

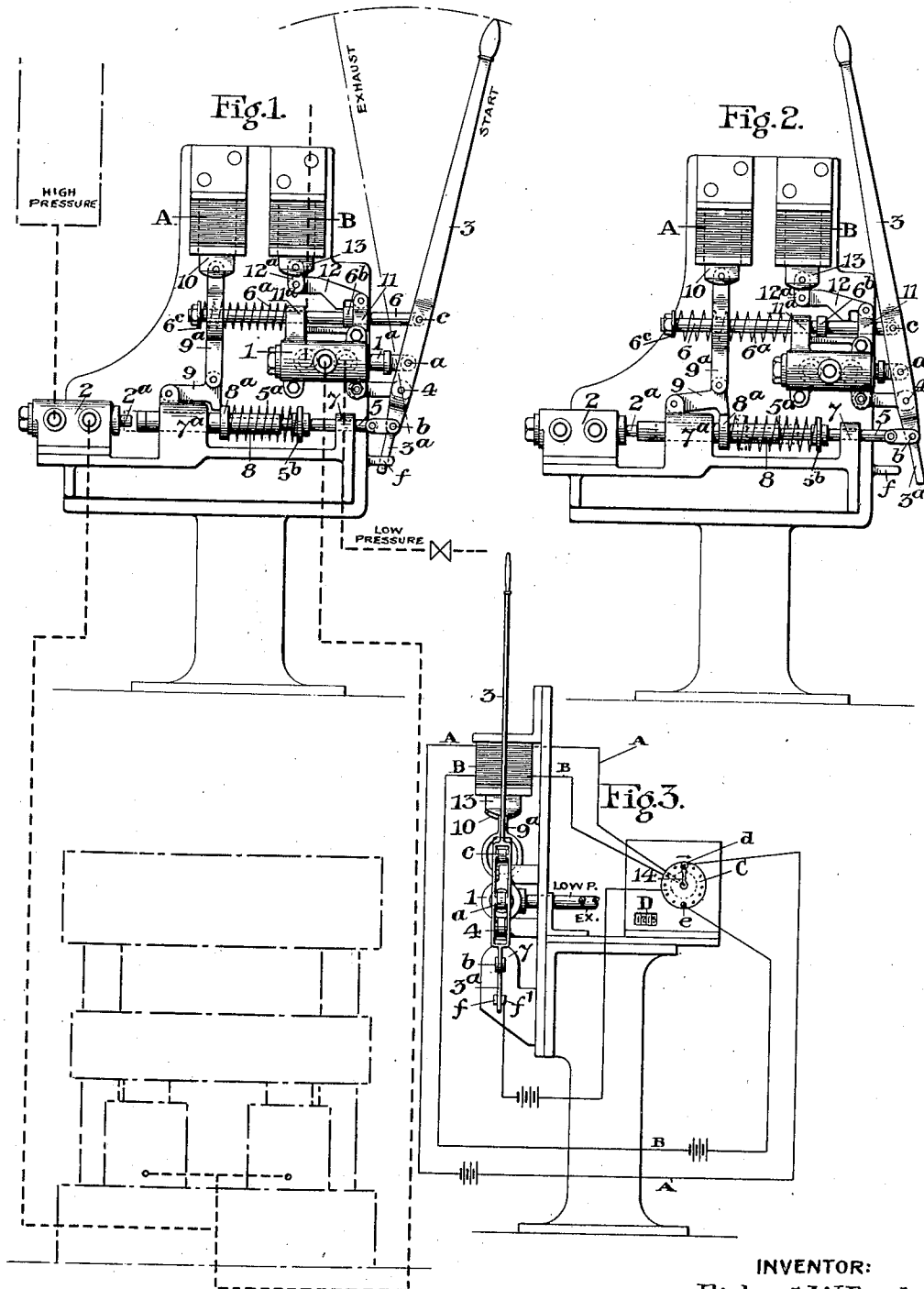
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R. W. DINZL

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VALVE OPERATING MECHANISM

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INVENTOR:

Richard W. Dinzl

by

Murray B. Boyer
Atty.

