May 26, 1936. R. R. BLOSS 2,042,294

WALKING BEAM FOR WELL PUMPING AND DRILLING MECHANISM

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Fig. 1.

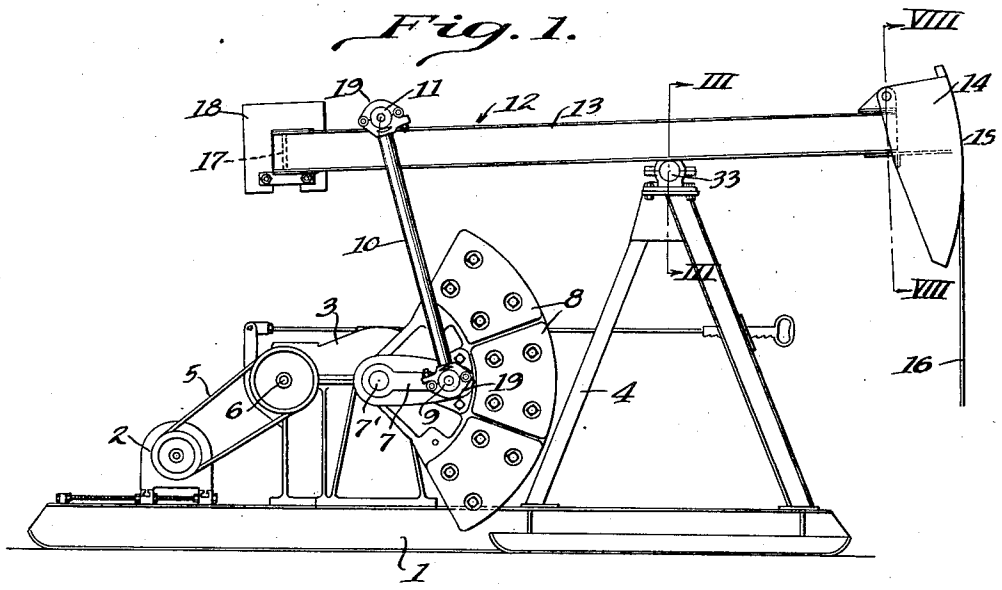

Fig. 2.

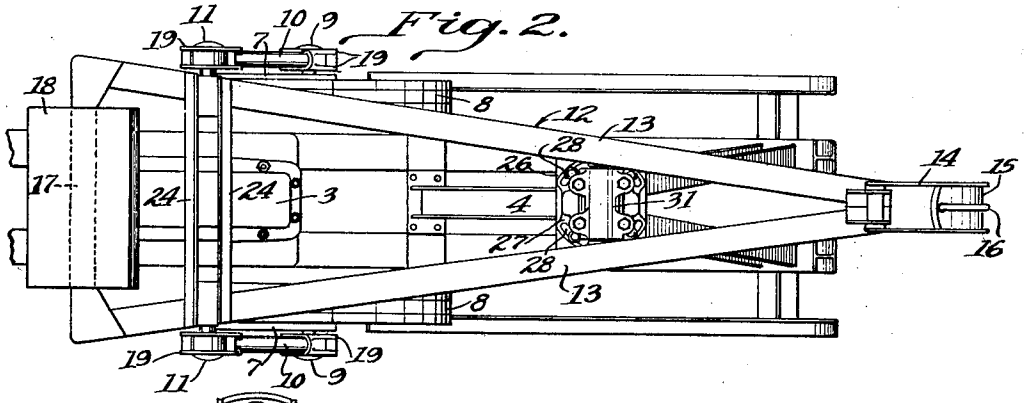

Fig. 8.

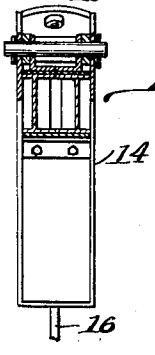

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Fig. 3.

