

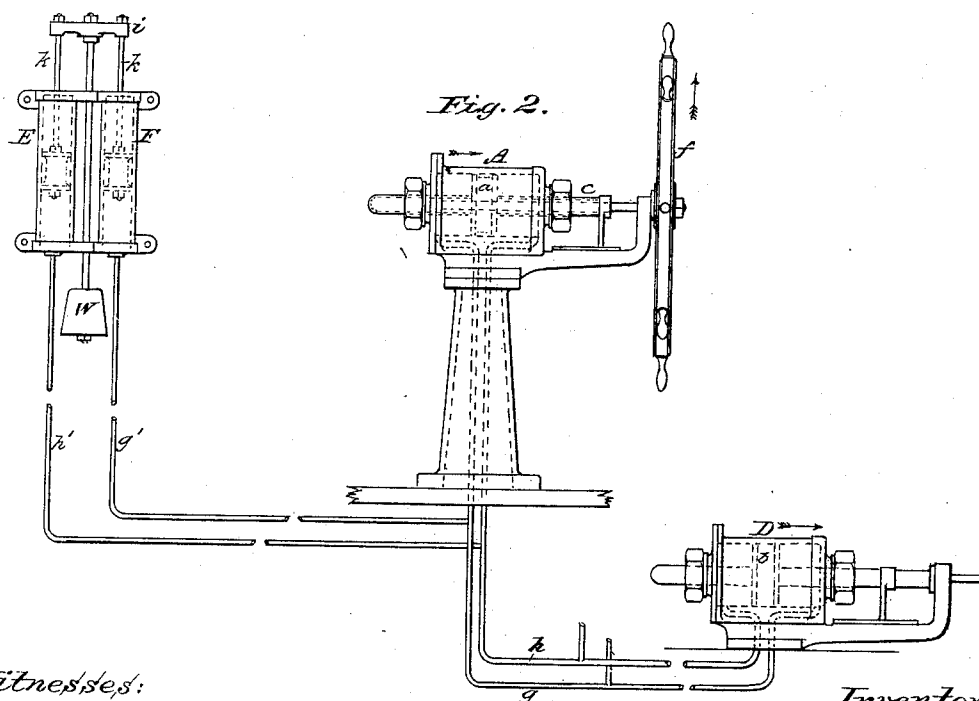
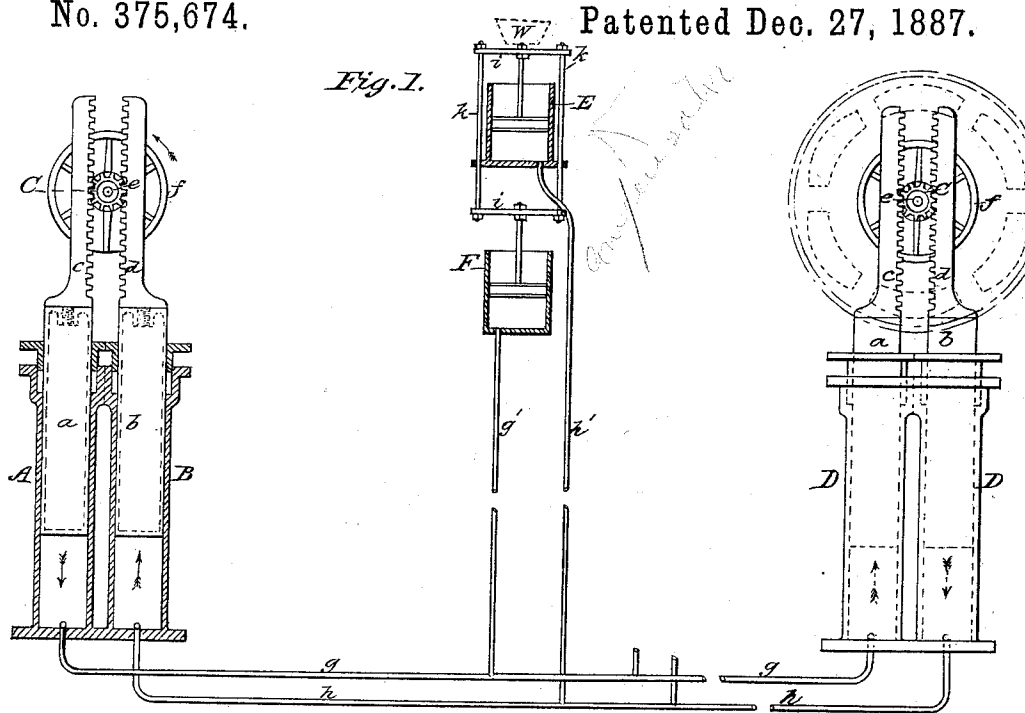
(No Model.)

