Sheet 1-3 Sheets.

Loner & Nystrom,

Reciprocating Steam Engine,

No. 8,039. Patented Apr. 15, 1851.

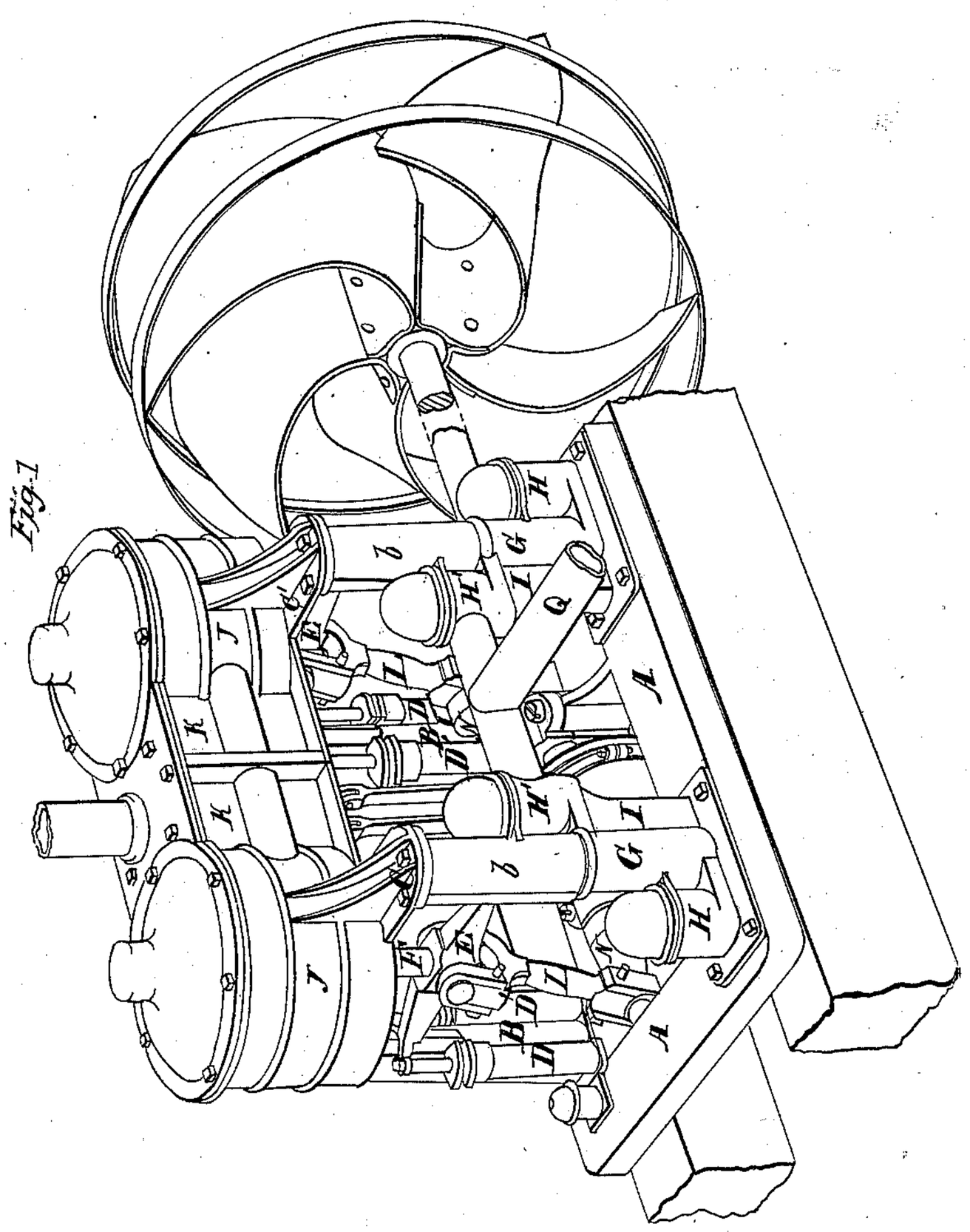

Fig. 1

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Sheet 2-3 Sheet.

Loper & Nystrom,

Reciprocating Steam Engine,

No. 8,039. Patented Apr. 15, 1851.

