

(No Model.)

2 Sheets—Sheet 1.

G. W. BROWNE & J. W. LITTLE.  
MOTOR.

No. 528,461.

Patented Oct. 30, 1894.

Fig 1

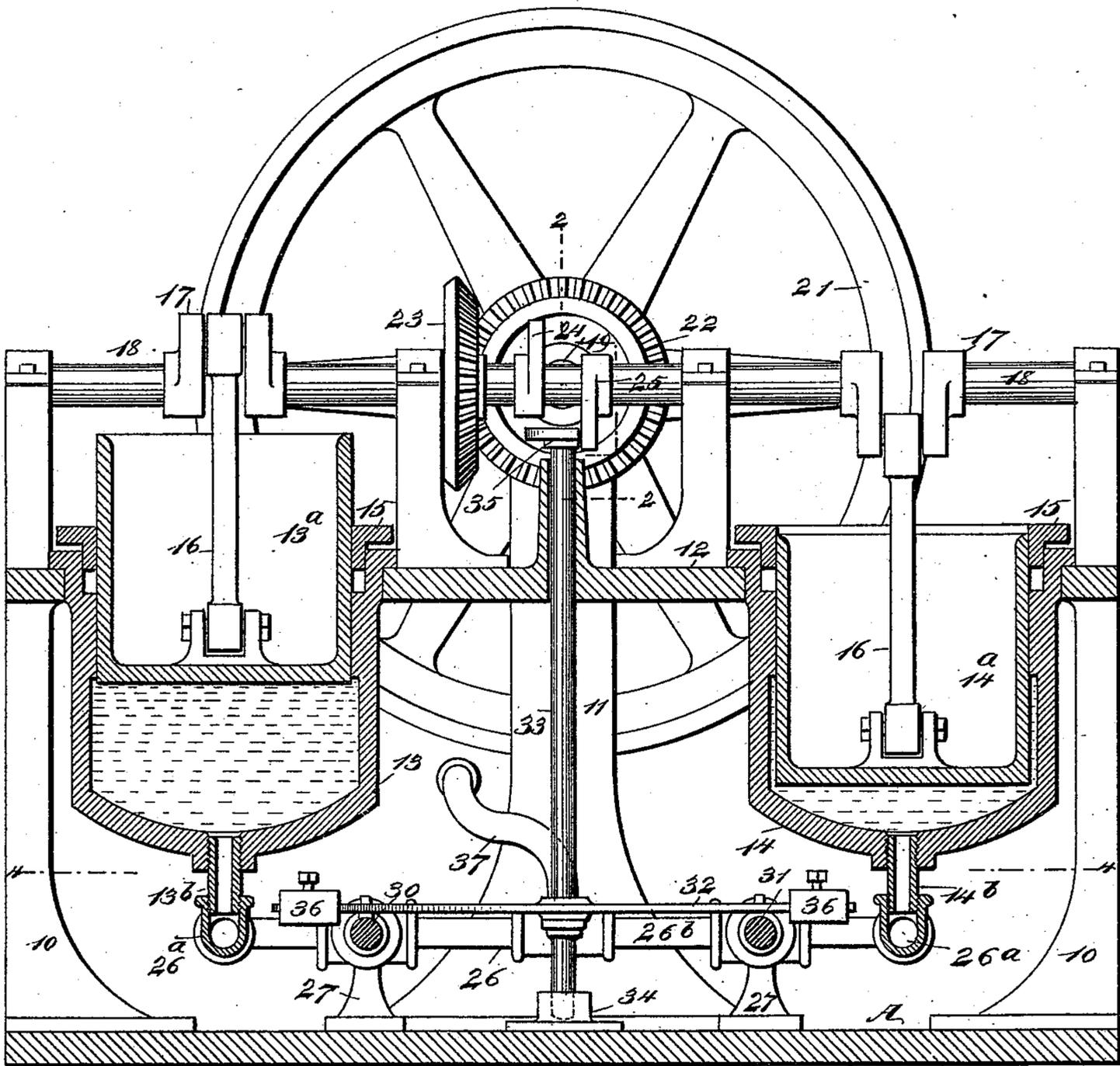
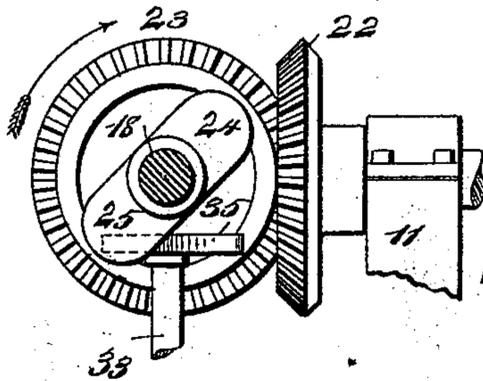


