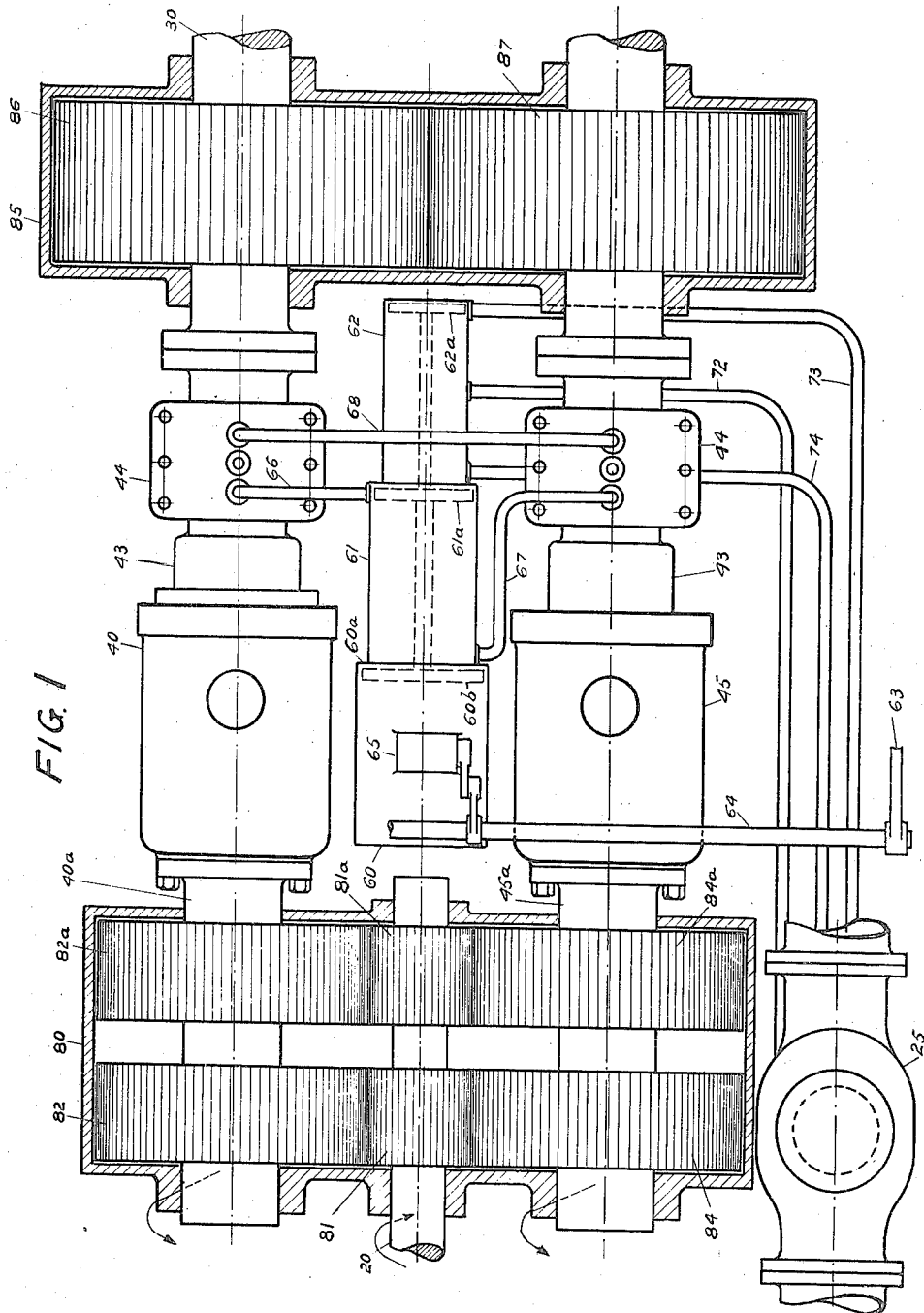


M. SITNEY.
REVERSING MECHANISM.
APPLICATION FILED MAR. 20, 1915.

1,248,735.

Patented Dec. 4, 1917.
4 SHEETS—SHEET 1.



