Sept. 27, 1955 F. E. DANNHEIM 2,718,804

POWER-OPERATED RECIPROCATORY IMPACT TOOL

Filed Oct. 30, 1952 2 Sheets-Sheet 1

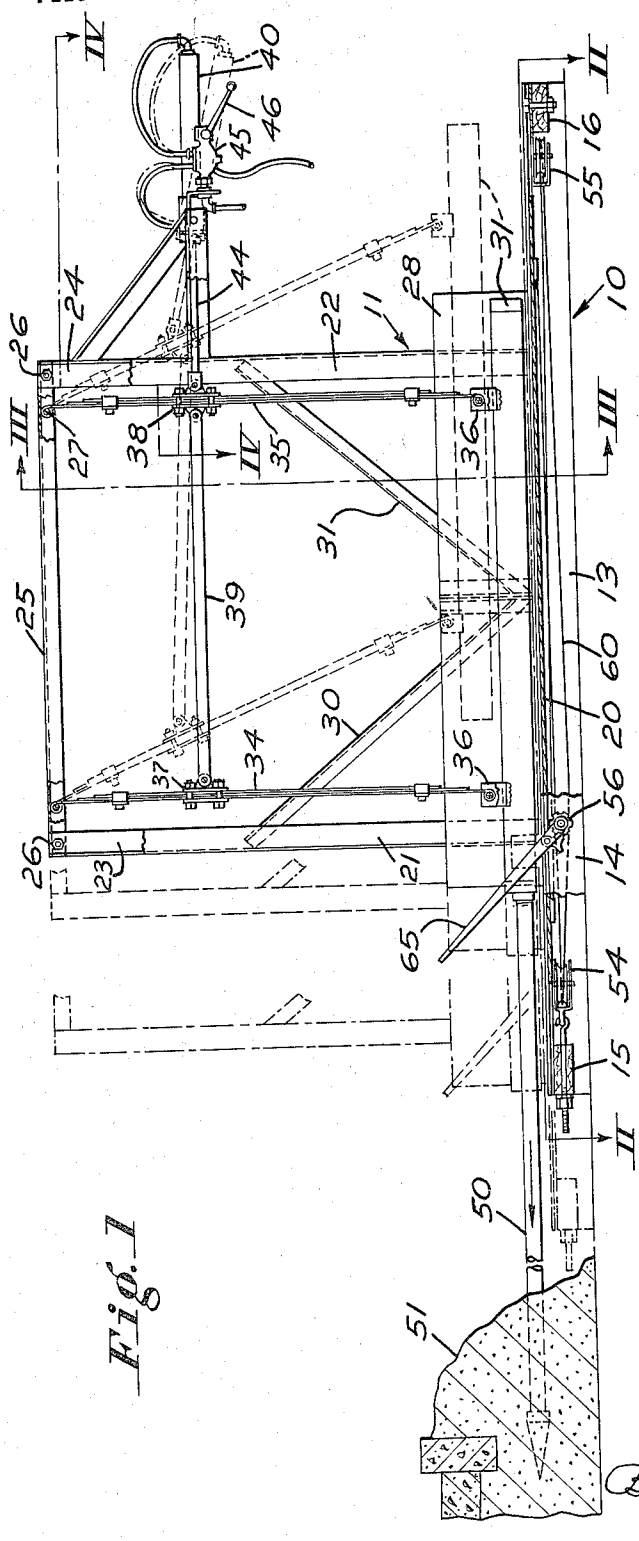


Fig. 1

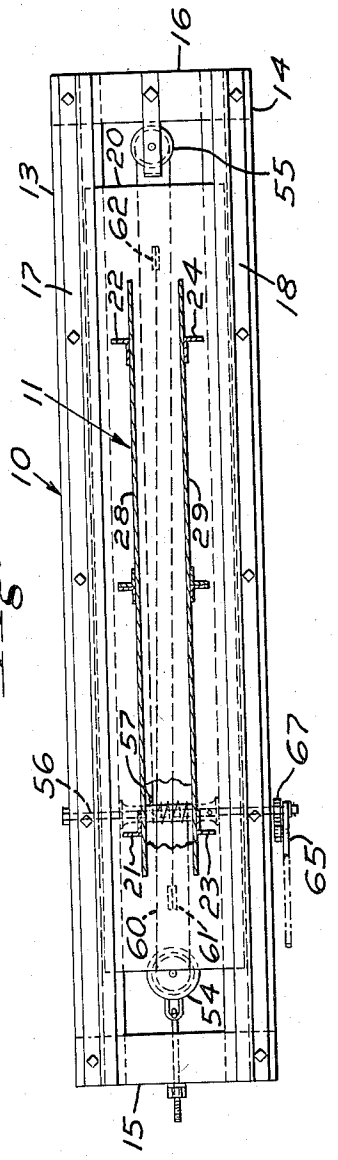


Fig. 2

INVENTOR.
FRED E. DANNHEIM
BY
Beau, Brooks, Buckley & Beau.
ATTORNEYS.

Sept. 27, 1955 F. E. DANNHEIM 2,718,804