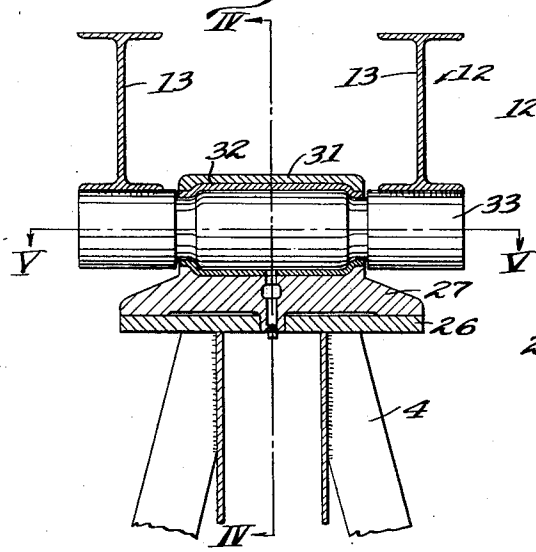


Fig. 4.

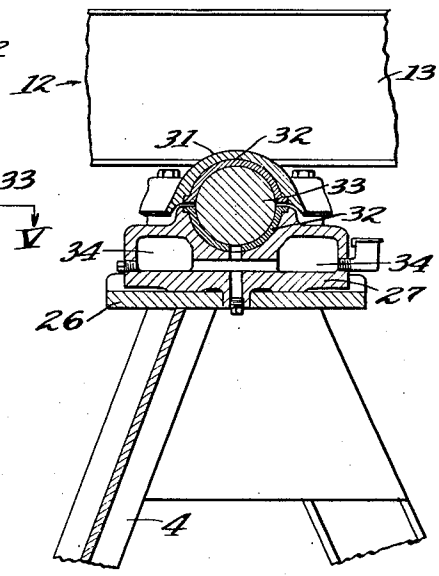


Fig. 5.

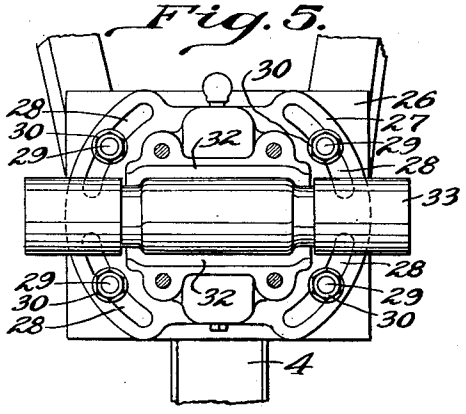


Fig. 7.

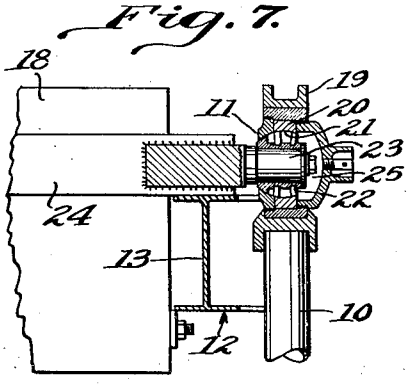
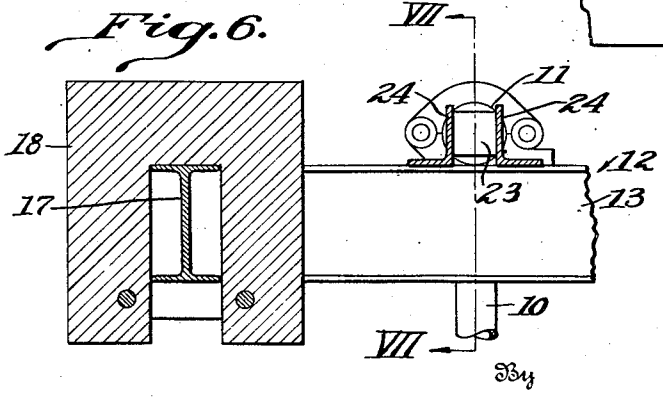


Fig. 6.



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WALKING BEAM FOR WELL PUMPING AND DRILLING MECHANISM

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Fig. 9.

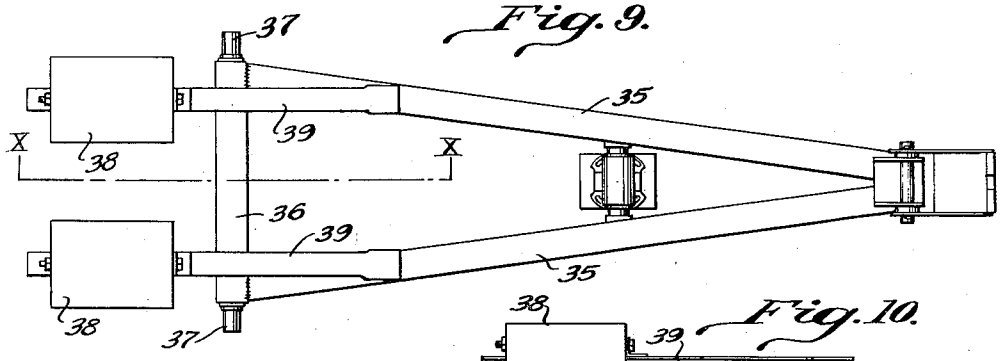


Fig. 10.