WITNESSES:
F. Graves.
E. Cohen

INVENTOR
Masscy Sitney
BY *R. J. Carlson*
ATTORNEY

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FIG. 2

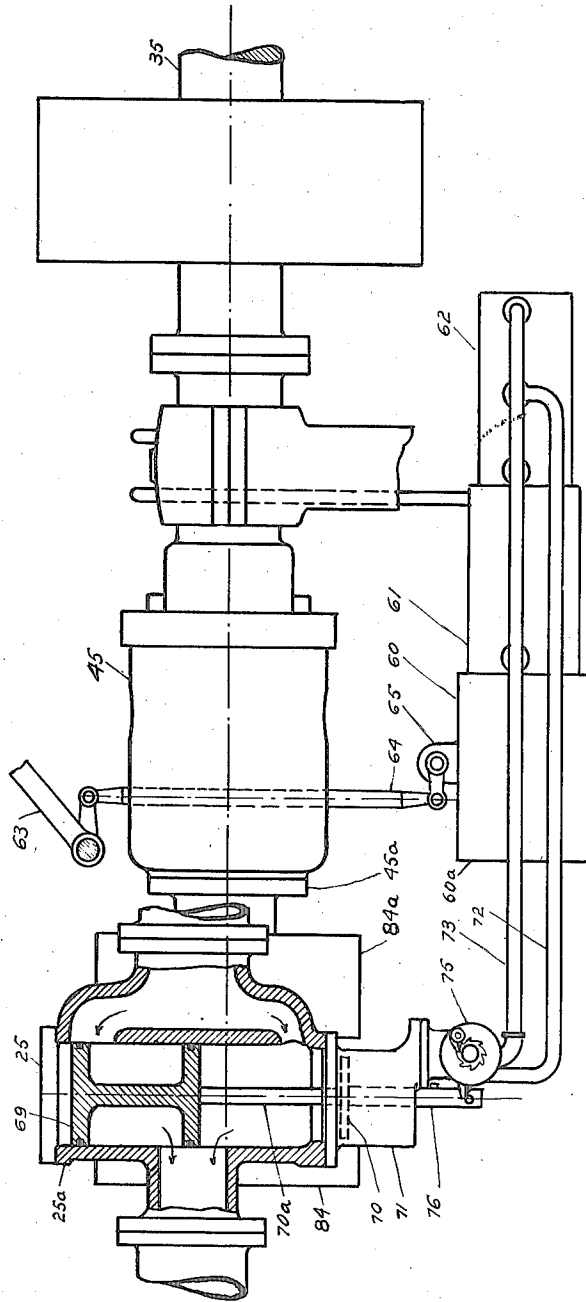
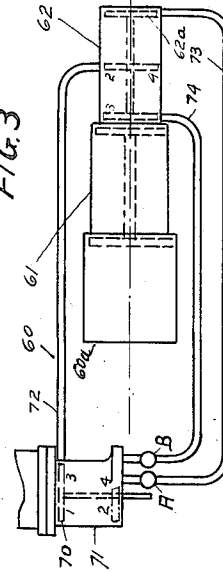
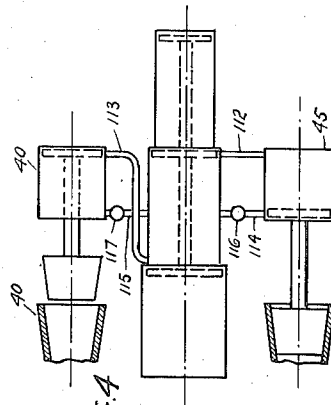


FIG. 3



WHEN PISTON IN POSITION 1 THEN VALVE A OPEN B CLOSED
 " " " " 2 " " A CLOSED B OPEN
 " " " " 3 " " A " B
 " " " " 4 " " A OPEN B CLOSED

FIG. 4



WITNESSES:

F. Graves
H. Cohen

INVENTOR

Massey Sitney

BY

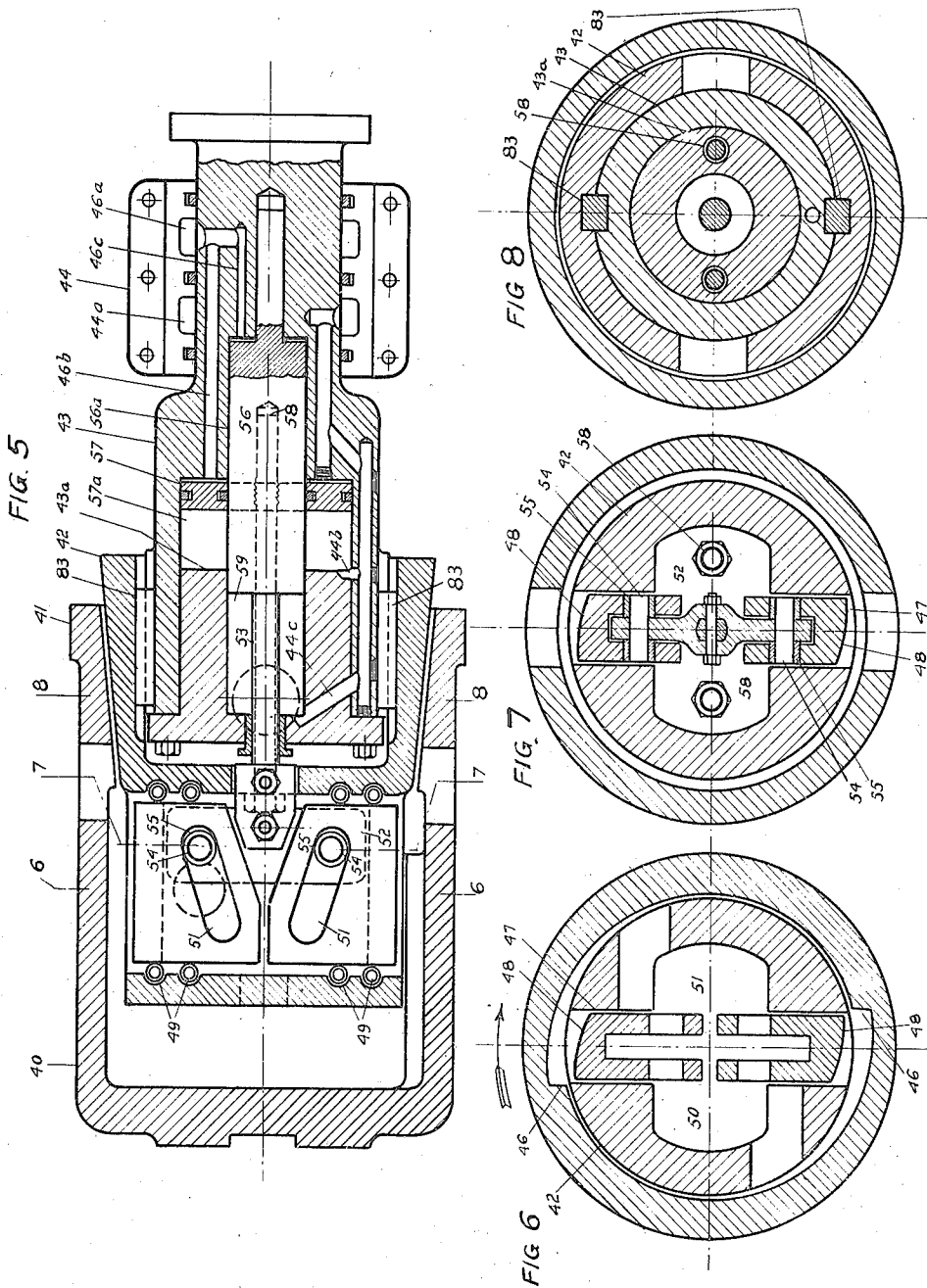
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4 SHEETS—SHEET 3.



