To all whom it may concern:

Be it known that I, RICHARD HOUK, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Hydraulic Motors for Hay-Presses, of which the following is a specification.

This invention relates to improvements in hay presses, and has particular reference to a portable baling press that is adapted for operation by hydraulic power.

It is an object of the invention to provide a hydraulic baling press in which a power cylinder may be employed for operating the platen of the press, the water or other fluid which is to operate the piston of the cylinder being compressed under a suitable head or pressure to exert all the power required for pressing the material to be baled, while water at a lower pressure is also kept in readiness for withdrawing the plunger after the pressing operation.

It is also an object of the invention to provide a portable baling press having a motor or engine thereon capable, not only, of securing the hydraulic pressure necessary, but of moving the portable device from place to place.

With these and other objects in view the invention consists in certain novel constructions, combinations and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings—

Figure 1 is a diagrammatic view partially in section and partially in elevation of the parts of the hydraulic mechanism with connecting pipes and controlling valves.

Fig. 2 is an enlarged side elevation of a portion of the baling press showing the valve changing mechanism employed for turning the power first into one end of the power cylinder and then into the other end thereof.

Fig. 3 is a fragmentary detail view of the same mechanism, showing the same upon an enlarged scale, and with parts broken away to better show its structure.

Fig. 4 is a detail fragmentary sectional view taken upon the line 6-6 of Fig. 2.

Fig. 5 is a longitudinal, vertical central sectional view through a modified form of the baling mechanism, showing the same when adapted to operate a double plunger device.

It is the purpose of the present invention to provide a hydraulic baling press in which the apparatus is light and easily moved from place to place upon its own wheels and under its own power, the motor thereof being used to pump and actuate the hydraulic columns, that are employed for reciprocating the platen or plunger of the baling chamber or chambers. The mechanism is particularly well suited for operation in places and sections of the country where it is difficult to obtain large quantities of water, and especially in dry seasons where care must be used that water is not wasted. For this reason also the device does not require the transportation of a large quantity of water, the same water being used over and over again.

In the accompanying drawings preferred embodiments of the invention have been illustrated and the details and features of the baling press will now be more specifically described and shown in the drawings. In the drawings 10 indicates the frame of a baling press, 11 the front or guide wheels thereof and 12 the rear or driving wheels. The wheels are secured beneath the frame 10 in any usual or preferred manner and the front wheels 11 are carried by the usual steering knuckles 13 so that they may be turned for steering the vehicle. Thus when the gears in the box 17 are properly set in the usual way motion may be imparted to the drive wheels from the transmission shaft 16, or said shaft 16 may be permitted to run freely without being connected with the jack shaft 18 when it is not desired to move the vehicle.

In order to obtain the desired hydraulic power for accomplishing the baling operation, a pump 22 of any preferred type is mounted upon a platform which projects from one side of the vehicle frame 10. The crank shaft 24 of said pump is provided at one end with a sprocket wheel 25 adapted to be connected by a sprocket chain 26, with a sprocket wheel on the shaft 16. Thus when the shaft 16 is connected by a clutch 15 with the engine shaft the sprocket chain 26 may be made to transmit power to the shaft of
the pump and operate the same for delivering hydraulic columns to the power cylinder of the device.

The platen of the baling press is operated by a piston 28 mounted in a power cylinder 29. The said power cylinder 29 is generally arranged centrally of the vehicle, extending longitudinally thereof for a short distance in the forward part of the machine. When the device is used as a one way, or one platen press the piston 28 is connected by a piston rod 30 with a baling platen or plunger 31. Said platen is usually provided with anti-friction rollers at 32 and 33 for facilitating the easy movement of the platen within the baling chamber 34 of the press. The said piston rod 30 passes through a gland 35 in one end of the cylinder 29 so that the pressure employed in the cylinder may not escape around the said piston rod.

