W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545, Patented Apr. 11, 1842.

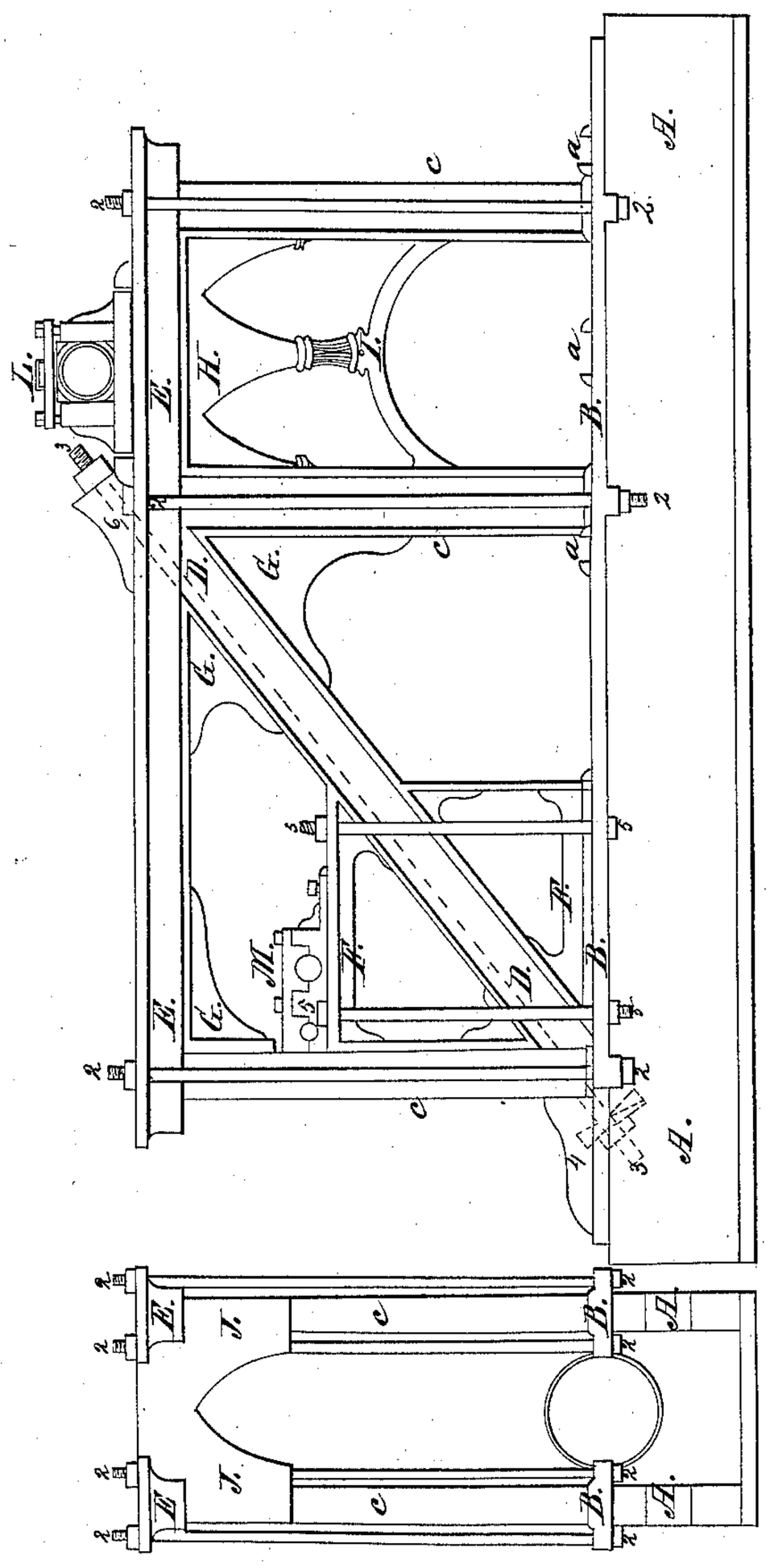


Fig. 1.

Sheet 2-6 Sheets.

W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545, Patented Apr. 11, 1842.

Fig: 2.