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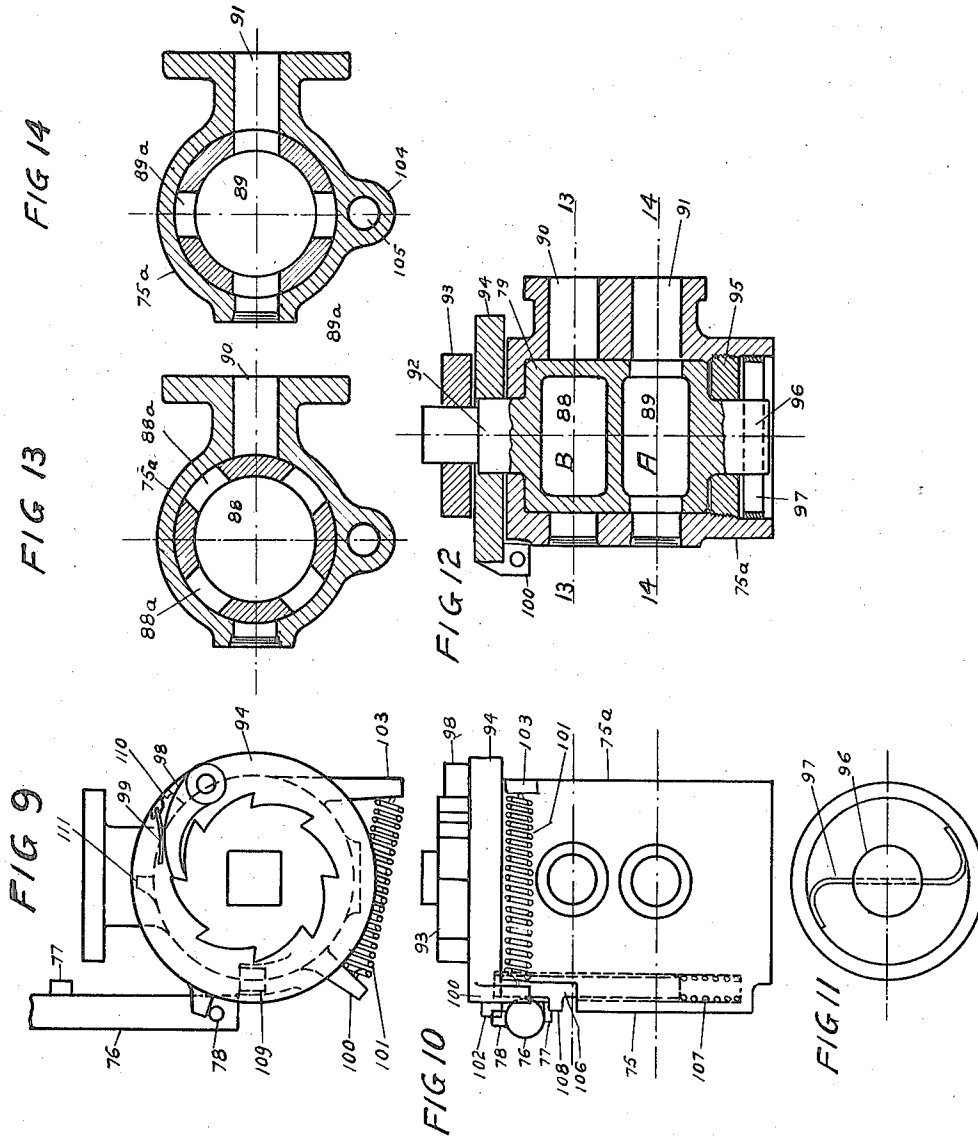
BY *R. J. Carlson*
ATTORNEY

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4 SHEETS—SHEET 4.



