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PILE DRIVING HEAD CONSTRUCTION

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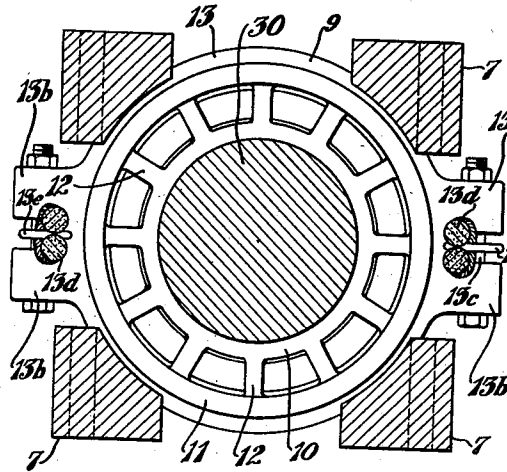


Fig. 3

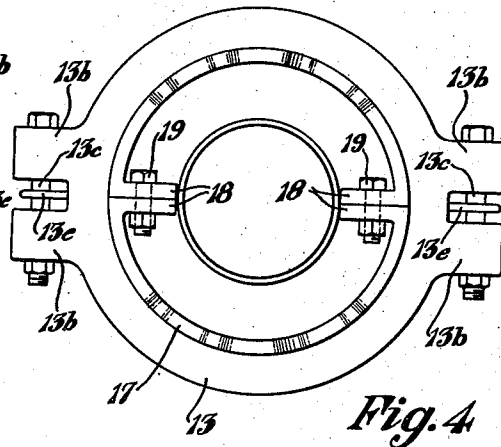


Fig. 4

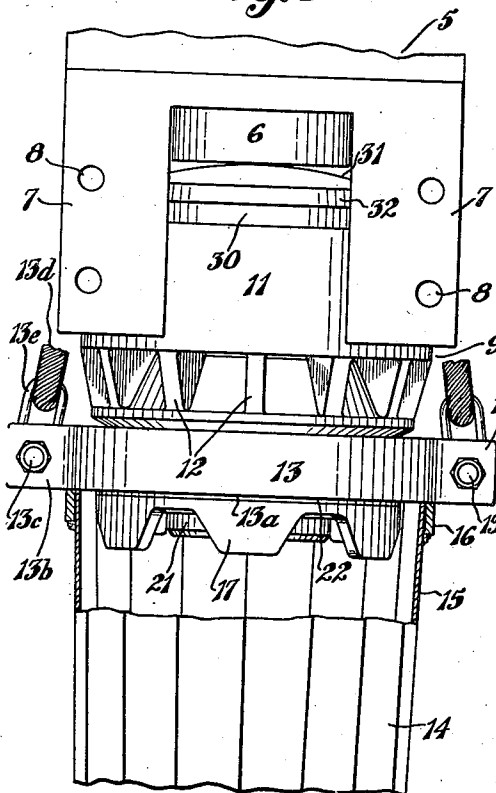


Fig. 1

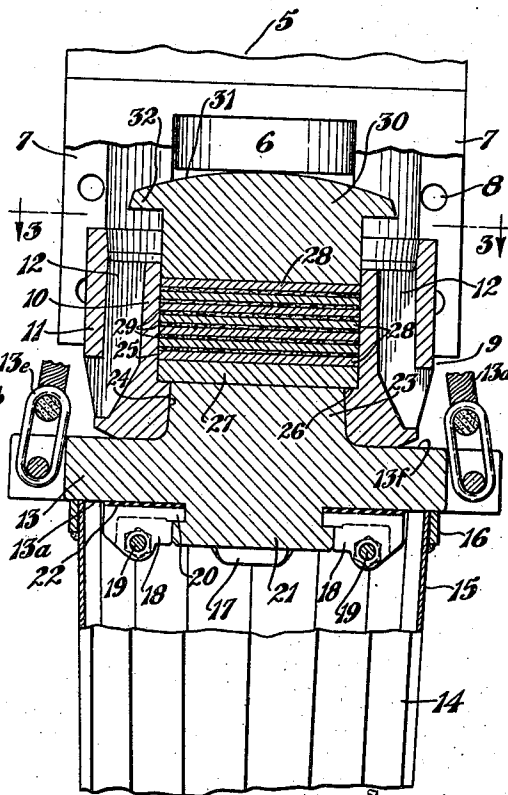


Fig. 2

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PILE DRIVING HEAD CONSTRUCTION

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2 Claims. (Cl. 61—77)

The invention relates to pile driving heads, and more particularly to improved pile driving heads for cushioning the blows of the pile driving hammer and uniformly distributing the force thereof to the entire top surface of a pile.