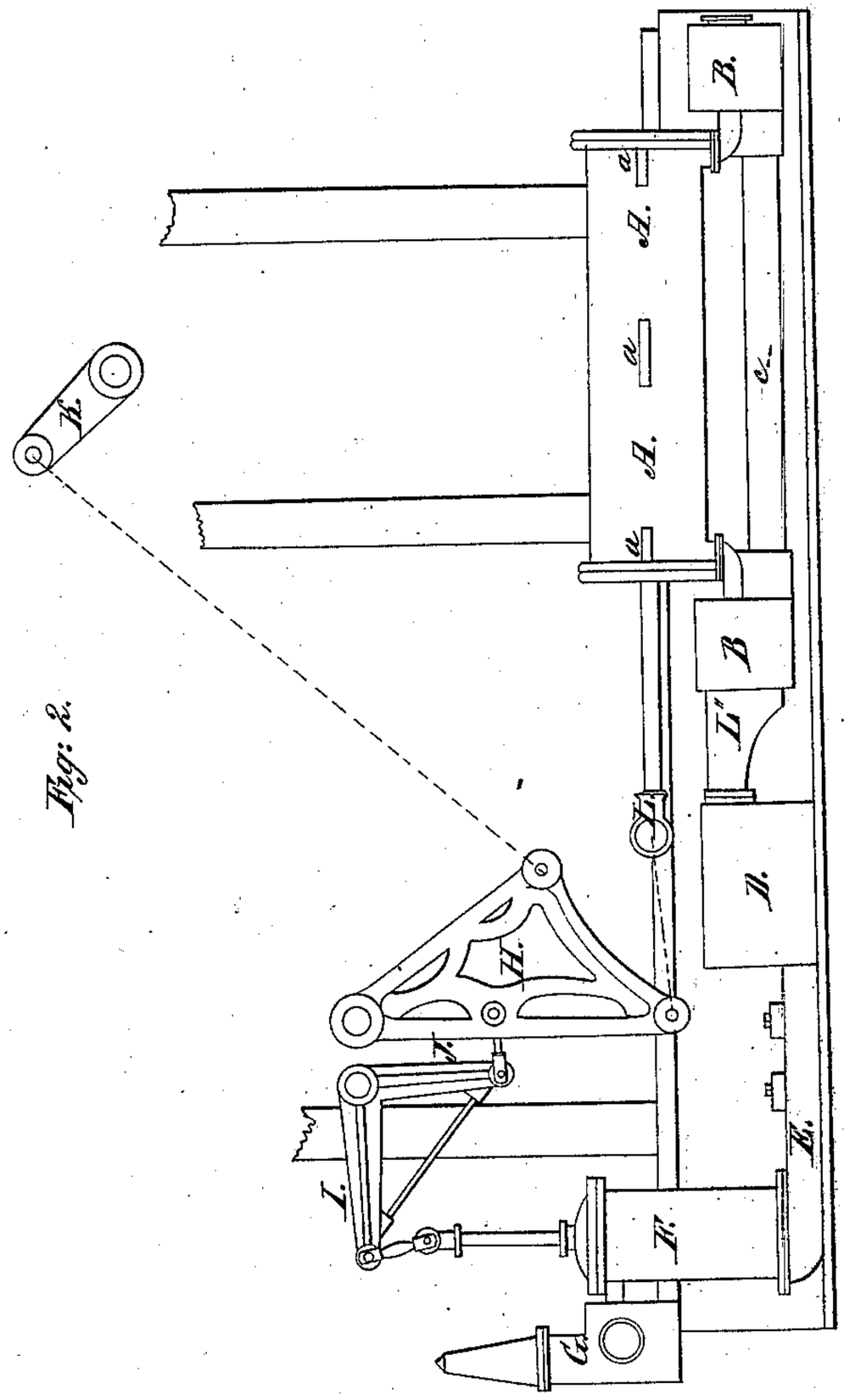
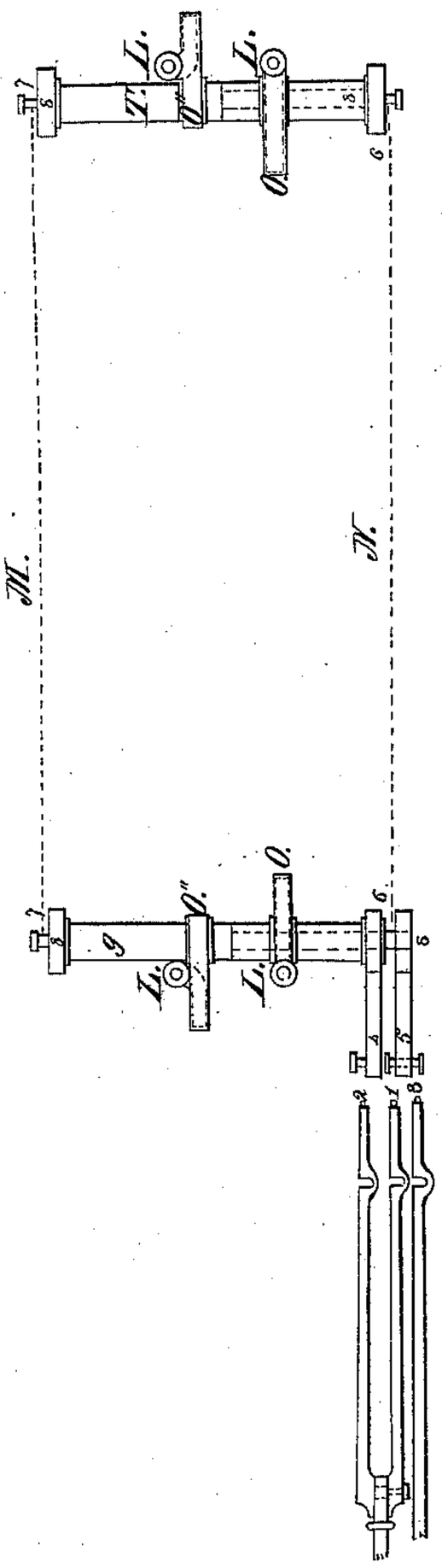


