Aug. 6, 1929. H. R. SMITH 1,723,086

APPARATUS FOR HANDLING CONCRETE PILES

Filed Feb. 17, 1926

Fig-1

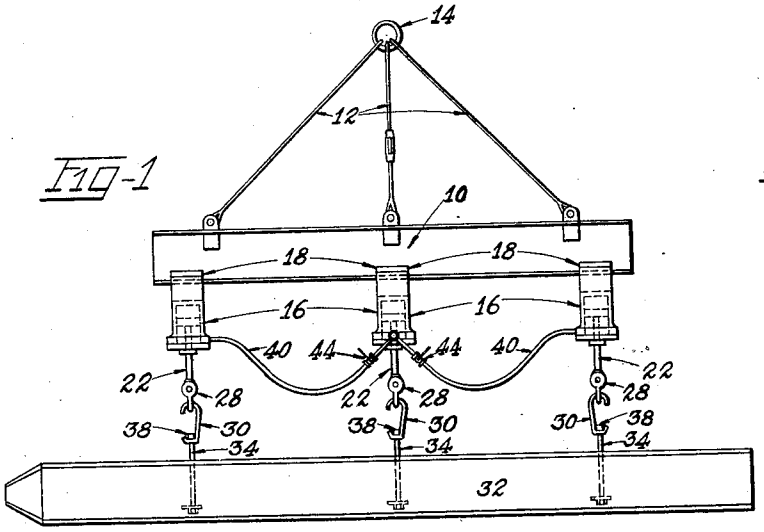



Fig-2

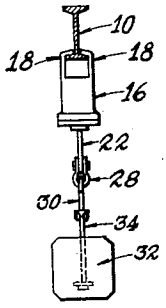



Fig-3

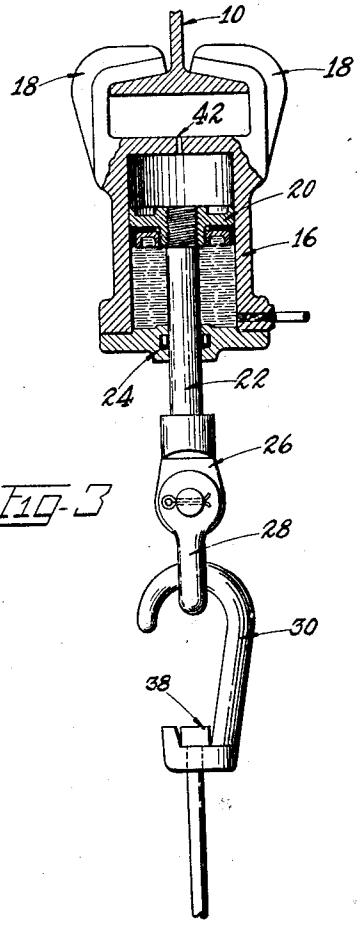
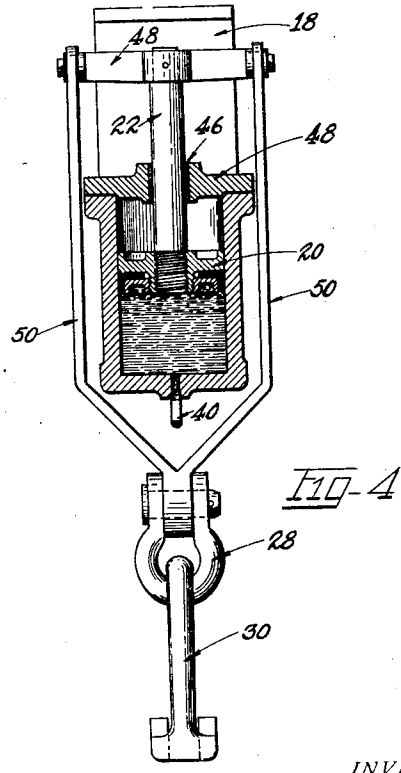



Fig-4




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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR HANDLING CONCRETE PILES.

Application filed February 17, 1926. Serial No. 88,840.

This invention pertains to apparatus for lifting and handling pre-cast concrete piles.

Concrete has very little tensile strength, therefore in order to prevent breaking of piles while being handled it is necessary that they be lifted in such manner as to subject them to no bending strains.

Practically all piles are reinforced by steel bars extending throughout their length, and it is found that more steel is required to insure safe handling in out-of-vertical positions than is necessary for their use while vertical either during driving or for carrying the final load. This difficulty is becoming more pronounced in recent years due to the tendency to put the reinforcing steel further in from the surface of the concrete in which position it is not so well able to resist bending strains.

It has been customary to fit long piles with lifting bolts projecting upwardly from one side of the pile when it was in a horizontal position. These bolts are spaced at intervals along the pile so that when the pile is lifted by hoisting tackle attached to the bolts, each bolt will carry its proportional share of the load. One or more of the bolts are arranged to be manually adjustable in length for the purpose of equalizing the loads on all the bolts when the pile is picked up, thus reducing as much as possible the tensile stresses in the pile due to bending strains.