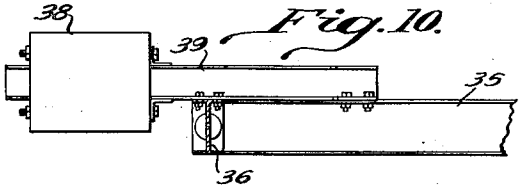


Fig. 11.

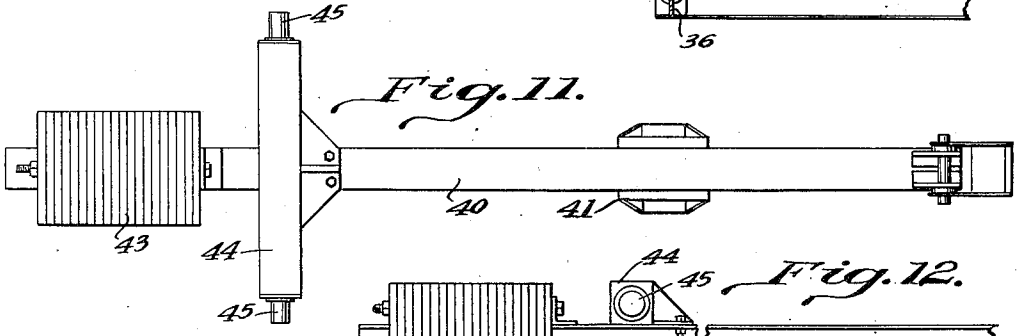


Fig. 12.

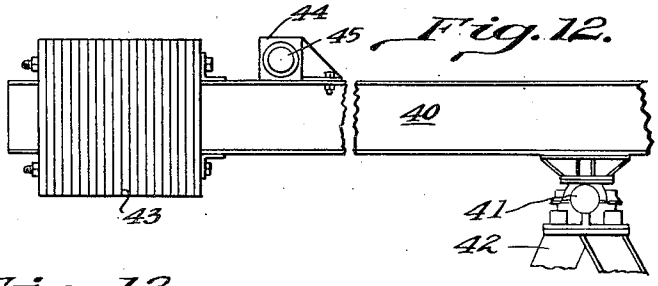
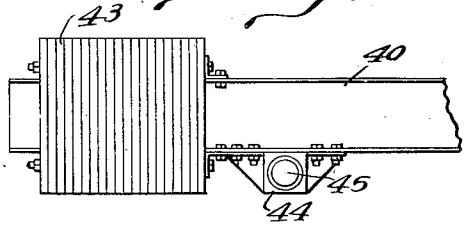


Fig. 13.



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WALKING BEAM FOR WELL PUMPING AND DRILLING MECHANISM

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Fig. 14.

