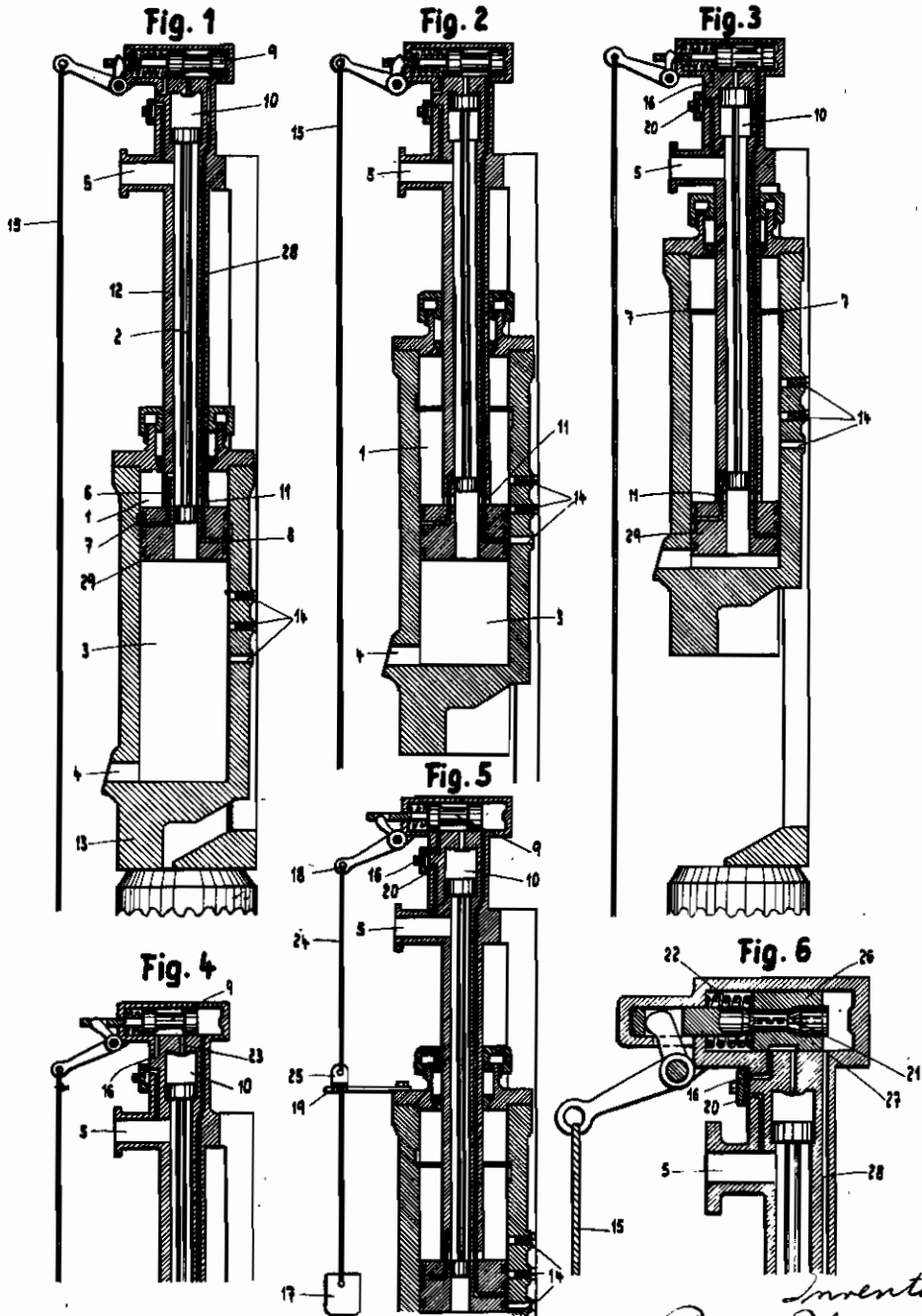


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REGULATING DEVICE FOR PILE-DRIVER MONKEYS

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Regulating devices for pile-driver monkeys, in which there is a regulating piston inside the working piston, are already known. Various forms have been suggested here, but owing to their complicated construction and the difficulties arising in their actual use, they have hitherto been practically unable to meet with any recognition. It has been suggested, for instance, to fit a three-part regulating piston inside the working piston, whereby very many channels would have to be bored within the latter, besides which the regulating piston must be correspondingly developed as a three-part piston and all other channels adapted to that figure. That is extremely awkward for the manufacture and for the operation, and no satisfactory practical solution has been found.

Here the present invention comes in, which, quite apart from being easier to produce, is also simpler in its operation.

In this invention a regulating device for steam monkeys is provided, in which, within the hollow piston rod of the working piston, there is a regulating piston, with a larger piston above to move the regulating piston and a smaller adjusting piston below to regulate the inlet and outlet steam for the working piston. The regulating piston regulates the driving medium for the working piston and the latter regulates the driving medium for the regulating piston, so that the monkey can strike automatically. In order to attain this end the upper regulating piston and the working piston are connected by channels.

On the crosshead of the piston rod there is a steam distributor with which single strokes and also strokes with a smaller drop can be given. This arrangement is necessary when ramming into soft soil and at the beginning of each ramming process, so that the pile does not sink away too quickly, as otherwise the monkey can be damaged. The monkey is hand-regulated with the steam distributor by pulling a rope. A spring brings the distributor back to its starting point.

In the tests at the manufactory, in order to protect the pile and to avoid jarring, the monkey must not strike, but must be caught up by premature reversal of the driving medium. This is effected by the steam distributor and by using a weight Fig. 5.

In one construction given as an example the invention is shown in the annexed drawing:

Fig. 1 shows the monkey with the striker in its lowest position, where it stands on the pile.

