July 1, 1930. H. REICHMANN 1,769,390

AUTOMATIC GRAB

Filed March 9, 1928 2 Sheets-Sheet 1

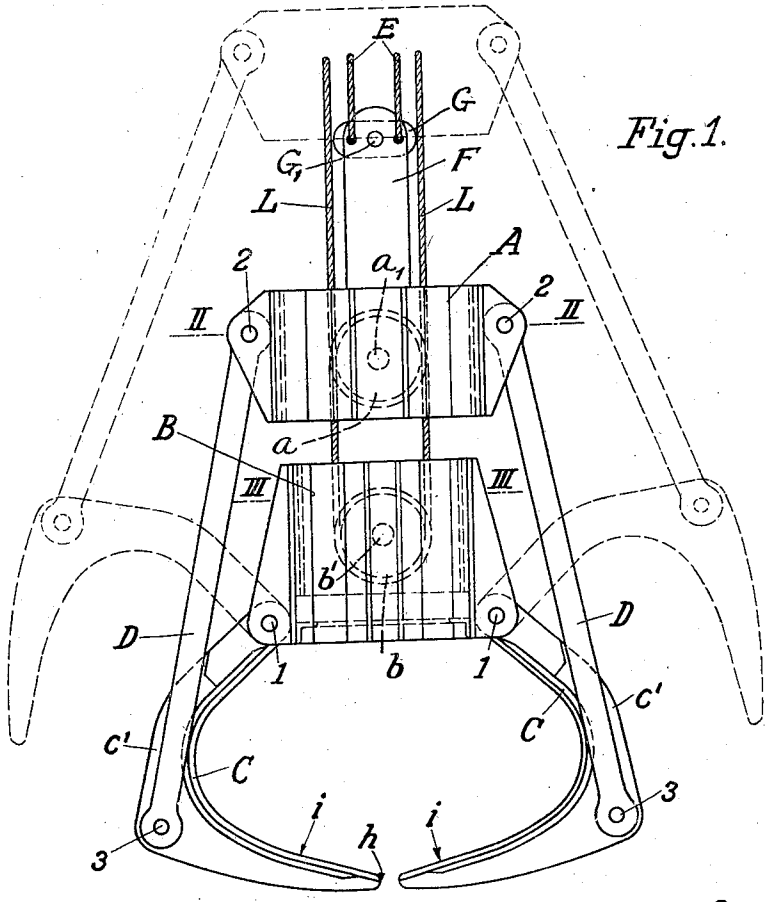


Fig.1.

Fig.2.

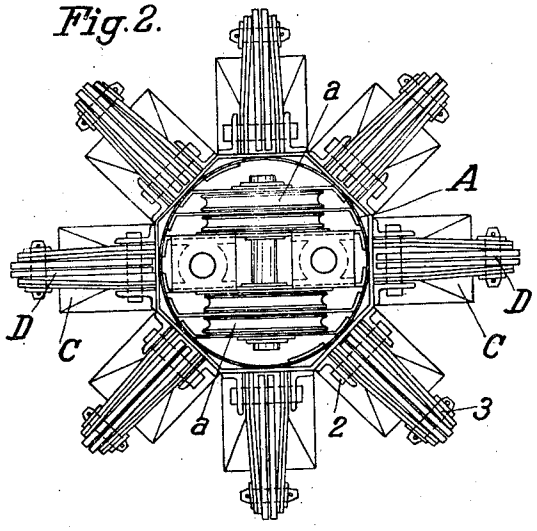
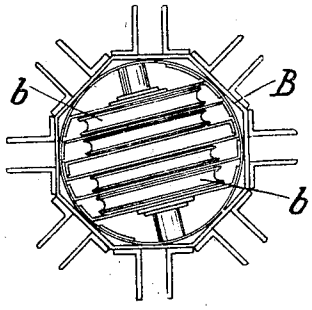


Fig.3.



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Fig. 5.