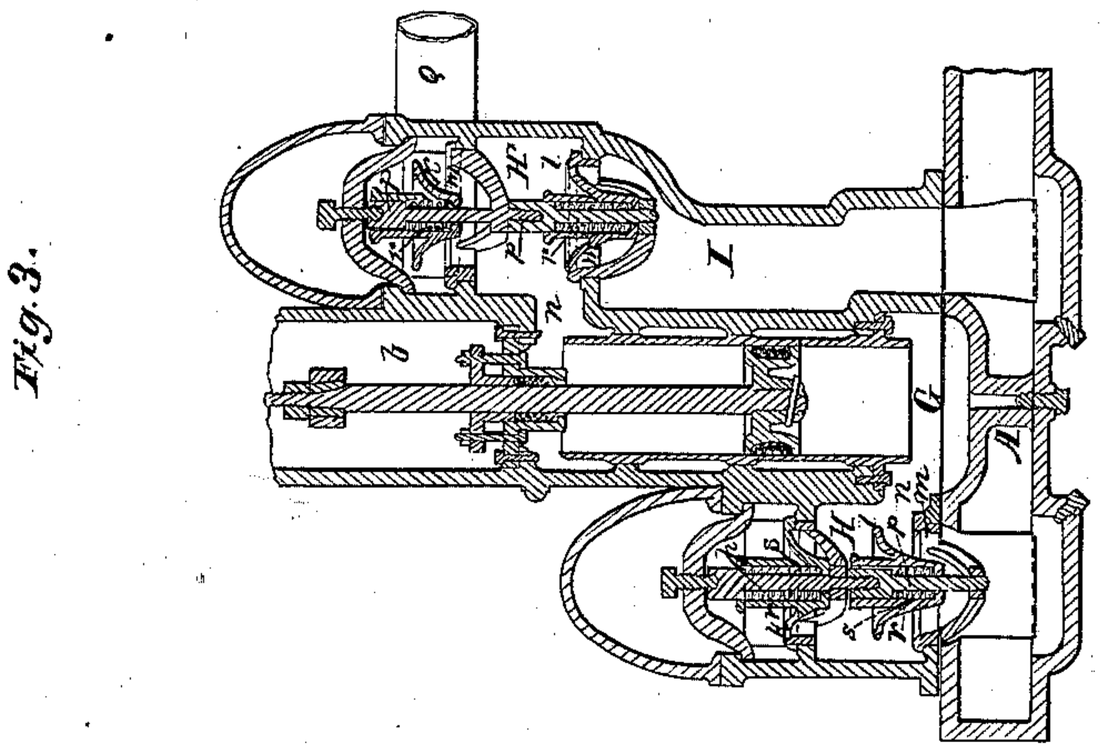

Fig. 3.

