June 1, 1937. J. REID 2,082,260

POWER GENERATING AND TRANSMITTING ORGANIZATION

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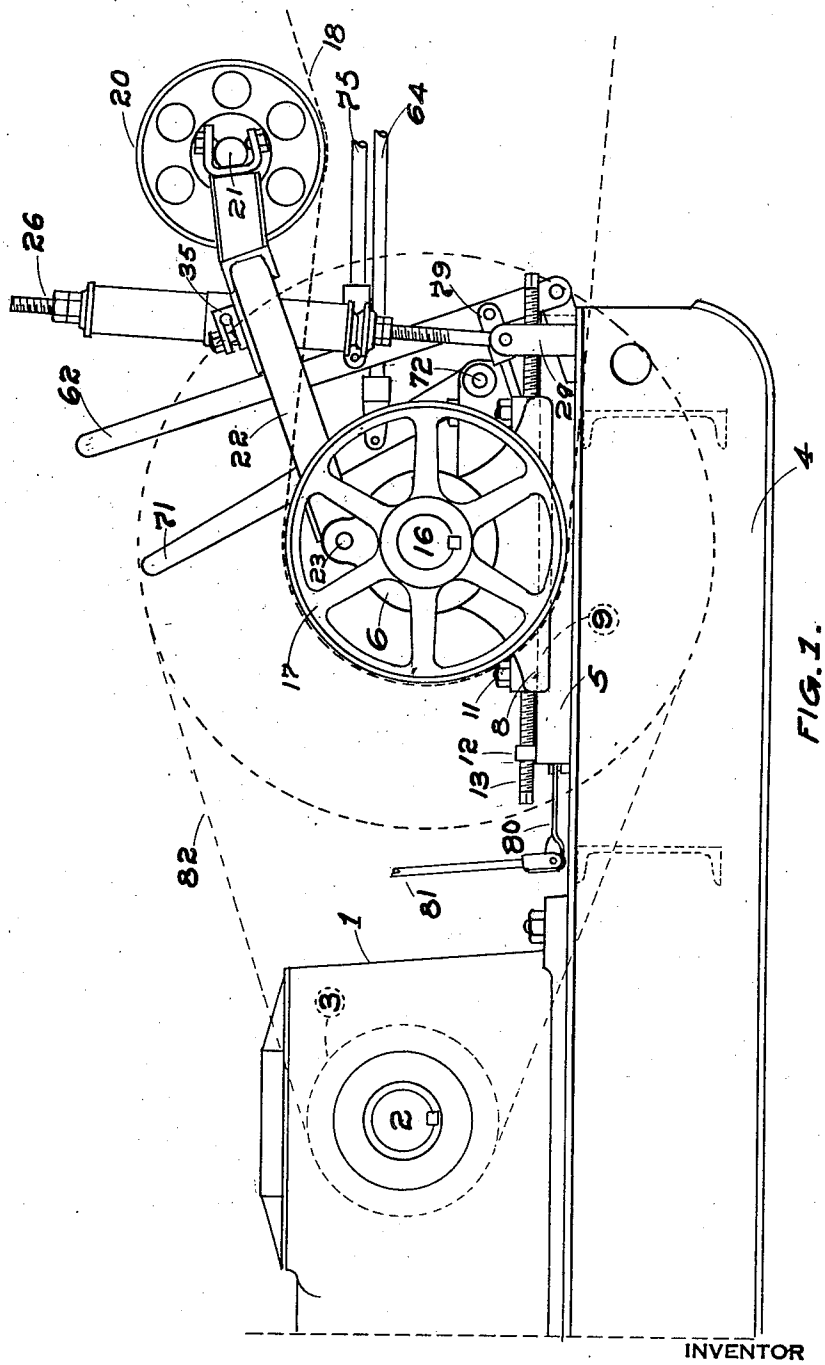


FIG. 1.