Fig. 2 shows the monkey at the commencement of reversing from lifting to dropping.

Fig. 3 shows the monkey in its highest position shortly before reversing for the drop. The monkey reaches this position by expansion of the steam and by inertia.

Fig. 4 shows a partial section, in order to indicate the situation of the steam distributor 9 towards the left.

Fig. 5 shows a partial section to indicate the weighting of the steam distributor 9 over the cranked lever 18 with the weight 17.

Fig. 6 shows an enlarged representation of the steam distributor 9 in section in its details in one special construction.

The steam passes through the steam inlet connection 5 into the hollow piston rod 12 and fills the space between the upper and lower regulating piston 2. From there, as shown in Fig. 1, the steam can pass through the channel 6 in the piston rod 12 into the channel 7 in the wall of the cylinder 1 and from there through suitable annular depressions in the cylinder 1 into the channel 8 and 28 and through the D of the slide valve 9 into the cylinder space 10 over the upper regulating piston. The regulating piston 2 is thus moved from its upper position shown in Fig. 2 into the position indicated in Fig. 1; thereby the lower regulating piston passes beyond the slot 11, so that the steam can now pass from the ring space of the piston rod 12 through the slot 11 into the cylinder space 1 and lift the monkey 13.

When the monkey has reached the position shown in Fig. 2 the steam leaves the space 10 over the regulating piston through the channel 8 and through the opening 14 into the open air. The regulating piston 2, the upper piston of which is larger than the lower one, is thereby brought by steam pressure into the position as shown in Fig. 2. The steam can now pass out from the cylinder space 1 through the slot 11 into the cylinder space 3 and from there through the exhaust opening 4 into the open air. The monkey 13 rises to the position of Fig. 3 and then drops down on the head of the pile. (Position Fig. 1.) Through the channel 7 and 8 the steam can now again pass from the ring space over the lower regulating piston 2 into the space 10 over the upper regulating piston and press down the latter, whereupon the monkey again begins to rise. At the commencement of the ramming work it is necessary to give short strokes, as the pile still draws strongly. That is the purpose of the steam distributor 9. When the monkey is rising the steam distributor can be moved to the left by a downward pull of the rope 15 (cf. Fig. 4). This causes the steam from