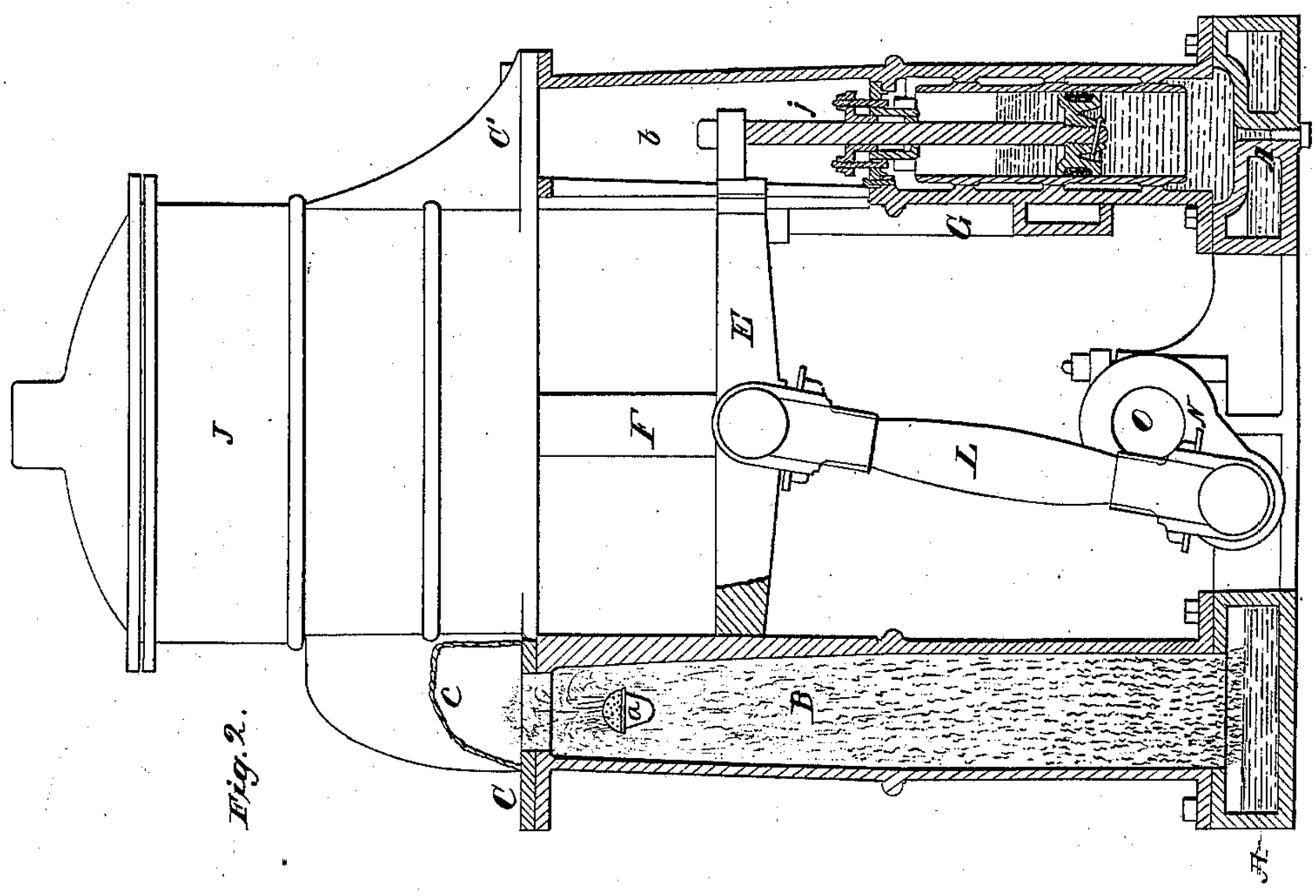

Fig. 2.

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Sheet 3 - 3 Sheets.

Loper & Nystrom,

Reciprocating Steam Engine,

No. 8,039, Patented Apr. 15, 1851.

Fig. 4.