INVENTOR
JOHN REID
BY
Edward R. Inman
ATTORNEY

June 1, 1937. J. REID 2,082,260

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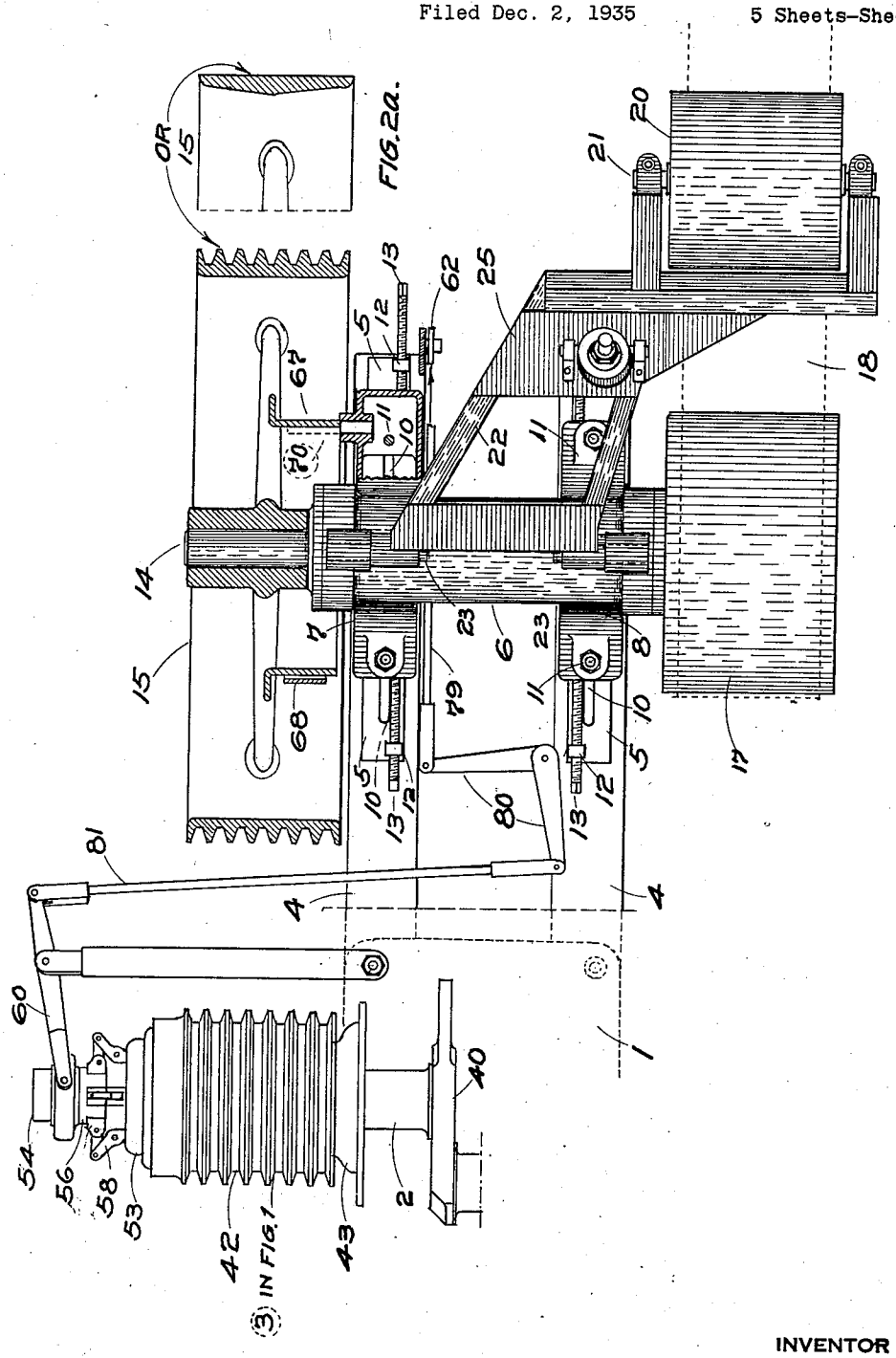


FIG. 2.

INVENTOR
JOHN REID
BY
Edward R. Inman
ATTORNEY

June 1, 1937. J. REID 2,082,260

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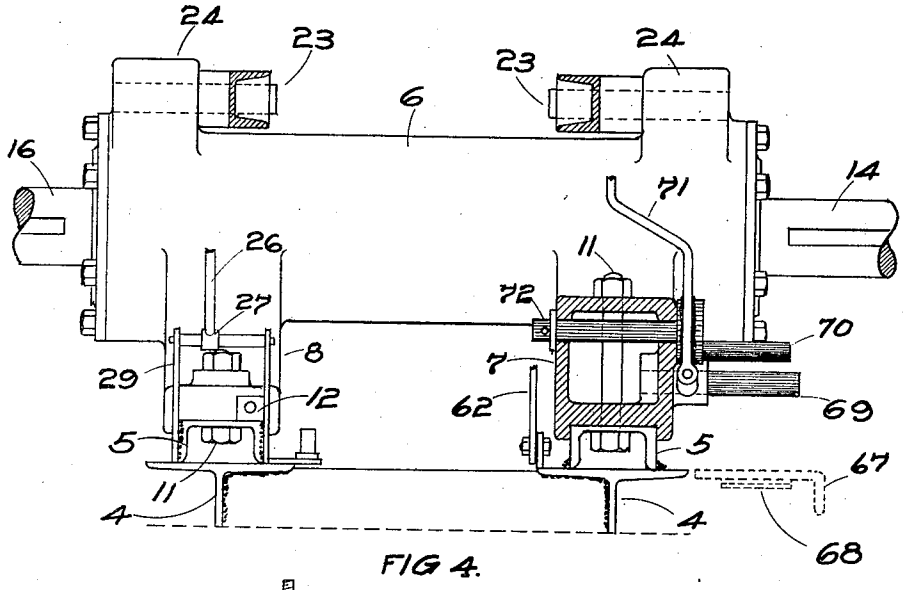


FIG 4.

