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(54) IMPROVEMENTS RELATING TO THE REDUCTION OF NOISE FROM PILING RIGS AND THE LIKE

(71) We, HUGH CHALKLEY SHELBORNE of Stondon Hall, Stondon Massey, Ongar, Essex, and ALBERT EDWARD JOHN SELFE of 3, Copper Beeches, Thundersley, Essex, both British subjects, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to piling rigs and is particularly concerned with the provision of a rig which reduces or alleviates the noise emanating from a pile-driving operation at the rig.

By the present invention there is provided a piling rig comprising a transportable frame having upstanding guides which are adapted to receive a pile or array of piles to be driven and to support and guide such pile or array of piles during driving, and means for driving the pile or array of piles; the frame and driving means being substantially totally enclosed above ground by a sound reducing casing which has at least one aperture through the top thereof for the passage of a control means for raising the driving means.

The invention was primarily developed having in mind the aim of reducing noise emanating from driving metal sheet piles. However, it is to be realised that the invention may be utilised for driving into or out of the ground such other types of piles as are well known in the field of civil engineering, for example concrete piles, timber piles or steel piles of box or other section and the like. The invention may also be used with advantage in the driving of metal stakes, rods, pipes or the like and these are intended to be included in the general term "piles".

The pile-driving means can be such that it drives piles into or out of the ground and may comprise a vibratory or percussive device. When used for driving piles into the ground, the pile-driving means is prefer-

ably in the form of a drop hammer which is controlled by a cable extending through the aperture (which is desirably small) in the top of the casing to a winch mechanism. Alternatively, if the pile-driving means is in the form of a diesel or fluid pressure operated reciprocating hammer or vibratory device (which latter device is normally mounted on top of the pile and may be suitable for driving piles into or out of the ground), auxiliary holes will generally be provided in the casing for the passage of fuel or fluid pressure conduits to the motor of the hammer or vibratory device. It is intended that in each case a control means (such as a cable) for raising the pile-driving means will extend through the aperture in the top of the casing so that, after a pile-driving operation in which a pile is driven into the ground, the driving means may be raised by the control means in preparation to receive a further pile or piles for a further driving operation.

The casing is preferably attached to the frame. The means of attachment, desirably, is arranged so that there is no continuous metallic path for conducting sound vibrations from the interior to the exterior of the rig through the frame and the material of the casing. It is realised, however, that such means of attachment is not essential and, for example, the casing may be secured to the frame by bolts having plastics or other resilient bushes which tend to absorb vibration in the bolts. Although the bolts may provide a continuous path through the casing for the transmission of sound energy, it is believed that the noise emanating therefrom will be negligible in comparison with the noise usually associated with a pile-driving operation.

Although the rig may be lowered over a pile to be driven into the ground whilst the latter is positioned as required, it is preferred that the casing is openable, for example, on an upstanding side thereof to allow a pile or array of piles to be placed

in position within the frame prior to a driving operation.

As will be apparent, the structure and material from which the casing is formed is of considerable importance if the noise which emanates from the rig during pile-driving is to be reduced to that conventionally regarded as acceptable. Although several materials for the casing may be used (for example cellular plastics sheets of desired wall thickness) it is preferred that the casing is made of laminated material comprising metallic sheet and plastics sheet preferably bonded together. In a preferred construction the casing walls comprise at least three laminations of metal sheet and two laminations of plastics sheet secured together (preferably bonded) in alternate arrangement. The metal sheet or sheets may be of mild steel and the plastics sheet or sheets may be of soft polyvinyl chloride. To provide the preferred construction of casing walls, the soft polyvinyl chloride sheets are coated, conveniently by spraying, with a plasticiser, such as nitrile rubber, as a barrier. The plastics sheets are then cured and sprayed or otherwise coated with the bonding agent such as a hot polychloroprene (neoprene) based adhesive (or an epoxy resin based adhesive such as the material sold under the Trade Mark "Araldite"). The mild steel sheets are similarly coated with the bonding agent and these sheets are laminated with the plastics sheets and bonded thereto under pressure.

In the majority of applications the piling rig of the present invention will be used for driving a pile, or array of piles, into the ground and, for convenience such use only will hereinafter be considered (it being realised that any modifications which may be necessary to the structure described to render it suitable for driving piles out of the ground will be apparent to persons skilled in the art and having an understanding of the present invention).