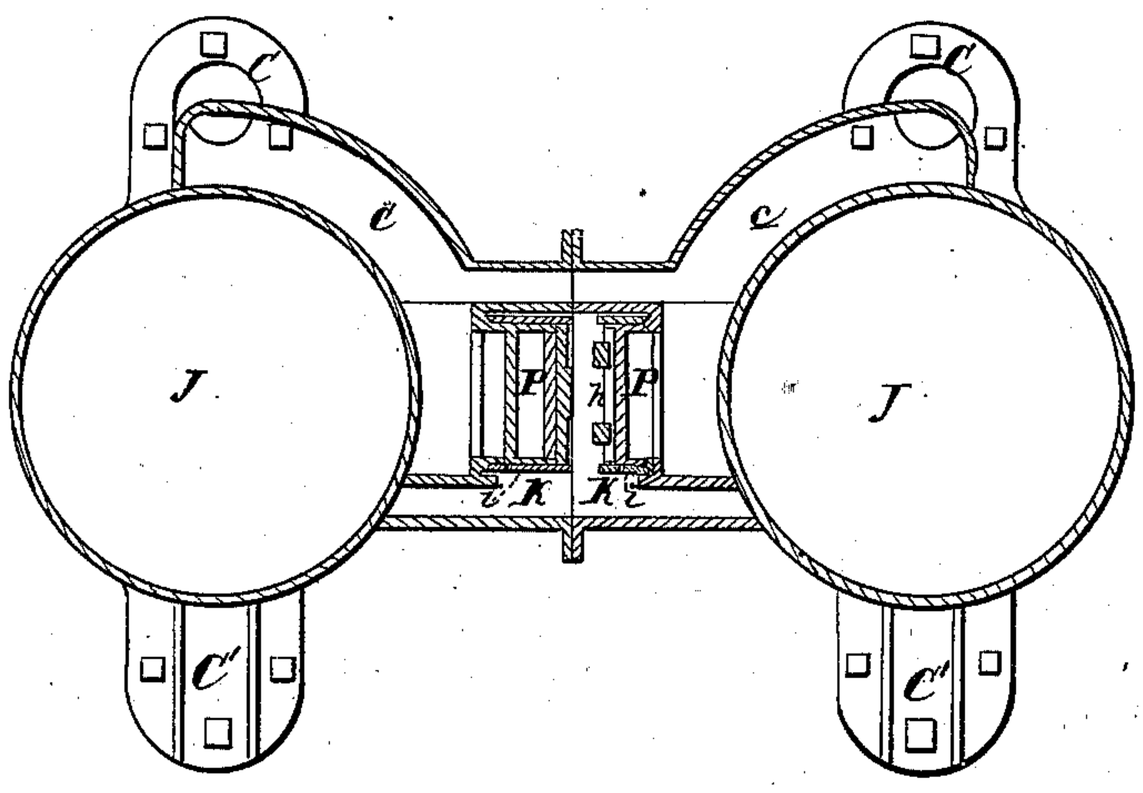


Fig. 5.

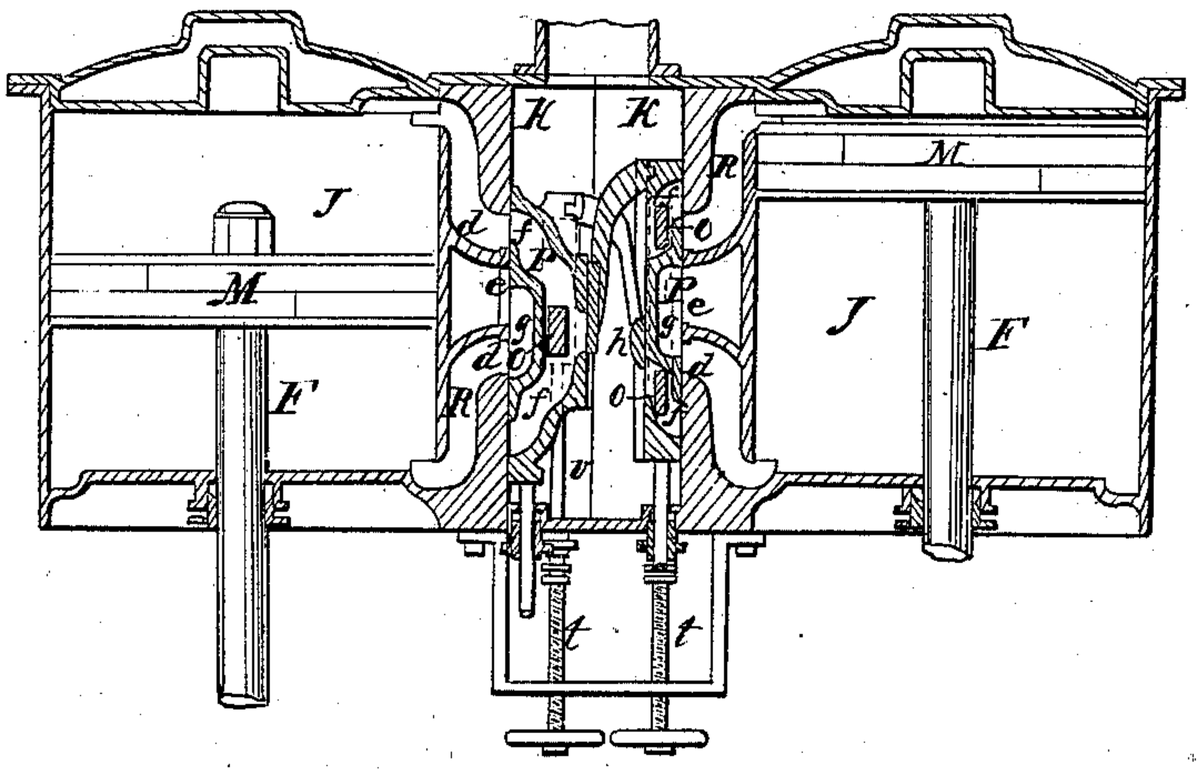
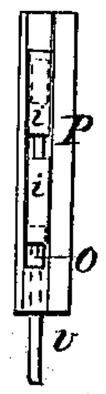


Fig. 6.