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VALVE-OPERATING MECHANISM

Richard W. Dinzi, Philadelphia, Pa., assignor to
Southwark Foundry & Machine Company,
Philadelphia, Pa., a Corporation of Pennsylvania

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My invention relates to mechanism for operating valves employed for the delivery of high and low pressure fluid to hydraulic and similar apparatus, and one object of my invention is to provide a low pressure valve and a high pressure valve in coordinated relation whereby operation of the low pressure valve, which may be effected manually, will load a spring (or springs); such spring (or one of such springs, when a plurality are employed), serving subsequently and at a predetermined time interval to operate a high pressure valve. When a plurality of springs are arranged to be loaded by the operation of the lever actuating the low pressure valve, a second spring at a still subsequent period of elapsed time may be arranged to open the low pressure valve to exhaust and permit closing of the high pressure valve.

A further object of my invention is to provide electrical means for tripping the loaded spring (or springs) at predetermined time intervals.

And a still further object of my invention is to provide time cycle means in the form of a synchronous clock or equivalent mechanism whereby the electrical operating means is automatically brought into action at desired and predetermined intervals.

These and other features of my invention are more fully described hereinafter; reference being had to the accompanying drawing, in which:

Figure 1 is a view, more or less diagrammatic in character, showing in elevation valve mechanism forming the subject of my invention and its relation to one form of hydraulic apparatus and in which a plurality of springs is shown; the low pressure valve being open for the passage of low pressure and both springs being illustrated in the loaded position.

Fig. 2 is a view of the valve operating means illustrated in Fig. 1, showing the low pressure valve open to exhaust and both springs unloaded; such view also showing by dotted lines the position of certain of the parts before the springs act to move such parts, and

Fig. 3 is an end elevation of the valve-operating mechanism illustrated in Figs. 1 and 2.

In the drawing 1 may represent the low pressure valve and 2 the high pressure valve. The low pressure valve may be of three-way piston type, and the high pressure valve may be of two-way piston type. An operating lever 3 is fulcrumed at 4, and this lever may be connected at *a* to the stem 1^a of the low pressure valve; at *b* to a guided rod 5 in operative engagement with a

spring 5^a, and at *c* to a guided rod 6 carrying a spring 6^a.

The rod 5 is guided in a bracket 7 and slidably engages a tubular member 8 mounted in a bracket 7^a for horizontal movement with respect to the stem 2^a of the valve 2; said tubular member having a stop or collar 8^a which may be engaged by a latch 9, operatively connected as by a link 9^a to the core 10 of a solenoid A, and the rod 6 is guided in brackets 11 and 11^a and has a collar or stop 6^b which may be engaged by a latch 12, operatively connected as by a link 12^a to the core 13 of a solenoid B.

A time cycle element, which may be a synchronous clock such as indicated at C, Fig. 3, is in circuit with the solenoids A and B; such clock having a moving member 14 with suitable contacts *d* and *e* that are engaged successively at the end of predetermined time intervals. The contacts *d* and *e* are adjustable so that different time intervals may be arranged.

The lever 3 is arranged to close an electrical circuit for operating the clock or other time cycle element, when moved to the position indicated in Fig. 1, and for such purpose its lower end may be provided with a switch blade 3^a adapted to engage contacts *f* and *f'*. The synchronous clock or other time cycle mechanism may be operatively connected to suitable counting mechanism, indicated at D.

In operation, the low pressure valve is opened by the operator upon moving the lever 3 to the position shown in Fig. 1, and this action serves to load the spring 5^a, and, when employed, the spring 6^a also. The spring 5^a lies between a collar 5^b on the rod 5 and the stop or collar 8^a, and the spring 6^a, when employed, may lie between a stop 6^c at the end of rod 6 and the bracket 11^a; such springs being held in the loaded position by the pawls or latches 9 and 12. When the predetermined time interval for delivery of low pressure has been reached and high pressure is to be delivered, a circuit is closed by the member 14 and the contact *d* through the operation of the time cycle element or clock C, which effects energization of the solenoid A, and its lifting core 10 raises the latch or pawl 9 releasing the tubular member 8 and permitting the spring 5^a to move said tubular element into engagement with the stem 2^a of the high pressure valve 2 whereby said valve may be opened for the passage of high pressure to the mechanism employing the same.

As the clock continues its operation, a second circuit may be arranged to be closed by engagement of the member 14 and the contact *e* and,

when the spring 6^a is employed, the closing of such second circuit effects energization of the solenoid B and its lifting core 13 raises or releases the latch or pawl 12 and permits the spring 6^a to move the rod 6 and actuate the lever 3 and open the low pressure valve 1 to exhaust. At the same time the spring 5^a is free to retract; permitting the high pressure valve to close automatically.