space 10 over the regulating piston 2 to pass through the inlet channel 23 and the exhaust channel 16 into the open air. The regulating piston 2 rises, reverses, and the monkey falls. If the rope 15, after having been pulled downward, is held firmly, the monkey cannot rise, because the steam entering through channel 7 can pass out into the open air again through the channels 23 and 16. It is therefore possible also to give single strokes of any desired drop.

For trying out new monkeys at the works it is necessary, for the purpose of running in the piston and the regulating piston, to let the monkey dance, i. e., the monkey is not allowed to drop right to the bottom, but reversed sooner, so that steam enters the cylinder space 1 and catches up the falling monkey, because otherwise any stop would soon be smashed by the heavy monkey. This running in is done at the works and is also necessary in many cases of repair. For that purpose the regulating piston 9 (Fig. 5) is weighted at its cranked lever 18 by a weight 17. This weight is caught up by a stop 25 by a bearing 19 attached to the monkey. Through a screwed joint the channel 16 is now connected to the channel 20 (Fig. 5). If the monkey 13 is down the steam distributor 9 is held to the left by the weight 17 and connects the channel 20, which opens into the steam inlet pipe 5, with the channel 16. The steam can pass out of this channel 16 through the D of the steam distributor 9 into the space 10 over the regulating piston 2, pressing down the latter so that the steam can pass into the cylinder space 1, causing the monkey to rise. When the monkey has been lifted a little the steam distributor moves to the right, because the weight is lifted by the bearing 19 and the spring 22 relaxes, and connects through its D the space 10 with an exhaust opening 14 (Fig. 2), by which means the regulating piston 2 is again reversed and the monkey falls. But together with the monkey there falls also the bearing 19 and the weight 17, moving the steam distributor once more to the left as soon as a certain depth has been reached, whereby the regulating piston 2 is again directed downward and the steam can enter the space 1 to catch up the falling monkey. The

connection 24 between 18 and 19 is in the form of a wire rope or a chain, because it must move aside, for the rising monkey reduces the distance between 18 and 19.

5 The steam distributor 9 (Fig. 6) consists of two half cylinders 29 and 27, the lower one 27 of which carries the D for the connecting of the steam channels, the upper half serving to press down the lower half against the steam pressure. 10 This is effected as follows: The slide valve rod presses apart the two halves of the steam distributor with its cone 21 through the action of the spring 22 which lays itself against the casing of the steam distributor and so presses the two 15 halves of the distributor apart with the help of the cone, whilst at the same time the spring 22 causes the return movement of the steam distributor when the latter has been moved to the left by pulling the rope 15.

20 In Fig. 6 the part 9 of Figs. 1 to 5 is represented more in detail in a somewhat clearer separate drawing, i. e., the steam distributor 9 of Figs. 1 to 5 is developed in accordance with Fig. 6. The essential point of the application is that by 25 the regulating piston 2 within the piston rod 12 all harmful space is avoided, the ring space 10 Fig. 3 in the hollow piston rod being always under steam pressure below the upper regulating piston, and further the connection for the steam 30 over the channel 6 26 to the steam distributor 9 and, according to the position of the latter, to the channel 23 and the space 10 being given through the openings 11 conjointly with the ring channel 7. In this way the steam is enabled to strike the 35 upper regulating piston from above, whereby it is led through the working piston 29.

The distance to which the monkey can rise is in this invention adjustable to any desired height by several exhaust openings 14 in the monkey, 40 whereby, as indicated in the drawings, those exhaust openings that are not required may either be open or closed. In the former case the lowest opening, which is reached first by the working piston 29 would determine the height the monkey 45 would rise.

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