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UNITED STATES PATENT OFFICE.

RICHD. F. LOPER AND JOHN W. NYSTROM, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-ENGINE.

Specification of Letters Patent No. 8,039, dated April 15, 1851.

To all whom it may concern:

Be it known that we, RICHARD F. LOPER and JOHN W. NYSTROM, of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification and in which—

Figure 1 represents a view in perspective of one of our double engines applied to driving a screw propeller. Fig. 2 is a transverse section through the condenser, bed frame, and air-pump of one of the steam cylinders. Fig. 3 is a longitudinal section through the air pump and its valve chests. Fig. 4 is a horizontal section through the steam cylinders and the steam valve chest. Fig. 5 is a vertical longitudinal section of the same, and Fig. 6 is a side view of the steam slide valves.

Our improvements are peculiarly applicable to that class of marine steam engines which are employed to drive screw propellers and which it is desirable should occupy the smallest space compatible with a due degree of strength and efficient action, and a free access to the several parts for repairs and adjustment; where also it is desirable that the engine should work at a high speed in order to drive the screw propeller at a sufficient velocity without the employment of gearing, and at the same time to obtain a large amount of duty from an engine of comparatively small size and light weight.

Our improvements consist, first, in constructing and arranging the condenser and air pump which appertain to each steam cylinder in such manner that they shall constitute the columns by which the cylinder is supported; second, in the construction and arrangement of the valves of two steam cylinders working in connection, which is such that the cut-off valve of one cylinder is actuated by the valve rod or valve of the other cylinder; third, in the construction and arrangement of the air pump valves, which is peculiarly applicable to engines running at a high velocity where it is essential that these valves should close quickly.

In the double cylinder propeller engine represented in the accompanying drawings A, is the bed-frame which is cast hollow as shown in section at Fig. 2 and is bolted fast to the keelsons or timbers of the vessel. The condensers of the two cylinders are mounted upon the one side of this bed frame while the air pumps are mounted upon the opposite side. The condensers B have the form of a hollow cylinder open at the top and bottom; at their lower extremities they are secured to the bed frame and at their upper to flanges or ears C cast upon the steam cylinder. These condensers are each fitted with a rose adjutage *a* through which the injection water is introduced. The hot and cold water pumps D D′ are cast fast to the condenser, and their plungers are connected with the cross-head E of the steam piston rod F. The air pump barrel G is cast in one piece with its valve chests H H′ and side-pipes I. The barrel is prolonged above the head as represented at *b* to match the condensers at the opposite side of the bed frame, and the upper extremity of this prolonged portion is secured to a flange or ear C′ on the steam cylinder J. The condenser and air pump thus constructed from the columns on which the steam cylinder J is supported, while the hollow bed frame forms the cistern or well in which the water of injection and condensation collect and by which they are conducted to the air pump.

The steam cylinders J J are each mounted upon and secured to the upper extremities of their appropriate condensers B and air pumps G; they have also cast fast to them the steam valve chests K and the passages *c*, *c* which convey the exhaust steam to the upper extremity of the condenser. Each cylinder is fitted with a piston M, piston rod F, cross-head E, and connecting rod L which latter takes hold of the pin of a crank N secured to a crank shaft O beneath. The cross-head is steadied by guides secured to the inner faces of the condenser and air pump.

