

July 14, 1936.

H. ALLEN ET AL

2,047,540

PUMP

Filed June 29, 1934

3 Sheets-Sheet 1

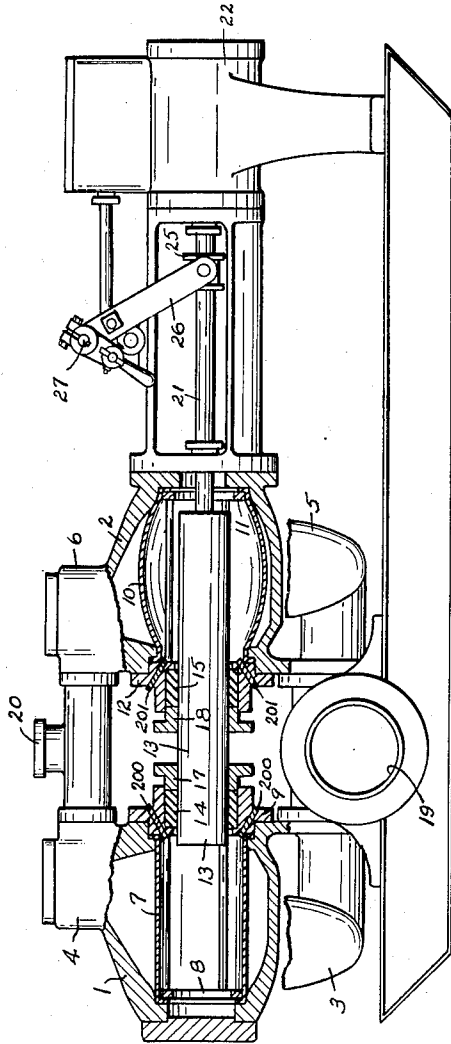


FIG. 1.

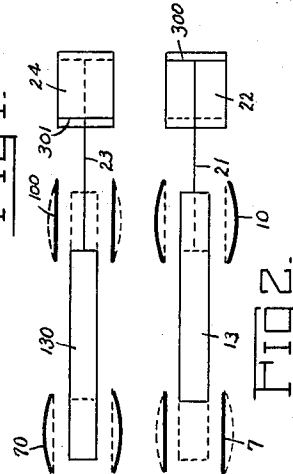


FIG. 2.

Herbert Allen
Madden T. Works

INVENTORS

BY

Frederic Martin

ATTORNEY.

July 14, 1936.

H. ALLEN ET AL

2,047,540

PUMP

Filed June 29, 1934

3 Sheets-Sheet 2

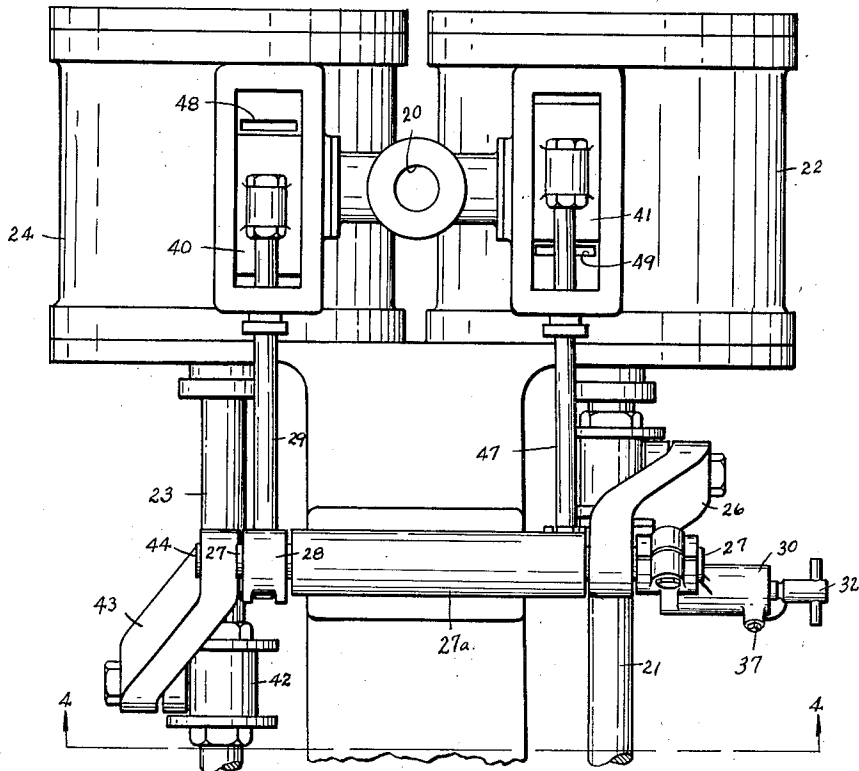


FIG 3.