Fig: 4.

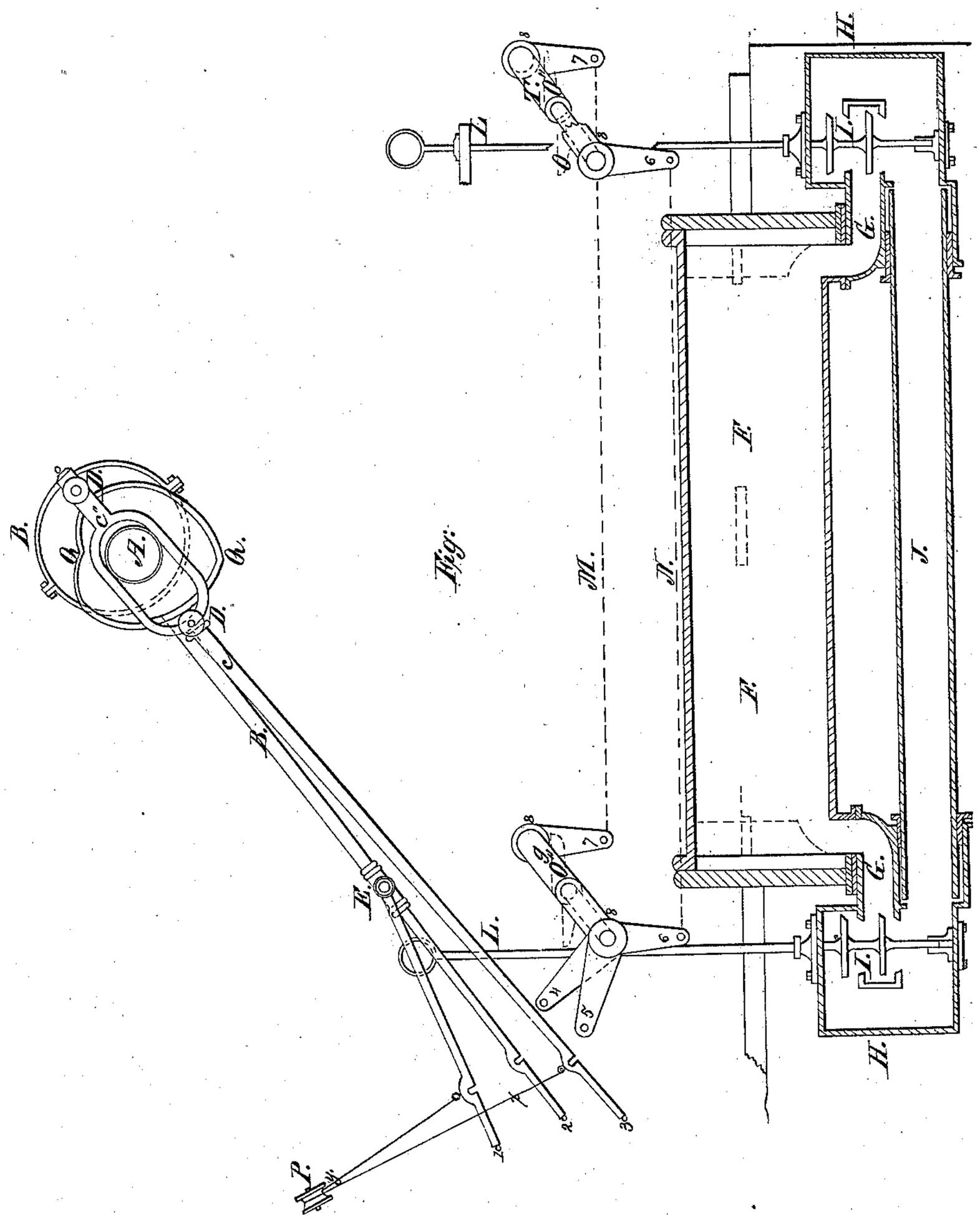


Sheet 3 - 6 Sheets.

W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