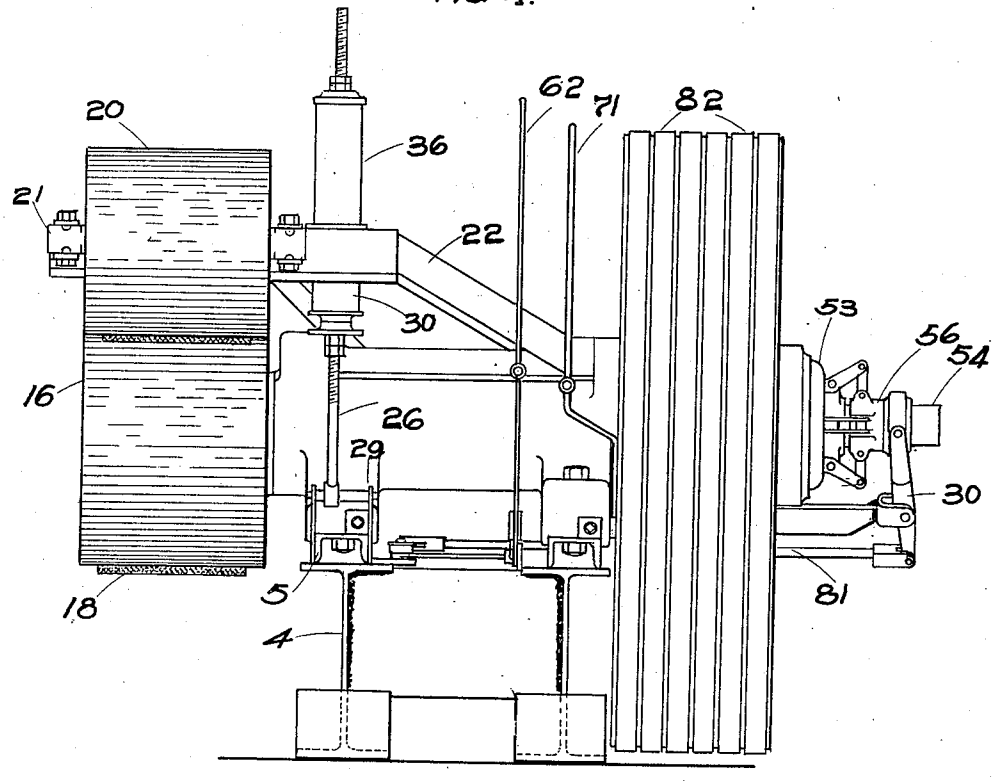


FIG. 3

INVENTOR
JOHN REID
BY
Edward R. Inman
ATTORNEY

June 1, 1937. J. REID 2,082,260

POWER GENERATING AND TRANSMITTING ORGANIZATION

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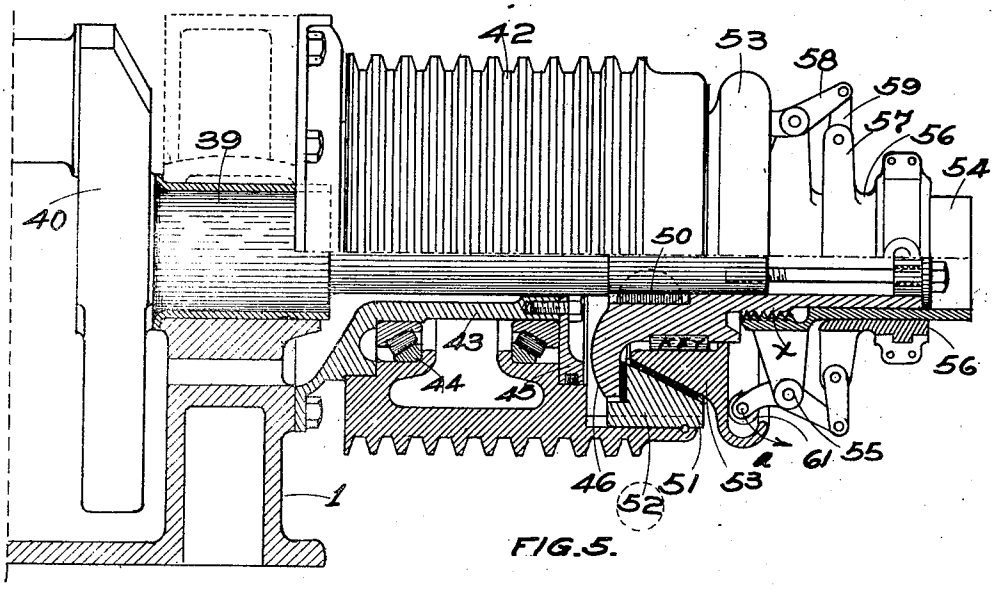


FIG. 5.