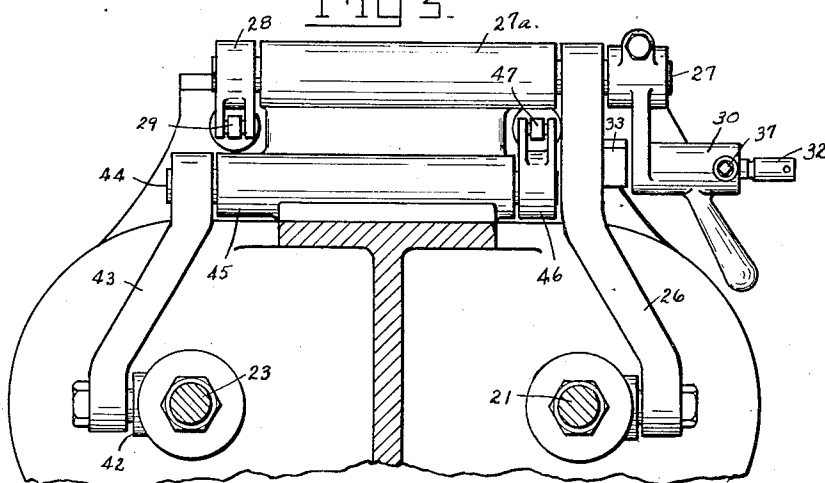


FIG 4.

Herbert Allen
Madden T. Works
INVENTORS

BY *J. Vincent Martin*
ATTORNEY.

July 14, 1936.

H. ALLEN ET AL

2,047,540

PUMP

Filed June 29, 1934

3 Sheets-Sheet 3

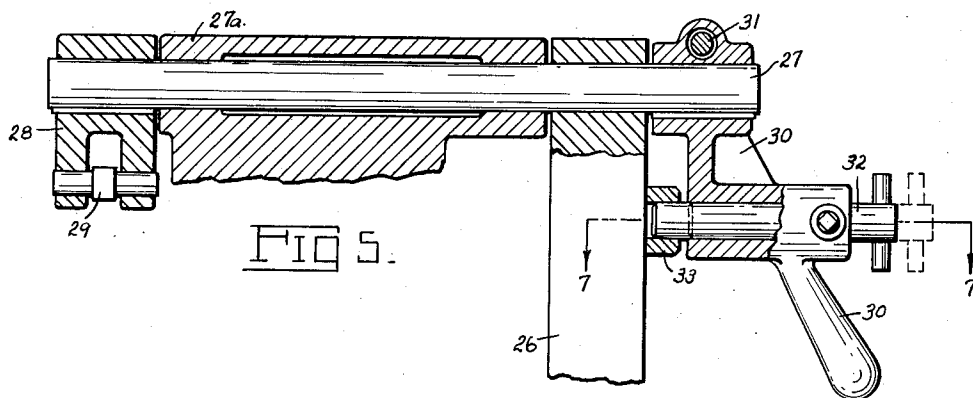


FIG 5.

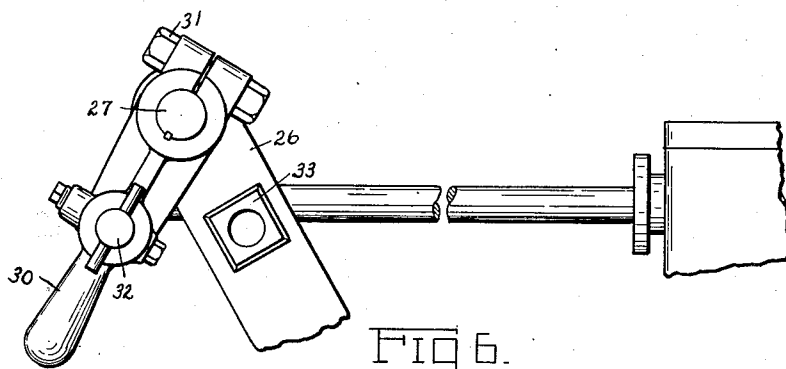


FIG 6.

