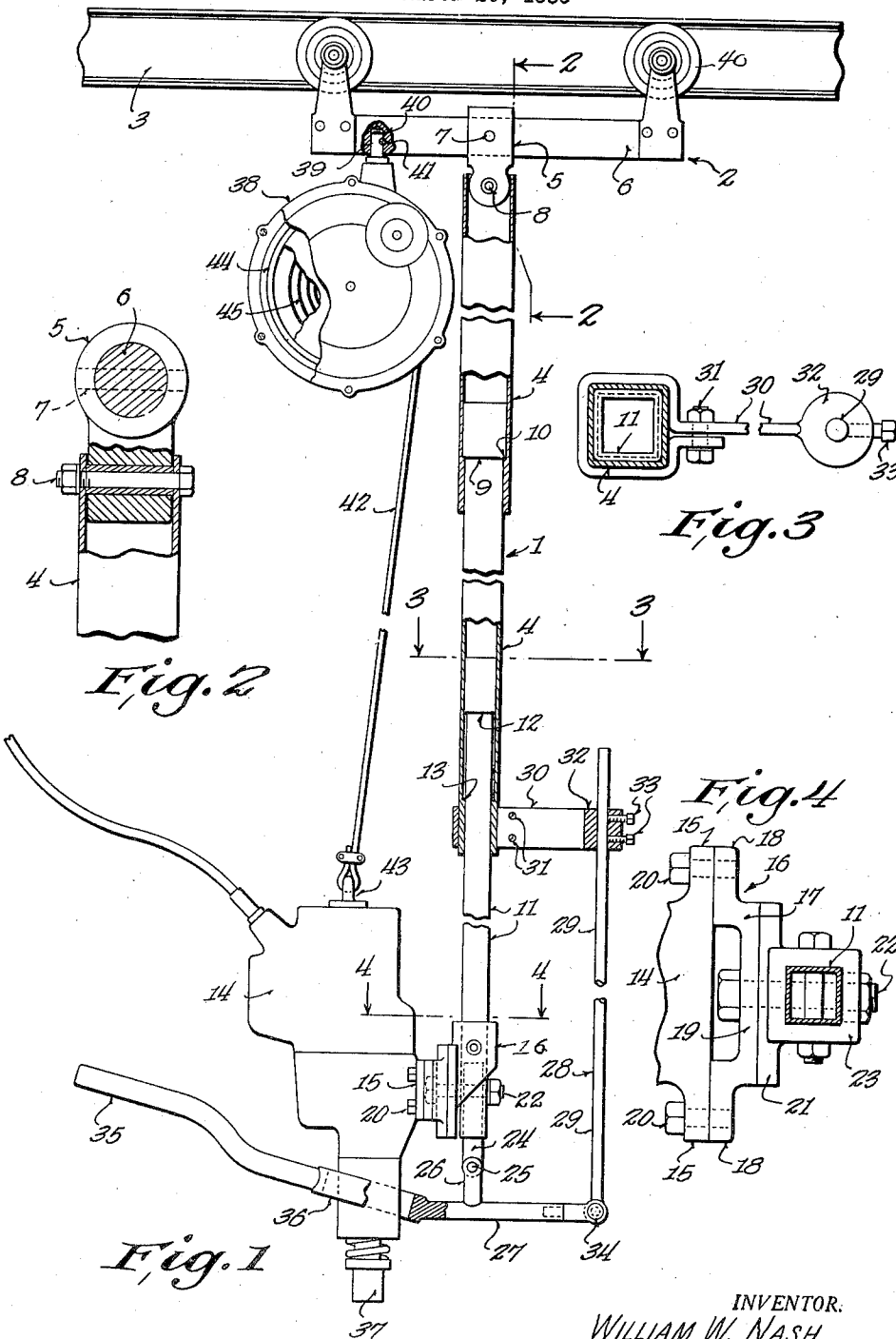


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TOOL SUSPENSION

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TOOL SUSPENSION

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In the ordinary nut setting operations by a portable motor driven nut setting tool suspended from an overhead support by a combined counter-balance and torque resisting fixture as disclosed and claimed in my copending application Ser. No. 255,258, filed February 8, 1939, the operator is nearly always required to use both hands, one at each side of the machine to raise and lower the tool for each nut tightened or each stud set. In some nut setting operations, it is necessary to use two operators, one for raising and lowering the tool and the other for holding or preventing the bolt from turning. It is to such operations that my present invention relates and according to its requirements I have developed a lever arrangement for use with the suspension and torque resisting fixture aforesaid so that the tool may be raised and lowered by one hand while the other hand is free for preventing the bolt from turning or for inserting the next bolt or nut to be driven.

This lever arrangement is available for vertical suspension and on such operations where there is a large number of nuts, cap screws or studs to be driven which are on one level such as cylinder head nuts or studs, main bearing cap nuts or studs, assembling a crawler tractor track on a flat surface or similar operations.

In accordance with my invention, the lever feed handle is fulcrumed on a support which may depend from the trolley frame at the upper end of the torque arm or be directly clamped to the torque arm at the desired point below the trolley as specifically disclosed therein.

The nut or stud setting tool is attached to the lower end of the torque arm through a terminal section which is free to slide up and down in the main portion of the arm so that the tool may be readily raised and lowered through the lever handle. It is to be understood in connection with my disclosure herein that the tool is attached to the torque arm through a bracket assembly which mounts the tool on the arm with the tool in a vertical position and parallel to the torque arm which is extensible.

The counter-balancing device used with the fixture is carried by the trolley as in my copending application aforesaid, but the lower end of the cable is directly connected to the tool instead of to the yoke bracket as in my other construction.

In the accompanying drawing illustrating one embodiment of my invention—

Fig. 1 shows a tool attached to the fixture referred to by a lever arrangement of my inven-

tion, the parts being shown in elevation and section, respectively, for the purpose of illustration;