Each cylinder is fitted with an appropriate steam slide valve P which is moved by an appropriate eccentric secured to the crank shaft of the engine, and traverses upon a seat R in which the steam and exhaust ports *d e* are formed. Each steam slide valve consists of a block in which suitable passages *f*, *f*, *g*, are formed, which by the motion of the valve are made to move over the steam and exhaust ports of the valve seat. The face of each valve slides upon the valve seat, while the back of each valve forms a seat to which a supplementary slide valve *h* is fitted by whose movement the

steam passages *f* of the steam slide-valves are closed at the proper moment to cut off the admission of steam to the cylinder. The supplementary or cut-off valve of each cylinder is connected by a link and moved with the steam slide valve of the opposite cylinder, and as in this example the cranks and eccentrics of the two cylinders are set at right angles with each other, the cut-off valve is moved with greater speed while its appropriate slide valve is moving with least speed or is almost stationary. This method of arranging and working the valves is extremely advantageous in cutting off the steam as the operation is effected with rapidity, while it is peculiarly applicable to fast moving engines where it is desirable to employ the least complex and most simple machinery.

As it is important to be able to work the steam at full pressure throughout the whole length of the stroke of the piston, apertures *o o* are made in the sides of the steam valves, which are closed by suitable slide valves *i i;* these valves (*i i*) are connected with rods *v* which pass through the valve chest and are fitted to screws *t*, *t*, or other hand gear by means of which they can be moved or kept at rest in any desired positions. When the engine is to be worked at full pressure these supplementary valves are adjusted by the engineer in such positions that the apertures *o o* of the steam slide valves are uncovered throughout their whole stroke thus permitting the steam to enter through these apertures when those at the back of the steam valves are closed by the cut off valve *h*.

The air pumps of the engine represented in the accompanying drawing are double acting. Their piston rods *j* are connected with the extremities of the cross-heads of the steam piston rods, so that as the latter are moved to and fro the air pump pistons are moved in a corresponding manner. Each air-pump barrel is fitted with two valve chests, one H being situated near the bottom of the barrel, while the other H′ is situated near its upper extremity. Each valve chest contains two valves *k*, *l*, and their appropriate valve seats *m;* and each communicates with the adjacent air pump barrel by a passage *n* which leads from the space between the two valves. The lower valve chest is connected directly with the hollow bed frame, while the upper is connected therewith by means of a pipe I through which the water passes to the lower valve of the chest. The valves are conical or trumpet shaped in order that they may open without shock when the water strikes them, and each is secured to a tubular stem which traverses upon a stationary spindle *p*. The prompt closing of each valve is insured by a helical spring *r* coiled upon the stationary spindle and concealed within the tubular stem which also protects it from injury. As the air pump piston is moved to and fro in its barrel, the lower valves *l* of the valve chests rise alternately to admit the water to pass into the air pump barrel, while the opposite upper valves of each chest rise correspondingly to allow the water to pass to the discharge pipe Q. As the spaces in which the springs are inclosed are alternately diminished and increased in capacity by the opening and closing of the valves, it is essential that free passage should be given to allow the water, which may be drawn therein when the valve drops, to pass out freely as the valve opens, this is effected by perforating the tubular stems as represented at *s* in the accompanying drawings.

Economy of space is one of the most important requisites in steamers and it is believed that an engine of this arrangement and construction attains this requisite in a higher degree than any condensing engine heretofore in use. While it excels in this respect it is evident that such an engine will not weigh as much as others whose members are arranged in the usual manner, for in this engine the ordinary columns for supporting the steam cylinder are dispensed with, and the condenser and air pump are made to supply their place, as well as to do their own peculiar duty in the condensation of the steam and the production of the vacuum. This economy of weight in connection with the corresponding economy of space is all important as any saving in the weight and space occupied by the machinery increases in a corresponding manner the capacity of the vessel for carrying freight.

What we claim as our invention and desire to secure by Letters Patent is—

1. The construction and arrangement of the columns by which the steam cylinder is connected with the bed frame in such manner that they constitute the air-pump and condenser substantially as herein set forth.

2. The method herein described of actuating the cut-off valve of one steam cylinder by a motion derived from the valve or valve rod of the other cylinder substantially as herein set forth.

3. The adjustable supplementary valve (*i*) in connection with apertures or ports (*o*) in the steam valves, by means of which the steam can be worked at full pressure throughout the whole length of the stroke without disengaging the cut-off valves.

In testimony whereof we have hereunto subscribed our names.

R. F. LOPER.
J. W. NYSTROM.

Witnesses:
H. C. MEYER,
STEPHEN H. SIMMONS.