A. S. GREENE.

HYDRAULIC MANIPULATOR AND INDICATOR.

No. 375,674.

Patented Dec. 27, 1887.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC MANIPULATOR AND INDICATOR.

SPECIFICATION forming part of Letters Patent No. 375,674, dated December 27, 1887.

Application filed March 7, 1887. Serial No. 230,018. (No model.)

To all whom it may concern:

Be it known that I, ALBERT S. GREENE, chief engineer United States Navy, a citizen of the United States, residing at Adams, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Hydraulic Manipulators and Indicators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in hydraulic manipulators for operating signals or machinery of any kind from one or more stations to a distant station; and the object is to produce an apparatus for the transmission of a positive and definite amount of motion, always within fixed limits, by means of a liquid pressure so arranged that while the capacity of one cylinder or chamber is increased by any amount the capacity of the other cylinder or chamber will be diminished by the same amount, and this change of capacity in one pair of cylinders or chambers will be transferred to another pair of similar cylinders or chambers at a distance, through communicating pipes in connection with a compensator, in such manner that exactly the same amount of motion, or any desired proportion of it, always between the same limits, will be caused at the distant pair of cylinders or chambers as was used to produce the change of capacity in the first pair of cylinders, which motion may be used for the setting or operating of signals or the manipulation of machinery of any kind, steam steering-engines or reversing-valves of marine engines, the working of any kind of railroad-switches, the training, elevating, and depressing of guns, or for any other purposes. One cylinder at each end may be used instead of the two cylinders, and the opposite ends of the cylinders are then connected by the pipes.

The invention consists in the construction of certain details and arrangement of parts of a hydraulic manipulator, as will be more fully described hereinafter, and specifically pointed out in the claims, reference being had to the accompanying drawings and the letters of reference marked thereon.

Like letters indicate similar parts in the different figures of the drawings, in which—

Figure 1 represents a side elevation, partly in section, of a hydraulic manipulator embracing my invention. Fig. 2 is a modification of the same, showing single cylinders applied to a steering apparatus of a vessel.

In the drawings, A and B are the cylinders of the transmitter, in which the plungers or pistons *a* and *b* move through suitable stuffing-boxes. The plungers are provided with racks *c* *d*, which mesh with a pinion, C, on a shaft, *e*, having on its end a hand-wheel, *f*, lever, or its equivalent. At any desired distance from the transmitter is placed the receiver D D, which is of the same construction as the transmitter, and they are both connected by the pipes *g* and *h*, and in such manner that when the capacity of one cylinder is increased by any amount the capacity of the other cylinder will be diminished by the same amount, and so that the same amount of motion or any desired proportion of it will be caused at the second pair of cylinders or receiver as was used to produce the change of capacity in the first pair of cylinders or transmitter, and vice versa. The cylinders and connecting-pipes are completely filled with some non-congealable and non-corrosive liquid, and to insure perfect action must be always kept so filled and free from air or vacuous spaces, and as the volume of the liquid will vary with variations of temperatures there will be a tendency to produce such spaces or to burst the apparatus; hence the necessity for a compensator.

