C. W. DAVISSON.

OIL WELL APPARATUS.

APPLICATION FILED OCT. 10, 1911.

1,034,698.

Patented Aug. 6, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

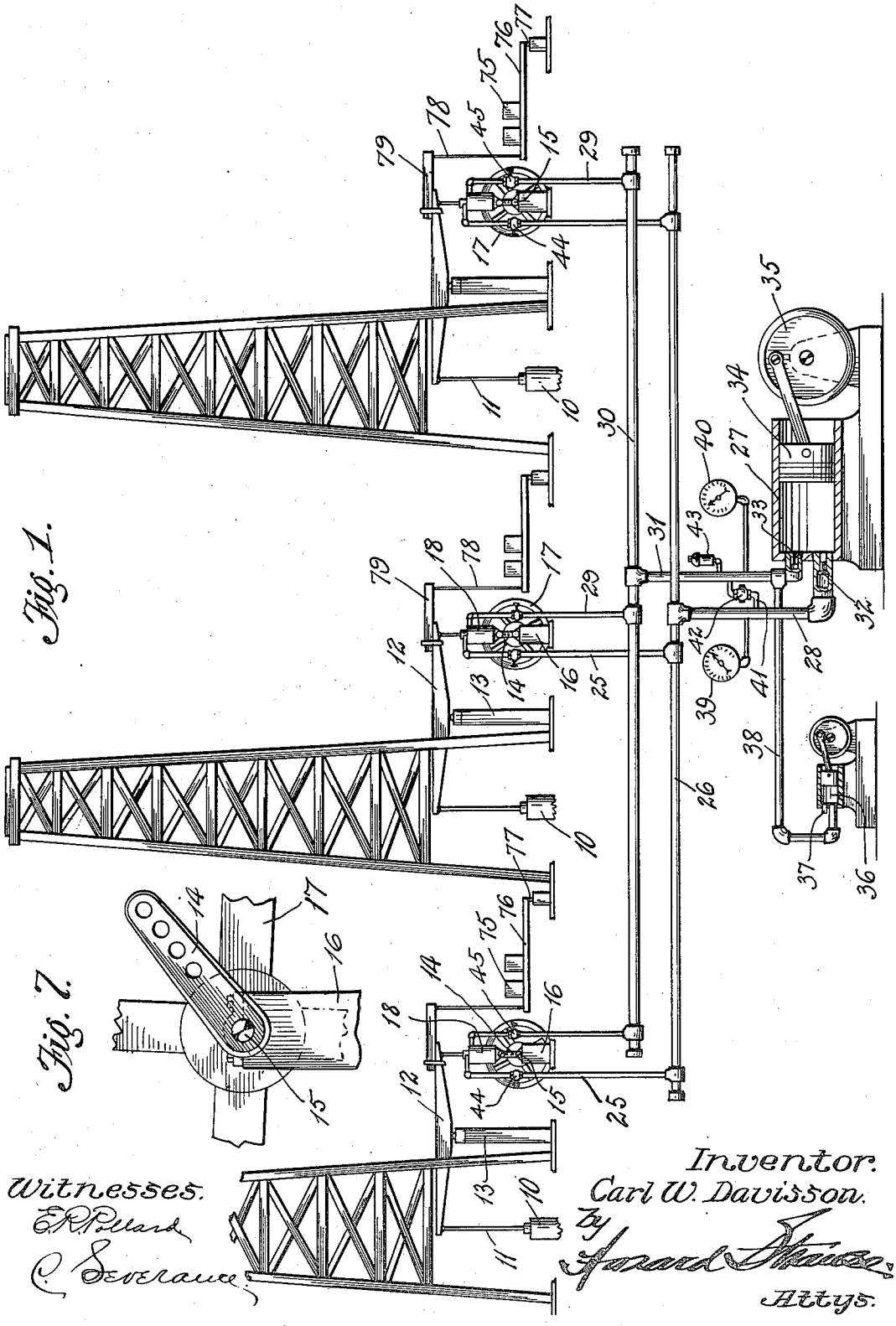

Fig. 7.

