

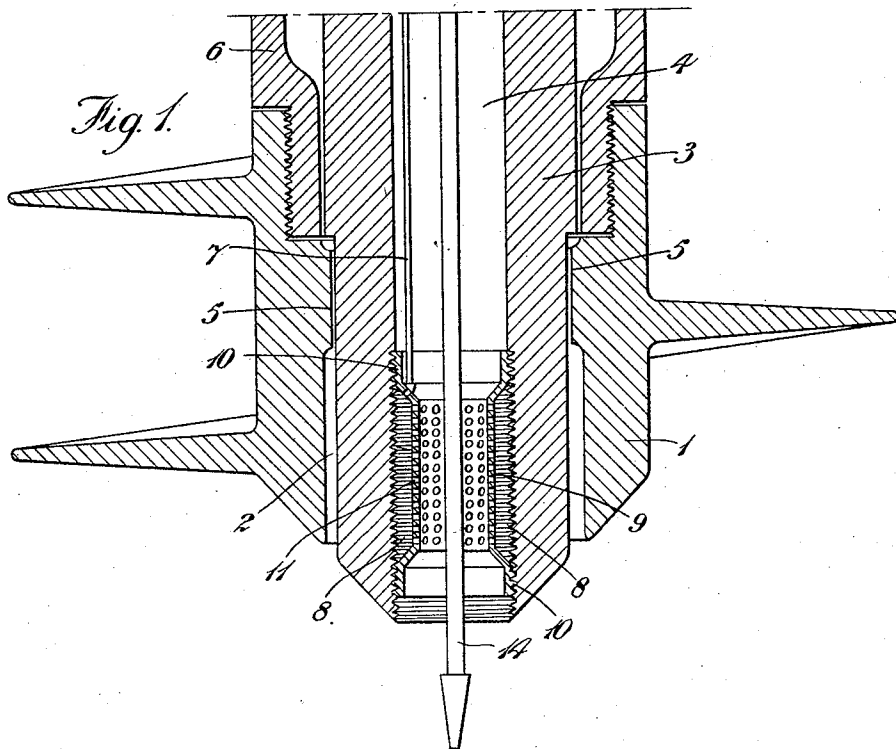
May 12, 1931.

W. A. RADICE

1,804,706

FILE SCREWING APPARATUS

Filed April 21, 1930 2 Sheets-Sheet 1



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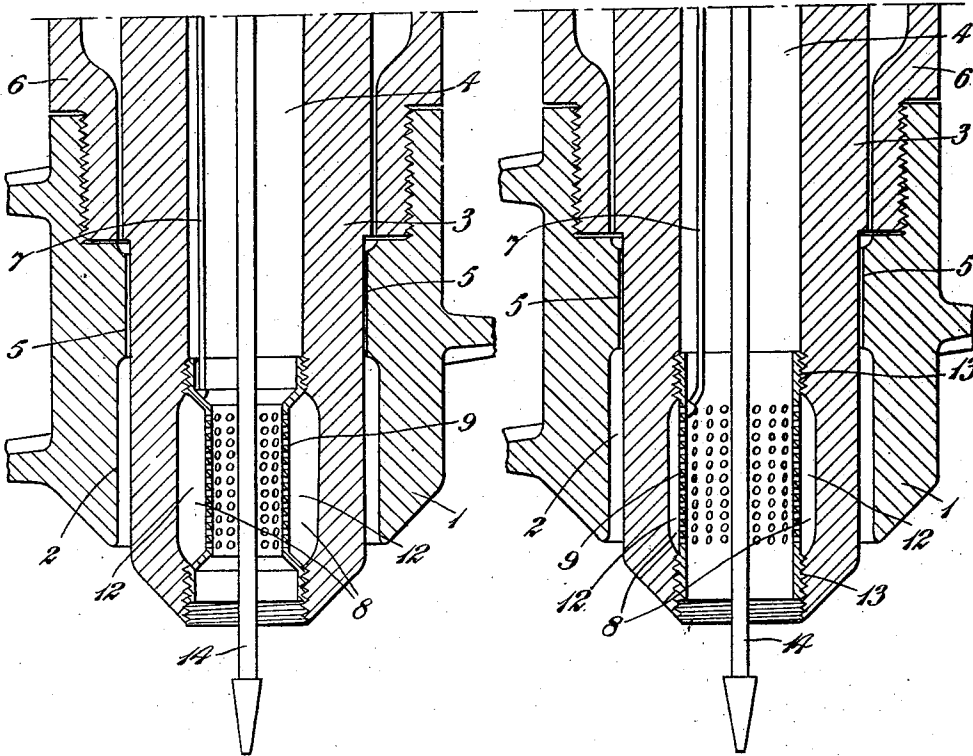
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Fig. 3.

