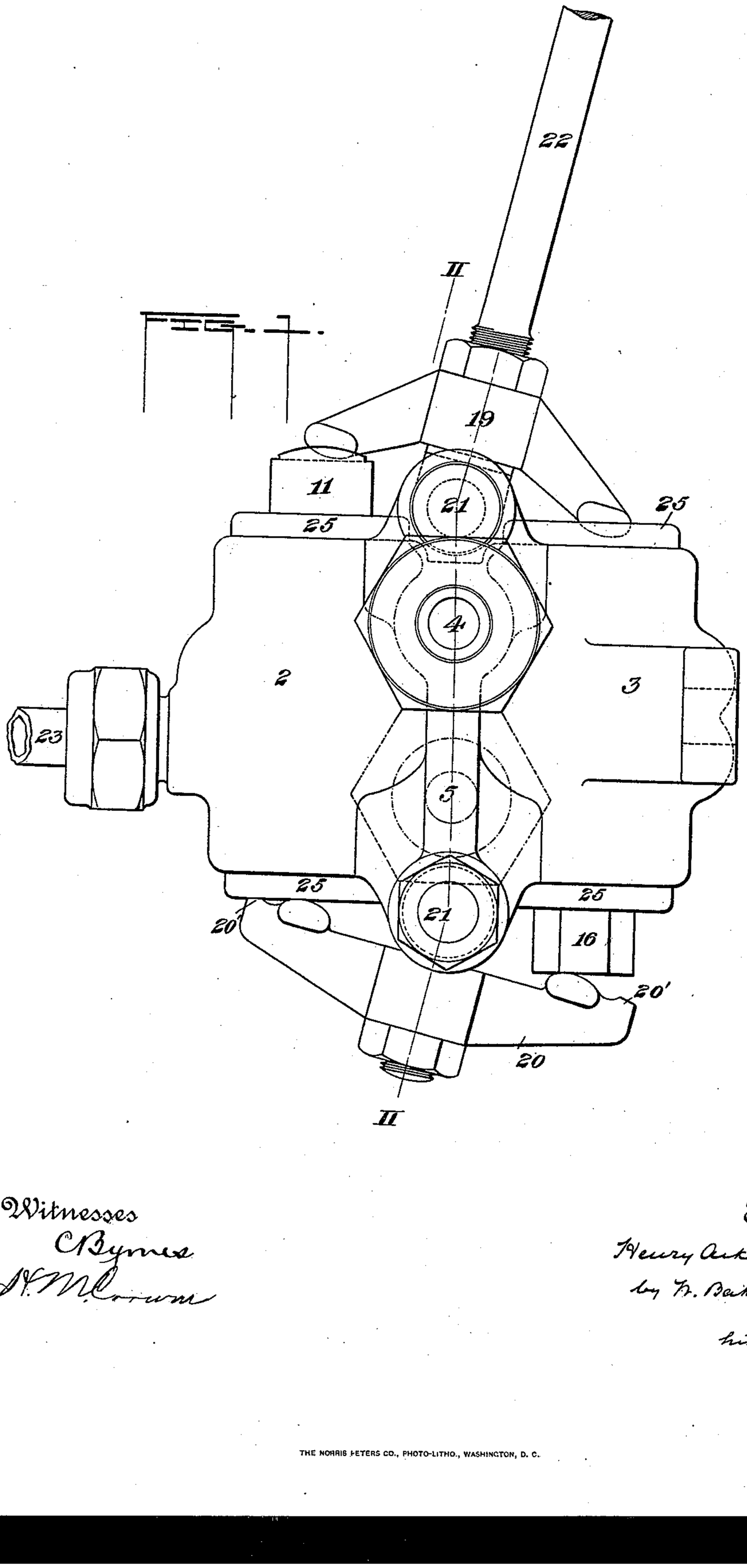
(No Model.)

6 Sheets—Sheet 1.

H. AIKEN.

HYDRAULIC VALVE.

No. 465,232. Patented Dec. 15, 1891.



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(No Model.) 6 Sheets—Sheet 2.

H. AIKEN.

HYDRAULIC VALVE.