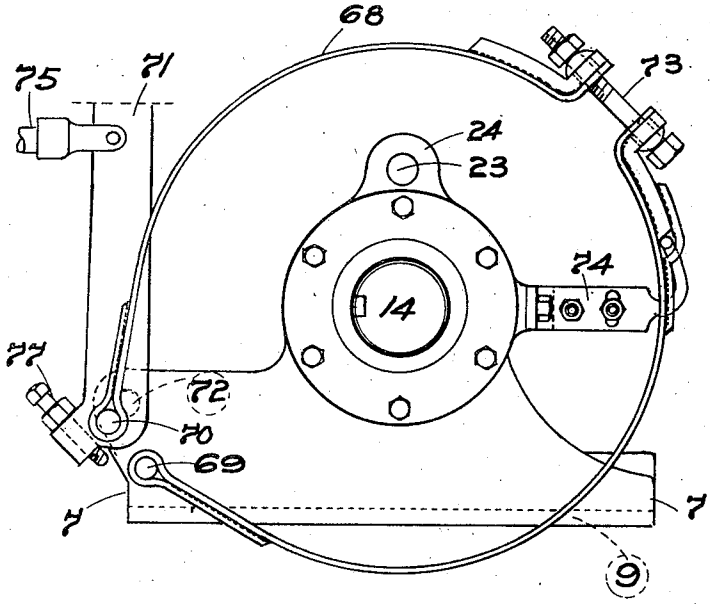


FIG. 6.

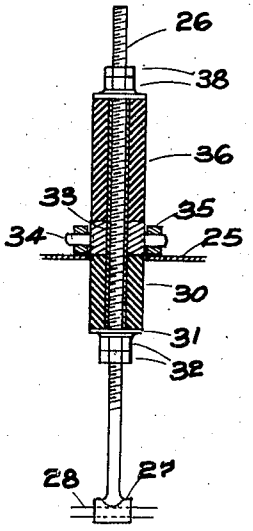


FIG. 7.

INVENTOR
JOHN REID
BY
Edward R. Inman
ATTORNEY

June 1, 1937. J. REID 2,082,260

POWER GENERATING AND TRANSMITTING ORGANIZATION

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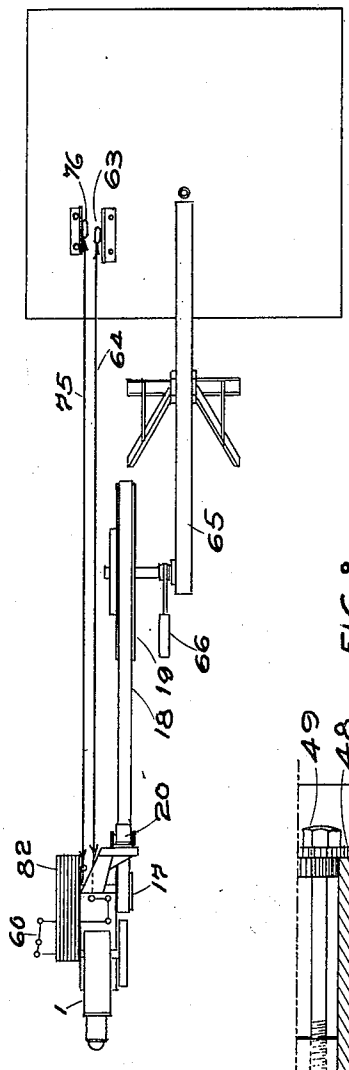


FIG. 8.

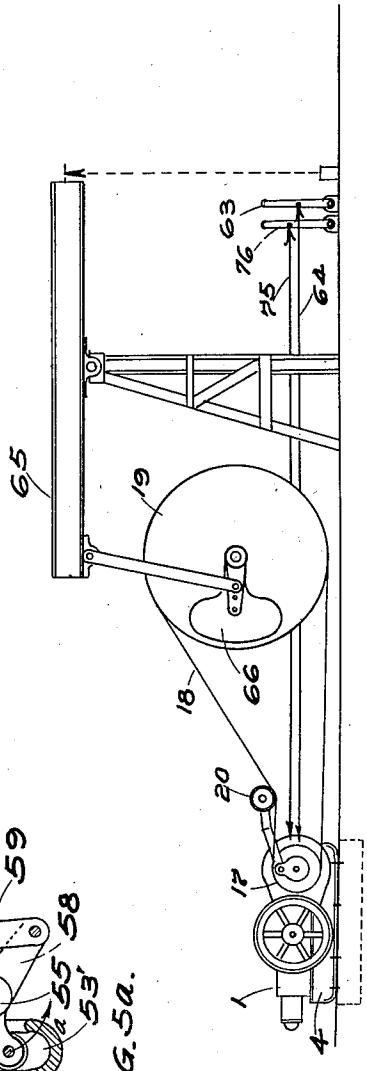


FIG. 9.

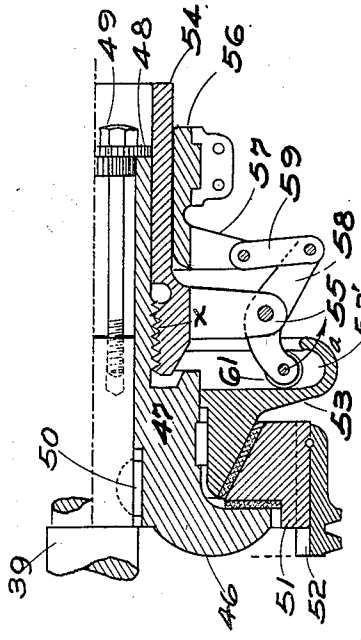


FIG. 5a.