The rig may include a support means which is slidably carried by the upstanding guides and is adapted to engage with the pile or array of piles when the same is in position to hold or assist in holding the pile or array of piles upright during driving into the ground. Such support means can be detachably secured to the upper end of the pile or array of piles to be driven. A helmet or cap may be interposed between the driving means and the pile or array of piles so that it is borne on the upper end of the pile or array of piles during driving. Such a helmet or cap is generally provided for the purpose of protecting the upper end of the pile (for example to prevent burring in the case of sheet metal piles) and can conveniently provide the aforementioned support means. When the helmet or cap

provides the support means, it may be suitably recessed, slotted, flanged or otherwise shaped to accommodate an upper end of a pile or array of piles to retain them in an upright position for driving. In the case of a rig which incorporates a helmet or cap (and support means when such is not provided by the helmet or cap) each such component and the driving means, especially in the case of a drop hammer, may be guided within the same upstanding guides of the frame.

In a preferred form there is further provided in accordance with the present invention a piling rig comprising a free standing transportable frame for receiving a pile to be driven; support means within the frame for engaging a pile to be driven and for guiding such pile vertically during driving, said support means being slidably engaged with and guided by the frame and being movable vertically relative thereto to follow the pile downwardly during driving; pile driving means within the frame above said support means and movable vertically relative to the frame for following the pile downwardly during driving; a sound reducing casing secured to and carried by the frame to provide a chamber which is enclosed above ground, the pile driving means and the support means being located within said chamber and said chamber being adapted to receive the whole length of a pile to be driven; the casing having in the upper part thereof an aperture for the passage of control means for raising the pile driving means and the casing having a door in an upstanding side wall thereof through which a pile to be driven is inserted into the chamber below the pile driving means.

One embodiment of a piling rig constructed in accordance with the present invention and of the drop hammer type, will now be described, by way of example only, with reference to the accompanying illustrative drawings in which:—

Figure 1 shows a perspective view of the rig in which the casing has been partly cut away to illustrate the frame;

Figure 2 is a perspective view from below of part of the rig and diagrammatically illustrates the manner in which a pile may be received thereby for driving, and

Figure 3 graphically illustrates comparative results of noise level tests carried out on a conventional "unsilenced" pile driving operation and on a pile driving operation within a piling rig constructed in accordance with the invention.

The piling rig comprises an inner steel frame shown generally at 1 which is formed by four upright support bars 2 secured in spaced relationship by vertically spaced, and horizontally disposed bracing bars 3. The inner frame 1 partly defines an enclosure

which is substantially rectangular in plan and elevation and has opposed side walls 4, an open front 5 and a rear wall 6.

The rig is approximately 33 ft. high, and secured to the exterior of the inner framework 1 to form the side walls 4 and rear wall 6 is sheet material 7 which partly provides a casing for the rig.

The front 5 of the inner frame 1 is provided over its upper part (for approximately 9 feet from the top of the rig) with a further sheet of material 7a. The sheet 7a has an exterior steel support frame shown generally at 8 which carries a bracket 9.

Pivotaly mounted between the bracket 9 and a base frame 10 of the rig is a further exterior steel frame part 11. This frame part 11 carries a sheet of material 7b and is so arranged that by pivotal movement of the frame part 11, the open front 5 on the lower part of the rig may be closed. In this respect the frame 11 and sheet material 7b provide an openable front wall or door for the rig. The sheet material 7b may, conveniently, be provided with a hinged flap or hatch shown at 11a of similar material which provides a small inspection door in the main front door of the rig.

The top of the rig is also provided with a sheet of material 7c having a small aperture 12 therein. The sheets of material 7 and 7a to 7c provide (when the door provided by the frame part 11 is closed) a substantially totally enclosed space above ground. As will be described hereinafter, the sheets of material 7 and 7a to 7c are so constructed as to provide a sound reducing casing for the rig.