POWER-OPERATED RECIPROCATORY IMPACT TOOL

Filed Oct. 30, 1952 2 Sheets-Sheet 2

Fig. 3

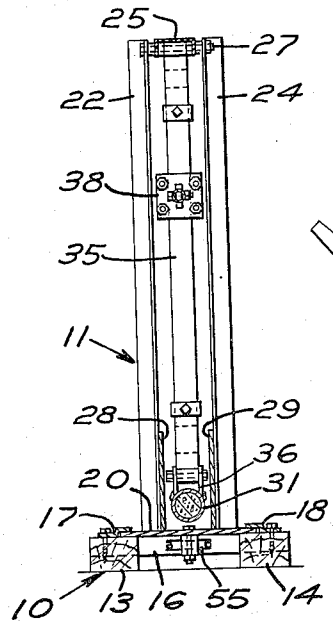


Fig. 4

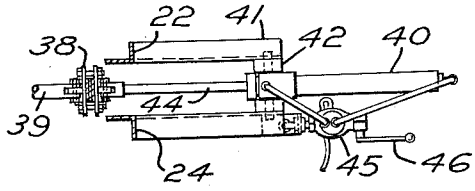


Fig. 5

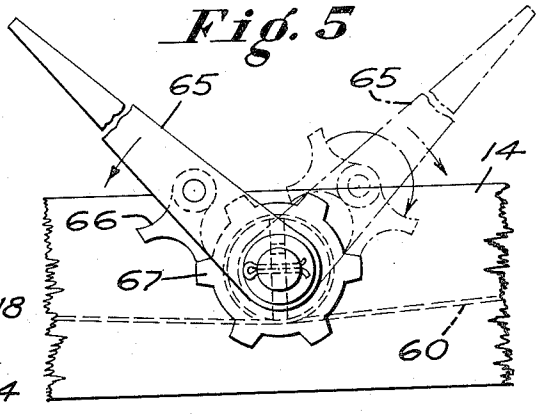


Fig. 6

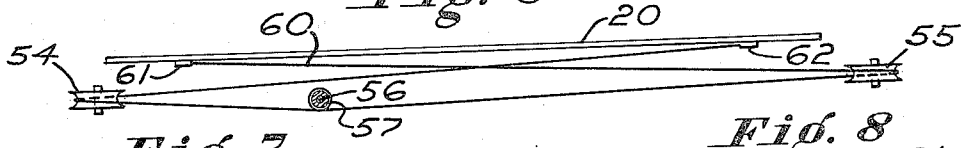


Fig. 7

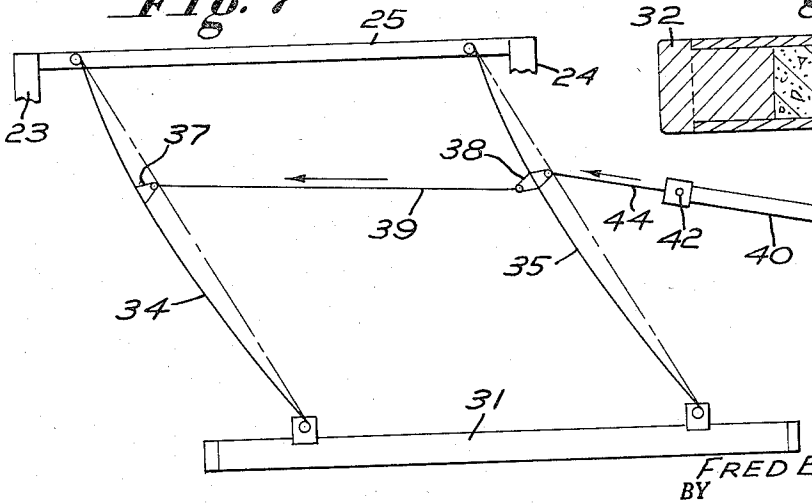
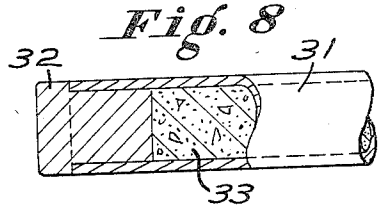