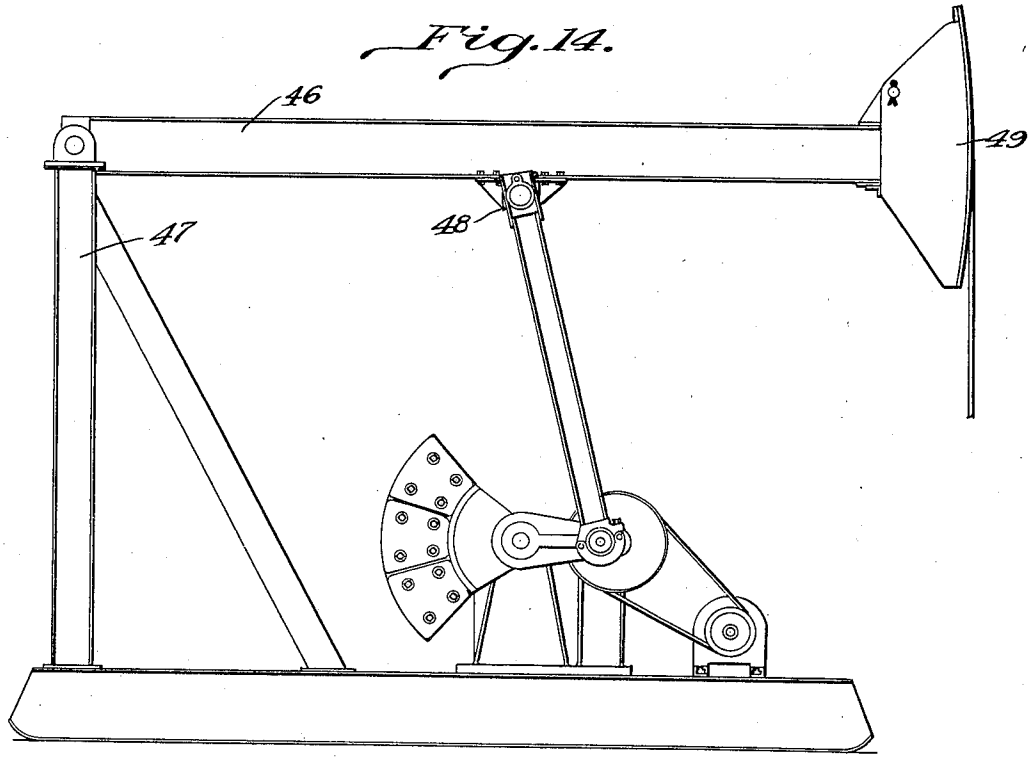
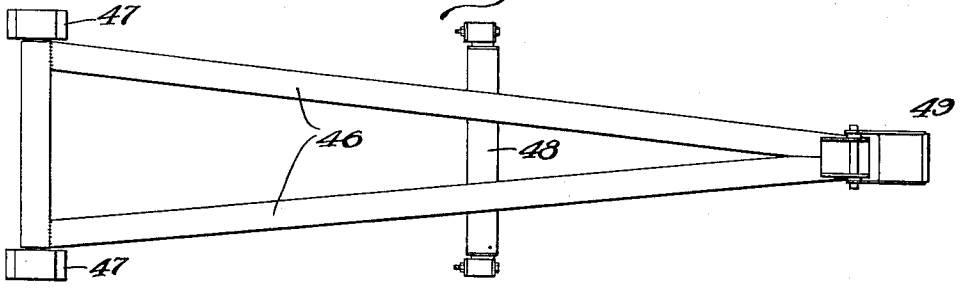


Fig. 15.



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UNITED STATES PATENT OFFICE

2,042,294

WALKING BEAM FOR WELL PUMPING AND DRILLING MECHANISM

Richard R. Bloss, Columbus, Ohio, assignor to International-Stacey Corporation, Columbus, Ohio, a corporation of Ohio

Application May 8, 1935, Serial No. 20,429

13 Claims. (Cl. 74—41)

This invention relates to well pumping mechanism and has particular reference to a structurally improved walking beam for use in connection with such mechanism wherein the walking beam is composed of rigidly assembled structural steel members relatively disposed to produce a substantially triangular frame which is of strong and durable design and readily capable of withstanding the severe stresses and strains which are imparted thereto during the operation of the well pumping mechanism of which the walking beam constitutes an essential component part.

Many modern well pumping units comprise suitably driven operating shafts which have the opposite ends thereof formed with fixed crank arms counter-weighted and united by means of twin pitman connections with one end of a walking beam. Prior to the introduction of such twin crank constructions, it was customary to employ but a single crank and a single pitman to connect such a crank with an associated walking beam. With the introduction of the twin crank construction, however, difficulties were encountered in compensating for inequalities and variations in the operating positions and planes of movement of the rotating cranks and the oscillating walking beam, whereby to relieve such operating parts of undue strains caused by misalignment of parts. These conditions led to the use of walking beams equipped at one end with transversely rockable bars having spaced pitmen secured to their outer ends, or in combined self-compensating types of pitmen adapted to variations in the relative alignment of the planes of crank arm rotation and walking beam oscillation. All of these structures, however, have resulted in mechanical complication and frequently in structural weaknesses which have been the source of considerable trouble in the fields where such well pumping mechanisms operate.

