outer edge, each of said blades being symmetrical about a radial axis and being uniformly thickened from its upper to its lower end, said blades terminating in a blunt point.

5. A pile driving point having a tip for H-beam bearing

pile, said point comprising a hollow collar open at opposite ends and a multiplicity of identical blades disposed substantially parallel to the axis of said collar, each of said blades being symmetrical about a radial axis, said collar being substantially square and having an upper portion and a shoulder for seating said H-beam bearing pile, said blades intersecting one another below said shoulder, said blades being integral and angularly disposed to one another and having their extreme edges sloping from the lower outer edge of said collar outwardly and downwardly to an outer edge beyond the outer wall of said collar and then tapering downwardly and inwardly toward said tip of said driving point, the length of said blades above said extreme outer edge being substantially less in length than the length of said blades below said extreme outer edge, each of said blades being symmetrical about a radial axis and being uniformly thickened from its upper to its lower end, said blades terminating in a blunt point.

6. The pile driving point set forth in claim 5, wherein said shoulder extends around the inner walls of said collar and said upper portion tapers upwardly and outwardly above said shoulder.

7. The pile driving point set forth in claim 6 in which said blades are parallel to the edges of said collar.

8. The pile driving point set forth in claim 6 in which said blades are disposed to coincide with the diagonals of said collar.

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