Fig. 8



INVENTOR.
FRED E. DANNHEIM
BY
Beau, Brooks, Buckley & Beau.
ATTORNEYS.

United States Patent Office 2,718,804 Patented Sept. 27, 1955

2,718,804

POWER-OPERATED RECIPROCATORY IMPACT TOOL

Fred E. Dannheim, Allentown, N. Y.

Application October 30, 1952, Serial No. 317,651

5 Claims. (Cl. 81—52.35)

This invention relates to a ram or impact driving device and particularly to apparatus of this class which is especially adapted to driving in a horizontal direction.

The principles of the invention may be variously applied but by way of setting forth a complete embodiment of the invention and a description of its general manner of use, reference will be had herein to the problem which is frequently presented in driving pipe or the like horizontally through earth. In oil field, for instance, where pipe is frequently strung along the surface of land, a common problem arises when relatively short elevations are encountered. A familiar instance is the occurrence of an elevated roadbed or similar earth formation, it being the common practice to drive portions of surface-laid pipe beneath such roadbeds in a horizontal direction.

Various forms of apparatus have been proposed in the prior art for effecting this kind of pipe driving operation, but none has proved particularly effective and expeditious. The problem of driving pipe under these circumstances is aggravated by the fact that the apparatus employed must be at least semiportable in its nature, despite the rather high-powered driving job which the apparatus must perform.

Various objects and advantages incident to use of the principles of the present invention will appear to those skilled in the art from a consideration of the form of the invention which is shown in the drawings and described in the following specification by way of example. It is to be understood, however, that the invention is not limited to the precise form thus set forth in detail or in any other way excepting as defined in the appended claims. Various mechanical modifications may be made within the limits of the present invention and without departing from its spirit or scope.

In the drawings:

Fig. 1 is a general side elevational view of one form of the apparatus of the present invention with portions thereof broken away for added clearness;

Fig. 2 is a cross sectional view taken approximately on the line II—II of Fig. 1;

Fig. 3 is a cross sectional view taken approximately on the line III—III of Fig. 1;

Fig. 4 is a fragmentary cross sectional view taken approximately on the line IV—IV of Fig. 1;

Fig. 5 is a fragmentary view on an enlarged scale taken generally similarly to Fig. 1 and showing one form of ratchet means for advancing the driving mechanism;

Fig. 6 is a side elevational schematic view showing the cable means for advancing the driving mechanism;

Fig. 7 is a further schematic elevational view showing one phase of the operation of the driving means; and

Fig. 8 is a longitudinal fragmentary cross-sectional view of the driving end of the driving ram proper.

Throughout the several figures of the drawing like characters of reference denote like parts and the numeral **10** designates generally a normally fixed base or foundation structure while the numeral **11** designates generally a horizontally movable carriage supported on the base

means, the carriage or superstructure **11** being adjustable along the base in a manner which will be described later herein. The base means comprises a pair of longitudinal rails or timbers **13** and **14** which are connected in spaced parallel relation by transverse members **15** and **16**.

The upper surfaces of the beams or timbers **13** and **14** have fixed thereto longitudinal guide strips **17** and **18**, respectively, which are offset as best shown in Fig. 3 to provide a pair of facing channels or guideways. A longitudinal plate member **20** is disposed with its longitudinal side edges in such facing channels and comprises the base member of the carriage or superstructure **11**.

The carriage **11** includes four upright members **21** through **24** which form a rectangular framework, the upright members being fixed at their lower ends to plate **20** as by welding or the like. An upper horizontal inverted channel member **25** extends longitudinally between the uprights **21** through **24** as best shown in Figs. 1 and 3 and is rigidly secured at its opposite ends between the upper ends of the uprights by bolt means **27**. As best shown in Fig. 3 suitable spacers are provided between the webs of the channel member **25** and between the outer faces of the channel member and the adjacent upper portions of the uprights **21** through **24**.