It is, therefore, the primary object of the present invention to provide a structurally improved walking beam of fundamentally sturdy and simple design especially adapted for use with twin crank operation and one which of itself possesses sufficient inherent flexibility to compensate for part mis-alignments and one wherein the durability and efficiency of the single crank and pitman connection is retained.

Another object resides in the provision of an improved mounting for effecting the oscillatory support of the walking beam through the provision of a single bearing support lying within the confines of the walking beam in lieu of the multiple spaced bearing supports, heretofore common in the art and disposed beyond the confines of the walking beam.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of well pumping mechanism arranged and constructed in accordance with the present invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a detail vertical sectional view taken through the bearing support for the walking beam on the plane indicated by the line III—III of Fig. 1;

Fig. 4 is a detail vertical sectional view through said bearing support on the plane indicated by the line IV—IV of Fig. 3;

Fig. 5 is a horizontal sectional view of the bearing support on the plane indicated by the line V—V of Fig. 3;

Fig. 6 is a detail vertical sectional view taken through the counter-weighted end of the walking beam adjacent to the point of pitman connection;

Fig. 7 is a detail transverse sectional view on the plane indicated by the line VII—VII of Fig. 6 showing the connection between the upper end of one of the beam operating pitmen and said beam;

Fig. 8 is a transverse sectional view on the line VIII—VIII of Fig. 1;

Fig. 9 is a plan view of a slightly modified form of walking beam disclosing my invention;

Fig. 10 is a detail vertical sectional view of the counter-weighted end thereof, the plane of the section being indicated by the line X—X of Fig. 9;

Fig. 11 is a plan view of a further modified form;

Fig. 12 is a side view of the beam disclosed in Fig. 11;

Fig. 13 is a similar view of the beam set forth in Figs. 11 and 12, showing the pitman stud shaft secured to the lower part of the beam;

Fig. 14 is a side elevation of a modified form of well pumping mechanism employing a walking beam formed in accordance with the present invention;

Fig. 15 is a plan view of the beam used in the mechanism shown in Fig. 14.

Referring more particularly to the drawings, and to the specific embodiment of my invention herein disclosed, the well pumping or drilling mechanism comprises a portable base 1, upon which is mounted at one end a motor 2, a casing

3 for the reception of speed reducing gearing and a Samson frame 4. The power of the motor is transferred by means of an endless chain 5 from the motor 2 to the driving shaft 6 of the speed reducing gearing, and a driven shaft 7' of said gearing has its opposite ends formed or provided with parallel cranks 7 suitably counter-weighted as at 8.

The outer ends of the cranks 7 are pivotally connected as at 9 with a pair of spaced parallel pitmen 10, which, in turn, have their upper ends pivotally connected as at 11 with a walking beam 12.

The walking beam, as shown in Fig. 2, possesses in general a substantially triangular configuration and includes longitudinally extending, forwardly converging, side members 13—13, preferably in the form of I-beams, which are suitably united at their forward ends to receive an operating head 14 having a curved outer surface 15 with which may be connected the upper end of a well drilling or pumping cable 16, from which the well tools, not shown, are suspended.

The spaced rear ends of the side members 13—13 are united by a transversely extending I-beam 17 which, as shown in Fig. 6, removably receives a fixed poise or counter-weight 18 which, in combination with the counter-weights 8 of the cranks 7 balance the loads on the outer or head end 14 of the walking beam, so that a smooth oscillatory motion will be imparted to the walking beam in the raising and lowering of the weights suspended from the head 14.

By this construction, a walking beam of a very substantial design is afforded but one wherein the frame of the walking beam is sufficiently flexible to compensate for slight misalignments which may exist between the planes of rotation of the cranks 7 and the planes of oscillation of the walking beam 12, particularly at the points of pivotal connection 9 and 11 of the pitmen. Minor variations may be compensated for, as shown in Fig. 7, by providing the upper and lower ends of each of the pitmen with shackles 19, in each of which is received an annular race ring 20 having transversely arcuate surfaces 21 for contact with anti-friction rollers 22 carried by a stud shaft 23 for a wrist pin formed in connection with the crank 7.