545, Patented Apr. 11, 1842.

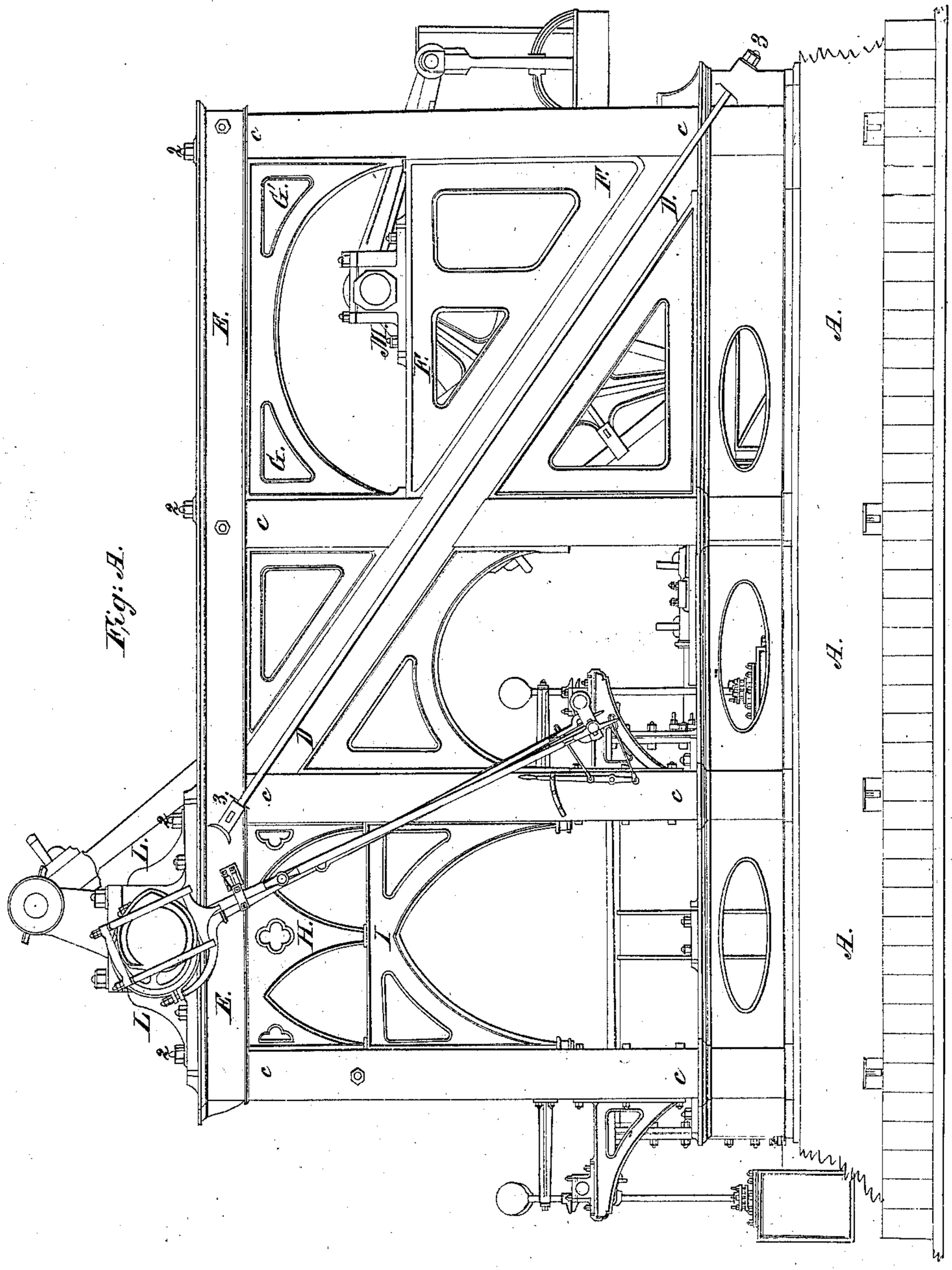


Sheet 4 - 6 Sheets.