Longitudinally extending vertical guard plates **28** and **29** are fixed to the inner faces of the uprights **21** through **24** at their lower portions and serve also to reinforce the carriage structure. As shown in Fig. 1, oblique brace rods or rails **30** and **31** are fixed between the uprights and the guard or side plates **28** and **29** as by welding or the like.

It will be clear from the foregoing that a rigid carriage assembly comprising the carriage base plate **20**, the uprights **21** through **24**, and the top channel member **25**, is guided for longitudinal movement on the base beams **13** and **14** by virtue of the guide bars **17** and **18**. The manner in which longitudinal adjustment of the carriage on the base **10** is accomplished will be described later herein.

The ram element itself comprises, in the instance illustrated and disclosed herein, a tube **31** which is provided at its head or operating end with a solid plug **32** as illustrated in Fig. 8. The tube **31** may be filled with concrete or the like as at **33** in Fig. 8 to give proper weight and mass to the ram element.

The ram itself is suspended from the top channel member **25** of the carriage **11** by means of a pair of horizontally spaced multiple leaf spring assemblies **34** and **35**, which may be of the type used commonly in automotive suspensions. For this purpose tube **31** has fixed thereto a pair of clips **36** and leaf spring assemblies **34** and **35** are pivoted at their upper and lower ends, respectively, to top channel member **25** and the clips **36** of the ram element by means of conventional eyebolts or the like.

The spring assemblies **34** and **35** are embraced medially by bracket assemblies **37** and **38**, respectively, and the two springs are interconnected by a link **39** which is pivotally connected at its opposite ends to the brackets **37** and **38**.

A hydraulic operating cylinder **40** is supported by a bracket extension **41** of the carriage framework, this support being best illustrated in Fig. 4. In the form shown herein, the inner end of hydraulic cylinder **40** is pivoted to bracket **41** as at **42** whereby the cylinder is free to oscillate upon the horizontal axis for purposes of adjustment during oscillation as indicated in dash lines in Fig. 1.

Cylinder **40** has an operating piston (not shown) which includes an outwardly extending piston rod **44** which is pivoted at its outer end to the embracing bracket **38** of spring assembly **35** as shown in Figs. 1 and 4. The hydraulic cylinder **40** is of the double acting type and a manual control valve is shown at **45** for selectively supplying fluid operating pressure to either end of the hy-

draulic cylinder **40** or to maintain the same neutral, such operation being under the control of a manual valve operating lever **46**. This selective manual control of the operation of the double acting cylinder **40** is entirely conventional and the details of the operating valve **45** need not be further described herein.

It will be obvious from the foregoing that the operating piston of the cylinder **40** may be successively activated in opposite directions to oscillate the piston rod **44** and thus swing the spring assemblies **34** and **35** in the manner of a pendulum. This swinging action is in turn transmitted to the ram member **31** and, by virtue of the resiliency of the spring suspension in the plane of operation of the ram member **31**, the amplitude of the swinging of the ram extends beyond normal due to flexure of the spring assemblies **34** and **35** under the inertia forces acting upon ram **31**. In fact these inertia forces will build up on successive oscillations of the ram under the control primarily of the manual operating valve **45**.

Provision is made for adjustably moving the carriage **11** along the base **10** by longitudinal movement of the carriage along the guide members **17** and **18** to permit the carriage to follow along as the ram drives a pipe or similar member and as the pipe is driven successively farther along into the obstruction. In Fig. 1 the numeral **50** designates generally a pipe being driven and the numeral **51** designates an earth or similar obstruction or formation through which the pipe **50** is to be driven horizontally.

A winch and cable arrangement is provided for thus feeding the carriage along the base and this portion of the apparatus is best illustrated in Figs. 2 and 6, to which figures reference will be had at this time in describing the winch and the cable arrangement and operation.

The transverse members **15** and **16** of the base means **10** are provided at their inner sides with a pair of pulleys **54** and **55**, the pulleys lying generally horizontally in the form of apparatus illustrated herein. A winch shaft **56** extends transversely of the base and is journaled near its opposite ends in the pair of beams **13** and **14** which extend horizontally of the base **10**. A winding drum **57** is fixed to winch shaft **56** substantially medially thereof.