The upright support bars 2 provide guides for a drop hammer 13. The hammer 13 has two opposed and horizontally projecting tongue portions 13a which are slideably received one in each of a pair of opposed tracks 14, each track 14 being formed between an adjacent pair of support bars 2 located on a common side wall 4. The hammer 13 is attached to a cable 15 which passes through the aperture 12 and by which the hammer is raised and dropped in its guides. Mounted in the guide tracks 14 in a similar manner to the hammer 13 is a helmet 16. The helmet 16 is located in the guide tracks below the hammer 13 and is intended to protect the top of a pile during driving whilst supporting the pile in an upright position. For this latter purpose the underside of the helmet 16 may have a recess 16a (see Figure 2) which is of complementary shape to the upper end of the pile and in which that upper end is received to ensure that the pile is held in its upright position. In addition to holding the pile upright the engagement between the recess 16a in the helmet 16 and the upper end of the pile may ensure that the

pile is restrained from twisting (about a vertical axis) out of a pre-determined plane in which it is to be driven. The helmet 16 is constructed from a mild steel body 16c having an upper portion or "dolly" 16b of hard wood or plastics which usually carries a coil of rope (not shown) on which the hammer blows are applied. Generally the dolly part 16b is readily removable from the mild steel body so that it can be renewed when required.

In use of the rig which is likely to weigh in the order of 15 British tons, the hammer 13 is raised into the upper portion of the inner frame 1, a pile (indicated by the broken lines 17) is positioned within the rig through the open lower front 5, and the helmet 16 engaged on the top of the pile. Depending upon its weight, the helmet 16 may be raised manually, or detachable coupling means (not shown) can be provided between the hammer 13 and the helmet 16 so that the latter can be raised and lowered with the hammer under the control of the cable 15 during positioning of the pile.

To assist in maintaining the pile in a pre-determined plane during driving the base frame 10 can include a removably mounted guide plate which is conveniently a base plate of the rig and is shown generally at 21 in Figure 2 in an aperture 22 of which the pile is initially located and through which the pile passes whilst it is being driven so that it is restrained by the guide plate 21 from twisting about a vertical axis.

Pile driving is achieved in a conventional manner by raising and dropping the hammer 13, and during such operation the door provided by the frame part 11 is pivoted so that the sheet material 7b closes the front 5 over the lower portion of the rig. Seals (not shown) may be provided between the sheet 7b and the lower part of the rig with which the sheet 7b would otherwise abut when the door 11 is closed. With the door 11 closed, the pile and hammer are substantially totally enclosed above ground in a sound-reducing casing constituted by the sheet material 7 and 7a to 7c.

The degree of sound reduction which is achieved may vary considerably depending upon the nature of the sheet material 7 and 7a to 7c. In experimental rigs we have determined that excellent sound reduction is achieved by having the sheet material 7 and 7a to 7c in bonded, laminated form comprising metallic sheet and plastics sheet. In a preferred structure the sheet material is formed by three laminations of mild steel sheet and two laminations of soft polyvinyl chloride sheet in alternate arrangement; the mild steel being 0.125 inches thick (12 gauge) and the plastics sheet being 0.02 inches thick. The soft polyvinyl chloride sheets are sprayed with a nitrile rubber

plasticiser as a barrier; these sheets are then cured and sprayed with a bonding agent of hot polychloroprene based adhesive. The mild steel sheets are similarly sprayed with the bonding agent and then laminated as
5 aforementioned with the plastics sheets; the laminate being bonded under a pressure of approximately three pounds per square inch. The sheets of the casing are secured
10 to the inner frame 1, outer frame part 8 and frame part 11 (as the case may be) by bolts having bushes of polyvinyl chloride or nylon positioned between the sheeting and frame.

15 To facilitate its movement between pile driving positions the rig is preferably mounted on rollers (shown generally at 18) located on the base frame 10. If required the rollers 18 can be positioned for movement
20 along a pre-determined track, for example they may be flanged and the rig mounted on rails. Eyes 19 are conveniently provided on the top of the rig by which it may be
25 lifted and transported by crane. The eyes 19 can be secured to steel beams (not shown) which form part of the frame and which extend between the topmost bracing bar 3 on the rear wall 6 and the external frame
30 part 8.

35 To facilitate transportation and assembly of the rig (particularly the pivotal mounting of the frame part 11 between the bracket 9 and the base frame 10) the rig may be formed in two parts (or several parts) which normally are bolted together but are separable for example, along the line indicated at
40 20.

In a modification (not shown) of the piling rig illustrated in Figure 1, the rig is formed in at least two separable parts, a lower part substantially as shown in Figure 1 below line 20 except that the bracket 9 is carried on the main frame of this lower part (thereby ensuring that the front door is hung entirely on the lower part) and a top part substantially as shown in Figure 1 above line 20 except that the bracket 9 is omitted from this part. By this arrangement rectangularly sectional tubular lengths of frame and casing (not shown) may be interposed and secured (preferably by bolts) between the top and lower parts to increase the height of the rig as may be required.