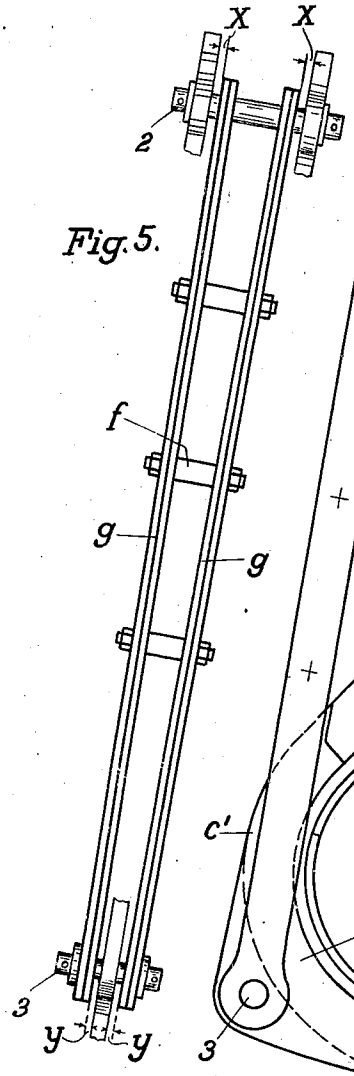


Fig. 4.

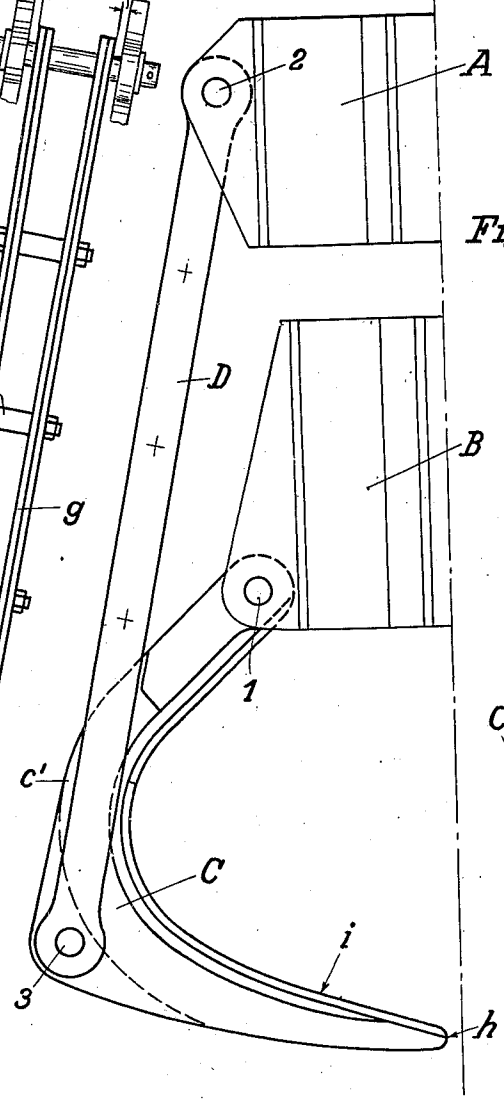
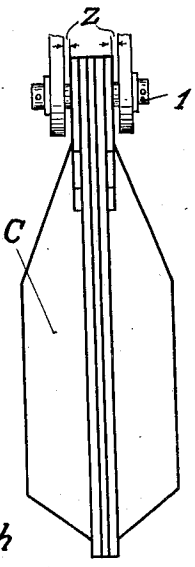


Fig. 6.



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UNITED STATES PATENT OFFICE

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AUTOMATIC GRAB

Application filed March 9, 1928, Serial No. 260,269, and in Germany March 11, 1927.