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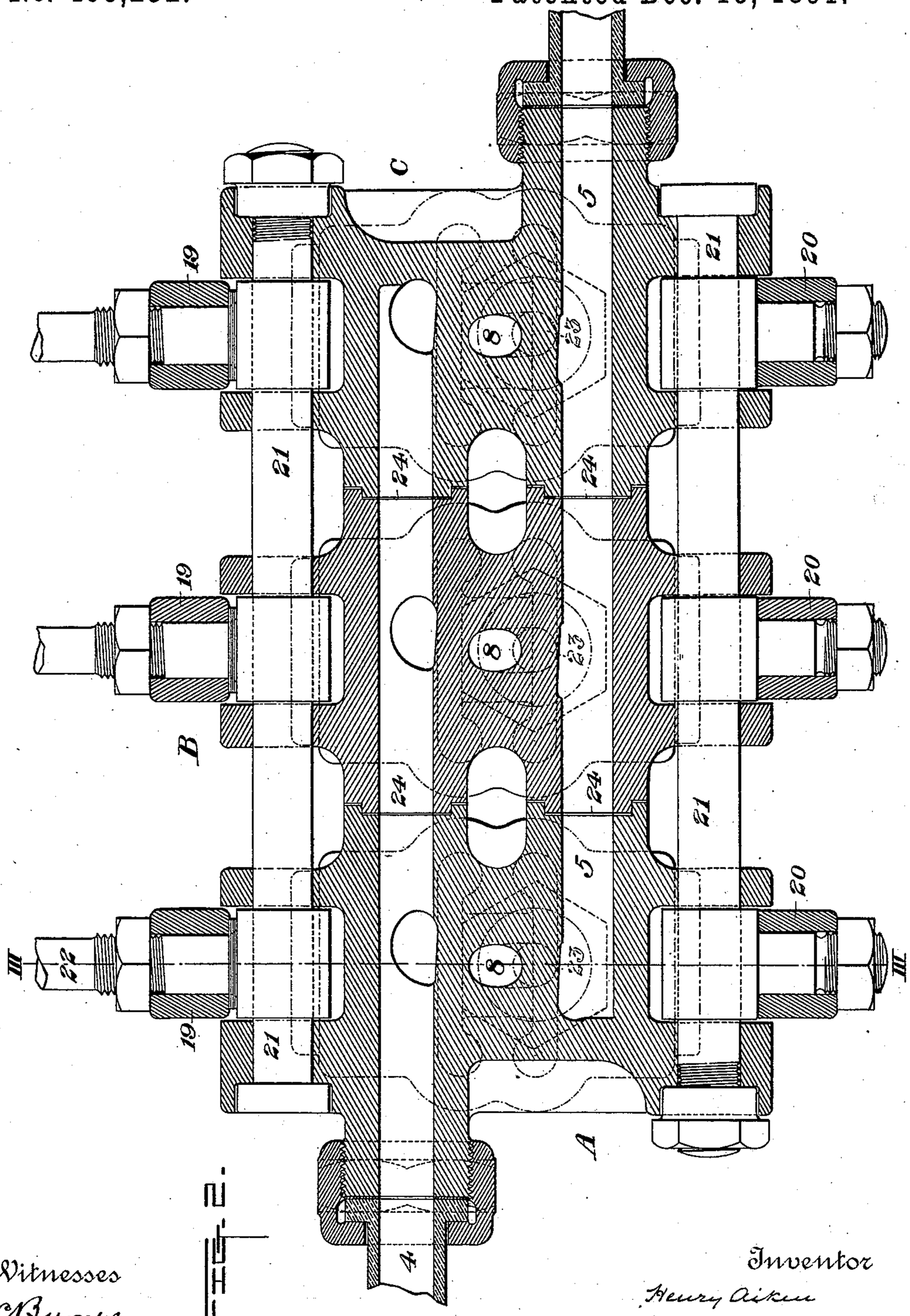

FIG. 2.

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(No Model.)

6 Sheets—Sheet 3.

H. AIKEN.

HYDRAULIC VALVE.

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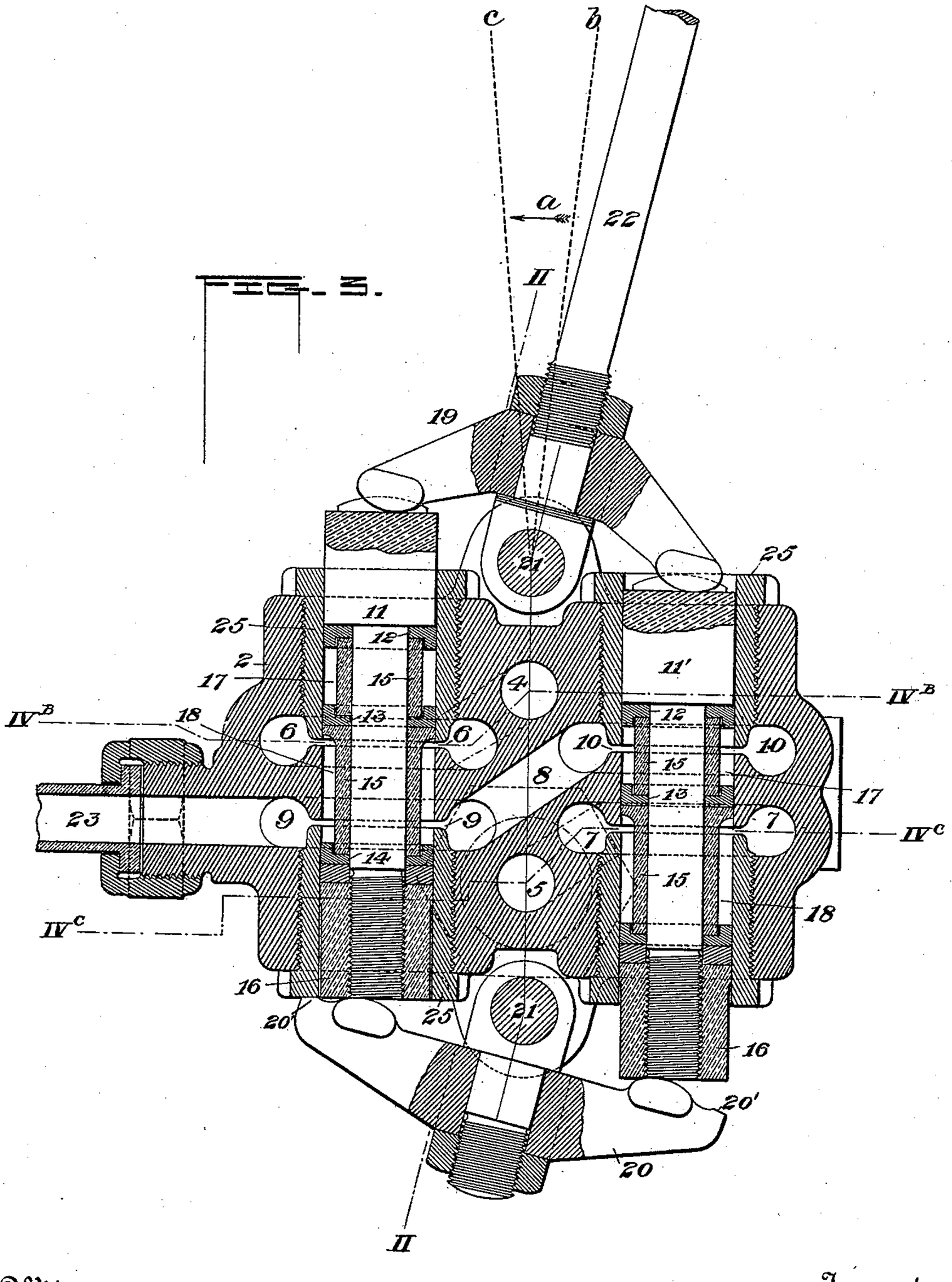
FIG. 3.