55 Noise level tests have been carried out on sheet pile driving operations, firstly with a conventional "unsilenced" rig, and secondly when pile driving within a rig substantially as above described with reference to Figure 1 and having the aforementioned preferred laminated structure of the sheet material; the results of these tests are comparatively illustrated in the graphs of Figure 3. The tests were made in free-field conditions and with a three ton drop hammer falling through approximately three feet
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to effect pile driving. Noise levels (d BA) were taken at varying distances from the noise source for each operation. In Figure 3 the noise level (d BA) is given on the ordinate and the distance to the source (in feet) is given on the abscissa (it will be noted that the abscissa is drawn on a logarithmic scale). Graph A shows the noise level variations for a conventional "unsilenced" sheet pile driving operation, graph B shows the measured data for pile driving within the rig of the invention, and Graph C indicates the likely true noise levels for pile driving within the rig of the invention after correcting for wind and crane noise included in the noise levels of graph B. It should be mentioned that the noise level measurements taken less than thirty feet from the source had a low order of accuracy due to the proximity of the source, for this reason graphs B and C at distances below thirty feet have been indicated as broken lines.

Although the noise levels emanating from pile driving are likely to vary to some extent as a result of changes in the driving conditions (for example, depending upon the ground structure, the weight and drop of the hammer, the depth to which the pile is driven, wind and crane noise, and whether any major reflective surfaces such as buildings are in the vicinity of driving) there is no doubt that the rig of the invention considerably reduces the noise emanating from pile driving in comparison with a conventional unsilenced operation. It is generally recognised that an acceptable noise level on construction sites is approximately 70 d BA; in an unsilenced pile driving operation a noise level of this order is unlikely to be attained at less than 400 feet from the source whereas in the rig of the invention noise levels have been maintained in the order of 70 d BA at distances as close as 50 feet from the source (which is approximately the same noise as would be expected from cranes, trucks and similar equipment on construction sites).

While the present invention is concerned with reducing noise which emanates from pile driving, the structure of the casing material, namely the sheets 7 and 7a to 7c may be used in a transportable structure for providing an enclosed space for the purpose of reducing noise from cacophonous machines located in the space and such a transportable structure is the subject of our co-pending Application No. 5979/74 (Serial No. 1,369,790).

WHAT WE CLAIM IS:—

1. A piling rig comprising a transportable frame having upstanding guides which are adapted to receive a pile or array of piles to be driven and to support and guide



plasticiser as a barrier; these sheets are then cured and sprayed with a bonding agent of hot polychloroprene based adhesive. The mild steel sheets are similarly sprayed with the bonding agent and then laminated as
5 the bonding agent and then laminated as aforementioned with the plastics sheets; the laminate being bonded under a pressure of approximately three pounds per square inch. The sheets of the casing are secured
10 to the inner frame 1, outer frame part 8 and frame part 11 (as the case may be) by bolts having bushes of polyvinyl chloride or nylon positioned between the sheeting and frame.

15 To facilitate its movement between pile driving positions the rig is preferably mounted on rollers (shown generally at 18) located on the base frame 10. If required the rollers 18 can be positioned for movement
20 along a pre-determined track, for example they may be flanged and the rig mounted on rails. Eyes 19 are conveniently provided on the top of the rig by which it may be lifted and transported by crane. The eyes
25 19 can be secured to steel beams (not shown) which form part of the frame and which extend between the topmost bracing bar 3 on the rear wall 6 and the external frame part 8.

30 To facilitate transportation and assembly of the rig (particularly the pivotal mounting of the frame part 11 between the bracket 9 and the base frame 10) the rig may be formed in two parts (or several parts) which
35 normally are bolted together but are separable for example, along the line indicated at 20.

In a modification (not shown) of the piling rig illustrated in Figure 1, the rig is
40 formed in at least two separable parts, a lower part substantially as shown in Figure 1 below line 20 except that the bracket 9 is carried on the main frame of this lower part (thereby ensuring that the front door
45 is hung entirely on the lower part) and a top part substantially as shown in Figure 1 above line 20 except that the bracket 9 is omitted from this part. By this arrangement rectangularly sectional tubular lengths
50 of frame and casing (not shown) may be interposed and secured (preferably by bolts) between the top and lower parts to increase the height of the rig as may be required.