Fig. 2.



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UNITED STATES PATENT OFFICE

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PILE SCREWING APPARATUS

Application filed April 21, 1930, Serial No. 445,941, and in Great Britain June 24, 1929.

The present invention relates to improvements in pile screwing apparatus particularly of the type wherein a screw head is detachably engaged in any convenient manner by a screwing key which transmits the rotation of the capstan or other driving means to the head.

The object of the invention is to modify or adapt pile screwing apparatus of this character so as to render possible the successful application of the air lift principle of fluid circulation for the purpose of removing from the bore hole debris displaced by the screw head.

In accordance with the invention the screwing key has a central bore which is adapted to constitute the discharge pipe of an air lift system. The air under pressure is delivered to an orificed chamber at the lower end of the bore conveniently through a flexible hose.

The invention also covers the use in conjunction with such an air lift system applied to pile screwing apparatus, of a pipe or the like passing down the bore and terminating at or near the extremity of the latter in a jet preferably of slightly smaller diameter than the pipe. By this means water under pressure may be applied as a scouring agent at the boring face so that the detached material is stirred up and is in the most favourable condition for being raised by the air lift. Incidentally if the site in which the piles are being driven in a dry one, the scouring fluid supplied in this manner serves to ensure a requisite depth of water in the bore hole and to maintain the pumping level.

The accompanying drawings show a number of practical applications of the invention in the case of a screwing head having a central bore which is engaged by the hollow screwing key, Figures 1, 2 and 3 being vertical sections respectively of the screwing head and associated parts in illustration of each of three forms of construction.

Describing firstly those features common to all the constructional forms the screwing head 1 has a through central bore 2 engaged by the tubular screwing key 3 having a central bore 4. The necessary torque is applied

to the head conveniently by the provision in the bore 2 through a part of its length of one or more pair of flats as at 5 engaged by corresponding flats on the key. The screw head may also make connection in any convenient manner with a cylindrical sheath 6 which is drawn down by the screw head and serves as a lining to the bore hole. The rotational torque from the capstan or the like to the screw head is entirely taken by the key 3. The compressed air for operating the air lift is supplied conveniently by a flexible hose 7 to a chamber 8 with perforated walls and situated within the bore 4 in the screwing key and closely adjacent to its lower end. The chamber is conveniently formed by screwing a perforated sleeve 9 into the lower end of the bore so that an annular space is left between the sleeve and the interior wall of the key.

Detail variations may be made to suit circumstances and three convenient methods of forming the chamber are illustrated.

In the method illustrated in Figure 1 the lower end of the screwing key is internally threaded and the perforated sleeve 9 has its end portions 10 externally screwed to engage the thread in the bore. Between the screw threaded portions 10 the wall of the sleeve is perforated and this section indicated by reference 11 is of smaller diameter than the bore of the key so that an annular air chamber is formed around the interior of the latter. The sleeve is screwed into place from the lower end of the key.

Figure 2 illustrates an alternative arrangement wherein the bore 4 of the screwing key itself is increased in diameter as at 12 over the length covered by the perforated portion of the sleeve, so that the latter is of the same diameter throughout and the continuity of bore 4 is not materially interrupted by the air chamber thus formed in its wall. The interior of the key is screw threaded both above and below the enlargement 12, the sleeve which has an upstanding thread 13 at either end being screwed into place as in the first example.

The features of the above described forms of construction may be combined as in the

arrangement illustrated in Figure 3, wherein the air chamber is formed by decreasing the diameter of the sleeve between its screwed end portions, and the internal diameter of the screwing key is in addition increased over the corresponding part of its length.

Wherever the internal bore of the key is increased as in the last two examples given the walls are materially weakened and it is preferable therefore in such cases to form the chamber beyond the operative engagement with the screw head with a view to keeping the weakened part from torsional stress. It will be noted from the drawings that for this reason the air chamber is situated in that portion of the key projecting below the flats 5.

The compressed air pipe 7 which passes through the hollow screwing key is connected to the air chamber 8 by any convenient means, and preferably at a point in the wall of the perforated sleeve.

