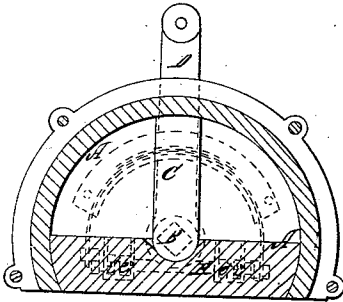


*H. H. Stuart,*  
*Hydraulic Engine.*

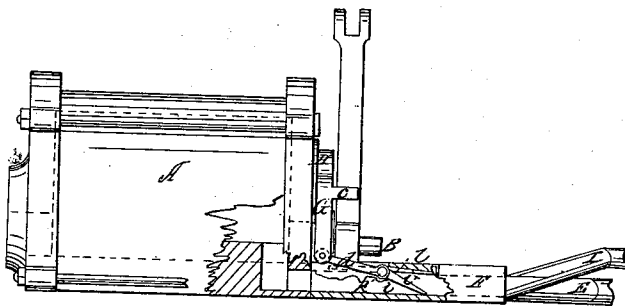
*N<sup>o</sup> 16,756.*

*Patented Mar. 3, 1857.*

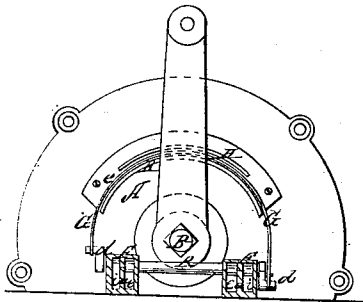
*Fig. 1.*



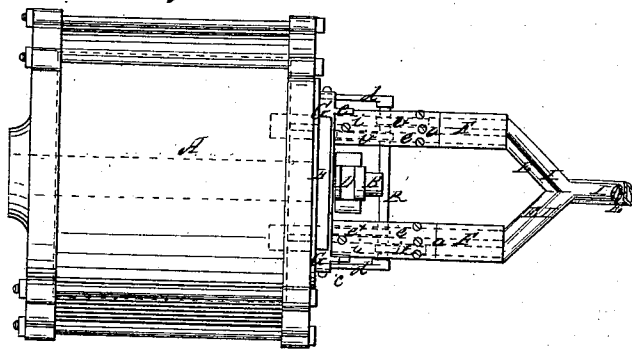
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



# UNITED STATES PATENT OFFICE.

HOMER H. STUART, OF NEW YORK, N. Y.

## METHOD OF OPERATING THE SUPPLY AND DISCHARGE VALVES OF HYDRAULIC ENGINES.

Specification of Letters Patent No. 16,756, dated March 3, 1857.

To all whom it may concern:

Be it known that I, HOMER H. STUART, of the city, county, and State of New York, have invented a new and useful improvement in the arrangement of and mode of operating induction and eduction valves in engines to be driven by water or other fluid for the purpose of obtaining motive power; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a transverse vertical section of an engine with my improvement. Fig. 2 is a side elevation of the same with one of the valve boxes partly in section. Fig. 3 is a front elevation of the same, with the valve boxes in section. Fig. 4, is a plan of the same.

Similar letters of reference indicate corresponding parts in the several figures.

The engine to which my invention relates is of the kind which may be termed "semi-rotary," the "cylinder" or part which corresponds with the cylinder of the rotary engine having in its transverse section the form of a sector, and the piston being radially arranged upon a rock shaft which passes through the axis of the cylinder, and deriving an oscillating motion from the pressure of water or other fluid admitted to the cylinder on opposite sides of the piston alternately, thus imparting to the rock shaft an oscillating motion, which by means of an arm attached to the rock shaft outside the cylinder and connected with a crank or other suitable mechanical device for converting reciprocating into rotary motion, may be made to drive a revolving shaft. The aforesaid arm attached to the rock shaft also serves to give motion to the valves for the induction and eduction of fluid to and from the cylinder, by the means which in connection with the arrangement of the said valves constitute my invention which I will now proceed to describe in such manner as to enable other persons to construct and use it.