Fig 2



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*G. W. Browne*  
*J. W. Little*  
 BY *Munn & Co.*  
 ATTORNEYS.

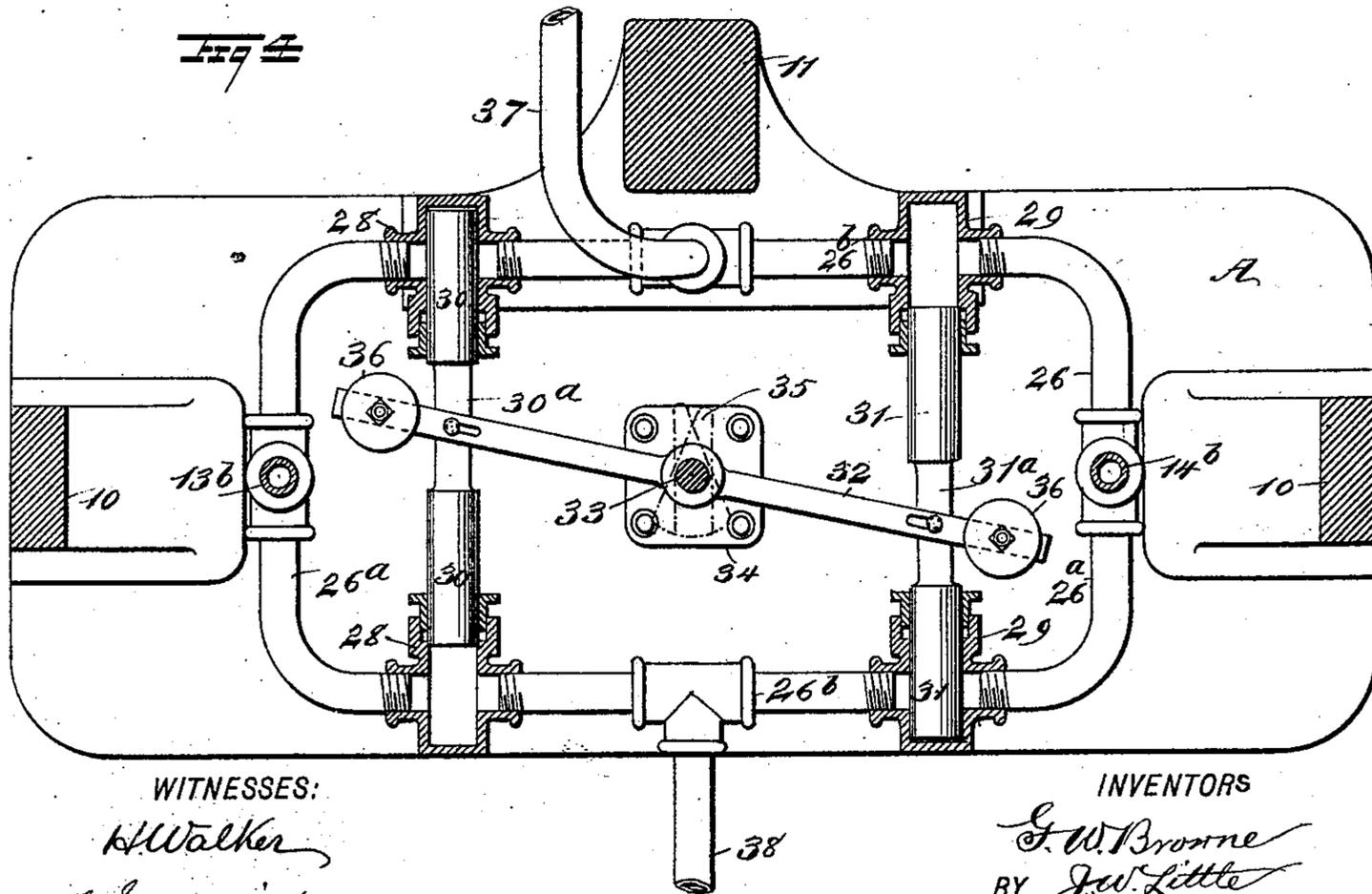
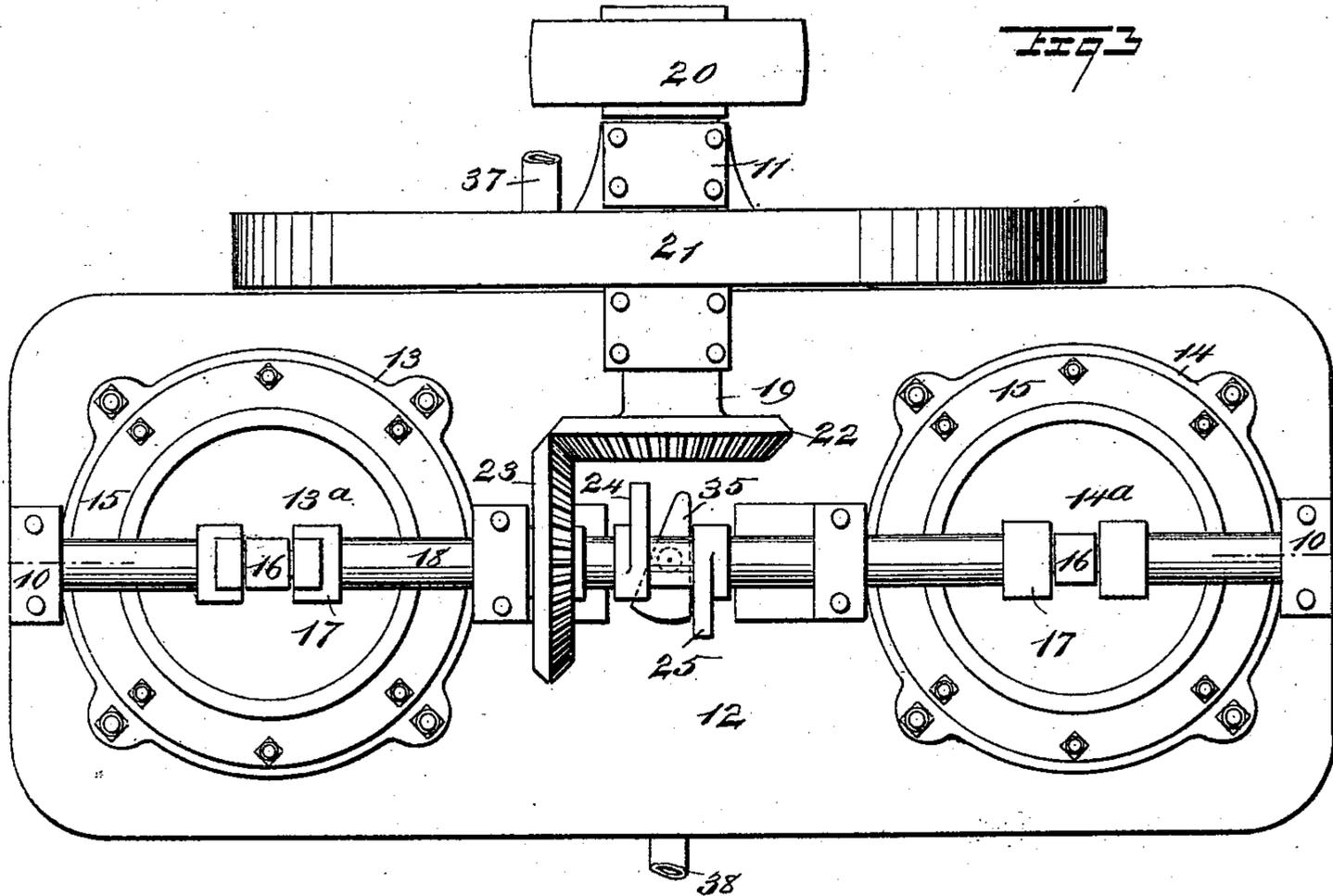
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# UNITED STATES PATENT OFFICE.