Witnesses.

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2 SHEETS-SHEET 2.

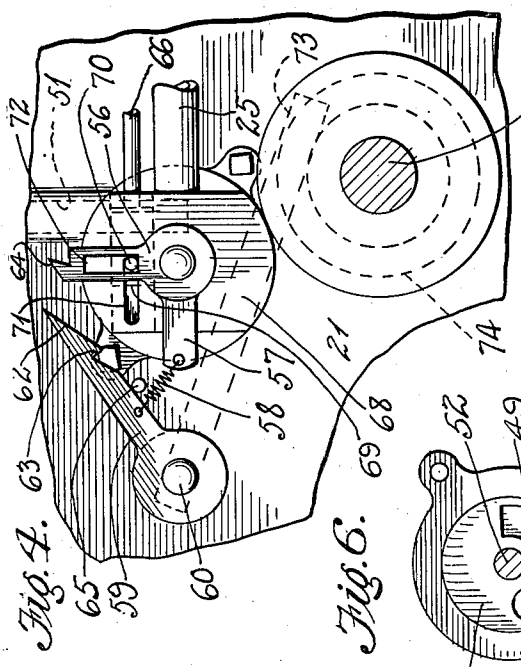

Fig. 4.

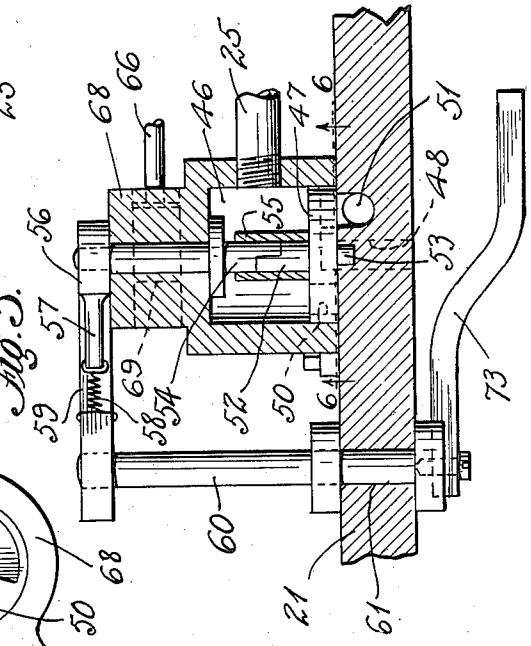

Fig. 5.

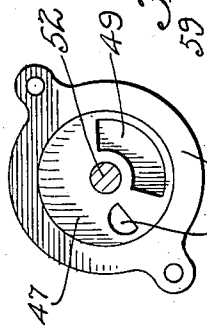

Fig. 6.