In pile driving it is practically impossible to maintain exact axial alignment between the pile driving hammer and the pile and the driving head. Consequently, means must be provided for cushioning and uniformly distributing the hammer blows to the top of the pile, and this is particularly true where the pile being driven is of thin wall construction. Otherwise repeated misaligned blows will crush or buckle one side of the top of the pile, making it extremely difficult if not impossible to drive the pile in the required direction.

Prior pile driving head constructions have included anvil blocks having rounded upward surfaces, and while these have improved driving conditions to some extent, they leave much to be desired in the accomplishment of uniform distribution of shock to the top of the pile, and of course do not cushion the blows.

In other prior constructions, cushioning members have been provided, the most common of which are wood blocks. Wood blocks are obviously short lived in use as a cushion, and they do not in themselves distribute the hammer blows to any substantial extent.

I have discovered that all of the foregoing difficulties are overcome by incorporating in a single driving head an anvil block with a rounded upper surface cooperating with a cushioning member and with centering means so as to uniformly distribute and cushion the blows of the hammer and maintain the head and pile in substantial axial alignment.

The present improved driving head has been used with a conventional pile driving hammer in actual practice for successfully driving tubular piles, whereas other attempts to drive the same piles to develop a required load bearing capacity in the same ground with the same hammer, but with a conventional driving head, have caused failure of the pile at its top end.

It is a general object of the present invention to provide an improved pile driving head construction which enables the successful driving of tubular piles including piles having thin walls, in the required direction with various kinds of conventional pile driving hammers.

Another and more specific object is to provide an improved pile driving head which will uniformly distribute the force of the hammer blows

to the entire surface of the top of the pile, even though the hammer, head and pile are not in exact axial alignment.

Another specific object is to provide a pile driving head having novel and improved means for cushioning the shock of the hammer blows imparted thereto.

A further object is to provide a pile driving head having improved centering means for maintaining the head concentric with the pile during the driving operation.

A still further object is to provide improved shock absorbing, force distributing, cushioning, and centering means, all cooperating to uniformly distribute the blows of the pile driving hammer to the entire top surface of a tubular pile being driven into the ground.

These and other related objects are accomplished by the improvements, parts, combinations and arrangements comprising the present invention, which may be stated in general terms as including a pile driving head having an anvil block with a rounded upper surface, a cushion in abutment with said anvil block and including a plurality of steel plates with shock absorbing plates interposed therebetween, a driving member for transmitting the blows from the cushioning means to the top of the pile, and means for maintaining said driving member substantially concentric with the pile being driven.

Referring to the drawing forming part hereof, in which a preferred embodiment of the invention is shown by way of example:

Figure 1 is a fragmentary side elevation of the improved driving head applied to the top of a tubular pile of thin wall construction, and being used with one form of pile driving hammer;

Fig. 2 is a similar view, partly in vertical section;

Fig. 3 is a plan sectional view thereof, as on line 3—3, Fig. 2; and

Fig. 4 is a detached bottom plan view of the improved driving head.

Similar numerals refer to similar parts throughout the several views of the drawing.

The improved pile driving head is illustrated in conjunction with one conventional type of pile driving hammer, but it will be understood that the improved pile driving head may be used equally well with other well-known types of hammers, without departing from the scope of the invention defined in the appended claims, by substituting a head adapter member having an outer contour suitable to the hammer used.

In the drawing the hammer base is indicated

generally at 5 having the hammer 6 reciprocating therein, and the hammer base has spaced depending portions 7 for fitting around the pile driving head, all in a usual manner.

Preferably the depending portions 7 are provided with apertures 8 through which cables or other connecting means may be inserted, for tying the depending portions together, as desired.

The improved pile driving head includes an annular head adapter member indicated generally at 9 over which the depending portions 7 of the hammer base loosely slidably telescope for positioning the hammer substantially directly over the driving head. The adapter member preferably includes an inner ring portion 10 and an outer ring portion 11 supported thereon by radial circumferentially spaced ribs 12, and said hammer base depending portions 7 fit slidably around the outer ring portion 11.

The improved pile driving head preferably includes a bottom driving member or plate 13, the bottom surface of which rests upon the top surface of the pile as shown. In the drawing the pile being driven is illustrated as a tubular fluted pile 14 having a thin wall 15, and preferably having a reinforcing ring 16 secured as by welding to the outside of the pile around the top thereof to prevent the top edge of the pile from being battered or spread radially outward during the driving operation. Obviously, the invention can be applied to other types of piles including non-fluted piles and cylindric tubular piles.