W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545. Patented Apr. 11, 1842.



Sheet 5-6 Sheets.

W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545. Patented Apr. 11, 1842.

Fig: A.

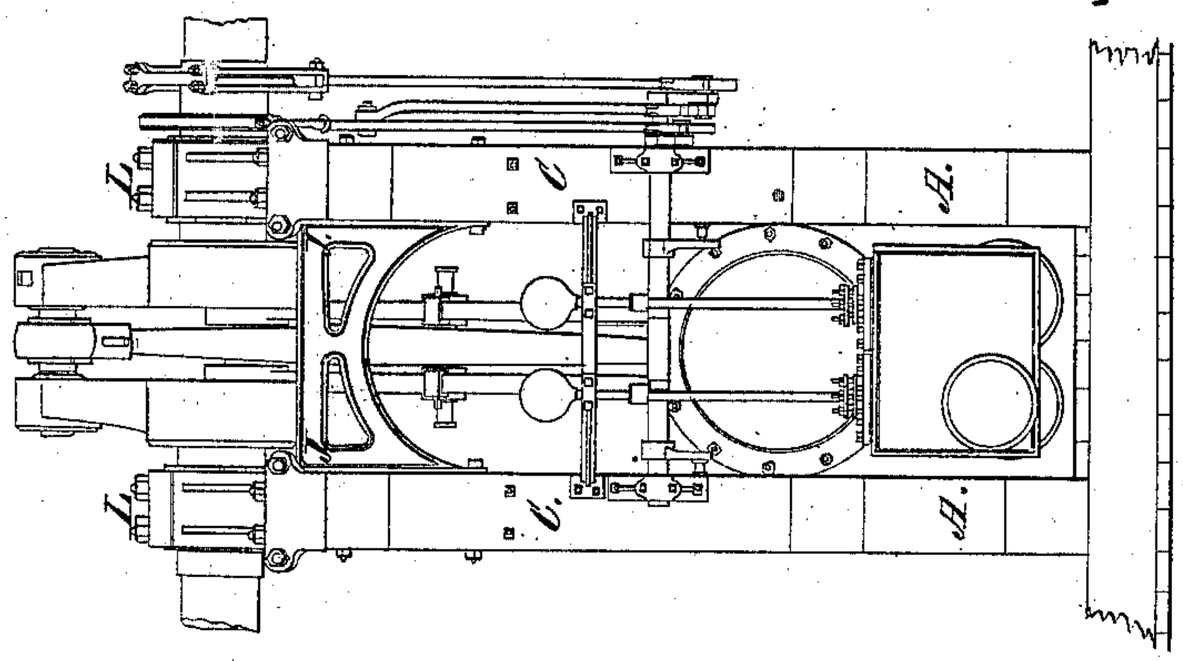
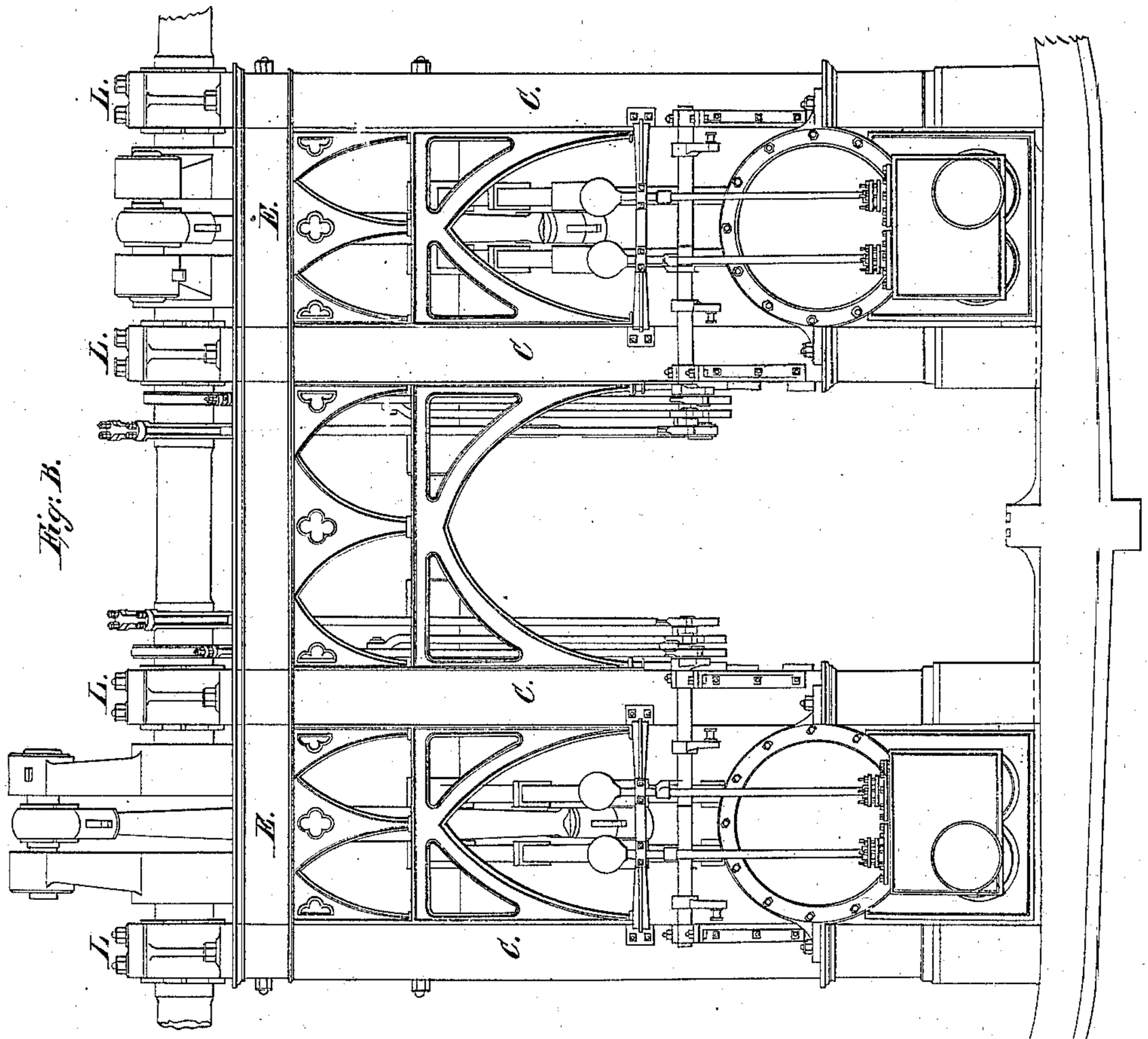