This invention relates to an automatic grab which is provided with a plurality of grippers or jaws hinged to the lower sleeve of the grab body and being closed and opened by rods hinged at their lower ends to said grippers or jaws and at their upper ends to the upper sleeve of said body. The known grabs of this type are not suited for scrap iron, ore and the like, as either the lower sleeve is kept parallel to the upper sleeve by means of guide members or its free adjustment is impeded or limited by abutment members in the closed position, as well as in the open one, of the grippers or jaws.

Now, in order to enable the individual grippers or jaws to accommodate themselves automatically in every position to any unforeseen resistance and to compensate this latter by acting upon the other grippers or jaws, the present improved grab is so designed that the pivotal connections of the grippers or jaws form, in the open, as well as in the closed position of the latter, a self-adjusting multi-jaw joint capable of yielding in all directions in the case of resistance arising.

In order to render it possible to increase the yieldability and the adjustability of the gripper or jaw ends when very bulky parts are to be seized and lifted, there is enough play left in every jaw joint to permit every one of the jaws and unconstrained adjustment also outside of its normal middle plane. Furthermore, in order to attain forceful entering of the grippers or jaws into the material to be seized and lifted, their middle pivot points are located about equally remote from the end of the same and from the upper pivot points, and the shape of the grippers or jaws is correspondingly and suitably chosen, as more fully described hereinafter.

The invention is illustrated diagrammatically and by way of example in the accompanying drawing, in which Fig. 1 is a side view of a grab designed according to this invention, there being, however, shown in this figure only those jaws which are located in the plane of the paper of the drawing, and these jaws are shown in two positions, viz. in full lines in closed position and in dotted lines in the open one; Fig. 2 is a horizontal section in the plane II—II of Fig. 1; Fig. 3 is a section through the lower sleeve in the plane III—III of Fig. 1; Fig. 4 shows one of the grippers or jaws and its operating rod together with halves of the upper and of the lower sleeve, this figure being drawn to an enlarged scale; Fig. 5 is an outer or edge view of the operating rod or, more precisely, of several connected operating rods relating to one gripper or jaw, the scale being the same as that of Fig. 4; and Fig. 6 is an outer view of the gripper or jaw shown in Fig. 4.

On the drawing, B denotes the lower sleeve, and C are the curved grippers or jaws (for instance, eight, as in the example shown in Fig. 2) which are jointed to the sleeve B by pivots 1. The grippers or jaws are connected by bolts 3 with the lower ends of rods D, the latter being hinged at their upper ends to the upper sleeve A by means of bolts 2 upon which these members C and D have some lateral play. A rope L, the closing rope, is guided over pulleys *a* and *b* mounted respectively on the sleeves A and B, one end of said rope being fastened in any suitable manner, so that when the other end of the rope is subjected to a pull the two sleeves are moved toward one another, with the result that the grab is closed. When said end of the rope L is again released, the lower sleeve moves away from the upper one by its own weight and the grab jaws or arms C are opened. The upper sleeve is suspended from a rope E, or from two ropes E, as in the example shown in the drawing; in the illustrated example the two ropes E are not attached directly to the sleeve *a*, but by means of an upwardly directed flat bar F fixed to said sleeve, and a horizontal member G which is connected with

said bar by a pivot G'. The lower sleeve is preferably made as wide as possible and the pivots 1 of the grippers or jaws are located at the circumference of this sleeve so that they are as remote as possible from the middle axis of the gripper or jaw. Owing to this arrangement the lower sleeve can assume an oblique position relatively to the upper sleeve, the whole, including the joints 1, 2 and 3, thus forming an automatically adjustable multi-jaw support which is yielding in all directions and the gripping jaws of which accommodate themselves automatically to any bulky material, and to any unequal resistance developed thereby.