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1; and

Figs. 3 and 4 are horizontal sectional views taken on lines 3—3 and 4—4, respectively, of Fig. 1.

In the drawing, 1 indicates the arm element of the fixture, and 2 indicates the trolley which suspends the arm from an overhead track-way 3.

The arm 1, as in my co-pending application, is extensible, comprising as herein shown a plurality of telescopically connected tubular sections 4, 4. A hanger 5 connects the upper end of the arm 1 to the trolley frame 6, the hanger being fixed against rotation with respect to the trolley frame 6 by a cross-pin 7 which extends through both the hanger and the trolley frame as shown in Fig. 2. This holds the arm in vertically suspended relation with respect to the trolley, no lateral adjustment being permitted as in my copending application. The hanger 5 is, however, connected to the upper section 4 of the arm 1 by a pivot pin 8 so that the arm may be swung forwardly and backwardly within limits in the plane of the trolley as in said co-pending application.

The arm sections 4, 4 have abutable stops or shoulders 9, 10 to limit the extensibility of the arm as before, but the lower section 4 is open at its lower end to receive a tool supporting element 11. The latter is preferably in the form of a tube like the section 4 and has a telescopic and non-rotative fit therein as shown. The element 11 has a stop shoulder 12 adjacent its upper end to abut a shoulder 13 near the bottom of the lower section 4 to limit the extensibility of the element 11. In use, the shoulders 12 and 13 are out of contact so that the element 11 may be slid up and down to raise and lower the tool as will be presently described.

The tool referred to is marked 14 in the drawing and is of the bracket mounted type as shown. That is, the tool has side lugs 15, 15 on its gear case section, whereby the tool may be attached to the element 11 by a bracket assembly indicated generally at 16 in Fig. 1. This bracket, as more clearly shown in Fig. 4, has an adapter plate 17 having side lugs 18, 18 and an off-set mid-portion 19. The lugs 18 fit against the tool lugs 15 and are secured thereto by bolts 20, 20. The body element 21 of the bracket fits against the mid-portion 19 of the adapter plate 17 and is secured thereto by a single bolt 22. The head

of the bolt 22 lies in the space between the adapter portion 19 and the tool casing as shown. The body portion 21 of the bracket has a tubular section 23 on its front side and which tubular section receives the arm element 11. The bolt 22 also passes through the element 11 and clamps the tool to the said element as well as to a rod section 24 which extends below the element and by a pivot pin 25 is connected to an upright extension 26 on a feed lever 27 at the lower end of the arm.