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(No Model.)

6 Sheets—Sheet 4.

H. AIKEN.

HYDRAULIC VALVE.

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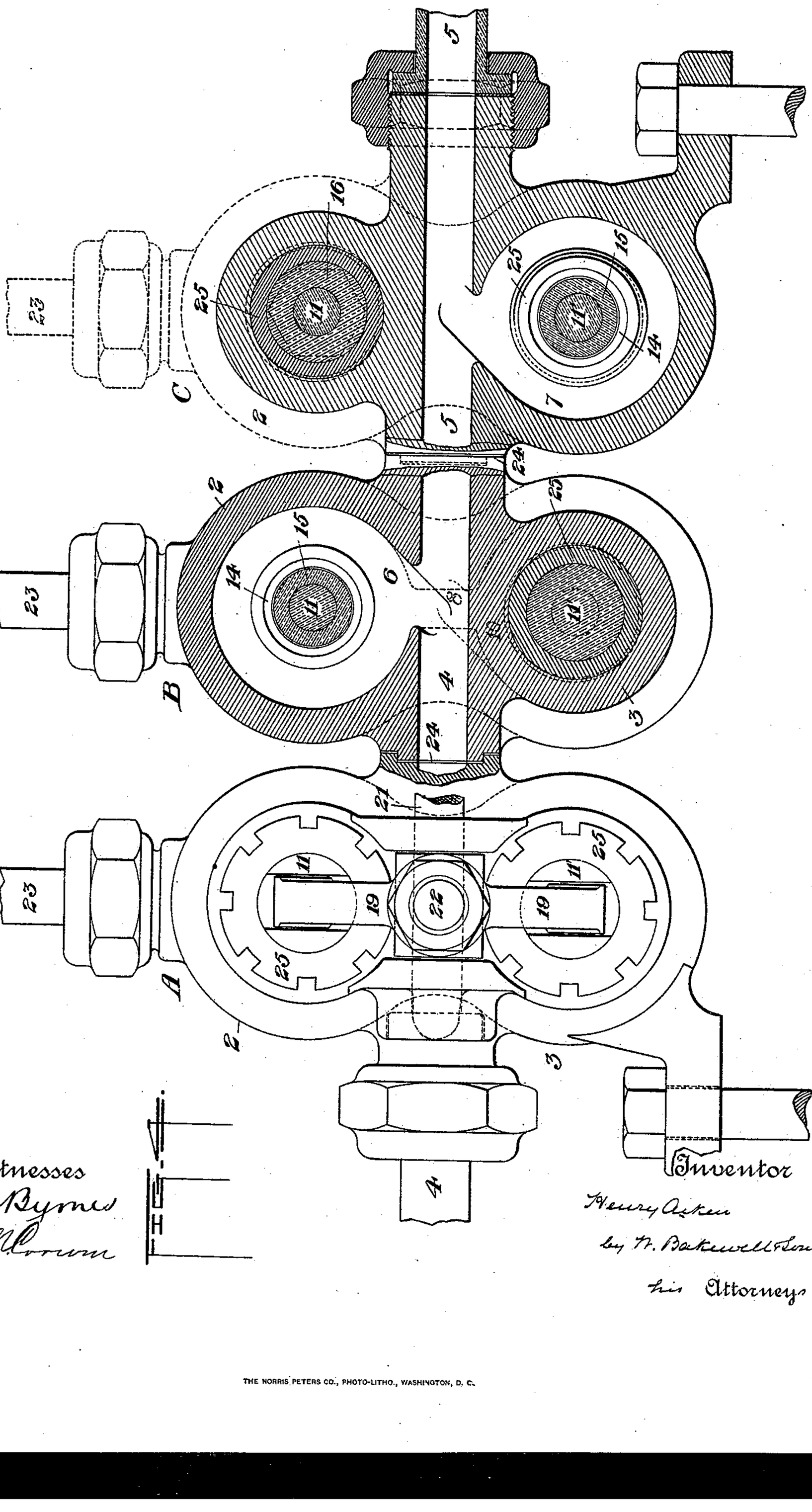

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(No Model.) 6 Sheets—Sheet 5.