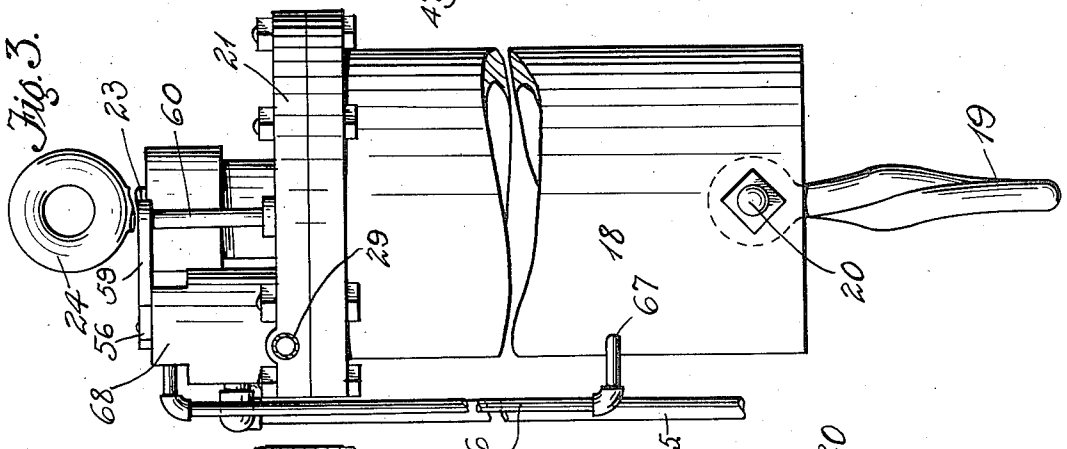

Fig. 3.

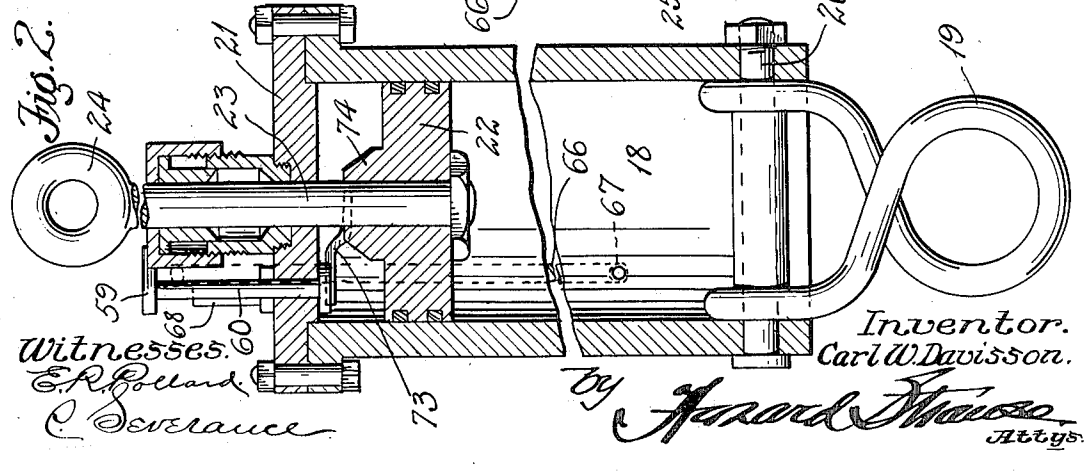

Fig. 2.

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UNITED STATES PATENT OFFICE.

CARL W. DAVISSON, OF LOS ANGELES, CALIFORNIA.

OIL-WELL APPARATUS.

1,034,698. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed October 10, 1911. Serial No. 653,769.

To all whom it may concern:

Be it known that I, CARL W. DAVISSON, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Oil-Well Apparatus, of which the following is a specification.

This invention relates to improvements in oil well apparatus and has particular relation to the means for operating well pumping devices.

It is an object of the invention to provide a pressure producing and distributing mechanism which may be applied to the pumping machinery of one or more oil wells.

It is also an object of the invention to provide means whereby compressed air may be supplied and used for operating the pumps in oil wells, the air after being used being also further conserved and utilized again.

It is also an object of the invention to provide mechanism capable of application to the walking beams of well pumps and to provide the same with controlling valves which are automatically operated by the action of the machinery, means also being provided for compressing and directing the air to the said mechanisms applied to the walking beams.

In the accompanying drawing forming a part of this specification, Figure 1 is a side elevation of the mechanism mounted at a series of oil wells for operating the pumps at said wells with compressed air, the said view also illustrating the compressing and distributing means for the air. Fig. 2 is a vertical central sectional view taken through a cylinder employed for operating the said pump mechanism, the same being shown upon an enlarged scale and parts being shown in elevation. Fig. 3 is a side elevation of the pumping cylinder and the valve mechanism mounted upon the head thereof. Fig. 4 is a detail plan view of the valve controlling mechanism mounted upon the head of an air cylinder. Fig. 5 is a detail sectional view through the valve mechanism shown in Fig. 4, the section being also taken through the adjacent part of the cylinder head. Fig. 6 is a detail sectional view taken upon the line 6—6 of Fig. 5. Fig. 7 is a detail side elevation of the crank and crank shaft.