The lever 27 is extended on opposite sides of the arm and is connected at one end to a fulcrum providing fixture 28. The latter in the embodiment shown comprises a rod member 29 extending along the arm 1 at one side thereof and clamped at its upper end to the lower section 4 of the arm by a bracket 30. Said bracket, as detailed in Fig. 3, embraces the arm section 4 and is clamped thereto by one or more bolts 31, 31'. The bracket 30 is enlarged at its outer end as at 32 to receive the upper end portion of the rod 29. The latter has a sliding fit in the enlargement 32 and is secured in its adjusted positions by one or more set screws 33. The lever 27 is connected to the lower end of the rod 29 by a fulcrum pin 34. Hence, the lever 27 when swung up and down raises and lowers the tool 14 with respect to the arm as is apparent from Fig. 1. The outer end of the lever extends beyond the tool 14 and is shaped to provide a handle 35 for grasping the lever.

To pass the tool, the lever 27 is provided with a loop portion 36 which extends about the lower end of the tool. It is to be understood that the tool has a socket element 37 at its lower end to engage over a nut or stud as the case may be and an automatic clutch device (not shown) which release when the tool is overloaded. Thus, the tool while under power may be engaged with the nut or stud to be set and have its driving torque on the work automatically released as soon as the nut or stud becomes set. The tool, while still under power, is raised from the work by the lever 27 and then lowered by the lever to engage the next nut or stud to be driven, the clutch engaging on pressing the tool against the work. This adapts the tool to rapid production operations while being suspended and enables one operator to manipulate the tool with one hand while having the other hand free to hold the bolt against turning or inserting the next nut or bolt to be driven.

The counter-balancing device used with the arm 1 is shown at 38 in Fig. 1. This device is of the self-contained spiral spring type and is attached to the trolley frame by a lug 39 on the balancer housing extending into a recess 40 in the trolley frame and locked therein by a pin 41 as in my co-pending application. The cable 42 of the counter-balance is attached at its lower end to the tool 14 through an eye fixture 43 on the upper end of the tool case. The other end of the cable 42 is anchored to a drum 44 rotatably mounted in the balancer housing and turned in a direction to wind-up the cable on the drum by a spiral spring 45. The latter is also housed within the balancer housing, the arrangement being detailed in my allowed application Serial No. 174,639, filed November 15, 1937, now Patent No. 2,152,969, granted April 4, 1939.

The balancer spring 45 is adjusted or tensioned to balance the load of the tool when lowered to a working level as shown in Fig. 1. The tool at this level is engageable with the work, being ad-

justed up and down by the feed lever 27. The tool when not in use may be raised up out of the way, the spring 45 lifting the tool and collapsing the arm 1 as apparent. The balancer device has a lock to hold the tool raised. To lower the tool it is first lifted slightly to release the lock whereupon a downward pull on the tool lowers it.

The fulcrum rod 29 could extend to the trolley frame and be anchored thereto. With an attachment of this character, the rod would need be collapsible to open and close with the torque resisting arm. The trolley has wheels or rollers 46 to mount the trolley on the track 3.

The rod 29 is clamped in the bracket 30 to the adjusted position required to space the shoulders 12, 13 to the extent necessary to permit raising and lowering of the tool by the lever 27 without hindrance by said shoulders. The latter and the shoulders on the arm sections 4 provide safety stops to prevent dropping of the tool should the balancer or its cable fail or break. The tool 14 is electrically operated having its electric motor within its tool case as in machinery of this general character. A pneumatically operated tool could also be used with my improved lever feed as herein described.