H. AIKEN.

HYDRAULIC VALVE.

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Fig. 5.

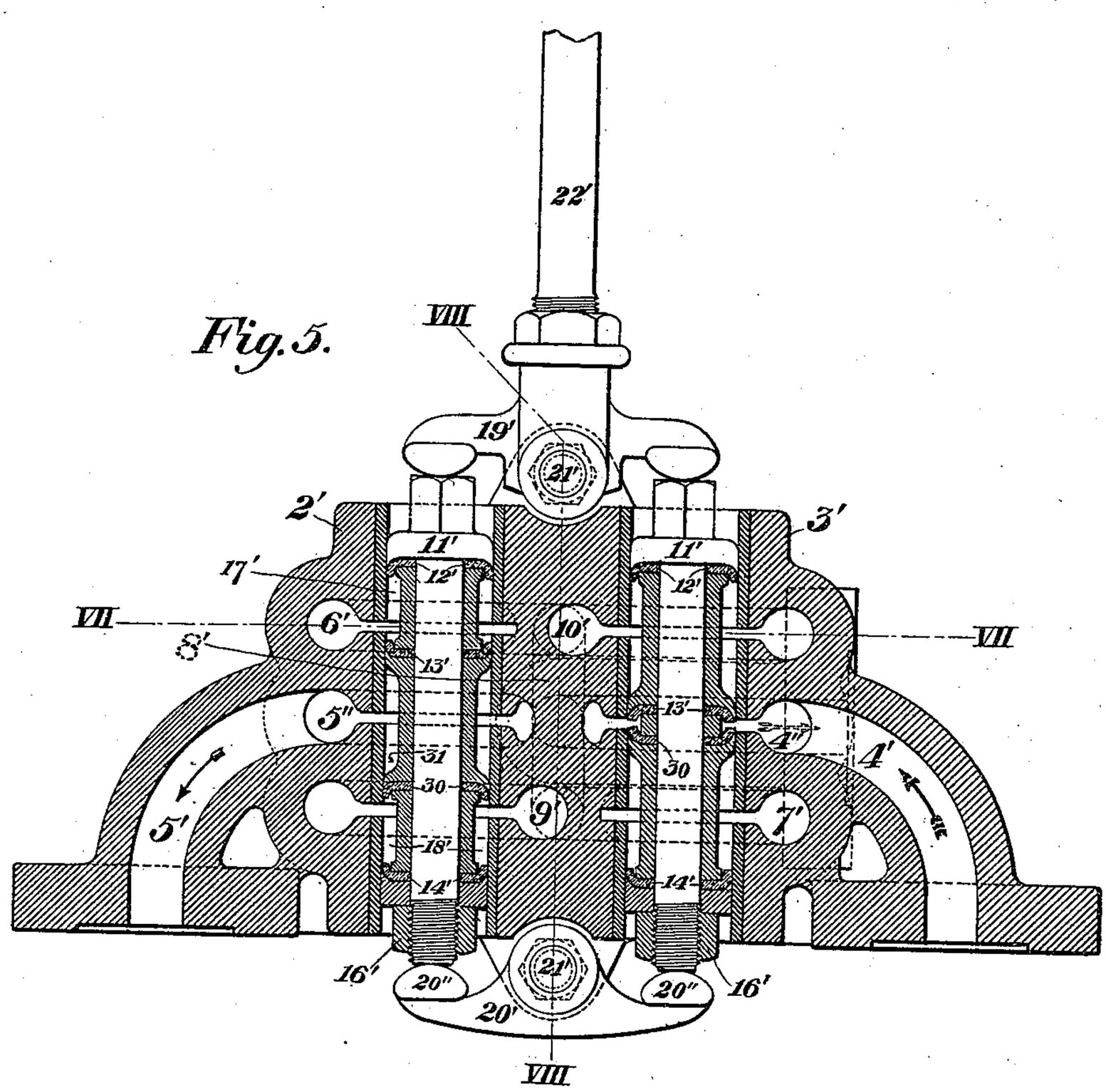
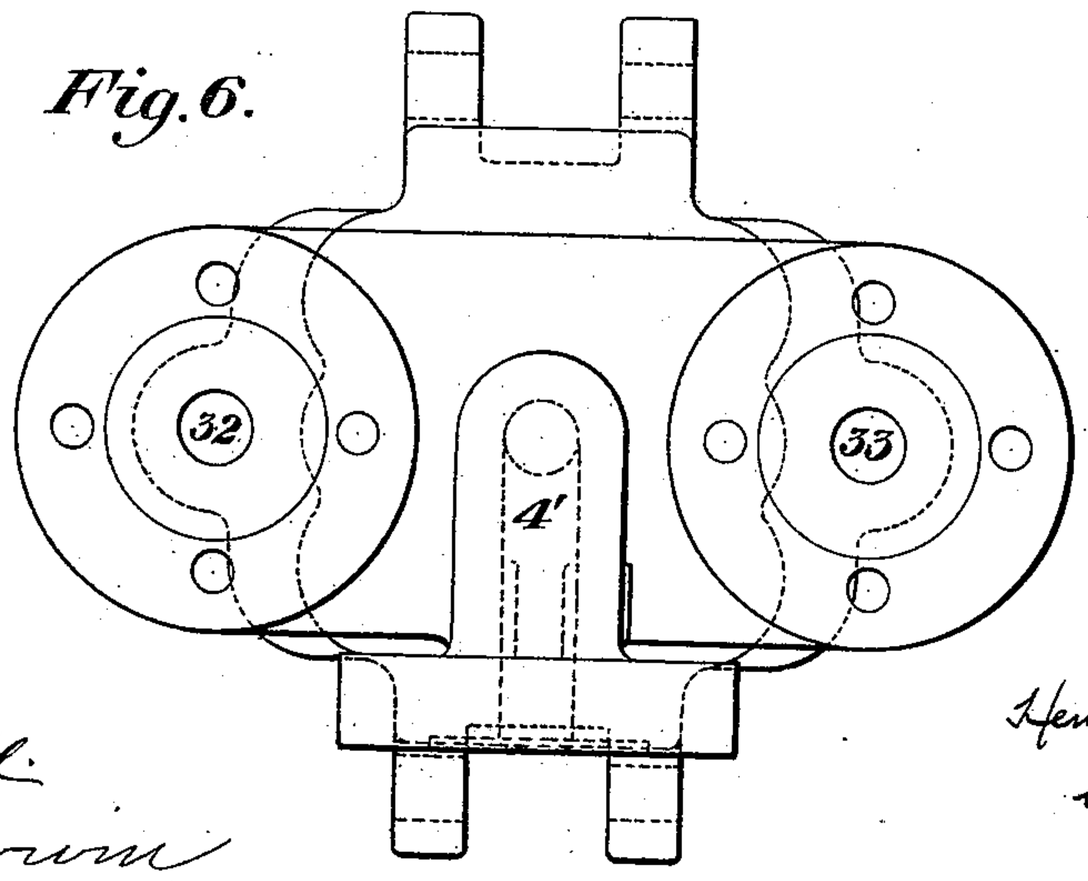