The compensator consists of two vertical cylinders, E and F, placed one above the other, or by the side of each other in this instance, and secured to a suitable place, preferably a little above the highest apparatus or cylinders. Said cylinders have fitted in them packed pistons, with rods secured to the cross-bars *i*, which are connected by the side rods, *k*, and a weight, W, is attached, as shown in dotted lines. The object of the weight is to counter-balance any pressure to which the liquid may be subjected in operating the apparatus, and also to overcome friction of the pistons, &c.

It is clear that as the volumes of liquids on opposite sides of the pistons of the apparatus are equal, there will be the same expansion

and contraction of liquid on the two sides, and as the bottoms of the compensating cylinders are connected by pipes *g' h'*, one each, to the connecting-pipes *g h*, the pistons will rise and
 5 fall together with said expansion and contraction, thus securing the desired object, the piston-rods being secured together and weighted, preventing any motion of the pistons from any other cause. The compensator also furnishes
 10 a convenient arrangement for filling the apparatus. In Fig. 1 the receiver is shown for operating a signal-dial, upon which any words, letters, symbols, &c., may be marked.

In the modification shown in Fig. 2 the
 15 transmitter and the receiver consist only of one cylinder each, and they are placed horizontally, and the connecting-pipes lead to the opposite ends of the said cylinders. The compensator consists of the cylinders E and F,
 20 placed side by side instead of one above the other, and the weight is suspended by a rod, *l*, passing between the cylinders. Instead of the racks and pinions employed in Fig. 1, the piston-rod of the cylinder A is provided with
 25 the hand-wheel *f*, and the piston-rod of the cylinder D can be connected to the reversing valve or hand mechanism of the main engines or steering-engines.

The operation is as follows: Everything
 30 having been set in central position and the apparatus properly filled with liquid, (consisting, preferably, of ninety per cent. glycerine and ten per cent. alcohol,) the hand-wheel *f* is turned toward the left, moving the piston
 35 of the cylinder A, Fig. 1, downward and of cylinder B upward, forcing the liquid from the lower end of said cylinder into the forward end of the cylinder of the receiver D, moving its piston aft, and thus its connections, whether
 40 to a signal-dial or the reversing valve or hand lever of an engine or to a switch, or to the usual hand-lever of machinery to train, elevate, or depress a gun, or for any other purpose.

In the modification, Fig. 2, the hand-wheel
 45 *f* is turned toward the left, moving the piston of the cylinder A forward, forcing the liquid from the forward end of said cylinder into the rear end of the cylinder D, moving its piston
 50 forward, and thus its connections, for any purpose desired.

Having thus described my invention, what I claim is—

1. A hydraulic manipulator consisting of one or more transmitters and receivers having cylinders with plungers or pistons provided with racks meshing with a pinion and connected by suitable pipes containing a liquid, in combination with a compensating device attached to said pipes, all as set forth. 55 60

2. The combination of a manipulator consisting of one or more transmitters and receivers connected by pipes containing a liquid with a compensating arrangement consisting of two cylinders whose pistons are connected so as to move in unison with each other, and having pipes communicating with the lower ends of said cylinders and with the pipes of the transmitter, as and for the purpose specified. 65 70

3. In combination with a manipulator for operating machinery or mechanism at different stations, the compensating arrangement consisting of two cylinders having pistons connected in such manner as to move in unison and communicating by pipes with the pipes of said manipulator, substantially as set forth. 75

4. The combination of a transmitter, A, and receiver B, provided with pistons or plungers and connected by pipes containing a liquid, with a compensating arrangement consisting of cylinders whose pistons are connected so as to move in unison and the lower parts of said cylinders communicating with the pipes of the manipulator, as specified. 80 85

5. The combination of one or more cylinders forming the transmitter and one or more cylinders forming the receiver of a manipulator with a compensating arrangement and suitable pipes connecting said transmitter, receiver, and compensator, all arranged for imparting motion to a liquid and manipulating machinery or mechanism, in the manner and for the purpose set forth. 90

In testimony whereof I hereby affix my signature in presence of two witnesses. 95

ALBERT S. GREENE.

Witnesses:

G. B. WHITE,
 HENRY B. NONES.