INVENTOR
JOHN REID
BY
Edward R. Inman
ATTORNEY

Patented June 1, 1937

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UNITED STATES PATENT OFFICE

2,082,260

POWER GENERATING AND TRANSMITTING ORGANIZATION

John Reid, Oil City, Pa.

Application December 2, 1935, Serial No. 52,593

5 Claims. (Cl. 74—216.5)

This invention relates to a combined power generating and transmission organization which is especially adapted for use in the oil production industry.

Briefly stated this organization consists of a power generating engine preferably of the internal combustion type and a countershaft organization which are combined into a unitary organization, adapted to be spaced from the ultimate power receiving organization such as the drilling or pumping equipment of a deep well.

The particular objects of this invention are, to supply a compact, efficient power transmission organization for use about oil wells whereby either pumping or drilling equipment can be economically operated.

Another object is, to supply a power transmission organization so constructed and equipped, that where a counterweight is employed to counterbalance the weight of either the drilling tools or the sucker rods, control levers for the power appliance may be manipulated, either directly at the engine, or in the derrick at a point adjacent to the well, so as to maneuver the walking-beam into the desired position, and be retained thereat, when connecting or disconnecting either drilling or pumping appliances which are actuated by said beam.

Still another object is, to supply an organization of the type specified which is self-contained and embodied in a compact structure whereby an expensive foundation of large extent will be dispensed with, and in place of which a comparatively inexpensive foundation will suffice; this being an important point in the case of both the drilling and pumping of wells; in drilling operations, for the reason that if a dry hole is the result, or in a pumping well which has become exhausted of oil, or the product is so small as to preclude the expense of pumping, the power equipment will be easily and quickly removed and will have approximately a 100 percent salvage value for relocation.

An additional object is, to provide a power unit so constructed that the power delivery shaft will be relieved of all side strain due to the lateral pull of the power delivery belt thereon; said shaft in this case being the crankshaft of an internal combustion engine. The provision whereby this latter object is attained dispenses with the necessity or desirability of providing an outboard bearing for the clutch end of the crankshaft, or at either or both ends of the countershaft; this arrangement not only facilitates the placement and removal of belts, but materially reduces the space occupied by this organization, as compared with previous organizations of this class.

The construction and organization of the various factors of this appliance are clearly illustrated in the accompanying drawings in which:

Fig. 1 is a right side elevation of the forward end of the bed of an internal combustion engine and a countershaft organization mounted upon a fabricated steel subbase or skid.

Fig. 2 is a plan view of said countershaft organization and the clutch pulley which is mounted upon a tubular hub of the bed and driven by the crankshaft of said engine.

Fig. 2*a* is a section of a plain belt face which may be substituted for the grooved pulley shown in Fig. 2.

Fig. 3 is a front elevation of Fig. 2.

Fig. 4 is a front elevation of the housing for the countershaft with a portion of the right foot thereof shown in section for a purpose which will presently appear.

Fig. 5 is a half vertical, transverse section through the bed of the engine taken at the center of the crankshaft, and is also a half section of the clutch pulley which is mounted upon said shaft.

Fig. 5*a* is an enlarged view of a portion of Fig. 5.

Fig. 6 is a side elevation of the left hand end of the countershaft housing and the brake band which is applied to the brake-flange of the power receiving pulley of said countershaft.

Fig. 7 is a central vertical section through the adjusting device whereby the pressure of a belt-tightening or idler pulley upon the driving belt which passes from the countershaft to the band wheel in or adjacent to the derrick may be varied as required to produce the requisite transmissive power of this belt.

Fig. 8 is a schematic sketch of my improved organization as connected to the equipment of a well.

Fig. 9 is a side elevation of Fig. 8.

In the foregoing description of the drawings, and throughout the following specification, the term "right hand" and "left hand" are employed as if the organization were viewed from the rear, or combustion end of the engine cylinder, and looking toward and beyond the crankshaft end; the terms "forward" and "rearward", also "fore-and-aft" are to be understood as determined from the same viewpoint; the term "overhung" in relation to a pulley means that the shaft of

such pulley is fully supported in its main bearing without the use of an outboard bearing.

The construction shown in said drawings is substantially as follows:

Any suitable power-generating motor may be employed as a power element, but in the drawings, especially in Fig. 1, there is illustrated the crankshaft end of an internal combustion engine bed 1, the crankshaft is shown at 2, and a clutch is indicated by dotted lines at 3; a subbase in the form of a mounting skid is shown at 4, which is preferably two laterally spaced, parallel, rigidly-connected, structural steel I beams. Upon the upper face of the top flange of each of said beams is rigidly secured a longitudinally disposed structural steel channel.