A cable **60** has its opposite ends fixed to the underside of base plate **20** of carriage **11** as at **61** and **62** in Fig. 6. The cable passes from its fastening **61** to the opposite pulley **55** and after passing thereabout winds on the drum **57** for several turns and then passes about the other pulley **54**, thence extends to the opposite fastening **62**. Since the pulleys **54** and **55** and the winch shaft **56** are all supported by the rigid base **10** they maintain constant relative positions. It will be obvious from the foregoing that rotation of the winch shaft **56** in either direction exerts a cable pull on one or the other of the fastenings **61** and **62** and thus moves the carriage **11** in one or the other direction along base **10**.

A manual operating lever **65** is provided for manually moving the carriage **11** along base **10** in either direction and the details of construction and operation of lever **65** will best be understood from a consideration of the enlarged fragmentary view thereof, of Fig. 5. Lever **65** is mounted for idle rotation on winch shaft **56** and carries a pawl member **66** which is freely pivoted thereto at a point spaced outwardly from the center of winch shaft **56**. A ratchet wheel **67** is fixed to winch shaft **56** and when pawl **66** is in the position shown in full lines in Fig. 5 oscillation of lever **65** to and fro results in pawl **66** engaging the teeth of ratchet wheel **67** to drive the same when the lever is oscillated in a counterclockwise direction while clockwise oscillation of lever **65** results in pawl **66** riding idly over the teeth of ratchet wheel **67**.

When it is desired to rotate the ratchet wheel in a clockwise direction the operator swings pawl **66** in a clockwise direction as indicated by the arcuate arrow shown

in the dot-and-dash line portion of Fig. 5 to an opposite position wherein it engages ratchet wheel **67** for driving operation when the lever **65** is oscillated in a clockwise direction with the pawl **66** riding over the teeth of ratchet wheel **67** when lever **65** is oscillated in a counterclockwise direction. The operator may thus selectively feed the carriage **11** longitudinally along base **10** in either direction selectively.

What is claimed is:

1. Impact driving apparatus comprising base means, an overhead support, and an elongated ram member, a pair of depending suspension members pivotally attached at their upper ends to said support and at their lower ends to said ram member at points spaced therealong, said suspension members being flexible in a plane generally including the pair of members, means engaging said flexible suspension members vertically medially of said overhead support and said ram member for oscillating the suspension members in said including plane, and means for selectively adjusting said support horizontally along said base means lengthwise with respect to said ram member.

2. Impact driving apparatus comprising an overhead support and an elongated ram member, a pair of depending suspension members pivotally attached at their upper ends to said support and at their lower ends to said ram member at points spaced therealong, said suspension members being flexible in a plane generally including the pair of members and relatively rigid in a horizontal direction at right angles thereto, and means engaging said flexible suspension members vertically medially of said overhead support and said ram member for oscillating the suspension members in said including plane.

3. Impact driving apparatus comprising an overhead support and an elongated ram member, depending suspension means engaging vertically between said support and said ram member, said suspension means being flexible in a vertical plane extending lengthwise of said ram member, and means engaging said flexible suspension means vertically medially of said overhead support and said ram member for oscillating the suspension means in said vertical plane.

4. Impact driving apparatus comprising base means, an overhead support, an elongated ram member, and depending suspension means engaging vertically between said support and said ram member, said suspension means being flexible in a vertical plane extending lengthwise of said ram member, means for oscillating the flexible suspension means in said vertical plane, and means for selectively adjusting said support horizontally along said base means lengthwise with respect to said ram member.

5. Impact driving apparatus comprising an overhead support and an elongated ram member, depending suspension means engaging vertically between said support and said ram member, said suspension means being flexible in a vertical plane extending lengthwise of said ram member and relatively rigid in a horizontal transverse direction, and means engaging said flexible suspension means vertically medially of said overhead support and said ram member for oscillating the suspension means in said vertical plane.

References Cited in the file of this patent

UNITED STATES PATENTS

335,544	Smith	Feb. 2, 1886
2,443,492	Austin	June 15, 1948
2,562,899	Finn	Aug. 7, 1951
2,568,540	Chambers	Sept. 18, 1951
2,568,613	Daso	Sept. 18, 1951
2,599,989	Haston	June 10, 1952

FOREIGN PATENTS

662,409	Great Britain	Dec. 5, 1951