Fig: B.



Sheet 6-6 Sheets

W. A. Lighthall,

Reciprocating Steam Engine,

No. 2,545, Patented Apr. 11, 1842.

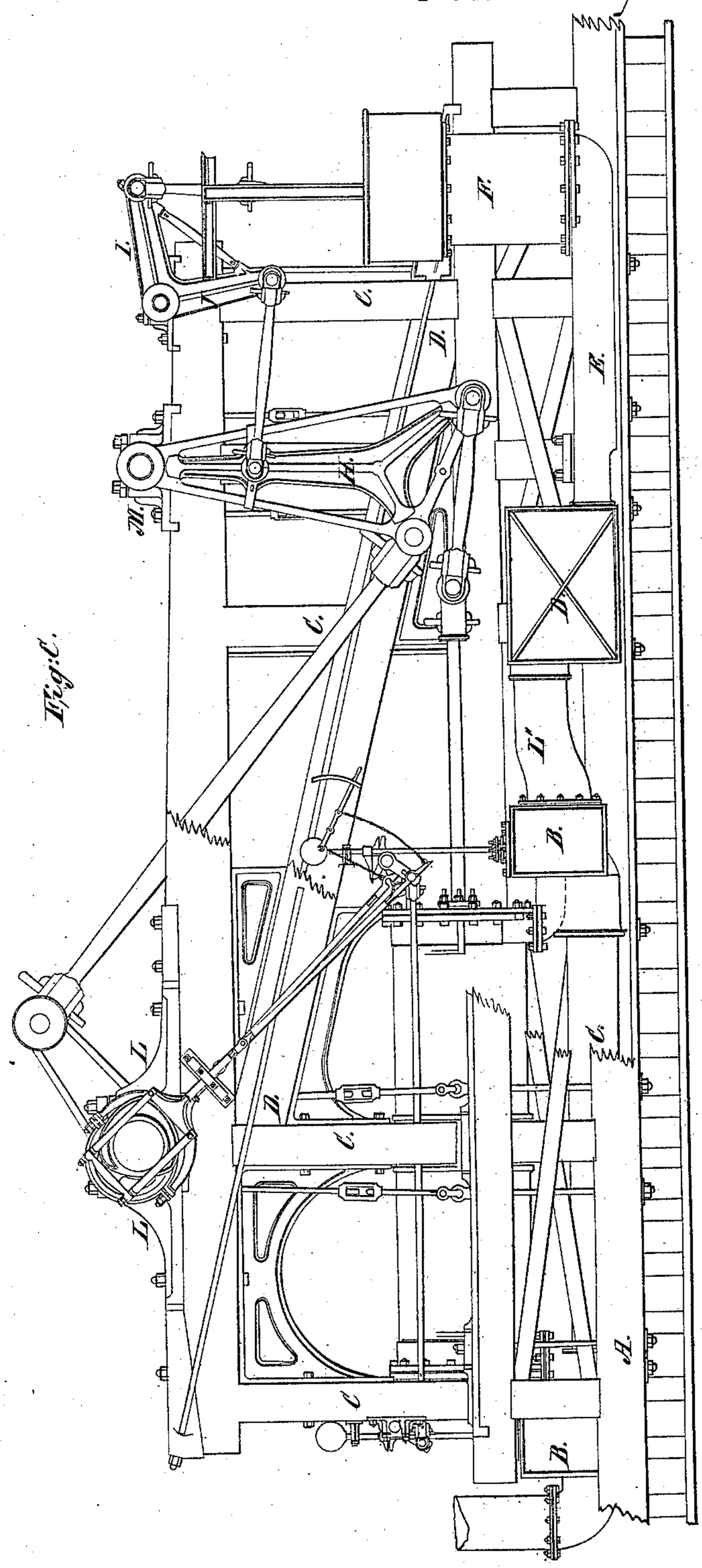


Fig. C.

UNITED STATES PATENT OFFICE.

WM. A. LIGHTHALL, OF ALBANY, NEW YORK.

MARINE STEAM-ENGINE.

Specification of Letters Patent No. 2,545, dated April 11, 1842.

To all whom it may concern:

Be it known that I, WILLIAM A. LIGHTHALL, of the city of Albany and State of New York, have made certain Improvements in Steam-Engines, and I do hereby declare that the following is a full and exact description of said improvements.

Figure 1 represents my improvements in the construction of the "frame" for the support of the different parts of said engine, when it is required to work a beam or half-beam.

A, A, represents the solid keelsons upon which is laid and firmly bolted a cast iron foundation, with sockets for the reception of the ends of the columns C, C, C. These columns may be either of wood or cast iron. E, E, is a castiron plate or "string piece" extending along the tops and embracing laterally the upper ends of said columns, along both sides of the columns are strong screw bolts 2, 2, 2, passing through the foundation and string piece; and by "nutting" them up the frame is firmly bound and held together in that direction. Instead of having screw bolts on either side of the column, one may be made to pass through the center of the column as shown in Fig. A.

D, D, represents a diagonal brace extending from the head of the column that supports the shaft pillow block L to the foot of the end column, directly below the beam pillow block M. A similar rod or screw bolt (represented by the dotted line) is let in the upper side of this brace, one end of which is shouldered or keyed into the cast iron abutment 4 and the other end receives a nut after passing through the saddle 6 which is cast solid with the string piece. Instead of this one rod or screw bolt there may be two, one on each side of this diagonal brace, as shown in Fig. A and Fig. C.

F, F, are cast iron angle braces held by the screw bolts 5, 5, giving additional strength to that part of the frame and at the same time supporting the pillow block for the half beam. In the boat engine the beam or half beam would be supported on the top or string piece as shown in Fig. C. The two sides or halves of the frame are held together by cast iron arches and bolts, as represented by J, J, in the end view. See also Figs. B, and D. In vessels of less depth of hold, it is only necessary to shorten the pillars or columns, and if the "whole bent beam" or yoke is worked instead of the half beam, then the diagonal brace D, D, should be reversed in position to meet the strain, that is, the lower end of the brace D, D, should rest in the angle at G′ and the upper end D, in the angle at *a*, at the foot of the column C *a*.

Fig. 2 represents my improvements in the arrangement and disposition of the cylinder, steam chests, side pipes, condenser, bed plate and air pump, if it be required to work an air pump and condenser.