The stud shafts 23 are welded to and project from transversely extending angle bars 24 which, as shown in Fig. 6, are secured to the upper surfaces of the beam members 13. The anti-friction rollers 22 may be retained within lubrication receiving chambers 25 by which these bearings are protected. If the inequalities in the operating planes of the walking beam and the crank 7 are not taken care of by the flexible connections at the ends of the pitmen, the triangular frame of the walking beam possesses sufficient inherent flexibility so that it may "weave" or flex to avoid placing undesirable strains on the driving mechanism for said beam. This produces an extremely substantial construction and at the same time adequately compensates for practical operating conditions.

The pivotal mounting for the walking beam has been particularly disclosed in Figs. 3 to 5, wherein it will be noted that the upper end of the Samson frame 4 carries a horizontal base plate 26 upon which rests a bearing frame 27, the latter being provided with arcuate slots 28 for the reception of studs 29 projecting upwardly from the base plate 26 and provided with nuts 30 which when tightened serve to clamp the bearing frame 27 in desired positions of adjustment about a substantially vertical axis in connection with the base plate 26.

The bearing frame 27 carries a removable cap section 31 by which a bearing lining 32 is retained around the central portion of a bearing shaft 33, the latter having its outer ends welded or otherwise secured to the under portions of the walking beam members 13—13, so that the shaft 33 may oscillate within the single bearing of the Samson post provided for the pivotal support of the walking beam.

Chambers 34 and communicating passages are formed in the frame 27 for the reception of a bearing lubricant. It will be observed that the Samson frame bearing for the walking beam lies entirely within the confines of said beam and consists of but a single bearing, in lieu of the spaced bearings heretofore employed in this capacity. This bearing construction is particularly substantial, simple and efficient.

In Figs. 9 and 10, a modified form of my invention has been disclosed wherein the beam is of the triangular form set forth in Figs. 1 and 2, but in this form of my invention, the forwardly diverging side members 35—35 have their rear ends united by a transverse I-beam 36, from the ends of which project pitmen receiving studs 37. The walking beam disclosed in Fig. 9 is counterweighted as at 38 and these spaced counterweights are supported by means of beams 39 which are riveted or otherwise secured to the upper surfaces of the beams 35 and 36.

In Figs. 11 to 13, the walking beam instead of being of triangular configuration possesses the form of a cross. In this arrangement, the beam comprises a single main longitudinally extending I-beam 40 which is pivotally supported as at 41 in connection with the upper end of the Samson post 42. The rear end of the beam receives adjustable and removable counter-weighting disks 43. Between the group of disks 43 and the pivotal support 41, the beam is provided with a rigid transverse member 44 having its outer ends provided with pitmen bearing studs 45.

As shown in Figs. 12 and 13, the transverse member 44 may be carried either by the upper or lower flanges of the beam 40.

In the modified form of the invention shown in Figs. 14 and 15, a triangular shaped walking beam 46 is employed, as in the preferred form. However, the beam is journaled at one end to the Samson post 47. A transversely extending member 48 is rigidly attached to the beam between its connection with the Samson post and the head end 49. The member 48 is provided at its outer ends with studs to receive the pitmen.

The counter-balance weight on the opposite side of the fulcrum point to balance the weight of the beam may be employed in this form as in the preferred form. This type of mechanism is employed when it is desired to impart a long stroke to the pumping or drilling tools.

What is claimed is:

1. In well pumping and drilling mechanism, a shaft, means to rotate said shaft, a pair of counter-weighted crank arms on said shaft, a Samson member, a walking beam pivoted thereon, said walking beam possessing a substantially triangular configuration, well operating means connected with the outer end of said beam, studs rigidly projecting from the sides of the walking beam at positions between the widened end of the latter and said Samson member, a counter-weight on the widened end of the walking beam, and pit-

men connections having their upper ends pivotally secured to said studs and their lower ends pivotally connected with said cranks.

2. In well drilling and pumping mechanism, said mechanism including a housing, a crank shaft extending from the opposite sides thereof, a counter-balanced crank arm on each end of said shaft, an oscillatory walking beam of triangular form, a counter-weight on the widened end of said walking beam, and pitmen uniting the widened portion of said walking beam with said crank arms.

3. In well pumping and drilling mechanism, a power unit including a driven shaft, parallel counter-weighted crank arms extending from the opposite ends of said shaft, a Samson frame, a substantially triangular walking beam supported for oscillation by said frame, the widened end of said walking beam being counter-weighted, and pitmen having their upper and lower ends pivotally connected respectively with the widened portion of said walking beam and the outer ends of said cranks.