WITNESSES:
F. Graves.
E. Cohen

INVENTOR
Massey Sitney
BY *[Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE.

MASSEY SITNEY, OF WEST BETHLEHEM, PENNSYLVANIA.

REVERSING MECHANISM.

1,248,735.

Specification of Letters Patent.

Patented Dec. 4, 1917.

Application filed March 20, 1915. Serial No. 15,976.

To all whom it may concern:

Be it known that I, MASSEY SITNEY, who is to become a citizen of the United States of America on January 11, 1915, and a resident of the city of West Bethlehem, county of Lehigh, and State of Pennsylvania, have invented certain new and useful Improvements in Reversing Mechanisms, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to the transmission of power by mechanical means, and has special reference to reversing mechanisms which are adapted to be interposed between any driving shaft or engine such as, for example, a steam turbine, which operates in one direction, and a driven apparatus, such as a marine propeller, a rolling mill, hoisting machinery or other device which must be capable of operating in either direction.

One object of my invention is to provide a complete apparatus of the aforesaid character which shall be relatively simple in construction, capable of transmitting large power at high speed, and adapted for reversing the driven apparatus while the driving shaft is still in motion to thereby reduce the time required to reverse.

Another object is to provide for the ready manipulation and control of the reversing mechanism, for the suitable governing of the driving mechanism to avoid injury or racing, and for the braking of the driven member preparatory to reversal.

Another object is to provide fluid pressure control apparatus and a governing mechanism therefor, whereby a simple movement of a hand-operated lever will suffice to effect the reversal of the transmission apparatus, including the various steps, which are necessarily involved for the safe and prompt action of the apparatus, and in their required sequence. For example, with a steam engine driven apparatus, it is desirable to shut off the steam supply to the prime mover before breaking the connection between driving and driven parts, to reverse the connection to the driven apparatus and then open the steam inlet.

Other objects and advantages of my invention will be set forth hereinafter, and in order that my invention may be thoroughly understood, I will now proceed to describe

the same in the following specification, and then point out the novel features thereof in appended claims.

Referring to the drawings:

Figure 1 is a plan view with the gear casings broken away and shown in section, of a reversing mechanism, constructed in accordance with my invention.

Fig. 2 is a side elevation of the same, with a throttle valve shown in section.

A diagrammatic view of the pipe connections between the fluid pump and the governor, is shown in Fig. 3.

Fig. 4 is a diagrammatic plan view showing a modified arrangement of piping between clutches, which may be employed within the spirit and scope of my invention.

Fig. 5 is a longitudinal section of one of the clutches which forms a part of the mechanism shown in the previous figures, drawn to a larger scale.

Figs. 6, 7 and 8 are transverse sections of the same mechanism, taken respectively on the lines 6—6, 7—7 and 8—8 of Fig. 5.

The governor which controls the operation of the throttle valve, is shown in end elevation in Fig. 9, and in plan view in Fig. 10.

A partial elevation of the opposite end is shown in Fig. 11.

Fig. 12 is a longitudinal section of the same mechanism, and

Figs. 13 and 14 are sectional views taken respectively on the lines 13—13 and 14—14 of Fig. 12.

The mechanism illustrated in the drawings comprises in general a driving shaft which may form a part of the prime mover, such as a steam turbine (not shown), a throttle valve 25 for the engine, driven shafts 30 and 35, clutches 40 and 45, a pump 60, a governor 75, and suitable gearing 80 and 85.

Gearing.

The gearing 80 may be of any suitable construction and comprises, as shown, pinions 81 and 81^a, which are secured to the turbine shaft 20; gears 82 and 82^a secured to a clutch shaft 40^a meshing with the pinions on one side; and gears 84 and 84^a mounted on a clutch shaft 45^a and meshing with the pinions on the opposite side. The

arrangement is such that the clutch shafts 40^a and 45^a are thus driven in the same direction of rotation.

The gearing 85 comprises a gear 86 mounted on the shaft 30, and a gear 87 mounted on the shaft 35 and meshing directly with the gear 86. Thus the shafts 30 and 35 are connected to rotate in opposite directions. As an example of one of the uses to which my invention may be put, screw propellers may be mounted on the respective shafts 30 and 35 in a well known manner: However, the apparatus may be used for various other purposes, and furthermore it is not necessary that both shall constitute driven shafts since either one of them may be cut off and serve merely to transmit power to the other for one direction of rotation.

20 *Clutches.*

The clutch 40 is interposed between the clutch shaft 40^a, to which one of its members is secured, and the shaft 30 to which its other member is secured. The clutch 45 is similarly interposed between the clutch shaft 45^a and the shaft 35. As more fully pointed out hereinafter, the clutches are never set at the same time, one or the other being set according as it is desired to rotate the driven shafts in one direction or the other, while the driving shaft continues to operate in one direction.

The clutches 40 and 45 are alike in construction and only one of them will be described. Referring to Figs. 5, 6, 7, and 8, the clutch 40 comprises a barrel 41 which is affixed to the clutch shaft 40^a and has an outwardly tapered bore near its open end, a plug 42 which is longitudinally movable into and out of the barrel, and a cylinder 43 which is secured to the shaft 30 and rotates in a bearing 44.