The pump 22 operates to force a column of water either directly or indirectly into the power cylinder. The water is preferably controlled directly at the cylinder ends, being forced through a pipe 36 into a pressure tank 37. The tank 37 is of a proper size to permit the entrapment of considerable quantity of air in the upper end of the tank by the water which is forced into the same near the bottom thereof. A pressure gage 39 is secured to the upper end of the tank to show the amount of pressure maintained within the tank. A blow off device 38 is usually interposed in the pipe 36 to prevent the pressure from accumulating in the tank 37 above a certain degree. The direction of the hydraulic columns toward and away from the pressure cylinder 29 is controlled by a suitable valve mechanism, usually carried in a valve casing 40. The water from the tank 37 is delivered through an outlet pipe 41, the end of which extends to a point near the bottom of said tank so as to be submerged at all times. A valve 42 in the pipe may be employed for controlling the passage of liquids in said pipe. A pipe 43 leads from the valve casing 40 to one end of the power cylinder 29, while a pipe 44 leads from another portion of said valve casing to the other end of said power cylinder 29.

The valve chamber 40 is preferably an elongated one adapted to receive an elongated piston or valve 45. The pipe 41 is preferably somewhat offset with respect to the pipe 43, where the said pipes enter the said valve chamber or casing 40. The valve 45 carries a double piston portion 46 adapted to control the flow of water from the pipe 41 to the pipe 43 and the power cylinder 29. The central portion of the valve 45 is provided with a double piston portion 47 which controls the passage of water through a pipe 48 to the water tank or receptacle 49. The pump 22 draws water from said tank 49 through any suitable suction pipe 50. In the preferred type of applicant's device in which a one way press platen is used, provision is made for withdrawing the platen by the use of a hydraulic column under less pressure than the column which forces the platen against the materials to be pressed. For this reason an auxiliary pressure tank 51 is used which is connected with the central portion of the valve casing 40 by a pipe 52. The said tank 51 is also connected with a point near one end of the valve casing 40 by a pipe 53. The said pipe 53 and the pipe 54 so enter the valve casing 40 that a double piston 54 on the valve 45 may control both of said pipes as clearly shown in Fig. 1 of the drawing. The adjacent ends of the pipes 48 and 52 are controlled by the central piston portion 47 of the said valve. The pipe 53 is also connected with the pipe 41 by a cross pipe 55 having a valve 56 for controlling the same. The tank 51 is also connected with the water tank 49 by the pipe 57 which is provided with a safety valve 58. The water tank 49 is not a closed tank, no pressure being maintained therein and the water from the pipes 48 and 57 drop into the same under the action of gravity. The valve 45 is preferably automatically operated in conjunction with the movement of the baling platen or platens, the mechanism being the same whether the machine is used for a single platen or a double one. The valve stern 60 is provided with tappets 61 sufficiently separated to receive the round end of an operating arm 62. The said arm 62 is secured to the end of a rock shaft 63 which extends from the side of the machine occupied by the valve mechanism across the frame to the other side thereof where an actuating lever 64 is secured thereto. The said actuating lever is connected by a spring 65 with one end of a lever 66 which is pivoted to the frame at a point adjacent to the said lever 64 as at 67. The lower end of the lever 67 is provided with an elongated slot 68 adapted to engage a pin 69 which projects from the side of a reciprocating bar or rod 70. In order to lock and positively hold the valve against premature movement, the lever 64 carries an enlarged head portion 71, having a curved edge concentric with the shaft 63 and provided about centrally of its curved edge portion with a recess of sockets 72. Latch members 73 and 74 are mounted upon a plate 75 adjacent to the said head portion 71, the inner ends of said latch members being adapted to alternately engage the said recess 72 for locking the lever 64 in the extremes of its movement. Springs 76 and 77 hold the said latch members 73 and 74 in position against the head 71. The said latch members are alternately lifted out of the socket or recess 72 by cam pieces 78 and 79 which are fastened to the bar 70. As the bar approaches the ends of its movements one or 130
the other of said cam pieces is adapted to engage the rounded outer ends of the latch pieces 73 and 74 for moving them against the action of their springs and releasing the lever 64 whereby said lever may be thrown by the action of the spring 65 for moving the valve with a positive action to the opposite end of its motion. The rod 70 is adapted to be moved at the proper time by a projection 80 carried by the platen 31 of the hay press when near the extremes of its movement.

The said projection 80 projects into the path of projections 81 and 82 which are carried by the said bar 70 near the opposite ends thereof. The structure is such that when the platen has nearly compressed the material placed before it on its pressure stroke, the projection 80 will engage the projection 81 and carry the bar 70 so that the cam 78 will disconnect the latch 73 from the recess 72. The lever 66 having also been moved by the bar 70 will cause the spring 65 to pull upon the said lever 64, so that when the said lever is released from the latch it will be quickly thrown to the other extreme of its movement, thus operating to throw the valve 45. The return movement of the platen 31 will move the bar 70 in the other direction causing the cam 79 to release the latch 74 from the recess 72 also moving the lever 66 to the other side of the axis of the shaft 63, so that the spring 65 will again throw the lever 64 and reverse the position of the valve. The valve will thus be positively thrown at the extreme movements of the platen, but will be positively held while the platen is traveling from one end of its stroke to the other.