The pumping mechanism of oil wells has been heretofore operated by various means, including steam power, the steam being generated and supplied to one or more wells for use. The use of steam however, is very expensive since the steam must be exhausted into the atmosphere in all apparatus heretofore used and there is therefore a constant loss. The present invention is designed to use mechanically compressed means preferably air which is directed to and properly caused to move the pumping mechanism, the exhausting air being retained and returned to the compressing mechanism whereby a large percentage of the compressed air is saved for further use and the work of compressing and maintaining the pressure of the air is greatly reduced and accomplished on an economical scale.

In the accompanying drawing the preferred form of mechanism has been illustrated.

The invention will now be more specifically described, reference being had to the said drawing in which—

10 indicates the upper ends of wells, 11 pump rods extending into the same, and 12 walking beams which are pivotally mounted upon standards 13 and capable of being rocked in the usual way for raising and lowering the working barrels or other parts of pumps.

The device contemplated by this invention is readily adapted to the usual or ordinary well rigs employing walking beams and which are generally capable of connection with a crank 14, carried by a crank shaft 15 mounted upon a standard 16 in the usual way and having a crank driving wheel 17 which may be operated by any desired mechanism. The crank 14 is usually connected with the adjacent end of the walking beam for oscillating it and in the present instance a cylinder 18 is employed having a pivoted loop 19 suspended in its open lower end and connected with the said crank 14. The loop 19 may be of any usual or ordinary construction and is pivoted in the end of the cylinder 18 upon a bolt 20. It will be understood that the said cylinder might be connected directly with the standard 16 or its lower end firmly held against vertical movement by securing it in any other desired manner, within the spirit of the invention. As, however, nearly all well rigs are provided with the cranks and

crank shafts above referred to, it is found convenient to secure the cylinder 18 to the said cranks by means of the loops 19.

The cylinder 18 is closed at its upper end by a head 21 bolted in position in any usual or ordinary manner and a piston 22 is mounted within the cylinder and provided with a piston rod 23 which projects upwardly through the head 21 and to a sufficient distance beyond the same to permit of the proper reciprocation of the piston within the cylinder. The upper end of the piston rod 23 is usually formed with an eye 24 which is pivotally connected with the walking beam 12. The weight of the pumping machinery at one end of the walking beam operates to depress it, while the piston 22 which is operated in the cylinder 18 operates to lift the said pump mechanism again by depressing the adjacent end of the walking beam 12. The cylinders are adapted to be supplied with air pressure through piping 25 and 26 which receives air from a compressor 27 through a pipe 28. The exhaust air from the cylinders 18 is received by piping 29 and returns through piping 30 and 31 to the cylinder of the compressor 27 again. Valves 32 and 33 control the outlet and return of air to the said compressor 27 so that the operation of the compressing piston 34 of the compressor by means of a crank wheel 35, will force the air out past the valve 32 into said pipe 28 and will upon its return stroke draw in the air exhausted from the system of cylinders through the pipe 31. Since there is always a loss of pressure in the system, it is necessary to supply the deficit in the exhaust side of the system so as to keep the air in the supply pipes 25, 26 and 28 at a uniform and desired pressure. For this purpose an auxiliary compressor 36 is employed which may be of the same type as the compressor 27 and is adapted to take in atmospheric air through an inlet 37 and compress and force the air through a pipe 38 to the pipe 31. In this manner the required amount of air is maintained in the system for operating the pistons 22. It is found in operation that about 60% of the air pressure can be utilized over again and the auxiliary compressor 36 can readily supply the remaining air and pressure needed in the system.