55 Noise level tests have been carried out on sheet pile driving operations, firstly with a conventional "unsilenced" rig, and secondly when pile driving within a rig substantially as above described with reference
60 to Figure 1 and having the aforementioned preferred laminated structure of the sheet material; the results of these tests are comparatively illustrated in the graphs of Figure 3. The tests were made in free-field
65 conditions and with a three ton drop hammer falling through approximately three feet

to effect pile driving. Noise levels (d BA) were taken at varying distances from the noise source for each operation. In Figure 3 the noise level (d BA) is given on the ordinate and the distance to the source (in
70 feet) is given on the abscissa (it will be noted that the abscissa is drawn on a logarithmic scale). Graph A shows the noise level variations for a conventional "unsilenced" sheet pile driving operation, graph
75 B shows the measured data for pile driving within the rig of the invention, and Graph C indicates the likely true noise levels for pile driving within the rig of the invention after correcting for wind and crane noise
80 included in the noise levels of graph B. It should be mentioned that the noise level measurements taken less than thirty feet from the source had a low order of accuracy
85 due to the proximity of the source, for this reason graphs B and C at distances below thirty feet have been indicated as broken lines.

Although the noise levels emanating from pile driving are likely to vary to some extent as a result of changes in the driving conditions (for example, depending upon the ground structure, the weight and drop of the hammer, the depth to which the pile
90 is driven, wind and crane noise, and whether any major reflective surfaces such as buildings are in the vicinity of driving) there is no doubt that the rig of the invention considerably reduces the noise emanating from
95 pile driving in comparison with a conventional unsilenced operation. It is generally recognised that an acceptable noise level on construction sites is approximately 70 d BA; in an unsilenced pile driving operation a
100 noise level of this order is unlikely to be attained at less than 400 feet from the source whereas in the rig of the invention noise levels have been maintained in the order of 70 d BA at distances as close as
105 50 feet from the source (which is approximately the same noise as would be expected from cranes, trucks and similar equipment on construction sites).

While the present invention is concerned with reducing noise which emanates from
115 pile driving, the structure of the casing material, namely the sheets 7 and 7a to 7c may be used in a transportable structure for providing an enclosed space for the purpose of reducing noise from cacophonous
120 machines located in the space and such a transportable structure is the subject of our co-pending Application No. 5979/74 (Serial No. 1,369,790).

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WHAT WE CLAIM IS:—

1. A piling rig comprising a transportable frame having upstanding guides which are adapted to receive a pile or array of
130 piles to be driven and to support and guide

such pile or array of piles during driving, and means for driving the pile or array of piles; the frame and driving means being substantially totally enclosed above ground by a sound reducing casing which has at least one aperture through the top thereof for the passage of a control means for raising the driving means.

2. A piling rig as claimed in Claim 1 wherein the driving means is percussive.

3. A piling rig as claimed in either Claim 1 or Claim 2 wherein the casing is attached to the frame.

4. A piling rig as claimed in Claim 3 wherein the means of attachment of the casing to the frame is such that there is no continuous metallic path for conducting sound vibrations from the interior to the exterior of the rig through the frame and material of the casing.

5. A piling rig as claimed in Claim 3 wherein the casing is attached to the frame by bolts having resilient bushes for absorbing vibration in the bolts.

6. A piling rig as claimed in any one of the preceding claims wherein the casing is openable to allow a pile or array of piles to be placed in position within the frame prior to driving.

7. A piling rig as claimed in any one of the preceding claims wherein the casing walls are made of laminated material comprising metallic sheet and plastics sheet secured together.

8. A piling rig as claimed in Claim 7 wherein the casing walls comprise at least three laminations of metal sheet and two laminations of plastics sheet secured together in alternate arrangement.

9. A piling rig as claimed in either Claim 7 or Claim 8 wherein the metallic sheet and plastics sheet are bonded together.

10. A piling rig as claimed in any one of Claims 7 to 9 wherein the metallic sheet is mild steel.

11. A piling rig as claimed in any one of Claims 7 to 10 wherein the plastics sheet is soft polyvinyl chloride.

12. A piling rig as claimed in any one of the preceding claims wherein support means is slidably carried by the upstanding guides, said support means being adapted to engage with the pile or array of piles when the same is in position and to hold or assist in holding the pile or array of piles upright during driving.

13. A piling rig as claimed in Claim 12 wherein the support means is adapted to be detachably mounted on the upper end of the pile or array of piles.