If, therefore, any one of the grippers or jaws encounters a particularly strong resistance owing to the presence of some bulky parts to be seized and lifted, the lower sleeve flange is free to assume a suitably oblique position relatively to the position of the upper sleeve and re-adjusts automatically all other grippers or jaws so that their gripping action is correspondingly increased. This yieldability of the grippers or jaws to resistances arising at different places and of relatively different strength is still further materially increased by the fact that the lower sleeve is made as wide as possible and the pivots 1 are arranged, as far as possible, at the circumference of said sleeve because in such a case the individual grippers or jaws are able to exert a great turning moment upon the lower sleeve. In addition the arrangement provides a larger number of grippers or jaws, that is, a better distribution of the forces, and this entails the further advantage that if, for instance, such parts as wooden beams, girders, or the like must be seized and lifted, oppositely located grippers or jaws may be detached from the grab so that the respective parts are seized only at their sides. The readjustment of the grippers or jaws is effected in the usual manner by lifting or lowering, as the case may be, the sleeve B relatively to the sleeve A.

In order to provide for a very great flexibility and adaptability of the grippers or jaws, all movable members of the same have a predetermined play in their bearings of such an amount that they can be shifted laterally to a certain extent. Thus, for instance, the rods D may be shifted laterally on the pivots 2 by as much as the distance x in Fig. 5 and on the pivots 1 and 3 by as much as the distance y in Fig. 5 and z in Fig. 6. All gripper or jaw joints form, therefore, in spite of their being positively connected with one another, and by reason of the play mentioned, a perfectly loose, self-adjusting joint connection able to accommodate itself in every direction to any developed resistances.

In order to increase this free adjustability still more, each of the rods is composed of two or more pairs of members g g (Fig. 5) spaced apart by spacing members f or proper equivalents. The members g are arranged edgewise, as shown, and consist of flexible steel. The number of the members g may be chosen according to requirement. Owing to this construction of the rods D, and in spite of their low weight, they are able to withstand all strains which are directed towards the middle axis of the grab or by which said rods, or the members composing them respectively, are subjected to bending stresses. If, however, when particularly resistant elements are to be seized and lifted, the laterally directed forces are so great that the dead play existing is not sufficient to effect the equalization, then the rods D, or the members g respectively, and with them the grippers or jaws, can singly give way laterally to a certain extent. The transmission of the forces is facilitated by the fact that the ribs c' (Figs. 4 and 5) of the grippers or jaws extend between the members g in the manner shown in these figures.

When the jaws have been opened and the load has been discharged, they quickly return to their former position under the elasticity of the members g, and in order to provide for an effective transmission of the lateral forces in this case, the ribs c' extend between the members g, as already described.

The described construction of the individual gripper or jaw joints increases considerably the ability of the jaws to accommodate themselves to existing conditions, and adds to the indifference of the grippers or jaws to bulky parts whereby the life of the grab is materially increased.

In order to prevent the jaws from jumping over the parts to be seized and lifted, or, in other words, in order to force them into the material and cause them to rake the respective parts together, the position of the pivots 1 and 3 of the jaws is so chosen that the middle pivot 3 of each jaw is equally spaced from the tip h and from the upper pivot 1 of the jaw. It is possible with this novel arrangement to have the pivots 3 located only slightly above that horizontal plane in which the jaw tips are located when the grab is closed.

The penetration of the grippers or jaws into the material to be seized and lifted is promoted also by the fact that the operating face i of each gripper or jaw extends in a practically straight line from the tip h in a direction toward the pivot 3 whereby damming up of the material when the tips h are entering thereinto is prevented.

I claim:

1. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, a mobile connection between said sleeves whereby the latter are capable of tilting and otherwise moving relatively to each other, gripping jaws for grabbing the material to be raised, flexible pivotal connections between said jaws and said lower

sleeve whereby said jaws are capable of movements other than their pivotal movements relatively to said sleeve, operating rods for said jaws, and flexible pivotal connections between said rods and said upper sleeve, and between said rods and said jaws, the mobility and flexibility of said connections permitting universal movements in the gripping ends of said jaws whereby the latter automatically accommodate themselves to any unequal resistances developed by the material being gripped.

2. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, a mobile connection between said sleeves whereby the latter are capable of tilting and otherwise moving relatively to each other, gripping jaws for grabbing the material to be raised, loose pivotal connections between said jaws and said lower sleeve, operating bars for said jaws, and loose pivotal connections between said bars and said upper sleeve and jaws respectively, the mobility and looseness of said connections permitting universal movements of the gripping ends of said jaws whereby the latter automatically accommodate themselves to any unequal resistances developed by the material being gripped.

3. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, a mobile connection between said sleeves whereby the latter are capable of tilting and otherwise moving relatively to each other, gripping jaws for grabbing the material to be raised, pivotal connections between said jaws and said lower sleeve on which said jaws have predetermined lateral play to permit relative lateral movements of the jaws out of their planes of normal pivotal movement, operating rods for said jaws, and pivotal connections between said rods and said upper sleeve, and between said rods and said jaws, on which said operating rods have predetermined lateral play to permit relative lateral movements of the operating rods out of their planes of normal pivotal movement, the mobility of said connections and the play therein permitting universal movements of the gripping ends of said jaws whereby the latter automatically accommodate themselves to any unequal resistances developed by the material being gripped.

4. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, a flexible connection between said sleeves, gripping jaws hinged to said lower sleeve, and flexible operating rods hinged to said jaws and to said upper sleeve and capable of yielding laterally, the hinge connections being loose and with the flexibility of the connection between the sleeves, and the flexibility of the rods permitting the gripping jaws to adjust themselves automatically, in the open position and in the closed position, to an unequal resistances developed by the material being gripped.

5. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, gripping jaws loosely hinged to said lower sleeve, operating rods loosely hinged to said jaws and to said upper sleeve and each consisting of a plurality of flexible flat steel members arranged edgewise and spacing members arranged between said rod members for fixing said members in spaced relation, the looseness of the hinge connections and the flexibility of the operating rods permitting the gripping jaws to adjust themselves automatically, in the open position and in the closed position, to any unequal resistances developed by the material being gripped.

6. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, gripping jaws loosely hinged to said lower sleeve, operating rods loosely hinged to said jaws and to said upper sleeve, and each consisting of at least two spaced parallel members, and a rib on each jaw extending into the space between the parallel members constituting the co-operating operating rod, the looseness of the hinge connections permitting the gripping jaws to adjust themselves automatically, in the open position and in the closed position, to any unequal resistances developed by the material being gripped.

7. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, gripping jaws loosely hinged to said lower sleeve, and operating rods loosely hinged to said jaws and to said upper sleeve, the hinge connection of each jaw with its operating rod being located midway between the gripping point of each jaw and its hinged connection with the lower sleeve.

8. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, gripping jaws loosely hinged to said lower sleeve, and operating rods loosely hinged to said jaws and to said upper sleeve, the hinge connection of each jaw with its operating rod being located slightly above the horizontal plane in which the gripping points of the jaws are located when the grab is closed.

9. An automatic grab for bulky materials, comprising, in combination, an upper sleeve, a lower sleeve, gripping jaws loosely hinged to said lower sleeve, and operating rods loosely hinged to said jaws and to said upper sleeve, the operating face of each jaw being so shaped as to extend in a practically straight line from the gripping end towards the hinge connection with the operating rod and along a curved line toward the hinge connection with the lower sleeve.

10. An automatic grab for bulky materials, comprising, in combination, an upper sleeve,

a lower sleeve, gripping jaws loosely pivoted to the lower sleeve, and operating rods loosely pivoted to said jaws and to said upper sleeve, the vertical distance, in the closed position of the jaws between the gripping points of the jaws and the horizontal plane in which the pivotal connections of the operating rods and the jaws are located being less than the vertical distance between said horizontal plane and the horizontal plane in which the pivotal connections of said jaws with said lower sleeve are located.

In testimony whereof I have affixed my signature.

HEINRICH REICHMANN.