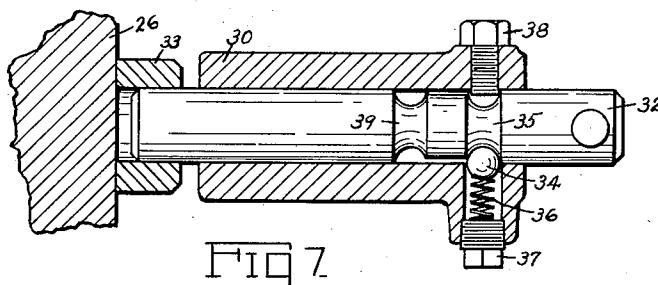


FIG 7.

Herbert Allen
Madden T. Works
INVENTORS

BY

J. Vincent Martin
ATTORNEY.

UNITED STATES PATENT OFFICE

2,047,540

PUMP

Herbert Allen and Madden T. Works, Houston, Tex., assignors, by mesne assignments, to Stephens Pump Company, Round Rock, Tex., a corporation of Delaware

Application June 29, 1934, Serial No. 733,080

14 Claims. (Cl. 103—44)

This invention relates generally to pumps, and specifically to new and improved means for locating the plunger of a pump at a predetermined point in the stroke thereof.

It will be found particularly useful in pumps of the type disclosed by patent to Stephens No. 1,832,258, which are designed for pumping abrasive or corrosive fluids. Such pumps include barrels, hollow expansible pumping members in said barrels and plungers reciprocable to displace pumping fluid confined within said members to draw pumped fluid into the barrels through the inlet means thereof, and to expel it from the barrels through the outlet means thereof. The hollow expansible pumping members serve to seal the plungers, rods, and packings from the pumped fluid, and as some of the pumping fluid within such members is lost by leakage through the packing, it must be replenished at intervals. To refill each of such pumping members it is necessary to let it assume its normal shape by moving its plunger to the end of the suction stroke with respect thereto. The plungers are usually driven by steam engines, and to effect the desired movement of the plungers manually or by adjustment of the throttle valve is quite unsatisfactory.

This invention has for its specific object the provision of new and improved means whereby the steam valves may be shifted to cause the plungers to move as desired, for the purpose above referred to.

Other objects will hereinafter appear.

The preferred embodiment of the invention is illustrated by the accompanying drawings wherein Fig. 1 is a side elevation partly in section of the pump; Fig. 2, a diagrammatic view of the pump; Fig. 3, a fragmentary top plan view of the steam end of the pump; Fig. 4, a sectional view taken on the line 4—4 of Fig. 3; and Figs. 5, 6, and 7 detail views of the steam valve actuating mechanism and associated parts.

Referring to Fig. 1 of the drawings, the numerals 1 and 2 indicate two of the barrels of the pump, the inlet and outlet means of the barrel 1 being indicated at 3 and 4, and the inlet and outlet means of the barrel 2 being indicated at 5 and 6. Within the barrel 1 is a hollow expansible pumping member 7, the ends of which are sealed adjacent ends of the barrel 1 by the ring 8 and head 9. The hollow expansible member 10 in the barrel 2 has its end likewise sealed to the adjacent ends of the barrel 2 by the ring 11 and head 12. The reciprocable plunger is indicated at 13 working through packings 14 and 15 held in place by glands 17 and 18.

When the plunger 13 is moved from the position shown by the drawings to the left the parts function as follows:

The pumping member 7 is expanded, the valve of inlet means 3 closes, the valve of outlet means 4 opens, and the pumped fluid in barrel 1 is discharged through outlet means 4. The valves of the inlet and outlet means are not shown. Simultaneously, the pumping member 10 is contracted, the valve of outlet means 6 closes, the valve of inlet means 5 opens, and a fresh charge of pumped fluid is drawn into the barrel 2 through the inlet means 5.

When the piston 13 is returned to the right to the position shown by Fig. 1, the pumping member 10 is expanded, the valve of outlet means 6 opens, the valve of inlet means 5 closes, and the pumped fluid in barrel 2 is discharged through outlet means 6. Simultaneously, the valve of inlet means 3 opens, and the valve of outlet means 4 closes, and a fresh charge of pumped fluid is drawn into the barrel 1 through the inlet means 3.

It will be understood that the expansion of the pumping members 7 and 10 is caused by the displacement by the plunger 13 of the pumping fluid confined within said members.

The conventional pump of this type includes four barrels, two of which are behind and twins of the barrels 1 and 2 shown by Fig. 1. The other two barrels (not shown) have associated therewith a plunger 130 (Fig. 2) the reciprocation of which is opposite to that of plunger 13, so that the pumping members, such as 7 and 10 or 10 and 70, are simultaneously expanded and contracted, as indicated by Fig. 2. The numeral 19 (Fig. 1) indicates a common inlet for the barrels, and the numeral 20 a common outlet.