The mechanism described both for the operation of the valve and for the connection of the power mechanism to the tank and pump is adapted for use with a press having only one pressing platen, or for one having a double platen or two oppositely operating platen. Such a double platen device is shown in Fig. 5, in which two platens 83 and 84 are employed and connected to the opposite ends of a plunger rod 85. In this case the plunger rod passes through packing glands at each end of the power cylinder 86. In this instance the power cylinder 86 is preferably mounted upon trunnions 87, which project from the opposite sides of the said cylinder and engage bearings in cross bars 88 and 89 on the frame, whereby the plunger which extends to the two platens may move freely, the cylinder being capable of accommodating itself to their movement. A piston 90 is secured to the said plunger rod 85 and is adapted to receive pressure from either end of the cylinder in operating the two platens. In this structure also two baling chambers as 91 and 92 are arranged in the frame of a machine so that one plunger is compressed in one chamber while it is being withdrawn from a new charge in the other.

In the operation of the device, the power mechanism is arranged the same for a machine having a single platen or a double platen. When the single platen machine is employed the pump 22, driven by the engine 14, forces water drawn from the tank 49, through the pipe 36 into the tank 37. When the valve 45 is in the position shown in Fig. 1, with the valve 56 closed the water will be forced through the pipe 41 and into the pipe 43, against the piston 28. The piston will thus be operated to force the platen 31 against the materials inserted in the baling chamber 34, so as to compress the same. The water in the end of the power cylinder 29, which is next to the platen 31 will be forced out through the pipe 44 and thence through the valve casing to the pipe 52 and into the auxiliary pressure tank 51. The valve 93 in the pipe 53 is kept open when the device is operating a single platen, but while the valve is in the position shown in Fig. 1 the water from the tank 51 is cut off by the piston portion 54 of said valve 45. Any excess of pressure in the tank 51 will force its way past the safety valve 55 into the tank 49. The rod 70 is moved at the same time or when the platen nearly reaches the end of its compression stroke, to operate the valve mechanism and reverse the valve 45, so that the pipe 41 will be closed and the pipe 53 will be open. This movement of the valve 15 also opens the pipe 43 to the exhaust pipe 48, so that the water in the high pressure end of the pressure cylinder 29 can run back into the tank 49. The valve will at the same time close the pipe 62 and open the pipe 44 to receive the water from the pipe 53. The pressure in the tank 51 while much less than that in the tank 37, is however sufficient to carry the piston 28 with the platen 31 to the position shown in Fig. 1 again, at which time the rod 70 will be again operated for changing the valve and permitting the high pressure to enter the power cylinder and act upon the piston 28. The operation of the valve mechanism through the parts actuated by the rod 70 will produce a continuous reciprocation of the piston 28. The withdrawing of the platen requires very much less pressure as just intimated, and sufficient power is stored in the tank 51, when the piston is moved by the high pressure from the tank 37, to supply a sufficient hydraulic power to return the piston 28 with the platen 31 carried thereby. The employment of differential pressures is economical in the operation of a single platen press and prevents the necessity of moving water to any great extent and the maintaining of a strong head upon the side of the piston which requires little pressure for operation.