GEORGE W. BROWNE AND JOHN W. LITTLE, OF BROOKLYN, NEW YORK.

## MOTOR.

SPECIFICATION forming part of Letters Patent No. 528,461, dated October 30, 1894.

Application filed November 10, 1893. Serial No. 490,508. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE W. BROWNE and JOHN W. LITTLE, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Motor, of which the following is a full, clear, and exact description.

Our invention relates to an improvement in motors especially adapted to be operated by water, and which is also capable of being operated by steam or through the medium of air under compression, and the object of the invention is to construct the motor in an exceedingly simple, durable and economic manner, and to provide a machine which will be exceedingly compact and which will generate and dispense a maximum of power in a continuous regular manner.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a vertical longitudinal section through the motor. Fig. 2 is a section taken practically on the line 2—2 of Fig. 1. Fig. 3 is a plan view of the motor; and Fig. 4 is a horizontal section taken essentially on the line 4—4 of Fig. 1.

In carrying out the invention a base A is provided from which standards 10, are projected upward from each end, and a third standard 11, is projected upward usually from the back or one side, and a horizontal platform or plate 12, is made to extend from one end upright to the other.

At each side of the center of the plate or platform 12 an opening is made to receive a tank cylinder, one of said cylinders being designated as 13 and the other as 14. The cylinders are secured to the plate by bolts, or the equivalent thereof, each being provided with a bushing 15, since each tank cylinder is adapted to receive a tank piston, the pistons being designated respectively as 13<sup>a</sup> and 14<sup>a</sup>.

Each tank piston is independently connected by a pitman 16 with crank arms 17, produced upon a drive shaft 18, which drive

shaft is journaled in suitable bearings formed in the upper portion of the uprights 10; and the drive shaft imparts motion to a power shaft 19, journaled in the side upright 11, the said power shaft being provided with a driving pulley 20 and preferably a driving wheel 21, together with a beveled gear 22, the beveled gear being made to mesh with a similar gear 23, located upon the drive shaft. The driving shaft is further provided at each side of its center with a cam, the cams being designated respectively as 24 and 25, and they extend from the shaft in diametrically opposite directions.

A line of piping 26, is supported upon the base by pedestals 27 of any approved construction. The said line of piping is ordinarily of more or less rectangular shape, its under stretches 26<sup>a</sup> being connected with the tank cylinders 13 and 14 through the medium of pipes 13<sup>b</sup> and 14<sup>b</sup>, entering the cylinders preferably at the central portion of each bottom. The side, or longer stretches 26<sup>b</sup> of the angular line of piping are provided with valved casings, each stretch having two casings located therein, one at each side of its center; and the valve casings are designated as 28 and 29. The valve casings in each stretch 26<sup>b</sup> of the line of piping 26, are immediately opposite one another.

A plug valve 30, is located in each valve casing 28, and a like valve 31 in each valve casing 29, and the plug valves 30, are connected by a stem 30<sup>a</sup>, the plug valves 31 being also united by a stem 31<sup>a</sup>. The length of the valve stems 30<sup>a</sup> and 31<sup>a</sup> is so regulated that when one valve is fully seated in one of the casings the other valve will have opened communication through its casing, and the valves 30 and 31 diagonally opposite operate simultaneously in the same manner, two diagonally opposing valves 30 and 31 cutting off communication through their casings, while the other two diagonally opposing valves will at the same time open communication through their casings.