The plunger 13 is reciprocated by the rod 21 connected to a piston 300 in the cylinder 22 (Figs. 1 and 2). The plunger 130 (Fig. 2) is actuated by the rod 23 connected to a piston 301 in the cylinder 24.

Referring now to the new and useful improvement provided by this invention: Extending upwardly from the crosshead 25 on the rod 21 (Figs. 1 and 3 to 7) is a rocker arm 26 pivotally connected to the rocker shaft 27. The rocker shaft 27 is rotatably supported by the bearing 27a, and has keyed on one of its ends the valve rocker 28 which actuates the valve stem 29.

On the other end of the rocker shaft 27 is keyed and clamped a shift lever 30 by means of a bolt 31. Slidable in the shift lever 30 is a retent pin 32 and carried by the rocker arm 26 is a

retent block 33. As shown by Fig. 7 the retent pin 32 may be yieldably held in the retent block by a ball 34 urged into groove 35 by a spring 36, the pressure of which may be varied by adjusting plug 37. The retent pin 32 may also be held immovable in such position by the set screw 38. The retent pin 32 may be yieldably or rigidly held out of engagement with the retent block 33 by the said means when the retent pin 32 is moved into a position to permit the groove 39 to receive the ball 34 or set screw 38.

By the means just described the actuation of the steam valve 40 by the plunger rod 21 may be effected and controlled as will hereinafter more fully appear.

Referring now to the actuation of the steam valve 41, it will be noted that extending upwardly from the crosshead 42 of the plunger rod 23 is a rocker arm 43 keyed to the shaft 44 which is rotatable in bearing 45 and has keyed thereon valve rocker 46 engaging valve stem 47 which is connected to valve 41.

It will be apparent to those skilled in the art that when the retent pin 32 is locked in the retent block 33 as shown by Figs. 5 and 7, and the rocker arm 26 thereby held against rotation with respect to the rocker shaft 27, the steam engine will operate in the usual manner to impart opposite reciprocation to the plunger rods 21 and 23, and to the plungers 13 and 130 (Fig. 2) connected thereto, the valves 40 and 41 being reciprocated by the plunger rods 21 and 23 through the connections just described to effect the alternate admission of steam into the steam cylinders 22 and 24 through the usual ports such as those indicated by the numerals 48 and 49.

Now when it is desired to fill the pumping members with pumping fluid the steam throttle (not shown) is closed, the retent pin 32 is moved into its inactive position shown by Figs. 1, 3, 4, and 6, and the shift lever 30 is moved to locate the steam valve 40 in the position shown by Fig. 3 (the motion of the lever 30 being imparted to the rocker shaft 27, rocker 28, valve stem 29, and ultimately to valve 40). The steam throttle (not shown) is then opened and steam will enter the cylinder 24 through the port 48 to actuate piston 301, effecting the movement of the plunger rod 23 to carry the plunger 130 into the position shown by Fig. 2. The rod 23 will move the rocker arm 43 to rock the shaft 44 and rocker 46 to move the valve stem 47 to carry the valve 41 into the position shown by Fig. 3, whereupon steam will enter the cylinder 22 through the port 49 to actuate the piston 300, effecting the movement of plunger rod 21 to carry the plunger 13 into the position shown by Figs. 1 and 2. The sleeves 7 and 100 may then be filled with pumping fluid through means such as that indicated by the numeral 200.

Then the shift lever 30 may be swung in the opposite direction to move the valve 40 to the other end of its stroke whereby the port 48 will be closed and another port (corresponding to the port 49, but not shown) will be opened to admit steam to the other side of the piston 301 in the cylinder 24, whereupon the plunger 130 will be moved into the dotted line position shown by Fig. 2, and the plunger rod 23 through the rocker arm 43, rocker shaft 44, rocker 46 and stem 47 will cause the movement of the valve 41 to the opposite end of its stroke, whereby the port 49 will be closed and a port (corresponding to port 48, but not shown) will be opened, and steam will be admitted to the cylinder 22 to actuate the piston 300 and cause the movement of the rod 21

and plunger 13 into the dotted line position shown by Fig. 2. The pumping members 7, 10, 70, and 100 will then assume the shapes indicated by the dotted lines, and the pumping members 10 and 70 may thereupon be filled with pumping fluid by means corresponding to that indicated at 201. (Fig. 1.)