The interior of the barrel 41 is smaller in diameter at its inner end than at its outer end which is tapered outwardly, and is provided with a pair of substantially opposite longitudinal grooves forming shoulders 46. The plug 42 is slightly smaller than the opening in the barrel 41, except for its outer tapered section which is adapted to cooperate with the tapered opening in the barrel when the clutch is set.

The inner end of the plug, as shown in Figs. 6, and 7, is substantially cylindrical and fits loosely into the inner end of the barrel. It has a transverse slot 47 which is enlarged to form a hollow center, as shown in Fig. 6. Mounted in the slot 47 are a pair of clutch jaws 48 which occupy the positions shown in Figs. 5, 6 and 7, when the clutch is released, and are forced outwardly to cooperate with the shoulders 46 when the clutch is fully set. Rollers 49 are preferably provided, to enable the clutch jaws

to move laterally with greater facility when they are actuated as hereinafter explained. Each of the clutch jaws has a mortise groove 50 and an oblique slot 51 which extends through its mortise. The two jaws are tied together by a tenon block or link 52 which is secured to one end of a piston rod 53, and extends freely into the mortises 50. Pins 54, preferably provided with rollers 55, extend through the link 52 as shown in Fig. 7 and through the oblique slots 51, the rollers 55 being adapted to run in the oblique slots. The arrangement is such that when outward pressure is exerted by the rod 53 the clutch jaws will be forced apart, provided the plug 42, as a whole, has first moved into engagement with the tapered surface of the barrel and cannot advance any farther. The jaws will then engage the shoulders 46 and the clutch will be positively locked. It is evident that by properly proportioning the parts, the clutch first acts as a friction clutch and after the two parts are operating at substantially the same speed, the jaws are set to positively lock the clutch.

The clutch is operated by fluid pressure, the cylinder 43 being provided with an inner piston 56 to which is connected the rod 53, and an outer ring piston 57 which is connected directly to the plug 42 by a pair of spaced rods or bolts 58.

The cylinder 43 has a relatively small central opening 56^a in which the piston 56 operates, and a counterbored opening 57^a in which the ring piston 57 operates. A head 43^a is secured to the open end of the cylinder and extends materially into the opening 57^a to avoid intercommunication between the spaces 56^a and 57^a, the piston 56 being relatively long and extending into a cylindrical opening 59 in the cylinder head 43^a. The outer end of the plug is hollow to receive the cylinder on which it is slidably mounted and the plug is prevented from independent rotation by splines 83.

The bearing 44 has annular grooves 44^a and 46^a to which fluid supply pipes are connected as hereinafter explained. The cylinder 43 has passages 46^b and 46^c communicating with the annular groove 46^a, and passages 44^b and 44^c communicating with the groove 44^a. The arrangement is such that when some suitable fluid under pressure, such as oil, is admitted to one of the grooves, the pistons 57 and 56 are successively actuated in one direction, and when fluid under pressure is admitted to the other groove the pistons are operated in a reverse direction.

Pump.

Referring particularly to Figs. 1, 2 and 3, the pump 60 comprises an actuating cylinder 60^a, a pair of pumping cylinders 61 and 62, and pistons 60^b, 61^a and 62^a which are connected in tandem and operate in the

respective cylinders. Steam or some other fluid under pressure, is admitted to the actuating cylinder 60^a on one side or the other of the piston 60^b, according to the position of a control lever 63, the lever being connected by link gearing 64 to a control valve 65. The pumping cylinder 61 is connected at one end by a pipe 66 to the groove 44^a through which oil is supplied to the grooves 44^b and 44^c of one of the clutches, and it is connected at its opposite end by a pipe 67 to the corresponding groove of the other clutch. A pipe 68 inter-connects the grooves 46^a of the two bearings.

The operation of this part of the mechanism is as follows: Assuming that the parts occupy the positions in which they are shown in Fig. 1, the clutch 40 being released and the clutch 45 set,—if the lever 63 is thrown to its opposite position, steam is admitted so as to move the piston 60^b to the opposite end of the cylinder 60^a. The piston 61^a is correspondingly moved in the pumping cylinder 61 and forces the oil into pipe 67 and receives oil on the other side of the piston from the pipe 66. The oil from the pipe 67 is forced through the groove 44^a and through the ports 44^b and 44^c of the clutch 45, and successively moves the pistons 56 and 57. The positive jaws of clutch 45 are released before the friction surfaces of clutch 40 are set into engagement, the succession of operation depending upon the fact that the opening 44^c is larger than the opening 46^c and opening 44^b smaller than 46^b. The oil on the opposite side of these pistons is forced out through the passages 46^b and 46^c, through the groove 46^a, and through the pipe 68 to groove 46^a of the other clutch. From this point it is forced into the passages 46^b and 46^c of the clutch 40, thereby actuating first the piston 57 which carries along piston 56, but without setting the clutch jaws 48. After the friction clutch is set and the piston 57 is stopped, piston 56 moves independently and sets the clutch jaws. The succession of this operation depends upon the fact that the opening 46^b is larger than the opening 46^c.