14. A piling rig as claimed in any one of the preceding claims wherein a helmet or cap is provided which is adapted to be interposed between the driving means and the support means or pile or array of piles.

15. A piling rig as claimed in Claim 14 wherein the helmet or cap is adapted to engage with the upper end of the pile or array of piles to restrain it from twisting about a vertical axis from the plane of driving.

16. A piling rig as claimed in Claim 12 and Claim 14 wherein the helmet or cap and the support means are combined.

17. A piling rig as claimed in any one of the preceding claims wherein the upstanding guides form tracks in which the driving means is slidably located and guided for its driving movement.

18. A piling rig as claimed in Claim 14 and Claim 17 wherein the helmet or cap is slidably located and guided in the same tracks as the driving means.

19. A piling rig as claimed in any one of the preceding claims wherein the driving means is a drop hammer.

20. A piling rig as claimed in any one of the preceding claims wherein the frame carries, at the bottom part of the rig, guide means which is adapted to position the pile or array of piles for driving and to restrain the pile or piles from moving out of the plane of driving whilst they are being driven.

21. A piling rig as claimed in Claim 20 wherein the guide means comprises a plate having an aperture through which the pile or array of piles are intended to be driven whilst being retained in the driving plane.

22. A piling rig as claimed in any one of the preceding claims and which is substantially rectangular in plan and side elevations, and wherein part of the frame on one upstanding side wall is pivotally mounted about a vertical axis to the remaining part of the frame to provide a door to the rig.

23. A piling rig as claimed in any one of the preceding claims wherein the frame is provided with ground engaging rollers to facilitate movement of the rig.

24. A piling rig as claimed in Claim 3 or in any claim appendant thereto wherein the rig comprises a top part which is separable from a lower part of the rig.

25. A piling rig as claimed in Claim 24 wherein the casing on the lower part of the rig includes a hinged door which is hung independently of the top part.

26. A piling rig comprising a free standing transportable frame for receiving a pile to be driven; support means within the frame for engaging a pile to be driven and for guiding such pile vertically during driving, said support means being slidably engaged with and guided by the frame and being movable vertically relative thereto to follow the pile downwardly during driving; pile driving means within the frame above said support means and movable vertically relative to the frame for following the pile



5 downwardly during driving; a sound reducing casing secured to and carried by the frame to provide a chamber which is enclosed above ground, the pile driving means and the support means being located within
10 said chamber and said chamber being adapted to receive the whole length of a pile to be driven; the casing having in the upper part thereof an aperture for the passage of control means for raising the pile driving means and the casing having a door in an upstanding side wall thereof through which a pile to be driven is inserted into the chamber below the pile driving means.

15 27. A piling rig as claimed in Claim 26 wherein the pile driving means engages with and is guided by the frame.

20 28. A piling rig as claimed in either Claim 26 or Claim 27 wherein the casing comprises laminated sheeting including metallic sheet and plastics sheet secured together in alternate arrangement.

25 29. A piling rig as claimed in any one of Claims 26 to 28 wherein the support means comprises a helmet which is adapted to be interposed between the driving means and a pile to be driven and to be mounted on the upper end of the pile during driving.

30 30. A piling rig as claimed in any one of Claims 26 to 29 wherein the support means is adapted to engage with the upper end of a pile to be driven to restrain the pile from twisting about a vertical axis from the plane of driving.

35 31. A piling rig as claimed in any one of Claims 26 to 30 wherein the frame comprises track forming guides in which track the pile driving means and support means

are slidably located and vertically guided for driving movement of the pile.

40 32. A piling rig as claimed in any one of Claims 26 to 31 wherein the pile driving means is a drop hammer.

45 33. A piling rig as claimed in any one of Claims 26 to 32 wherein the frame carries, at the bottom part of the rig, further guide means for positioning a pile for driving and for restraining the pile from moving out of the plane of driving while it is being driven.

50 34. A piling rig as claimed in Claim 33 in which the further guide means comprises an apertured plate through which the pile is adapted to slide vertically and be guided during pile driving.

55 35. A piling rig as claimed in any one of Claims 26 to 34 and comprising a top part and a lower part, the top part being separable from the lower part and the casing of the lower part of the rig including the door, the door being hinged to the frame and being hung independently of the top part.

60 36. A piling rig substantially as herein described with reference to the accompanying illustrative drawings.

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