Means for centering the bottom driving member 13, or for maintaining it substantially concentric with the pile during the driving operation preferably includes a pilot or centering ring 17 made up of two half rings abutting each other and having radially inwardly extending flanges 18 secured together by bolts 19. The centering ring 17 has an inwardly extending annular flange 20 for engaging in an annular groove formed in the central depending portion 21 of the bottom driving member 13, so that the half rings of the centering member 17 can be detachably mounted with their annular flanges 20 engaged in the annular groove of depending portion 21 and afterwards bolted together by means of bolts 19. Preferably a rubber gasket 22 is inserted between the upper surface of the centering ring 17 and the lower surface of the driving member 13, for a purpose to be described.

The bottom driving member is provided on its under side with a flat annular bottom surface 13a surrounding the depending portion 21, for engaging the top surface of the pile 14, so that the force of the hammer blows transmitted to the bottom driving member will be evenly distributed to the entire top surface of the pile.

Preferably, the bottom driving member is provided with diametrically opposite pairs of ears 13b extending radially outwardly therefrom. Bolts 13c are secured in the ears 13b, and the usual hanger cables fragmentarily shown at 13d are secured to the bolts 13c by means of clevises 13e for use in applying the pile driving head to or removing it from the top of the pile.

The base of the head adapter member 9 rests on the flat upper annular surface 13f of the bottom driving member 13 as shown, and the driving member 13 preferably has an upwardly projecting central cylindric portion 23 which fits into the cylindric bore 24 formed by the base of the inner ring 10 of the adapter member. Preferably the upper part of the inner ring portion 10 of the adapter member has an inner cylindric bore 25

of slightly larger diameter than the bore 24 forming a shoulder 26 between the bores 24 and 25, and a steel knockout plate 27 fits in the bore 25 and rests on the shoulder 26. The cylindric portion 23 terminates substantially at the shoulder 26 so that the knockout plate 27 abuts the top surface of said cylindric portion 23.

Means for cushioning the shocks of the blows of the hammer preferably includes a plurality of circular metal disks 28 fitting slidably in the bore 25 of the inner ring portion 10, between which disks 28 are interposed cushioning disks 29 of fibre and the like. The number of metal disks 28 can be varied as desired, but preferably alternate disks 28 and fibre disks 29 are superimposed one upon another.

An anvil block 30 for receiving the blows of the hammer 6 is provided at the upper portion of the improved pile driving head and has a lower cylindric portion adapted to fit slidably in the bore 25 and rest upon the top disk 28 of the cushioning means. The top of the anvil block 30 is concentrically crowned or convexly rounded as indicated at 31 and is preferably enlarged radially as indicated at 32. By making the top surface 31 of the anvil block rounded, the force of the hammer blows is distributed substantially uniformly downward even though the anvil block and the pile driving head which carries it are not in exact axial alignment with the hammer 6.

The metal disks 28 and fibre disks 29 constituting the cushioning means not only cushion the shock of the hammer blows but further distribute the force of the same and transmits the distributed force through the knockout plate 27 uniformly to the entire flat upper surface of the upwardly projecting portion 23 of the bottom driving member. The driving member serves to further uniformly distribute the shock and force of the blows and the bottom surface 13a thereof transmits the shock and force of the blows to the upper surface of the pile 14 in a straight downward direction, while the centering ring 17 insures that the driving member 13 is maintained substantially concentric with the pile.

Thus regardless of axial misalignment of the hammer, pile driving head and pile, or irregular bottom surface of the hammer due to wear, the force of the hammer blows is uniformly distributed, cushioned and transmitted substantially evenly to the entire top surface of the pile due to the cooperating effect of the anvil block, cushion and bottom driving member; with the result that the pile is effectively driven in the required downward direction without materially damaging the top end of the pile.

The rubber gasket 22 serves to cushion the reaction of the centering ring 17 upwardly against the bottom surface 13a, which is caused by the inertia of the ring when the force of the hammer blows is transmitted through the bottom driving member 13.

The improved pile driving head is compact and easily handled, is extremely durable, and is readily adapted for use with various types of pile driving hammers.

I claim:

1. In pile driving head construction, an anvil block having a convexly rounded upper surface, cushioning means for absorbing shocks from said anvil block, a bottom driving member for receiving and distributing the force of hammer blows from said cushioning means and having a bottom pile engaging surface for engaging the top of a tubular pile, pilot means detachably

mounted on said bottom driving member for maintaining it concentric with said pile, and a yieldable gasket interposed between said pilot means and the bottom surface of said bottom driving member.

2. Pile driving head construction including an anvil block having a convexly rounded upper surface, cushioning means for absorbing shocks from said anvil block, a bottom driving member for receiving and distributing the force of hammer blows from said cushioning means and hav-

5 ing a bottom pile engaging surface for engaging the top of a tubular pile, means for maintaining said anvil block, cushioning means and bottom driving member in axial alignment, pilot means detachably mounted on said bottom driving member for maintaining it concentric with said pile, and a yieldable gasket interposed between said pilot means and the bottom surface of said bottom driving member.

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