Said countershaft structure comprises a housing which is a body 6 of tubular form having an integrally formed supporting base or foot 7 adjacent the left hand end thereof and a somewhat modified but substantially similar base or foot 8 positioned at the right hand end thereof; the lower face of each of these feet is supplied with a longitudinally-extending seating channel 9 adapted to seat upon the upper face of said channels 5 and to be longitudinally adjustable thereon. For the purpose of providing for such longitudinal or fore-and-aft adjustment, said channels 5 are provided with longitudinally-extending slots 10 through which the bolts 11 pass, and by means of which said housing is secured to said channels, and thereby to said subbase; for the purpose of effecting the longitudinal fore-and-aft adjustment aforesaid, a fixed nut 12 is provided adjacent to each end of each of said structural channels 5 and through each of these nuts a screw-threaded bolt 13 passes respectively, with its inner end in contact with the respectively, adjacently positioned foot of said housing. A countershaft passes revolubly through said housing and upon the left end 14 thereof is mounted and keyed a power-receiving primary pulley 15 which is driven by a suitable primary or engine belt indicated at 15',—in Fig. 1—, as will presently appear. Upon the right hand end 16 thereof is mounted and keyed a secondary power transmitting pulley 17 over which passes a secondary belt 18 to the band wheel 19 of the derrick equipment.

For the purpose of automatically maintaining a normal driving tension upon said belt 18, an idler pulley 20 is revolubly mounted upon an arcuately-movable shaft 21; said shaft 21 is securely mounted in the outer end of a frame 22; the inner forward end of a horizontally-extending, fore-and-aft elongated frame is pivotally secured to said housing by means of the trunnion pins 23, which pass through the lugs 24 that are formed integrally upon the upper portion of the respective ends of said housing,—see Fig. 2. Said frame is fabricated from structural steel elements and steel plates, the various members of which are welded together; through the plate 25 is formed an opening for the passage of a substantially, vertically extending, automatically operative adjusting device which is shown in side elevation in Fig. 1 and in longitudinal section in Fig. 7; the function of said adjusting device is to maintain the frame 22 in such position that the idler, or belt-tightening pulley 20 carried thereby will bear upon the upper face of belt 18 with such a degree of pressure as to cause it to have a constantly maintained driving action upon the band wheel 19, which is located in or adjacent to the derrick, as indicated in Figs. 8 and 9; said adjusting device comprises a vertically extending, screwthreaded rod 26 equipped at its lower end with a horizontally extending sleeve 27, for the passage therethrough of a supporting pin 28 whereby said rod is mounted in the brackets 29, which are, in turn, welded to the sides of the channels 5; upon the lower portion of said rod is mounted a section of tubular rubber cushion 30, which is supported by a washer 31 and the lock nuts 32; above this lower cushion is positioned a metallic sleeve 33, which is provided with two oppositely-extending trunnions 34, which are for the purpose of engagement with suitable boxes or bearings 35, 35, which are affixed to the upper face of plate 25 of frame 22. Above said sleeve 33 is located another tubular rubber sleeve or cushion 36 which is secured in position by means of a suitable plate or washer 37, and the lock nuts 38. By means of the construction just described, the cushions, together with the intermediate sleeve 33, may be adjusted vertically, so as to cause the idler pulley frame to be raised or lowered and thereby to cause the requisite tension producing, cushioned action of the idler pulley upon the main driving belt 18. The tension adjusting action of said idler pulley is compensatory to the fore-and-aft adjustability of said housing and its countershaft and pulleys.

In oil field power plants of the class here shown, the main bearing of the power delivery shaft of the prime mover has heretofore been subjected to a heavy side strain caused by the tension and side pull of the belt upon the pulley of the crankshaft, (or the armature shaft, as the case may be); said side strain is in addition to the torsional power transmitting strain, and is a large factor in causing friction in said main bearings of said shaft, and has heretofore necessitated the use of an outboard bearing; there is, therefore, a well recognized need of a construction other than and dispensing with an outboard bearing, which will relieve said main bearing of the power plant from said tensional side strain. Such a construction forms an important factor of this invention and the same will now be described.

A portion of the crankshaft of an internal combustion engine is shown at 39 in Fig. 5; a portion of the crank is shown at 40, and an adjacent portion of the engine bed is there indicated by the numeral 1; the clutch pulley proper is indicated at 42. Upon the bed of the engine is rigidly affixed a tubular hub 43, the bore of which is concentric with the bearing 44 for said shaft, and said shaft extends therethrough and is firmly supported in the bore of the outer end of said hub in addition to the support afforded by the main bearing. The clutch pulley 42 which is revolubly mounted upon said hub, is supplied with suitable antifriction bearings as indicated at 44, and is prevented from moving longitudinally upon said hub by means of the plate 45 which is suitably affixed to the end of said hub and contacts with the adjacent portion of said pulley. The crankshaft projects outwardly from said hub, and upon the projecting end thereof is nonrevolubly mounted and firmly keyed a member which is termed the disk-barrel; this is a tubular member which has upon the inner end thereof a disk 46 from which extends outwardly a barrel 47 projecting somewhat beyond the end of the crankshaft and is secured thereon by means of a cap 48 and bolt 49. The adjacent end of pulley 42 forms a

chamber or housing within which said disk 46 is positioned, and the bore of the barrel thereof is provided with suitable keyseats whereby said disk structure is nonrevolubly fixed to said crankshaft by means of keys, such as 50. Within said pulley housing is positioned a nonrevolubly affixed, friction annulus 51, said affixing means being of a plurality of spline, as indicated by a dotted line at 52; one face of this annulus is perpendicular to the axis of the pulley, is arranged in proximity to and in parallel relation with the adjacent face of disk 46; the inner wall of said annulus is formed into the counterpart of a cone; a cone clutch-engaging member 53 is slidably mounted upon and nonrevolubly keyed to said barrel 47, with its cone face in engageable juxtaposition to said inner counterpart face of said annulus 51; the enlarged, outer circumferential edge of said member 53 is inwardly curved to form an internal groove 53′ which faces toward the axis of the clutch pulley.