Fig. 6.



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(No Model.) 6 Sheets—Sheet 6.

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HYDRAULIC VALVE.

No. 465,232. Patented Dec. 15, 1891.

Fig. 8.

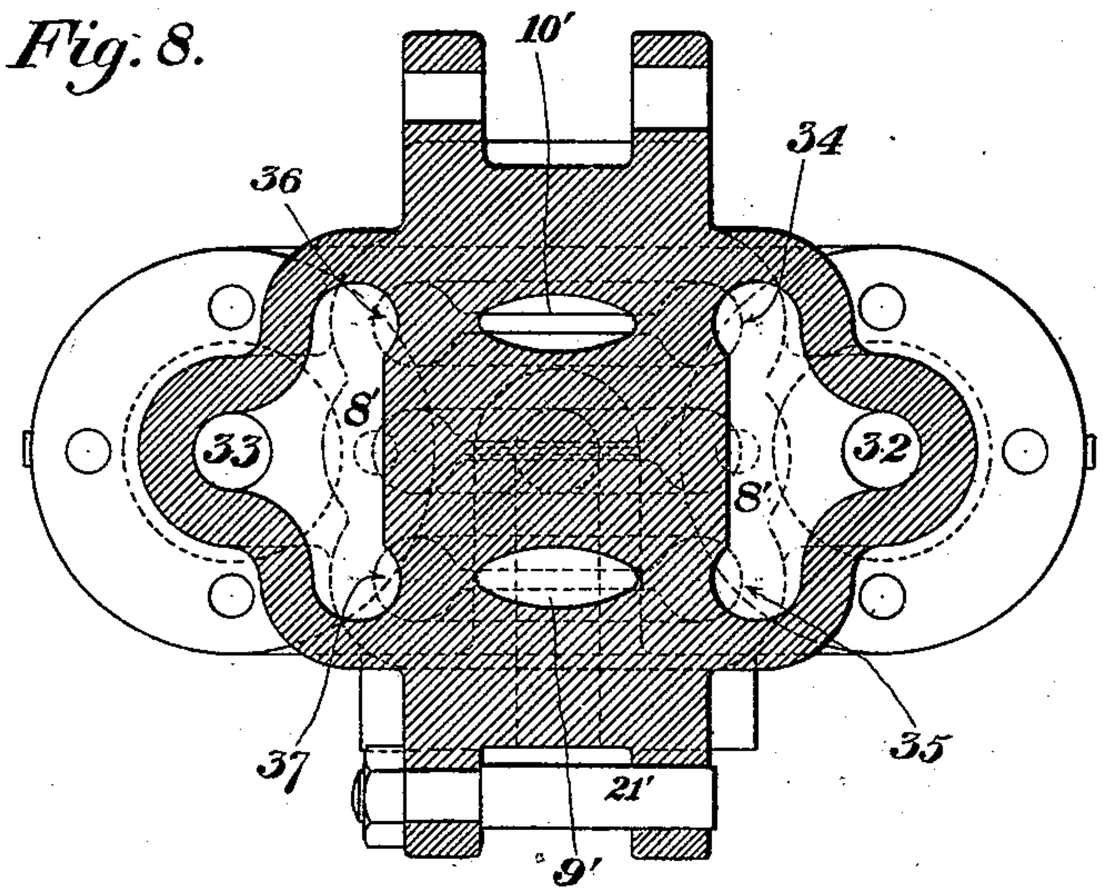
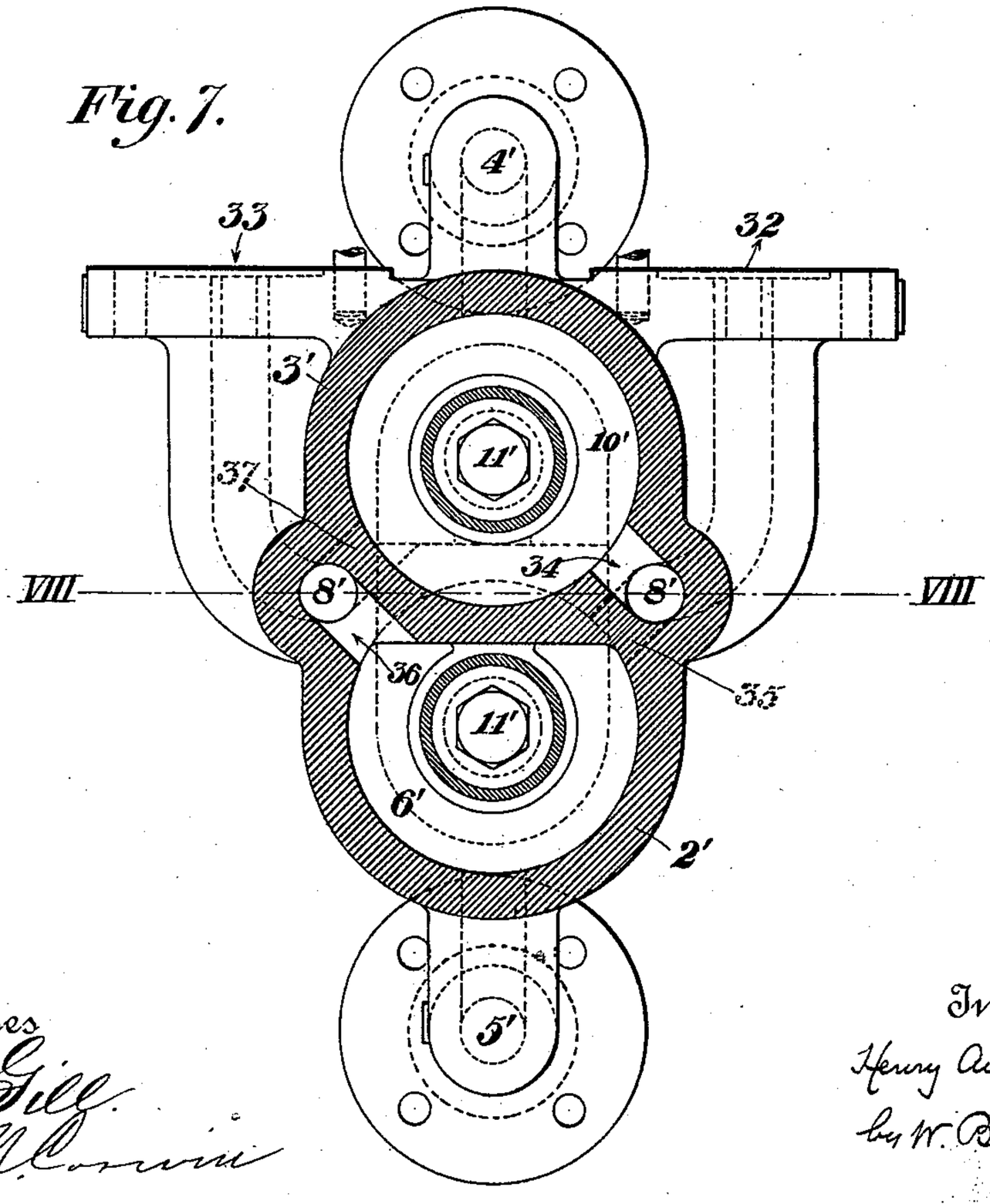


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

HYDRAULIC VALVE.

SPECIFICATION forming part of Letters Patent No. 465,232, dated December 15, 1891.

Application filed August 31, 1891. Serial No. 404,243. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hydraulic Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end view of a series of my improved valves. Fig. 2 is a vertical section on the line II II of Fig. 1. Fig. 3 is a vertical cross-section on the line III III of Fig. 2. Fig. 4 shows the three valves A, B, and C, the valve A being shown in end view, the valve B in vertical section on the line IV^B IV^B of Fig. 3, and the valve C in vertical section on the line IV^C IV^C of Fig. 3. The figures on Sheets 5 and 6 represent a modification of my improved valve, adapting it to be used in cases where there are two water-supply connections to the motor to be controlled by a single valve. In these figures I show the valve singly and not constructed to be nested with other like valves; but by suitable changes in location of the passages it may be adapted to be nested. Fig. 5 is a vertical central section of the said modified form of valve. Fig. 6 is an end elevation thereof, showing the two ports which lead to the motors—*i. e.*, either to opposite ends of one double-acting cylinder or to the supply-ports of separate motor-cylinders. Fig. 7 is a horizontal section on the line VII VII of Fig. 5. Fig. 8 is a vertical central section on the line VIII VIII of Figs. 5 and 7.