4. In well pumping and drilling mechanism, a portable base frame, a power unit mounted on said base frame including a driven shaft, a pair of cranks fixed to the outer ends of said shaft, segmental counter-weights secured to the ends of said shaft contiguous to said cranks, a Samson frame arising from the base frame, a substantially triangular walking beam pivotally mounted for oscillation on the other end of said Samson frame, and spaced pitmen connections uniting the outer ends of said cranks with said walking beam.

5. In well pumping and drilling mechanism, a portable base frame, a power unit mounted on said base frame including a driven shaft, a pair of cranks fixed to the outer ends of said shaft, segmental counter-weights secured to the ends of said shaft contiguous to said cranks, a Samson frame arising from the base frame, a substantially triangular walking beam pivotally mounted for oscillation on the other end of said Samson frame, spaced pitmen connections uniting the outer ends of said cranks with said walking beam, and means for counter-weighting the widened end of said walking beam.

6. In well pumping and drilling mechanism, a Samson frame, and a walking beam of triangular configuration pivotally mounted intermediately of its ends on the upper end of the Samson frame, the plane defining the triangle formed by said beam being substantially parallel to the longitudinal axis of said pivot.

7. In well pumping and drilling mechanism, a Samson frame, a walking beam of substantially triangular configuration, a bearing shaft having its ends fixed to said walking beam, said shaft being disposed transversely of the walking beam at a position intermediate the ends thereof, and a single bearing housing carried by the upper end of said Samson frame for the reception of said shaft, said bearing housing lying entirely within the confines of the walking beam.

8. In well pumping and drilling mechanism, a Samson frame, a walking beam of substantially triangular configuration, a bearing shaft having its ends fixed to said walking beam, said shaft being disposed transversely of the walking beam at a position intermediate the ends thereof, a single bearing housing carried by the upper end of said Samson frame for the reception of said shaft, said bearing housing lying entirely within the confines of the walking beam, and means for adjusting said bearing housing rotatably about a substantially vertical axis.

9. In well pumping and drilling mechanism, a power driven shaft, a crank arm on said shaft, a Samson frame, a substantially triangular walking beam mounted for oscillation on said frame, the plane defining the triangle formed by said beam being substantially parallel to the axis of rotation of said shaft, and a pitman connected to said crank arm and said beam.

10. In well pumping and drilling mechanism, a power driven shaft, a crank arm on said shaft, a substantially triangular walking beam, pivot means provided at the widened portion of said beam, additional pivot means provided intermediate the ends of the beam, the longitudinal axes of both of said pivot means being substantially parallel with the plane defining the triangle formed by said beam, a Samson frame connected with said beam by one of said pivot means, and a pitman connecting the other pivot means with said crank arm.

11. In well pumping and drilling mechanism, a power driven shaft, crank arms extending from the opposite ends of said shaft, a Samson frame, a substantially triangular walking beam pivotally supported at one end by said Samson post, the widest portion of said triangular beam being at said pivoted end, pivot means provided upon said beam intermediate of its ends and pitmen connecting said pivot means with said cranks.

12. In well pumping and drilling mechanism, a power driven shaft, crank arms extending from the opposite ends of said shaft, a Samson frame, a walking beam composed of a pair of longitudinally extending sections spaced at one end and converging toward each other at the other end and a transverse bar connecting said spaced ends, pivot means provided on said beam adjacent the spaced ends of said sections, additional pivot means provided intermediately of the ends of said beam, said beam being connected to said Samson frame at one of said pivot means, and pitmen connecting said beam to said crank arms at the other pivot means.

13. In well pumping and drilling mechanism, a power driven shaft, a pair of crank arms extending from the opposite ends of said shaft, a Samson frame, a walking beam composed of a pair of longitudinally extending sections spaced at one end and converging toward each other at the other end, and a transverse bar connecting said spaced ends, pivot means provided on said beam adjacent the spaced ends of said sections, additional pivot means provided intermediately of the ends of said beam, said beam being connected to said Samson frame at one of said pivot means, pitmen connecting said beam to said crank arms at the other pivot means, and counter-weight means mounted on said beam at the end where said sections are spaced and beyond said pivot means.

RICHARD R. BLOSS.