In lieu of using a spring such as that indicated at 6^a for the purpose of shifting the lever, this lever may be moved manually and the clock or other time interval mechanism may be employed to give a signal to the operator for the time of such movement or he may watch the same for the expiration of the time interval during which the high pressure is on and then shift the lever 3; thereby opening the low pressure valve to exhaust and permitting the high pressure valve to close. The low pressure and high pressure lines will be provided with check valves.

Each solenoid will be deenergized following the lifting of the several latches or pawls so that the latter may be in position to engage the respective stops or collars when the springs are loaded for further operation of the valve mechanism. When the spring 6^a is omitted, the solenoid B and its circuit may also be omitted.

It will be understood of course that while ordinary clock mechanism coordinated with standard time may be employed, any mechanism that is employed will be of a type that will effect intermittent movements at regular intervals of any suitable member that may be employed as a circuit closer, the member 14, for instance, and in which the number of such movements over any period of elapsed time may be altered or changed at will; the contacts d and e being adjustable, to insure operation of the valves at the desired time intervals after the low pressure valve has been manually operated. As illustrated, the time intervals provide for a single complete clockwise movement of the member 14.

I claim:

1. In a valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, and means for actuating said latch at a predetermined time interval whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment.

2. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, and electrical means for actuating said latch at a predetermined time interval whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment.

3. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, electrical means for actuating said latch at a predetermined time interval whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment, and time interval mechanism controlling the operation of said electrical means.

4. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating said low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a slidable member operated by said spring for engaging and opening the high pressure valve, a latch for holding said spring in the loaded condition, and electrical means for actuating said latch at a predetermined time interval whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment.

5. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, an electric circuit, time interval mechanism in said circuit, means carried by the actuating lever for closing the circuit of the time interval mechanism; the latter having a movable circuit-closing member, a solenoid for operating said latch; said solenoid being in an independent circuit, and a contact arranged for engagement by the circuit-closing member of said time interval mechanism whereby said solenoid circuit may be energized to release the latch at a predetermined time interval and permit said spring to actuate the high pressure valve to open position whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment; said solenoid being deenergized upon the continued movement of the circuit-closing member of the time interval mechanism.

6. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon actuation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, an electrical circuit, time interval mechanism in said circuit, means for closing said circuit upon operation of the actuating lever, a solenoid in a second circuit, and a circuit-closing member actuated by said time interval mechanism for closing said second circuit and energizing said solenoid; the latter releasing the latch holding the spring for opening the high pressure valve whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment; said solenoid being deenergized following release of said latch.

7. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of springs simultaneously loaded upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, latches for holding said springs in the loaded condition, and means for actuating said latches successively at predetermined intervals whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment and the low pressure valve may be opened to exhaust at a successive and predetermined moment.

8. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a spring simultaneously loaded upon the operation of said lever; said spring serving to open the high pressure valve when released, a latch for holding said spring in the loaded condition, and means for actuating said latch at a predetermined time interval whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment, and time interval mechanism controlling the operation of said electrical means.

8. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of springs simultaneously loaded upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, latches for holding said springs in the loaded condition, and electrical means for actuating said latches successively at predetermined intervals whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment and the low pressure valve may be opened to exhaust at a successive and predetermined moment.

9. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of springs simultaneously loaded upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, latches for holding said springs in the loaded condition, electrical means for actuating said latches successively at predetermined intervals whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment and the low pressure valve may be opened to exhaust at a successive and predetermined moment, and time interval mechanism controlling the operation of said electrical means.

10. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating said low pressure valve, a pair of springs simultaneously loaded upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, a slidable member operated by the first mentioned spring for engaging and opening the high pressure valve, latches for holding said springs in the loaded condition, and electrical means for actuating said latches successively at predetermined intervals whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment and the low pressure valve may be opened to exhaust at a successive and predetermined moment.

11. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating said low pressure valve, a pair of springs simultaneously loaded upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, a slidable member operated by the first mentioned spring for engaging and opening the high pressure valve, latches for holding said springs in the loaded condition, electrical means for actuating said latches successively at predetermined intervals whereby the flow of high pressure may follow the flow of low pressure at a predetermined moment and the low pressure valve may be opened to exhaust at a successive and predetermined moment, and time interval mechanism controlling successively the operation of the electrical means releasing said latches.

12. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of springs simultaneously loaded

upon the operation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, latches for holding said springs in the loaded condition, a series of electric circuits, time interval mechanism in one of said circuits, means carried by the actuating lever for closing the circuit of the time interval mechanism; the latter having a movable circuit-closing member, solenoids for operating said latches successively; said solenoids being in independent circuits; and contacts arranged for successive engagement by the circuit-closing member of said time interval mechanism whereby said solenoid circuits may be energized to release the latches successively at predetermined intervals; said solenoids being successively deenergized upon the continued movement of the circuit-closing member of the time interval mechanism; the first solenoid releasing the latch for the spring serving to actuate the high pressure valve to open position and the second solenoid releasing the latch for the spring serving to actuate the low pressure valve to exhaust position.

13. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of independent springs simultaneously loaded upon actuation of said lever; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, independent latches for holding said springs in the loaded condition, a series of electrical circuits, time interval mechanism in one of said circuits; means for closing said latter circuit upon operation of the actuating lever, a solenoid in a second circuit, a circuit-closing member actuated by said time interval mechanism for closing said second circuit and energizing said solenoid; the latter releasing the latch holding the spring for opening the high pressure valve, a second solenoid in a third circuit; said circuit-closing member of the time interval mechanism closing said last-mentioned circuit at a predetermined time interval after closing the circuit of the first solenoid; the latter being deenergized following release of the first-mentioned latch and the energization of the second solenoid releasing the latch holding the spring for actuating the low pressure valve to exhaust position.

14. In valve operating mechanism, the combination of a low pressure valve, a high pressure valve, a lever for operating the low pressure valve, a pair of independent springs simultaneously loaded upon actuation of said lever, slidable rods upon which said springs are mounted operatively connected to said lever, stops carried by said rods engaging said springs; one of said springs serving to open the high pressure valve when released and the other spring serving to open the low pressure valve to exhaust when released, independent latches in engagement with the stops of said rods for holding the respective springs in the loaded condition, a series of electrical circuits, time interval mechanism in one of said circuits, means for closing said latter circuit upon operation of the actuating lever, a solenoid in a second circuit, a circuit-closing member actuated by said time interval mechanism for closing said second circuit and energizing said solenoid; the latter releasing the latch holding the spring for opening the high pressure valve, a second solenoid in a third circuit; said circuit-closing member of the

time interval mechanism closing said last-mentioned circuit at a predetermined time after closing the circuit of the first solenoid; the latter being deenergized following release of the first-mentioned latch and the energization of the second solenoid releasing the latch holding the spring for actuating the low pressure valve to exhaust position.

15. In valve mechanism for controlling high and low pressures, the combination of a valve casing, a valve therein having a projecting stem, a pivotally mounted lever operatively connected to said stem, a sliding member paralleling the valve stem and operatively connected to said lever, means for holding said sliding member against movement when the lever has been moved to open the valve, means for releasing said sliding member at a predetermined time interval, means for actuating said sliding member whereby the lever may be operated to close the valve, a second valve mechanism operatively connected to said lever for effecting actuation of the same; said means including a spring, means for holding said spring when actuated by said lever, and means for releasing said spring at a predetermined time interval.

16. The combination of a valve casing, a valve mounted therein having a projecting stem, a pivotally mounted lever operatively connected to said valve stem, a rod paralleling said valve stem

and operatively connected to said lever, a spring for actuating said rod whereby said lever may move the valve to closed position, a latch in engagement with said rod, means for releasing said latch at a predetermined time interval, a second valve, mechanism operatively connected to said lever for actuating the same, releasable means for holding said actuating mechanism, and means for releasing said holding mechanism whereby actuation of said second valve may be effected at a predetermined time interval.

17. The combination of a valve casing, a valve mounted therein having a projecting stem, a pivotally mounted lever operatively connected to said valve stem, a rod paralleling said valve stem and operatively connected to said lever, a spring for actuating said rod whereby said lever may move the valve to closed position, a latch in engagement with said rod, means for releasing said latch at a predetermined time interval whereby the spring may actuate said rod and lever, a second valve, mechanism operatively connected to said lever for effecting actuation of the same; said means including a spring, a latch for holding said mechanism when actuated by said lever, and means for releasing said latch and permitting actuation of said spring to operate said second valve at a predetermined time interval.

RICHARD W. DINZL.

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