Like symbols of reference indicate like parts in each.

With reference to the construction of the individual valves the invention consists in a valve comprising two connected cylindrical chambers having ports cast in the body of the valve-chamber and piston-valves controlling the ports; also, in such construction and relative arrangement of the ports and valves that each valve will act as a cut-off for the other; also, in the connection of the piston-valves with levers so arranged that the motion of one will actuate the other in the contrary direction; also, in the combination of two balanced piston-valves arranged, substantially as shown, with their ends exposed.

The apparatus shown in Figs. 1, 2, 3, and 4 consists of a number of valves A B C, nested together and having supply and waste passages formed by the connection of such passages appertaining to the individual valves. Each valve has two parallel valve-chambers 2 3 and at right angles thereto two water-passages 4 5 for supply and exhaust, respectively. The supply and exhaust passages extend through the valve, and at their ends the valves are shaped with tongued or socketed portions, so that each may be nested into the next adjoining valve, as shown in Figs. 2 and 4, and that when so nested the said passages shall register and form continuous channels. The valve-chambers are constituted by enlarged portions of the casing or shell of the valve and extend at right angles to the waste and supply passages and at the sides of the same. (See Fig. 3.) The supply-passage 4 is connected by a branch with an annular chamber, which communicates through a port 6 with the valve-chamber 2. The exhaust-passage 5 has a branch connecting it with an annular chamber, which communicates through a port 7 with the valve-chamber 3, and the valve-chambers 2 and 3 are connected by a passage 8, communicating with said chambers through ports 9 and 10. In each valve-chamber is a valve stem or plunger 11 11′, having packing-rings 12, 13, and 14, held in place by follower-rings 15 and a compressing-nut 16. These packing-rings form on each valve-plunger annular passages 17 and 18. The packing-rings are preferably made of L shape in cross-section, their bases being set outwardly.

In making the valve-chambers I form them with their diameters greater from the middle of the annular ports outwardly than between the ports, and in fitting the valve I insert hollow bushings 25, screwed into place, so that their inner ends shall form the outer lips of the ports. These are convenient, because they render the valve-chambers easily accessible in their first fitting and for purposes of repair.

In order to move the valve-plungers longitudinally within their chambers, I employ double levers 19 and 20, pivoted at middle points 21 to the sides of the valve-chamber with the ends of their arms bearing on the exposed ends of the valve-plungers 11 11′.

One of these levers 19 is provided with an operating-handle 22. When the parts of the valve are in the position shown in Fig. 3, the supply-passage 4 communicates through the port 6, valve-passage 18, and port 9 with the pipe 23, leading to the motor which is controlled by the valve. The exhaust-passage 5 is covered by the passage 18 of the valve in the chamber 3, and is cut off thereby from communication with the pipe 23, while the port 10 is covered by the passage 17 of said valve. If now it be desired to cut off the pipe 23 from communication with the supply without connecting it with the exhaust, the lever 22 is moved in the direction of the arrow *a* into the position represented by the dotted line *b*, the effect of which is to cause the lever 19 to move the valve-plunger 11 inwardly until the packing 13 covers the port 6, thereby cutting off the supply. The other end of said plunger, pushing on the lever 20, moves it on its pivot, and thereby causes it to push the plunger 11′ in the opposite direction. In order to cut off the supply and to establish communication between the pipe 23 and the exhaust, the lever 22 is moved into the position indicated by the dotted line *c*, thereby moving the plunger 11 so that its passage 17 shall inclose the port 6 and that the port 9 shall be covered by the passage 18 and cut off thereby from communication with the port 6, while the plunger 11′ is simultaneously moved in the opposite direction, so that its passage 18 shall cover and connect both the port 7 and the port 10. The pipe 23 is thereby connected, through the port 9, passage 8, and ports 10 and 7, with the exhaust-passage 5. The motions of the valves in both directions are limited by means of stop portions 20′ on one of the levers 19 and 20, adapted to engage with the valve-casing, as shown in Fig. 3.

When the valves are nested together, as shown in Figs. 2 and 4, they are connected by bolts 21, which also serve as pivots on which the levers 19 and 20 turn, and the joints between the several valves are sealed by interposed gaskets 24. The pipes for the supply and exhaust to and from the valves are connected therewith at the ends of the series. The supply-pipe may be connected therewith at one end and the exhaust-pipe at the other end. Therefore in making the valves one of the end valves A may be formed with the supply-passage extending entirely through it and the exhaust-passage not extending to its outer end, while in the other end valve C the supply-passage may terminate short of its end, while the exhaust-passage extends through and is adapted to be coupled to the exhaust-pipe.

The advantages of my invention will be appreciated by those skilled in the art. The individual valves are simple in construction, are adapted to be operated under high pressure of water, are perfectly balanced, and the ends of the pistons are exposed, so that any leakage will be outward and can easily be detected. The parts are easily accessible, easy to put together and to take apart for repair. The group of nested valves affords distinct advantages. The several valves are separately constructed and can be separately repaired or renewed, while they possess all the advantages of conjoint valves in respect of compactness in form and economy in the number and arrangement of the inlet and outlet water-passages.