Throttle valve.

The pumping cylinder 62 is independent of the cylinder 61, although its piston 62^a is connected to and operated with the other piston of the pump. The function of this cylinder is to control the throttle valve 25, and cause it to shut off the steam supply to the prime mover before the engaged clutch is disconnected and then open after the reversing clutch is thrown in for each complete stroke of the pump piston.

As shown in Fig. 2 the throttle may have the form of a piston valve and comprise a piston 69 operating in a cylinder 25^a. The valve body is actuated directly by a piston

70 which is connected to it by a rod 70^a and reciprocates in a cylinder 71. This cylinder and piston are shown diagrammatically in Fig. 3, to which reference may now be had. As here shown the cylinder 71 is connected at one end by a pipe 72 to substantially the middle point of the pump cylinder 62. The respective ends of the pump cylinder are connected through pipes 73 and 74, and through the governor valve which is illustrated in Figs. 9 to 14 inclusive and comprises two valve units which are indicated by A and B in the diagram, to the opposite end of the cylinder 71.

The positions successively occupied by the piston 62^a, as it moves from its outer position to its inner position and back, are indicated on the diagram by 1, 2, 3, 4, the chart adjacent to Fig. 3 indicating the desired condition of the valve units for each piston position in order that the throttle valve may be operated as above indicated.

Throttle valve governor.

As shown in Fig. 2, the piston 70 has a piston rod extension 76 (see also Fig. 9), which is provided with a lateral lug 77 and a pin projection 78. Referring now to Figs. 9 to 14 inclusive, the throttle valve governor comprises a barrel 75^a in which is a rotary valve cylinder 79. This cylinder has two independent chambers 88—89 having ports 88^a and 89^a, each set of ports having a quadrature relation as clearly shown in the sectional views Figs. 13 and 14.

The barrel 75^a has a pair of through-passages 90—91 which are adapted to register respectively with the ports 88^a and 89^a depending upon the position of the valve cylinder. The barrel is closed at one end except for a central hole through which a shaft projection 92 of the cylinder extends. A ratchet 93 is affixed to this projection at its outer end, and a pawl carrier 94 is rotatively mounted on the shaft projection between the ratchet and the end of the drum. The drum at its opposite end is provided with a removable head 95 through which another shaft projection 96 of the cylinder extends.

In order to retard the rotative movement of the valve cylinder a resilient brake or drag 97 is mounted in the projection 96 and makes frictional engagement with the inner surface of the drum near its outer end which extends beyond the head 95. The ports 88^a and the passage 90 constitute the valve unit B of the diagram, and the ports 89^a and the passage 91 constitute the unit A.

Pivotaly mounted on the pawl carrier 94 is a pawl 98 which is pressed into one of the ratchet notches by a spring 99. The pawl carrier has a projection 100 to which a tension spring 101 is connected and a projection 102 which is engaged by the pin pro-

jection 78 of the member 76. The opposite end of the spring 101 is secured to a projection 103 from the drum 75^a. The pawl carrier is provided with a shoulder 110 and the drum with a stop 111 so as to limit the movement of the pawl carrier when it is released.

The drum is provided with a rib 104 having an opening 105 which is parallel to the axis of the valve cylinder and in which a pin 106 is located. This pin is forced outwardly by a spring 107 so that its outer end engages the inner surface of the pawl carrier 94. The pin 106 has a lateral projection 108, by which it is released when the member 76 is carried downwardly by a stroke of the piston 70 and the projection 77 engages the projection 108. The pawl carrier is provided with a notch 109 which is adapted to receive the pin 106.

The operation of this governor is as follows:—Assuming that the parts occupy the position in which they are illustrated and that the pump cylinder 62 is actuated; as it moves from position 1 to position 2, the valve unit A is open and the valve unit B closed, therefore oil is forced through the pipe 72 and pushes the piston 70 downwardly. The piston 70 thus has a full downward stroke, shutting the throttle valve 25 while the pump piston 62^a moved through one-half its stroke. The valve cylinder remains stationary, being locked by the pin 106 and the pawl 98, until the piston 70 reaches the end of its stroke. The projection 77 then engages the projection 108 (one or both of the engaging surfaces being beveled), and releases the pin from the notch 109. The pawl carrier 94 is immediately advanced a distance equal to one notch of the ratchet, and carries the valve cylinder with it.

The relative location of the quadrature ports 88^a and 89^a is such that the aforesaid movement of the valve cylinders closes the valve A and opens the valve B. Oil is now admitted from pipe 74 to the opposite end of the cylinder 71. The piston 70 is consequently returned and the throttle valve 25 opened. In the meantime, however, the clutches 45 and 40 have been respectively released and set and the closing of the throttle takes place just at the proper time to prevent the turbine from racing when the load connection is temporarily interrupted. The upward movement of the rod 76 which accompanies the opening of the throttle valve, does not affect any movement of the valve cylinder by reason of the ratchet and pawl connection, the pawl carrier being merely returned to the position shown in Fig. 9, by reason of the engagement of the pin 78 with the projection 102.

Operation.