Applicant's device is also so constructed.
that a double baling press may be operated, which has not been very successfully done heretofore. One form of such double press has been shown in Fig. 5 and the operation of the press is accomplished through the same hydraulic mechanism, with a slightly different adjustment of valves thereof. When using the double frame hydraulic columns from the high pressure tank 37 are required on both sides of the power piston 90. It is only necessary in order to secure this power to close the valve 56 and open the valve 56. In this instance when the piston 45 of the valve mechanism is in the position shown in Fig. 1 pressure will be delivered from the tank 37 into the left hand end of the power cylinder 29. When the piston is to be reversed and the valve 45 has been moved to the other end of its stroke, the pressure from the high cylinder 37 sends the hydraulic column through pipe 41, pipe 53, upper end of pipe 59 into the valve casing, and thence through the pipe 44 into the right hand end of the power cylinder. At this time the left hand end of the cylinder will exhaust through the pipe 43, valve casing and pipe 48 into the tank 49. When the power is being delivered into the left hand end of the power cylinder, the right hand end will exhaust through pipe 44, valve casing and pipe 52 to the auxiliary tank 51, and thence through the pipe 57 into the tank 49. It will be observed with what facility the hydraulic mechanism may be changed for use with a single platen press, or for use with a double platen press. It will also be seen that either type of press can be operated with a very small quantity of water, facilitating the employment of the baling press in dry sections and at points distant from water supplies. When the press is to be moved from place to place the chain 26 is generally removed and the gears in the gear box 17 are shifted to permit the engine to drive the traction wheels.

What is claimed is:

1. A hydraulic motor comprising in combination a cylinder with piston and piston rod therein, means for maintaining a hydraulic column under a high pressure and connected to one end of said cylinder, means for maintaining a hydraulic column under a low pressure and connected with the opposite end of said cylinder, and means for automatically and alternately connecting said high and low pressures with said cylinder, for the purpose described.

2. A hydraulic motor comprising in combination, a cylinder, a piston and piston rod therein, a pressure tank connected with one end of said cylinder, means for maintaining high pressure in said pressure tank, an auxiliary pressure tank with connections to the opposite end of said cylinder, means for maintaining a lower pressure in said tank, and means for automatically connecting said pressure tanks alternately to said cylinder for moving said piston and piston rod, substantially as described.

3. A hydraulic motor comprising in combination, a cylinder, a piston and piston rod therein, a pressure tank, means for maintaining pressure therein, means connecting the same to said cylinder, an auxiliary pressure tank connected to said cylinder, a receptacle connected to said cylinder and to said auxiliary tank, and valve mechanism for controlling said several connecting communications.

4. A hydraulic motor of the character referred to comprising in combination a power cylinder, a piston therein, a pump for moving a hydraulic column under pressure, means for driving said pump, an auxiliary pressure system adapted to receive a portion of the hydraulic column under reduced pressure, and means for delivering the full force of the hydraulic column into said cylinder for moving its piston under a load.

5. A hydraulic motor comprising in combination a power cylinder, a piston therein, a pressure tank adapted to receive a liquid, means for compressing the liquid against a body of air in said pressure tank, piping for delivering said pressure to one side of said piston for causing its movement under a load, an auxiliary pressure tank adapted to receive exhaust pressure and liquid from said cylinder from one side of the piston, a valve mechanism adapted to control the admission of a hydraulic column to either side of the piston, the structure being such that the column under a high pressure can be delivered to one side of the piston, while the auxiliary pressure tank will be caused to deliver a lower pressure to the other side of said piston to accomplish its return movement, and means for receiving the overflow of the liquid from either side of the piston.

6. In a device of the character referred to, a cylinder, a piston therein, a high pressure tank, a low pressure tank, means connecting said tanks, respectively, to said cylinder at opposite sides of said piston, and a valve mechanism with means for automatically operating the same for directing the high pressure to one side of the piston and the low pressure to the other side thereof, and means for maintaining the pressure in said high pressure tank, substantially as described.

7. In a device of the character referred to, in combination, a power cylinder, a piston therein, a high pressure tank, means for maintaining high pressure therein, means connecting the same to said cylinder at one side of said piston, a pressure tank connected to said cylinder at the opposite side of said piston, a receptacle, connections therefrom to said high and low pressure
tanks, and valve mechanisms for controlling the communications between said pressure tanks and said cylinder, and said receptacle, substantially as described.

8. In a device of the character described, in combination, a power cylinder, a piston therein, a high pressure tank, connections therefrom to said cylinder at one side of said piston, means for maintaining pressure in said high pressure tank, a low pressure tank, connections therefrom to said cylinder at one side of said piston, means for maintaining pressure in said low pressure tank, means for connecting the exhaust from said cylinder therewith, means connecting the low pressure tank with said receptacle with check safety interposed in said connection, and means connecting said receptacle with said high pressure tank through said first mentioned means, substantially as and for the purpose described.

In testimony whereof, I have hereunto set my hand, in presence of two witnesses.

RICHARD HOUK.

Witnesses:

Cassell Severance,

Earle R. Pollard.