In order to stir up the sediment displaced by the screwing and to disperse it throughout the water so that it may be readily raised by the air lift, a pipe 14 is provided passing down the hollow screwing key, whereby water under pressure may be applied to the working face. The pipe preferably terminates in a jet at a point at or beyond the extremity of the bore in the key.

It will be seen that the pressure water pipe 14 restricts the bore of the screwing key. By utilizing pipes of various different diameters therefore the annular space through which the debris carrying fluid rises can be varied at will to give any desired speed of discharge. The degree of constriction of the centre portion of sleeve 9 is also a controlling factor in the speed at which discharge takes place.

Generally speaking the pressure water jet and the air lift will be operated simultaneously. This would essentially be the case where sand is traversed during the driving. In some soils however as for example in clay, it might be more desirable first to use the water jet for a time, and then to allow the air lift to come into operation.

What I claim is:—

1. Pile screwing apparatus comprising in combination a screw head, a tubular screwing key engaging the head, an orificed chamber near the lower end of the bore on the key and means for delivering air under pressure to the chamber.

2. Pile screwing apparatus comprising in combination a screw head with a through axial bore an axially bored screwing key engaging the bore in the head, a detachable driving connection between the key and the head a chamber with perforated wall within and closely adjacent the lower end of the bore in the key and a flexible hose passing through the hollow key and communicating with the chamber.

3. Pile screwing apparatus comprising in combination a screw head, with a through axial bore an axially bored screwing key, means for detachably engaging the key within the head to transmit a rotational torque thereto, a perforated sleeve screwed into the lower end of the bore in the key so that an annular chamber with perforated wall is formed between the sleeve and the interior wall of the key, and a flexible hose passing through the hollow key and communicating with the annular chamber.

4. Pile screwing apparatus comprising in combination a screw head with a through axial bore, an axially bored screwing key, means for detachably engaging the key within the head to transmit a rotational torque thereto, a sleeve with screw threaded end portions and with an intermediate perforated portion of restricted diameter screwed into the lower end of the bore in the key so that an annular chamber with perforated wall is formed between the sleeve and the interior wall of the key, and a flexible hose passing through the hollow key and communicating with the annular chamber.

5. Pile screwing apparatus comprising in combination a screw head with a through axial bore, an axially bored screwing key, means for detachably engaging the key within the head to transmit a rotational torque thereto, a sleeve with screw threaded end portions and with an intermediate perforated portion of restricted diameter screwed into the lower end of the bore in the key, an enlargement in diameter of the bore in the key over the length thereof covered by the perforated portion of the sleeve, so that an annular chamber with perforated wall is formed between the sleeve and said enlarged portion the bore in the key and a flexible hose passing through the hollow key and communicating with the annular chamber.

6. Pile screwing apparatus comprising in combination a screw head, a tubular screwing key engaging the head, a detachable driving connection between the key and the head, an orificed chamber near the lower end of the bore in the key and below the driving connection so that the chambered portion is kept from torsional stress and means for delivering air under pressure to the chamber.

7. Pile screwing apparatus comprising in combination a screw head with a through axial bore, an axially bored screwing key, means for detachably engaging the key within the head to transmit a rotational torque thereto, a sleeve with screw threaded end portions and with an intermediate perforated portion of restricted diameter screwed into the lower end of the bore in the key and below the means for detachably engaging the key within the head, so that the portion of the key containing the sleeve is kept from torsional stress, an enlargement in diameter of

the bore in the key over the length thereof covered by the perforated portion of the sleeve so that an annular chamber with perforated wall is formed between the sleeve and said enlarged portion of the bore in the key and a flexible hose passing through the hollow key and communicating with the annular chamber.

8. Pile screwing apparatus comprising in combination a screw head a tubular screwing key engaging the head, a water supply pipe passing through the screwing key and terminating closely adjacent the lower end thereof, an orificed chamber near the lower end of the bore on the key and means for delivering air under pressure to the chamber.

9. Pile screwing apparatus comprising in combination a screw head, with a through axial bore an axially bored screwing key a water supply pipe passing through the screwing key and terminating in a jet closely adjacent the lower end thereof, means for detachably engaging the key within the head to transmit a rotational torque thereto, a perforated sleeve screwed into the lower end of the bore in the key so that an annular chamber with perforated wall is formed between the sleeve and the interior wall of the key, and a flexible hose passing through the hollow key and communicating with the annular chamber.

In testimony whereof I affix my signature.
WILLIAM ARCHIBALD RADICE.