Mounted upon said barrel 47 in such manner as to be longitudinally adjustable thereon by means of interengaging screwthreads, x, is fulcrum sleeve 54 which is supplied with radially extending, rigid fulcrum lugs 55; mounted and adapted to slide longitudinally upon said fulcrum sleeve 54 is a clutch engaging and disengaging collar 56 which is supplied with radially extending arms 57; a plurality of clutch actuating levers 58 are pivotally mounted at a point intermediate their ends upon said lug 55, and their outer ends are each respectively connected by means of toggle-links 59 to said arms 57.

The clutch mechanism thus described constitutes a combined disk-friction and cone-friction clutch; when members 46, 51 and 53 are in the position shown the clutch is in its engaged state and the opposing disk faces of members 46 and 51 are in frictional driving contact, also the juxtaposed cone faces of members 51 and 53 are in frictional, driving contact. In this position it will be noted that the longitudinal center lines of the toggle links 59 incline inwardly, thus locking the clutch in its driving function. When the clutch is to be disengaged, the collar 56 is actuated outwardly by means of the lever 60, and when this movement is taking place the inward end of lever 58 moves outwardly as indicated by the arrow A in Figs. 5 and 5a; which causes the disengagement of both driving faces of the members 46, 51 and 53; this disengagement is caused by the contact of the roller 61 with the outer lip of groove 53′. It is pointed out that the disengaging action of lever 58 will cause the inward movement of disk 46 and the simultaneous outward, opposite, movement of the cone member 53. The requisite distance between the friction face of said disk and the fulcrum point of lever 58 is attainable and maintainable by means of the interengaging screwthreads x. The lever 62 is the proximate means whereby the clutch is manipulated; for the purpose of remote actuation as from the derrick of a well, a remote lever 63 is provided from which a reachrod 64 extends to the proximate lever; the particular purpose of said remote actuation will presently appear.

The firm and ample support which is provided by means of the tubular hub 43 for the body 42 of the clutch pulley, dispenses with the necessity or desirability of providing this end of the crankshaft with an outboard bearing; it thereby diminishes the otherwise necessary width of the whole countershaft organization and greatly facilitates the removal of the belt. In carrying out and completing this idea of ready removability of the engine belt, the countershaft housing is made amply rugged to fully support its countershaft so as to dispense with outboard bearings for this shaft also.

The engine belt 82 is illustrated in Fig. 3 as being a plurality of V-belts, but this is not necessarily so, as a flat belt might be employed as indicated by the alternative constructions shown in Fig. 2a.

Both the pumping and drilling equipment employed at deep wells, which are vertically reciprocated by the walking beam 65, are of such weight as to require a counterbalance; in this case such a counterbalance is shown at 66 in Figs. 8 and 9, and when the drilling or pumping equipment is detached from the walking beam this counterweight will gravitate to its lowest point, and possibly actuate said beam out of the required position for reattachment of said equipment thereto; because of this it becomes necessary to maneuver the beam into and to secure same at the requisite, reattaching position.

The clutch mechanism just described with its remote control, is used for maneuvering the beam, as stated above; for the purpose of holding the beam in this maneuvered position, a brake is used which is shown in detail in Fig. 6, and partly shown in Fig. 2. For this purpose the countershaft pulley is equipped with a brake-flange 67, and for cooperation with said flange, a brakeband 68, shown especially in Fig. 6 is employed; one end of this band is rigidly attached to the pin 69, which in turn is rigidly carried by the foot 7 of the housing 6; the actuative end of said band is attached to the pin 70 which is rigidly carried by the brakelever 71; the pivotal or fulcrum point of said lever is indicated at 72 in Fig. 4. Said brakeband is provided with suitable tension equipment, 73, and with a supporting device shown at 74, the object of which device is to sustain the brakeband out of contact with said flange when the band is released from its braking position and function.

The proximate actuator of this brake is the lever 71, from which a reachrod 75 extends to the remote lever 76 in the derrick, and which is located in close proximity to lever 63.

By means of said remote levers, the walking beam may be maneuvered into and maintained at will, in any desired position of its normal movement, as necessity may require. An emergency limiting device for lever 71 is provided at 77.

The clutch actuating lever 60 is connected to the lever 62 by means of shackle work which comprises the reachrod 79, bellcrank 80, and the reachrod 81.