It is the chief object of this invention to provide apparatus which will automatically equalize, or distribute, the weight of the pile among a plurality of lifting bolts, and to this and other ends the invention comprises the novel features and combinations hereinafter described.

In its preferred form the invention not only obviates the necessity for the manual adjusting operation heretofore required, but provides, without manual manipulation, better equalization than was possible with the manual adjustment of prior methods. In its preferred form the invention comprises an arrangement of beams, hydraulic cylinders and plungers, so interconnected and supported that when a load is applied simultaneously at various points the entire system will automatically adjust itself to insure the desired distribution of lifting effort at each point of load support.

The embodiment just referred to is illustrated in the accompanying drawings, in which—

Fig. 1 is a side view of the apparatus supporting a pile.

Fig. 2 is an end view of the beam, cylinder and pile shown in Fig. 1.

Fig. 3 is an enlarged cross section of one type of cylinder, with lifting hook.

Fig. 4 is an enlarged cross section of another form of cylinder, together with another view of the lifting hook.

In Fig. 1, 10 is an I-beam supported by tie bars 12 from ring 14 which is designed to engage the hook of a lifting crane. The I-beam supports a plurality of depending hydraulic cylinders 16, preferably three in number and of the same inside diameter, provided with integral upwardly projecting hook members 18 adapted to engage the lower flange of the I-beam.

Each cylinder is fitted with a piston 20, from which a piston rod 22 projects downwardly (Figs. 1, 2 and 3) through a stuffing box 24. Each rod 22 has an eye 26 from which hangs a shackle 28 adapted for engagement by a hook 30. 32 represents a concrete pile, of square cross section, and provided with three T-head lifting bolts 34. These bolts are shown with nuts on their lower ends fitted under plates near the lower side of the pile. The upper ends of bolts 34 are formed into T-heads 38 adapted for engagement by the lower ends of hooks 30. Bolts 34 are so located, lengthwise of the pile, that when the pile is properly lifted, all bolts will be substantially equally loaded.

The lower ends of cylinders 16 are interconnected by lengths of hose 40.

In service, the system contains enough oil or other liquid to fill the hose and partially fill all the cylinders. The hose is also utilized to pour the oil into the cylinders when the system is originally filled, air being allowed to escape from above the piston through vents 42 (Fig. 3).

In operation, beam 10 is moved by the crane so as to be central over the middle lifting bolt 34 of the pile. The middle cylinder 16, if not already at the middle of beam 10, is moved to that position, and the other cylinders are moved on the beam to positions directly above the bolts they are to engage. Each hook 30 is then engaged with its respective T-bolt 34 and the crane begins hoisting. All pistons 20 are the

same diameter, so if any piston 20 receives a load greater than either of the other pistons the oil under that piston will be subjected to a pressure per square inch greater than in the other cylinders and oil will thereupon flow from that cylinder through hose 40 to cylinders where the unit pressures are less, until the unit pressures in all the cylinders become uniform. The cylinders shown are all of the same diameter, therefore when the unit pressure (per square inch) is the same in all, the total loads are the same in all. Thus is the weight of the pile evenly distributed among all the lifting bolts, and the safe handling of the pile insured.

While lifting piles from the molds in which they are cast it sometimes happens that one end of a pile will stick in the mold, thereby requiring a slightly increased pull to raise it. To meet such a situation a manually operable valve 44 is inserted in each hose 40. The closing of either valve will suspend the operation of the equalizing feature of the apparatus in the cylinder cut off by the closed valve and an increased lifting effort will be exerted by that cylinder. After the pile is free from the mold the valve is opened and equalization is immediately effected automatically.

In the type of cylinder described above and illustrated in Fig. 3, the piston rod 22 passes through the bottom of the cylinder and therefore requires packing 24 to prevent oil leakage.

Fig. 4 shows a modified cylinder design which obviates the necessity for oil tight packing around the piston rod. The lower end of the cylinder is entirely closed except for a connection to hose 40. The piston rod extends upwardly from the piston through a bushing 46 in head 48. As bushing 46 is not in contact with the oil it needs no packing but acts simply to guide piston rod 22 in its vertical travel. The upper end of rod 22 in this modification is fitted with a cross head 48 which carries on each of its outer ends a downwardly extending link 50. Links 50 are bent towards each other and meet below the cylinder in shackle 28. When filling this model with oil the air escapes through a hole (not shown) drilled through rod 22.

It is to be understood that the invention is not limited to the constructions herein specifically illustrated but can be embodied in other forms without departing from its spirit.

I claim—

In an apparatus for handling concrete piles, in combination, means to engage a pile at a plurality of points, a device arranged to apply lifting effort to the pile through said points of engagement, means to automatically equalize said lifting effort among said points of engagement, and means for causing a lifting effort to be applied to one or more of said points of engagement independently of said equalizing means.

In testimony whereof I hereto affix my signature.

HERMAN R. SMITH.