The valve stems 30<sup>a</sup> and 31<sup>a</sup>, are alternately reciprocated in opposite directions through the medium of an arm 32, which arm is fast upon and extends horizontally beyond opposite sides of a vertical shaft 33, said shaft being pivoted in a bearing 34, located cen-

trally within the line of piping 26; and the said vertical shaft 33, is rocked alternately to the right and to the left by placing upon its upper end a segment 35, which is alternately  
 5 acted upon by the cams 24 and 25 of the drive shaft.

The arm 32 of the vertical shaft 33, which may be termed a trip shaft, is pivotally connected with each of the valve stems 30<sup>a</sup> and  
 10 31<sup>a</sup> at a point centered between the valves which they connect, as shown in Fig. 4; and the ends of the trip arm 32, are made to extend over and beyond the valve stems 30<sup>a</sup> and 31<sup>a</sup>, and are provided with adjustable  
 15 weights 36, which weights serve to cause the arm to act quickly, and not depend entirely upon the shaft 33 for motion, thus relieving the segment 35 from the severe wear it must necessarily undergo when it only is employed  
 20 to operate the valves.

We desire it to be understood that although we have four purposes of convenience referred to the line of piping 26 as being rectangular, it may be of any desired formation;  
 25 and it is continuous in any event, or practically so, and the valves and valve casings must sustain the same relation to each other that has been described.

The inlet pipe 37, through which the water,  
 30 air or other agent is to be introduced into the line of piping 26, is located at one side of the line of piping, about centrally between the valve casings 28 and 29 on that side, while the exhaust pipe 38, is located opposite the inlet  
 35 pipe at the opposite side of the line of piping, and likewise centrally between the valve casings 28 and 29 at that side.

In the operation of the motor, when it is in the position shown in Fig. 1, the right-hand  
 40 piston 14<sup>a</sup> is about to be elevated by the water entering into the right-hand piston cylinder 14, since the valve between the inlet pipe and the branch pipe 14<sup>b</sup> of the right-hand cylinder 14 is open, while the valve be-  
 45 tween the exhaust and the said branch pipe is in closed position. The valves belonging to the left-hand cylinder 13, are in a reverse position at this time, the valve near the inlet being in a closed position while that near  
 50 the exhaust is in an open position. Thus, while the water, for example, is entering the cylinder 14, carrying up its piston 14<sup>a</sup>, the water will be leaving the cylinder 13 to provide for the downward stroke of its piston 13<sup>a</sup>.

55 Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a motor of the class indicated, the combination with tank cylinders, pistons, and drive crank shaft of piping arranged in rectangular form beneath said cylinders, and having pipe extensions that connect with the cylinders and serve both for inlet and exhaust, alternately, and two sets of valves arranged  
 60 in opposite branches of said piping, the two valves of each set being rigidly connected and operated together and one valve being between the inlet and a cylinder, and its companion valve being between the exhaust and  
 65 such cylinder, whereby one opens the inlet branch of said piping as the other closes the exhaust branch, and vice versa, and means for shifting the sets of valves, alternately, as shown and described. 70

2. In a motor, the combination, with a drive shaft, cylinders, pistons located in the cylinders and connected with the drive shaft, and a line of piping provided with an exhaust and an inlet, the said line of piping being connected with the cylinders between the exhaust  
 75 and inlet, of a pair of opposing valve casings located in the line of piping between the exhaust and inlet of each cylinder, connected valves operating simultaneously in each opposing pair of valve casings, one to close and  
 80 the other to open, a weighted trip arm connected with the valves, and a trip shaft connected with the arm and rocked from the drive shaft, substantially as shown and described. 85

3. In a motor, the combination, with cylinders, pistons operating in the cylinders, a drive shaft connected with the pistons, and a line of piping provided with an inlet and an exhaust in communication with both cylinders,  
 90 of connected valves, one acting to close while the other opens, located between each cylinder and the said inlet and exhaust, a rock shaft, a segment carried by the rock shaft, cams located upon the drive shaft and acting  
 95 upon said segment, and a weighted trip arm carried by the trip shaft, connected with each set of valves, whereby each set of valves is simultaneously operated, one set of valves operating to open communication between the  
 100 inlet and its cylinder and cutting off communication between the cylinder and the exhaust, the other set of valves operating in a reverse manner, as and for the purpose specified. 105

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Witnesses:

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