In the deep oil wells which are now so numerous, the weight of the tools and cable required to drill them, and of the sucker-rods used in pumping them, average at the rate of two pounds per foot of depth, and the depth of many wells exceeds five thousand feet. While a greater portion of this weight is intended to be counterbalanced by the counterweight 66, the weight of equipment is constantly varying while drilling is progressing, also in pumping, because of the varying relative proportions of oil and water that is pumped; hence the strain upon the engine belt 82 is severe enough to cause its permanent stretch; against such stretching, provision must be made for tension adjusting means; this is attained by means of the adjust-

ing screws 13 for the housing of the countershaft and, as the distance between the body of the clutch pulley 43, and the shaft of the countershaft pulley 15 is thus increased, compensating provision must be made whereby the proper tension upon the power delivery belt 18 may be maintained; such provision is embodied in the idler pulley 20, and its mounting and adjusting mechanism, as previously described. Applicant believes the portion of the inventive novelty of the organization here disclosed, resides in the mounting of the engine and countershaft upon the same subbase, as a self-contained organization with the resulting interrelation and coaction between the main factors thereof, together with certain of the component details specifically pointed out and defined in the appended claims.

I claim the following:

1. A power-generating and transmitting organization comprising in combination, a self-contained assembly of sub-organizations consisting of, a readily portable sub-base, an internal combustion engine rigidly mounted upon said sub-base, a primary power-delivery shaft for said engine, a primary-power-delivery pulley mounted upon and driven by said shaft, a fore-and-aft adjustable countershaft housing mounted upon said sub-base, a countershaft mounted in said housing in parallel relation to said power-delivery shaft with its ends projecting from the respective sides of said housing, a primary power-receiving pulley mounted upon one of said ends in fore-and-aft alignment with said power-delivery pulley, a primary transmission belt passing about said pulleys, a secondary power-delivery pulley mounted upon the other end of said countershaft, a secondary driving-belt passing about and extending forwardly from said secondary driving pulley to an ultimately driven pulley, a pulley-supporting frame pivotally attached at its rearward end upon said housing and extending forwardly therefrom in lateral proximity to said secondary driving belt, a belt-tightener pulley carried by said frame, in overhung relation thereto, extending forwardly therefrom in fore-and-aft alignment with the secondary belt, and a belt-tightener pulley mounted in the forward end of said frame positioned above and in tension-producing relation to said secondary belt, said tension-producing action being compensatory to the fore-and-aft adjustment of said housing and in simultaneous compensatory coordination therewith.

2. In a power-generating and transmitting organization according to claim 1, a tension-maintaining organization for said secondary driving belt consisting of a horizontally-extending tension-pulley supporting frame, pivotally attached at its rearward end to said countershaft housing with its forward end extending in substantially parallel alignment with, positioned above and in proximity to said secondary belt, and adapted to swing vertically; a pulley carried at said forward end in tension producing contact with the adjacent upper face of said belt; a vertically-extending screw-threaded rod, pivotally mounted at its lower end upon said sub-base with its upper end extending through a portion of said frame, a vertically-adjustable cushion member upon said rod positioned below, and upon which, said frame rests, a vertically adjustable cushion member upon said rod positioned above and bearing upon said frame, and means operable to cause a vertical adjustment of said cushions respectively, together with the forward portion of said frame and said pulley.

3. A power-generating and transmitting organization comprising in combination, a plurality of sub-organizations as follows: A power generator, a power-delivery shaft for said generator, a primary power-delivery pulley mounted upon and driven by said shaft, a sub-base upon which said generator is rigidly mounted, a fore-and-aftly-adjustable housing mounted upon said sub-base, a countershaft mounted in said housing, with its ends projecting from the ends of said housing respectively and extending in parallel alignment with said power-delivery shaft, a primary power-receiving pulley mounted upon one of said projecting ends in fore-and-aft belting alignment with said primary power-delivery pulley, a transmission belt for and connecting said pulleys, a secondary power-delivery pulley mounted upon the other projecting end of said countershaft, a secondary transmission belt engaging said secondary transmission pulley and extending forwardly therefrom in transmissive engagement with an ultimately-driven organization, a pulley-supporting frame pivotally attached at its rearward portion to said housing and extending forwardly therefrom, a belt-tightener pulley carried by the forward end of said frame in fore-and-aft alignment with said secondary pulley, in tension-producing contact with the upper adjacent face of said secondary belt so as to exert a tightening action thereon which is compensatory to said fore-and-aft adjustment of said housing whereby tension variation of said primary belt is caused.

4. In an organization according to claim 3 wherein all of said pulleys are mounted in overhung relation to their respective carrying structures, whereby any supplementary equipment which would hinder or interfere with the placement or removal of said belts is dispensed with.

5. In a combined power-generating and transmitting organization according to claim 1, a power-generating factor thereof consisting of an engine, a power-delivery shaft for said engine, a bed in which said shaft is revolubly mounted, a tubular extension rigidly carried by said bed with its bore in axial alignment with, forming a bearing for and through which said shaft extends with its outer end projecting therefrom, a power-delivery pulley revolubly mounted upon said projecting end, and clutch mechanism mounted upon and keyed to said projecting end adapted for driving engagement with said pulley.

JOHN REID.