The operation of the complete apparatus

will be apparent from the foregoing and will now be outlined briefly as follows: Assuming that the clutch 40 is released and the clutch 45 set,—if the driving shaft 20 rotates as indicated by the arrow shown in Fig. 1, it is evident that the clutch shafts 40^a and 45^a will each rotate in a reverse direction. By reason of the fact that the shafts 30 and 35 are connected by direct gears they must evidently always operate in reverse directions. Consequently, with the clutch 45 set as assumed, the shaft 35 rotates in the same direction as the clutch shafts 40^a and 45^a, while the shaft 30 rotates in the same direction as the driving shaft 20.

Assuming that it is now desired to reverse the direction of rotation of the shafts 30 and 35, the lever 63 is thrown from one position to the other, the pump 60 is actuated, the throttle valve 25 is first closed by the first half of the pump stroke, the clutch 45 released, the clutch 40 set, and the throttle valve finally opened.

It is evident that when the clutch 40 is being set the tapered friction surfaces will first be engaged and will act as a brake in bringing the driven shafts 30 and 35, and their attached parts, to rest, and finally, when the clutch is set the jaws 48 will be locked against the shoulders 46 and a positive driving connection established.

It is evident that the structure illustrated and described may be modified in various particulars within the spirit and scope of my invention, and I intend that only such limitations be imposed as are indicated in the appended claims.

For example, the piping may be connected as shown in Fig. 4, between the pump cylinder 61 and the clutches 40 and 45.

As here shown, the pump cylinder 61 is connected at one end by a pipe 112 to the back end of the actuating cylinder for the clutch 45, and at its opposite end by a pipe 113 to the back end of the actuating cylinder of the clutch 40. The front end of each clutch actuating cylinder is connected to substantially the middle point of the pump cylinder 61 by pipes 114—115. This arrangement is for the purpose of causing one of the clutches to be completely released before the other clutch is set instead of permitting both clutches to be actuated at substantially the same time.

The operation of this modification is as follows: Assuming that the clutch 45 is set and the clutch 40 released, as shown in Fig. 4, the pump piston 61^a being at the outer end of its stroke; if the actuating piston 60^b is now moved on its return stroke the piston 61^a in advancing from the extreme end of its stroke to the middle of its stroke will act upon the piston of the clutch 45 to release the clutch. This half of the stroke

of the piston 61^a will have no effect upon the clutch 40 because the fluid pressure is substantially balanced on opposite sides of the piston of this clutch as is evident from an inspection of Fig. 4. However, as soon as the piston 61^a passes the point of connection between the pipes 114—115 and cylinder 61, fluid will be forced through the pipe 113 and will actuate the clutch piston and set the clutch 40. During this second half of the stroke of the piston 61^a fluid pressure will be balanced in the cylinder of the clutch 45.

It is evident that the arrangement above described has the advantage of not depending upon a difference in size of the pipe or passages since it is positive in action and it is therefore impossible for both clutches to be set at the same time.

It will, of course, be understood that Fig. 4 is a diagrammatic view and that the clutches 40—45 may be constructed as shown in the other figures of the drawings.

As already pointed out the apparatus is not restricted for use in transmitting power from a prime mover to a propeller and as an example of other uses to which it is well adapted the following may be mentioned. The apparatus may be utilized for transmitting power from a prime mover such as a gas engine, electric motor or the like, to the rolls of a steel mill. It may furthermore be utilized for operating hoists and in fact it is adapted for use in any relation where it is desirable to operate a driven member in either direction of rotation from a driving member which rotates only in one direction.

In-order to have both clutches 40 and 45 released for any length of time, check valves 116 and 117 are inserted in the pipe lines 114 and 115 as shown in Fig. 4. These valves are normally open, but when desired to have both clutches disconnected and assuming the piston 60^b to be in position, shown in Fig. 4, then by closing valve 117, the pistons 61^a and 60^b will be able to travel only to the middle of the cylinders 61 and 60, and thereby disconnecting clutch 45 while not being able to travel farther and throw in clutch 40. When piston 60^b is in the outer position of cylinder 60, then by closing valve 116 and leaving open valve 117 the same result will be obtained.

What I claim is:

1. A reversing mechanism comprising a source of energy, a driving shaft, a pair of clutch members operatively connected thereto, a driven shaft, cooperating clutch members operatively connected to the driven shaft, and fluid responsive means for throttling the source of energy, releasing one of said clutches and setting the other clutch and opening the source of energy.

2. A reversing mechanism comprising a source of energy, a driving shaft adapted to

rotate continuously in one direction, a pair of clutch shafts operatively connected to the driving shaft and adapted to rotate in opposite directions, a driven shaft adapted to rotate in one direction or the other, and cooperating clutch members operatively connected to the driven shaft; and means for temporarily throttling the source of energy and releasing one of said clutches and setting the other.

3. A reversing mechanism comprising a source of energy, a driving shaft, a pair of clutch members operatively connected thereto, a driven shaft, cooperating clutch members operatively connected to the driven shaft, and pneumatically responsive means for temporarily throttling the source of energy while one of the clutches is being released and the other set.

4. A reversing mechanism comprising a source of energy, a driving shaft adapted to rotate continuously in one direction, a pair of clutch shafts operatively connected to the driving shaft and adapted to rotate in opposite directions, a driven shaft adapted to rotate in one direction or the other, and cooperating clutch members operatively connected to the driven shaft, and means for temporarily throttling the source of energy and in the meantime successively releasing one clutch and setting the other clutch.