The device disclosed is simple in construction and operation. It may be operated with convenience and safety as the load of the tool is carried by the trolley and the torque strains are taken up by the arm 1 which is long enough to absorb them without being impressed on the trolley. The flexible connection of the arm with the trolley allows the tool to be adjusted with respect to the normal suspended position of the arm and thus the tool may be swung forwardly or backwardly to reach the work positioned within the range of adjustment permitted of the tool.

The details of construction shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. The combination with an overhead support, of a portable motor driven tool containing its driving motor, an arm for suspending the tool from said support, means connecting the upper end of the arm to the support and holding the arm against axial rotation with respect to said support, an element connecting the tool to the lower end of the arm and having a sliding connection therewith, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, a lever operable on said element for raising and lowering the tool with respect to the arm, and a fulcrum for the lever carried by the arm.

2. The combination with an overhead support, of a portable motor driven tool containing its driving motor, an arm for suspending the tool from said support, means connecting the upper end of the arm to the support and holding the arm against axial rotation with respect to said support, an element connecting the tool to the lower end of the arm and having a sliding connection therewith, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, a bracket carried by the arm, a rod depending from said bracket, and a lever fulcrumed on said rod and operable on

the element for raising and lowering the tool with respect to the arm.

3. The combination with an overhead support, a portable motor driven tool containing its driving motor, an arm and a counter-balancing device for suspending the tool from said support, means connecting the upper end of the arm to the support and holding the arm against axial rotation with respect to said support, said arm consisting of telescopically connected sections to permit raising and lowering of the tool with respect to the support, an element connecting the tool to the lower end of the arm and constituting the lowermost extensible section thereof, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, and a lever carried by the arm and operable on said element for raising and lowering the tool with respect to the arm.

4. The combination with an overhead trackway and a trolley mounted to run thereon, of a portable motor driven tool containing its driving motor, an arm and a counter-balancing device for suspending the tool from said trolley, said counter-balancing device and said arm being respectively connected to the trolley, the connection between the trolley and the arm holding the arm non-rotative axially, said arm consisting of telescopically connected sections to permit raising and lowering of the tool with respect to the trolley, an element connecting the tool to the lower end of the arm and constituting the lowermost extensible section thereof, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, and a lever carried by the arm and operable on said element for raising and lowering the tool with respect to the arm.

5. The combination with an overhead support, of a portable motor driven tool containing its driving motor, an arm and a counter-balancing device for suspending the tool from said support, said counter-balancing device and said arm being respectively connected to said support with the connection between the arm and the support holding the arm non-rotative axially, said arm

consisting of telescopically connected sections to permit raising and lowering of the tool with respect to the support, an element connecting the tool to the lower end of the arm and constituting the lowermost section thereof, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, and a lever operable on said element and carried by the arm for raising and lowering the tool with respect to the arm, said lever extending on opposite sides of the tool and having a looped portion to pass the lower end of the tool.

6. The combination with an overhead support, of a portable motor driven tool containing its driving motor and having an outer casing enclosing said motor and the driving connection between the motor and the spindle of the tool, an arm for suspending the tool from said support with the tool disposed with its spindle extending downwardly to engage work below the arm, means connecting the arm at its upper end to the support and holding the arm against axial rotation with respect to said support, and means adjustably connecting the tool through its outer casing to the lower end of the arm whereby the tool may be raised and lowered in respect to the arm, said last named means and said arm being non-rotative axially of the arm to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof.

7. The combination with an overhead support, of a portable motor driven tool containing its driving motor, an arm for suspending the tool from said support, means connecting the upper end of the arm to the support and holding the arm against axial rotation with respect to said support, an element connecting the tool to the lower end of the arm and having a sliding connection therewith, said arm and said element being non-rotative axially to resist any torque strains which may be impressed thereon by the tool motor in the operation thereof, a lever operable on said element for raising and lowering the tool with respect to the arm, and a fulcrum for the lever carried by the means which connects the arm to the overhead support.

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