After the pumping members have been filled with fluid as above described, the steam throttle (not shown) may be shut off, and the retent pin 32 of the shift lever 30 moved into its active position shown by Figs. 5 and 7, whereupon the steam throttle may be opened and the pump operated.

It will be apparent from the foregoing that the invention provides new and improved means to locate the plungers quickly and easily for the purpose of permitting the pumping members to be filled with pumping fluid, thereby eliminating the trouble and uncertainty incident to locating the plungers manually or by adjustment of the throttle valve.

The invention is not limited to the preferred embodiment herein disclosed. Various changes may be made within the scope of the following claims.

We claim:

1. The combination with a pump and a steam engine; said pump having twin pumping assemblies, each of said assemblies including a pair of barrels, a hollow expansible pumping member in each of said barrels, means to introduce pumping fluid into said members, and a plunger associated with the pumping members of each of said twin assemblies to actuate the fluid therein and cause expansion and contraction thereof; said steam engine including a pair of cylinders, each of said cylinders having a piston reciprocable therein, and a steam valve therefor; a rod connecting the plunger of each assembly to a corresponding one of said pistons; a rocker arm, a rocker shaft, a rocker and a valve stem connecting each of said rods to the valve controlling the movement of the piston to which the other of said rods is connected; one of said rocker arms being pivotally connected to its rocker shaft, and having a retent block; a shift lever having a retent pin movable therein and adapted to engage said retent block, said shift lever being keyed on the rocker shaft to which said rocker arm is pivotally connected; said lever serving to operatively connect said arm and shaft when said pin is in engagement with said block; said retent pin being disengageable from said block, and said shift lever being then movable to shift the steam valve to which it is connected independently of the movement of said rods.

2. The combination with a pump having a first and second plunger operatively associated with respective pump barrels; a steam engine having a first cylinder, piston and valve, and a second cylinder, piston and valve; a first rod connecting said first plunger and said first piston; a second rod connecting said second plunger and said second piston; a first rocker arm, rocker shaft, rocker and valve stem, said arm being pivoted to said first rod and on said shaft; a second rocker arm, rocker shaft, rocker and valve stem connecting said second rod to said first valve; and a valve shifting lever keyed on said first rocker shaft, and having means to releasably engage said first rocker arm, said lever serving when in engagement with said first rocker arm to impart the motion of said first rocker arm to said first rocker shaft, and thereby operatively connect said first rod to said second valve, and when disengaged from said first rocker arm to

effect the movement of said second valve independently of said first rocker arm whereby each of said pump plungers may be accurately located in a desired position with respect to its barrel.

3. The combination with a pump of the character described, having a pair of plungers, a pair of hollow expansible pumping members associated with each of said plungers, and pump barrels encompassing each of said expansible members, means to introduce pumping fluid into each of said members; a steam engine having a pair of cylinders, a piston in each of said cylinders, valves to control the admission of steam to said cylinders; of valve actuating means for each of said cylinders operatively connecting said plungers, pistons and valves, each of said means including a rocker arm, a rocker shaft on which said arm is pivoted, and a valve shifting lever fixed on said rocker shaft having elements to operatively connect said arm and shaft and to operatively disconnect said arm and shaft to actuate said valve independently of said arm.

4. The combination with a pump of the character described, having a pair of plungers, a pair of hollow expansible pumping members associated with each of said plungers, and pump cylinders encompassing said expansible members, means to introduce pumping fluid into each of said members; a steam engine having a pair of cylinders, a piston in each of said cylinders, valves to control the admission of steam to said cylinders; of valve actuating means operatively connecting said plungers, pistons and valves, said means including disengageable parts whereby one of said valves may be shifted independently of the other parts of said means.

5. In a duplex steam engine of the class described including two normally automatic valve mechanisms for the steam valves, a shifting device serving when in its active position to connect the elements of the actuating mechanism for one of the valves, and, when in its inactive position, serving as a means whereby said valve may be shifted independently of the normally automatically actuating mechanism.

6. The combination with a pump of the character described having a hollow expansible pumping member, means to introduce pumping fluid into said member, and a plunger to actuate said pumping fluid to cause expansion and contraction of said pumping member; a steam engine having a piston and a valve; a rod connecting said piston and plunger; a rocker arm, a rocker shaft on which said arm is pivoted, means connected to said rocker shaft and to said valve for causing movement of said valve upon movement of said rocker shaft; of a valve shifting lever keyed on said rocker shaft and having means to releasably engage said rocker arm, said lever serving when in engagement with said rocker arm to impart the motion of said rocker arm to said rocker shaft and when disengaged from said rocker arm to effect the movement of said valve independently of said rocker arm.