5. A reversing mechanism comprising a source of energy, a driving shaft receiving its power from said source, a pair of clutch members operatively connected to the driving shaft, cooperating clutch members, fluid pressure actuated means for setting and releasing the clutch members, a fluid pressure pump for controlling the setting of the clutches, and means adapted to operate concurrently with the fluid pressure control means for temporarily throttling the source of energy.

6. A reversing mechanism comprising a source of energy, a driving shaft receiving its power from said source, a pair of clutch members operatively connected to the driving shaft, cooperating clutch members, fluid pressure cylinders, pistons operating therein for respectively setting the clutches and a fluid pressure pumping means connected to the fluid pressure actuating cylinders of the clutches.

7. A reversing mechanism comprising a driving shaft, a driven shaft and a pair of interposed clutches, a fluid pressure cylinder and piston for each clutch, a fluid pressure pumping cylinder for actuating the clutches, and means for causing the clutches to act in succession whereby one is released before the other is set.

8. A reversing mechanism comprising a driving shaft, a driven shaft and a pair of interposed clutches, a fluid pressure cylinder

and piston for each clutch, a fluid pressure pumping cylinder for actuating the clutches, a connection from the front end of each clutch actuating cylinder to an intermediate point in the pumping cylinder and from the outer ends of the actuating cylinders to the respective ends of the pumping cylinders.

9. A reversing mechanism comprising a driving shaft, a source of energy, a throttle for said source, fluid pressure responsive means for actuating said throttle, a pair of clutch shafts operatively connected to the driving shaft, a driven shaft, a pair of cooperating clutch members operatively connected to the driven shaft and arranged to operate in opposite directions of rotation, an actuating cylinder for each of said clutches and means for actuating the clutches and the throttle whereby the throttle may be temporarily closed, and the driven shaft reversed.

10. A reversing mechanism comprising a driving shaft, a source of energy, a throttle for said source, an actuating cylinder for said throttle, a pair of clutch shafts operatively connected to the driving shaft, a driven shaft, a pair of cooperating clutch members operatively connected to the driven shaft and arranged to operate in opposite directions of rotation, an actuating cylinder for each of said clutches, a fluid pressure pump comprising one cylinder communicating with the actuating cylinders of the clutches, another independent cylinder communicating with the actuating cylinder of the throttle and means for actuating the pump to temporarily close the throttle, release one of the clutches and set the other clutch.

11. A reversing mechanism comprising a driving shaft, a source of energy, a throttle for said source, an actuating cylinder for said throttle, a pair of clutch shafts operatively connected to the driving shaft, a driven shaft, a pair of cooperating clutch members operatively connected to the driven shaft and arranged to operate in opposite directions of rotation, an actuating cylinder for each of said clutches, a pump comprising an actuating cylinder, one pumping cylinder connected to the clutch actuating cylinders, a second pumping cylinder connected to the throttle actuating cylinder and interposed means between the throttle actuating cylinder and the pump for producing a forward and back movement of the throttle during each stroke of the pump.

12. A reversing mechanism comprising a driving shaft, a driven shaft, a pair of

interposed clutches, a source of energy for the driving shaft, a throttle for the source of energy, a piston connected to the throttle, a fluid pressure cylinder in which the piston operates, a pumping cylinder connected to the throttle actuating cylinder and means for automatically varying said connections to produce a forward and back stroke of the throttle piston during each stroke of the pump.

13. A reversing mechanism comprising a driving shaft, a driven shaft, a pair of interposed clutches, a source of energy for the driving shaft, a throttle for the source of energy, a piston connected to the throttle, a fluid pressure cylinder in which the piston operates, a pump cylinder connected near its middle point to one end of the throttle cylinder, and connected near its respective ends to the opposite end of the throttle cylinder, and means for selectively opening and closing the aforesaid end connections.

14. A reversing mechanism comprising a driving shaft, a driven shaft, a pair of interposed clutches, a source of energy for the driving shaft, a throttle for the source of energy, a piston connected to the throttle, a fluid pressure cylinder in which the piston operates, a pump cylinder connected near its middle point to one end of the throttle cylinder, and connected near its respective ends to the opposite end of the throttle cylinder, and automatic means dependent upon the throttle piston for selectively opening and closing the aforesaid end connections.

15. A reversing mechanism comprising a driving shaft, a driven shaft, a pair of interposed clutches, a source of energy for the driving shaft, a throttle for the source of energy, a piston connected to the throttle, a fluid pressure cylinder in which the piston operates, a pump cylinder connected near its middle point to one end of the throttle cylinder, and connected near its respective ends to the opposite end of the throttle cylinder, and a governor dependent upon the throttle piston and comprising a rotary valve, a ratchet therefor, a pawl cooperating with the ratchet, and a pawl carrier adapted to be actuated by the throttle piston.

In testimony whereof I have hereunto set my hand this 12th day of December, 1914, in the presence of two subscribing witnesses.

MASSEY SITNEY.

Witnesses:

T. A. HALL,

CHAS. LARSON.