A, A, is the cylinder lying horizontally upon the solid keelsons, sustained and supported in that position by the lugs *a*, *a*, *a*. If the cylinder be of large diameter, or it is necessary to raise it farther from the bottom of the vessel instead of carrying up the keelsons solid to support the same, it may rest upon a wood or cast iron frame as shown in Fig. A and Fig. C. B, B, the steam chests and *c* the side pipes under the cylinder and connected to its lower side, which can be seen more in detail by referring to Fig. 3 and also Fig. C, L″ the exhaust pipe. D, the condenser under the piston rod. L, which works over them; E, the bed plate, F, the air pump worked by the bell crank I, J, G the reservoir. See also Fig. C. In vessels of greater depth of hold, the air pump may be worked by an arm from the beam center and thus dispense with the bell crank. This arrangement brings all the parts above enumerated in line and between the two keelsons, thus occupying the least space and still perfectly accessible and by placing the side pipes and steam chests below the cylinder obviates all the difficulties and dangers consequent upon working water in the cylinder; for in this position of the openings, the engine will free herself rapidly and most effectually.

Fig. 3 represents more in detail the arrangement of the steam chests and side pipes below the cylinder, together with my improvements in working the valves for the horizontal cylinder, at full or half stroke, as may be required. See also Fig. 4.

A represents the main shaft with B, B^2, the ordinary eccentric and hook which has a branch hook E^1, working on a center at E. Attached to the same shaft is a heart cam Q, Q; between the eccentric and cam is a cast iron frame or guide which plays upon the shaft in the direction D, D, alternately, in accordance with the motion communicated to it by the revolution of the heart

cam, the edge or periphery of which is constantly in contact with the two friction rollers D, D, placed upon opposite ends of this guide. Attached to the guide is a rod C^3, by which the cam motion (which is the movement for effecting the half stroke) or making the steam valves perform the duty of expansion valves. 8, 8, 8′, 8′, are the rock shafts represented in plan at Fig. 4, one half solid and passing through the other half, which is hollow. 8, *g o* being the solid shaft and extending across, has the arm 5 attached to it and the arms 7, 7, attached to 8, *g*, *o*, and 8 T, O, respectively and also connected by a rod at M, passing from 7 to 7, it is evident that the arms 5, 7, 7, will have the same motion, that is, will move in union with each other the arm 5 being attached to that end of the solid shaft which passes through the hollow shaft. They are intended to work the steam valves and by hooking the rod C^3, upon the arm 5, the cam or half stroke motion will be given. In the same manner the other halves of the rock shaft and arms 8, 6—8, 6, are connected by a rod at N and the arm 4 being also connected with them, it is evident that if the eccentric rod B^2, be hooked on the arm 4, the motion of the eccentric will be given and thus work the valves on the exhaust side. If then it be required to work a full stroke, it is only necessary to unhook 3 (which receives motion from the cam) the half stroke and hook on 1, E, the branch from the eccentric and we will have the motion of the eccentric on the steam valves and also on the exhaust valves. For this purpose the center or journal in the arm 5 should pass through so that the branch eccentric may hook on one side and the cam hook on the other side of the arm.

A chain represented by the line *x*, *y* passing over the pulley P, should connect the branch eccentric hook and the cam hook, by which arrangement the hooking on one will necessarily unhook the other; or either of the well known modes of hooking on and unhooking, as shown in Fig. A, and Fig. C, may be adopted.

The valves are lifted in the ordinary manner by feet upon the rock shafts and toes upon the lifting rods, which lifters are either socketed and keyed to the valve stems just above the steam chests or continuations of the valve stems. Fig. 4 shows also the position of the lifters L, L, L, L, the feet O O attached to the solid half of the rock shaft and the feet O, O, attached to the hollow portion while the dotted lines represent the toes attached to each lifter. Instead of working the half stroke or cut off by means of the single frame and friction rollers as before described, the heart cam may be made to play or revolve against steel faces or hardened surfaces, as represented in Fig. A, and Fig. C.

In the foregoing specification, I claim as my improvement in the steam engine—

1. The arrangement and disposition of the steam chests, side pipes, condenser, exhaust pipe, bed plate and air pump, in combination with the cylinder lying horizontal upon the solid keelsons or frame, said cylinder being in the hold of the vessel, below the deck beams.

2. The mode of working the valves whole and half stroke by the combination of the eccentric wheel, eccentric hook and branch hook, the heart cam and cam hook together with the hollow rock shafts substantially as herein before described, in combination with the cylinder in the aforesaid horizontal position.

WILLIAM A. LIGHTHALL.

Witnesses:
WASH. Q. MORTON,
HAMILTON MORTON.