The pipes 28 and 31 are usually provided with gages as 39 and 40 for showing the pressure on the two sides of the system. The pipes 28 and 31 are also connected with a cross pipe 41 having a by-pass check valve 42 therein so that when the pressure in the outgoing piping from the compressor exceeds that which is needed, the excess pressure will be carried into the exhaust side of the system and reduce the work necessary in the compressor.

In the event of the pressure becoming greater than desired or needed, a safety outlet valve 43 is used and connected with the pipe 31. The system is thus well adapted for the constant maintenance of an even air pressure, to operate the valve 44 for controlling the admission of air to the different cylinders and the pipes 29 are also provided with valves as 45.

Pipes 25 are each adapted to extend to a valve chamber 46 formed upon the head 21. In each of said chambers 46, a valve 47 is provided controlling the entrance of the air into the adjacent end of the cylinder 18, a passage 48 being provided in the head 21 and arranged to be controlled by the said valve 47. The said valve 47 is preferably of the disk type and is formed with ports 49 and 50. The port 50 extends entirely through the valve 47 and when it is moved over the passage 48 is adapted to control the air from the inlet chamber 46 to escape into the cylinder. When the valve is turned, the port 49 which is in the form of a segmental recess made in the lower face of said valve 47, will connect the end of the passage 48 with an exhaust outlet passage 51 formed in the head 21 of the cylinder. The said passage 51 extends to the periphery of the head where the exhaust air is delivered into the pipe 29 as will be understood by reference to Fig. 3.

The valve 47 is provided with a stem 52 having a reduced lower end 53 which engages a socket bearing formed in the upper face of the cap 21. The upper end of the stem 52 is off set and adapted to have a spliced engagement with the lower off set end of a shaft 54. The off set ends of the shaft and stem are coupled by means of a sleeve 55 into which they extend, so that the said shaft 54 is adapted to turn the valve stem when it is turned. The upper end of the shaft 54 extends outside the wall of the chamber 46 and is provided with a lever 56. The said lever 56 is formed with a laterally projecting arm 57 which is connected by a spring 58 with a pivoted latch 59. Said latch 59 is carried by the upper end of the shaft 60 which is journaled at 61 in the head 21. The latch 59 is formed with an inclined end 62 and a retaining notch forming a shoulder 63, which is adapted to engage a beveled projection 64 formed upon the end of the lever 56.

A spring 58 normally tends to pull the latch 59 against the stop pin 65 upon the head 21 and also tends to draw the arm 57 of the lever 56 to the position illustrated in Fig. 4. When the lever 56 is turned against the action of the spring 58 for moving the valve 47, the beveled projection 64 will ride upon the inclined face 62 and force the lever 59 outwardly until the shoulder 63 of said lever 59, is sprung over said beveled projection 64 and thus caused to hold the lever

56 in adjusted position. When the lever 56 is in the position shown in Fig. 5 the valve 47 is in position to permit the exhaust of pressure from the cylinder 18. When the lever 56 is turned so as to engage and be held by the latch 59 the inlet to the cylinder will be closed and the exhaust therefrom will be opened through the passageway 51. In order to move the said lever 56 to this position automatically at the proper time, an auxiliary exhaust pipe 66 is provided, one end of which extends through the walls of the cylinder 18 at a point a little more than half way down the length thereof as indicated at 67 while the upper end thereof extends into an upper extension 68 of the valve chamber 46. In this extension 68 a piston block 69 is mounted and is provided with a pin 70 which extends upwardly therefrom and through a slot 71 in the top wall of the casing the pin latch engages an elongated slot 72 formed in the lever 56, the connection being such that when the piston 22 reaches a point below the lower end of the pipe 66, the pressure within the cylinder will enter the pipe 66 and force the block piston 69 over in the casing and move the lever 56 into engagement with the latch 59. The lever 56 should be disconnected from the latch 59 at a proper time to close the exhaust outlet and to again open the air inlet to the cylinder 18 and for this purpose the shaft 60 has connected to its lower end a lever 73 which extends laterally from said shaft toward the piston rod 23 and in such relation thereto that as the piston 22 rises in the cylinder 18, a beveled post 74 provided on the upper side of the piston 22 will engage the inner free end of the lever 73 and push the same to one side, thus turning the shaft 60 sufficiently to swing the latch 59 with its shoulder 63 out of the path of the pivot projection 64. The spring 58 will thus operate to turn the lever 56 to the position shown in Fig. 4 again and move the valve 47 so as to admit air pressure into the cylinder 18 for forcing the piston 22 downwardly again. It will be observed from the above description that the operation of the valve mechanism and the piston 22 is entirely automatic and will continue intermittently depressing the outer end of the walking beam 12 so as to lift the pump mechanism. At each exhaust of the air from the cylinder 18 the weight of the working barrel and pumping mechanism will carry the walking beam in the opposite direction again.