The principle of construction of the valve shown on Sheets 5 and 6 is similar to that above described. In these figures parts corresponding to parts in the other figures are indicated by the same reference-figures distinguished by the prime (′) mark. The valve-chamber 2′ has, in addition to the packing-rings 12′, 13′, and 14′, a fourth packing-ring 30, constituting, in addition to the passages 17′ and 18′, a third annular passage 31. 4′ is the supply-pipe which communicates with the chamber 3′ through an annular port 4″. 5′ is the exhaust-pipe, leading from an annular port 5″ of the chamber 2′. 32 33 are the passages leading to the motor or motors to be operated. These passages are connected with the valve-chamber and the valve-chambers are connected with each other in the following manner: 8′ are two vertical passages, both of which are connected at their top and bottom portions with the annular passages 6′, 7′, 9′, and 10′, as clearly shown in Fig. 7, the one passage 8′ having at its top the branch passage 34, leading to the annular space 10′, and at its bottom the branch passage 35, (shown in dotted lines,) leading to the annular space 9′, while the other passage 8′ communicates at its top by the passage 36 with the space 6′ and at its bottom by the passage 37 with the space 7′, the passages 32 and 33 leading to the vertical passages 8′ at about their middle portions.

The operation of the valve is as follows: Fig. 5 shows the valve stems or plungers in such relative position that both the supply and exhaust passages 4′ and 5′ are closed. If now the lever 22′ be moved so as to bring the packing-ring 13′ of the valve 3′ below the annular passage 4″, the entering water passes through the passage 10′ and branch passage 34 to the pipe 32, and thence to one motor or one end of the single motor. At the same time the valve-stem of the valve 2′ being raised, the annular passage 5″ is put in communication with the passage 6′ and by the branch 36 with the other motor or the opposite end of the single motor, thus allowing the waste water to escape. If, on the contrary, the lever 22′ be moved so as to bring the packing-ring 13′ above the passage 4″, the water then flows to the annular passage 7′, and thence by the branch 37 to the passage 8′ and the pipe 33, leading to the other motor or the opposite end of the single motor,

while the waste water escapes through the pipe 32, passage 8′, branch 35, and annular passage 9′. Thus it will be seen that 7′ and 10′ always serve as motive-fluid passages and 6′ and 9′ as waste-water passages.

It will thus be seen that with the valve shown in the last-described figures, as well as in the valve shown in Figs. 1, 2, 3, and 4, each valve-chamber acts as a cut-off for the other. The difference between the two is mainly that in the second-described form each valve-chamber is connected with a motor, and corresponding changes in form are made to accommodate the valve thereto. The two forms of apparatus are therefore generically the same, and both are included in the broad claims of this specification.

I claim—

1. A valve comprising two connected cylinders or chambers having ports communicating, respectively, with supply and exhaust passages, and a pipe connecting the motor with at least one of said chambers, a passage having ports connecting said chambers and affording a water-course from one to the other, and balanced piston-valves arranged in the chambers and adapted to control said ports and to be moved to open and close communication between the chambers, substantially as and for the purposes described.

2. A valve comprising two connected cylinders or chambers having ports communicating, respectively, with supply and exhaust passages, and a pipe connecting the motor with at least one of said chambers, a passage having ports connecting said chambers and affording a water-course from one to the other, and balanced piston-valves arranged in the chambers and adapted to control said ports and to be moved to open and close communication between the chambers, one of said valves acting as a cut-off for the other, substantially as and for the purposes described.

3. A valve comprising two cylinders or chambers 2 3, a passage 8, and ports 9 10, connecting them with each other and with the delivery-pipe from the valve, supply and exhaust passages communicating with said chambers through ports 6 and 7, and piston-valves 11 11′, having separated annular packing-rings 12, 13, and 14, affording intermediate annular water-passages adapted to control the ports, substantially as and for the purposes described.

4. A valve comprising two connected cylinders or chambers connected by ports and communicating, respectively, with the supply and exhaust passages, and balanced piston-valves arranged in said cylinders or chambers and adapted to control said ports, said valves having exposed ends and levers connecting them at both ends, substantially as and for the purposes described.

5. A valve comprising two connected cylinders or chambers having ports communicating, respectively, with supply and exhaust passages and one only of the chambers having a port leading to the motor to be operated, a passage having ports connecting said chambers and affording a water-course from one to the other, balanced piston-valves arranged in the chambers and adapted to control said ports and to be moved to open and close communication between the chambers, and mechanism by which the valves are moved simultaneously, substantially as and for the purposes described.

6. A valve comprising two connected cylinders or chambers having ports communicating, respectively, with supply and exhaust passages and one of the chambers having a port leading to the motor to be operated, a passage having ports connecting said chambers and affording a water-course from one to the other, and balanced piston-valves arranged in the chambers and having separated packing-rings affording intermediate exterior water-passages adapted to control said ports and to open and close communication between the chambers, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 27th day of August, A. D. 1891.

HENRY AIKEN.

Witnesses:
JNO. B. SCOTT,
W. B. CORWIN.