7. The combination with a pump having a plunger; a steam engine having a piston and a valve; a rod connecting said piston and plunger; a rocker arm, a rocker shaft on which said arm is pivoted, means connected to said rocker shaft and to said valve for causing movement of said valve upon movement of said rocker shaft; of a valve shifting lever keyed on said rocker shaft and having means to releasably engage said rocker arm, said lever serving when in engage-

ment with said rocker arm to impart the motion of said rocker arm to said rocker shaft and when disengaged from said rocker arm to effect the movement of said valve independently of said rocker arm.

8. In an engine of the character described having supply valves for operating the engine, a valve actuating rocker arm, a shaft on which said arm is pivoted, a valve shifting lever secured to said shaft having disengageable means to operatively connect said arm and shaft and to actuate said shaft independently of said arm and means operatively connecting said shaft to one of said valves.

9. In a duplex steam driven double acting pump of the class described having duplex engine and pump pistons and valves to control the respective pistons of the duplex steam engine, and means interconnecting the respective pump and engine pistons, the combination of, means connecting the valves and said last named means including a cross head on one interconnecting means, a shaft having a rocker fixed at one end connected to the valve associated with the other engine piston, a second rocker free to rotate on the other end of the shaft and pivotally connected to said cross head, an arm keyed to said shaft having means to releasably engage said second rocker whereby the engine may be manually controlled.

10. In a duplex steam driven double acting pump of the class described having duplex engine and pump pistons and valves to control the respective pistons of the duplex steam engine, and means interconnecting the respective pump and engine pistons, the combination of, means connecting the valves and said last named means including a cross head on one interconnecting means, a shaft having a rocker fixed at one end connected to the valve associated with the other engine piston, a second rocker free to rotate on the other end of the shaft and pivotally connected to said cross head, an arm keyed to said shaft having means to releasably engage said second rocker whereby the engine may be manually controlled, said last described means arranged to be yieldably held in engaged or disengaged position.

11. In a duplex steam driven double acting pump of the class described having duplex engine and pump pistons and valves to control the respective pistons of the duplex steam engine, and means interconnecting the respective pump and engine pistons, the combination of, means connecting the valves and said last named means including a cross head on one interconnecting means, a shaft having a rocker fixed at one end connected to the valve associated with the other engine piston, a second rocker free to rotate on the other end of the shaft and pivotally connected to said cross head, an arm keyed to said shaft having means to releasably engage said second rocker whereby the engine may be manually controlled, and means to lock said releasable means in engaged or disengaged position.

12. In a pump, a pair of spaced barrels, inlet and outlet means associated with said barrels, a hollow, expansible member in each of said barrels, and a piston between said barrels and extending into said members to expand and contract said members to draw fluid into said barrels through said inlet means and to force it out of said barrels through said outlet means, means to introduce pumping fluid into each of said

- members, a steam engine having a valve and piston to drive said pump, means having a cross-head connecting said pistons, a rock shaft, rock arms fixed on said shaft, means connected to
- 5 one of said rock arms and to said valve for causing movement of said valve upon movement of said rock shaft, the other of said rock arms having a releasable retent, an arm pivoted on said shaft and connected to said crosshead and means
- 10 on said arm to receive said retent.
13. In a steam engine driven pump of the class described the combination of a pump having a barrel, inlet and outlet mears for said barrel, a
- 15 hollow expansible pumping member in said barrel, pumping fluid in said member, a plunger associated with said pumping fluid and arranged to effect the expansion and contraction of said member; means to introduce pumping fluid into said member, a steam engine having a cylinder
- 20 and piston therein, a valve for said cylinder; means connecting said piston and plunger, a

rocker shaft, means connected to said rocker shaft and to said valve for causing movement of said valve upon movement of said rocker shaft; a second arm pivotally mounted on said shaft and connected to said piston and plunger connecting members, and releasable means keyed to said shaft and arranged to lock said second arm and said shaft for cooperative movement.

14. In an engine having supply valves for operating the engine, automatic valve actuating mechanism therefor including two relatively movable elements adapted to move together in automatic operation of said valve actuating mechanism, means normally engaging both of said elements to hold them against relative motion and

15 provide for such automatic operation, said means being disengageable from one of said elements to interrupt automatic operation and provide for manual operation of said valve.

HERBERT ALLEN. 20
MADDEN T. WORKS.