Since the weight of the pumping mechanism, including the usual working barrel becomes heavier than is required for operating the walking beam, it is preferable to employ counter balance weights 75 which may be placed upon a platform 76 journaled at 77 and having its free end suspended by a cable 78 from an arm 79 secured to the walking beam. The arrangement is such that one or more weights 75 may be readily set upon the platform 76 so as to counterbalance the weight of the pumping tools and not make it necessary to employ such high pressure in the cylinders 18 for carrying out the pumping operation as would otherwise be required.

What I claim is:

1. A system of operating well pumps, comprising cylinders mounted adjacent to the wells and connected with the walking beams thereof, pistons movable in said cylinders, means for admitting compressed air to each cylinder, comprising valves, means for operating the valves when the pistons approach one end of their cylinders, the said piston being arranged to uncover an exhaust outlet near one end of its stroke, means for delivering the pressure of the exhaust to the valve mechanism, and a plunger for operating the same to cut off the inlet of air to the cylinder.

2. A well pumping mechanism comprising a cylinder having a piston adapted to reciprocate a pump mechanism, an air compressing mechanism for delivering compressed air to said cylinder, and a valve mechanism operable by air pressure from the said cylinder for directing the movement of the air in the cylinder to produce reciprocation of the pump mechanism.

3. A system for operating a series of well pumps by compressed air comprising in combination with walking beams on the said wells, of cylinders suspended adjacent to said walking beams, pistons operating in said cylinders and connected with walking beams, the cylinders being open at one end and closed at the other, means for compressing air and delivering the same into the closed ends of the cylinders for driving the pistons in one direction, the weight of the well pumping mechanism producing a return movement thereof, a valve for controlling the inlet of compressed air to the cylinder, means for rotating said valve through the application of compressed air from the cylinder, a latch mechanism for holding the valve in the position to which it is moved by said compressed air, and means operable by the movement of the piston for disconnecting the latch mechanism and permitting the valve to be turned to its original position again, the structure being such that the valve mechanism is automatically operated for driving the piston in one direction and then permitting of its return by the weight of the well mechanism.

4. An oil well operating mechanism, comprising a cylinder having a piston movable therein and adapted to be connected with the walking beam of a well pump, means for compressing air and delivering it to the

cylinder, a valve adapted to control the admission of air pressure to the cylinder, a latch for holding the valve in closed position, means adapted to be moved by the piston at one end of its stroke for releasing said latch and permitting of the entrance of air pressure to the cylinder, the said piston being adapted to uncover and exhaust port at the opposite end of its stroke, and a movable member operated by the exhaust, thus releasing from the cylinder for opening the inlet valve for compressed air, and permitting the latch to hold the same while the air is driving the piston the full length of its stroke.

In witness that I claim the foregoing I have hereunto subscribed my name this 28th day of Sept., 1911.

CARL W. DAVISSON.

Witnesses:

CASSELL SEVERANCE,

EARLE R. POLLARD.