A, is the cylinder the circular portion of whose interior and the two ends thereof are faced truly. This cylinder has its axis in a horizontal position.

B, is the central rockshaft fitted at one end to a bearing within the back end of the cylinder, and passing through a stuffing box in

the front end thereof. C, is the piston secured to the rockshaft B, and fitted to the circular portion of the interior and to the ends of the cylinder.

D is the arm secured to the rockshaft B, outside of the cylinder, and supposed to be connected by a connecting rod with a crank on a rotary shaft arranged parallel with the rockshaft. The crank shaft and its connections are not shown as engines of this kind are well understood.

I, is the induction pipe for supplying water or other fluid from a reservoir in which there is a suitable head or pressure, and E is the eduction pipe for the escape of the waste water or fluid, each having two branches leading to two valve boxes, F, F, which are arranged parallel with each other on opposite sides of the center of the cylinder and parallel with the axis thereof. The valve boxes are each divided vertically and longitudinally by a central partition *a*, into two compartments *i* and *e*, of unequal width, the largest compartments *e*, *e*, of the two boxes being eduction passages forming communications between the two branches of the eduction pipe E, and the cylinder which they enter on opposite sides of the piston, and the smaller compartments being induction passages forming communication between the two branches of the induction pipe I, and the cylinder which they enter in the same manner as the eduction passages.

The induction and eduction passages *i*, *i*, and *e*, *e*, are made of quadrangular form in their transverse section for the purpose of receiving each one of four flap valves *i*\*, *i*\*, and *e*\*, *e*\*, which are all secured to the same rockshaft R, which is fitted to work in bearings in the sides or caps of the two valve boxes, the valves being so arranged on the rockshaft R, that when the induction valve *i*\*, of one valve box is open wide, the eduction valve *e*\*, of the other valve box is in the same condition and the other two valves are both closed, and vice versa. When the valves are open they fit into recesses *b*, see Fig. 2, in the caps or covers of their respective passages so as to offer no obstruction to the ingress or egress of the water or other fluid to or from the cylinder.

The movements of the rockshaft R, to reverse the position of the valves suddenly at the termination of the stroke of the piston in either direction is effected, by an arch

shaped sliding piece of metal G, which slides  
in a guide H, of corresponding form secured  
to the front end of the cylinder concentric-  
ally to the axis thereof, said sliding piece  
5 being connected at or near its extremities  
with the wrists of two arms *d, d*, that are  
secured to the rockshaft R, at or near oppo-  
site ends thereof, outside the valve boxes,  
and receiving the necessary sliding motion  
10 to raise one arm *d*, and depress the other al-  
ternately just before the strokes of the pis-  
ton terminate, from the arm D, of the rock-  
shaft B, which strikes one of two projec-  
tions *c, c*, on the outer edge of the said slid-  
15 ing piece G, just before the piston termi-  
nates its stroke in either direction. The  
reversing of the position of the valves at  
each end of the stroke of the piston by the  
above described action of the arm D, sliding  
20 piece G, and rockshaft R, admits the water

or other fluid to the cylinder to act on the  
proper side of the piston to drive it back to  
the opposite direction, and to permit the es-  
cape of the water or fluid which has finished  
its action on the opposite side of the piston. 25

What I claim as my invention, and desire  
to secure by Letters Patent, is:

Arranging the four flap valves on the  
rock-shaft, R, to operate in the separate  
compartments of the two valve-boxes, placed 30  
at one end of the cylinder, and operating the  
same by means of the sliding arch piece G,  
connected with arms at opposite ends of the  
said rock-shaft R, and driven by the vibrat-  
ing arm D, of the main rock-shaft B, of the 35  
engine, substantially as herein set forth.

HOMER H. STUART.

Witnesses:

I. W. COOMBS,

HENRY T. BROWN.