

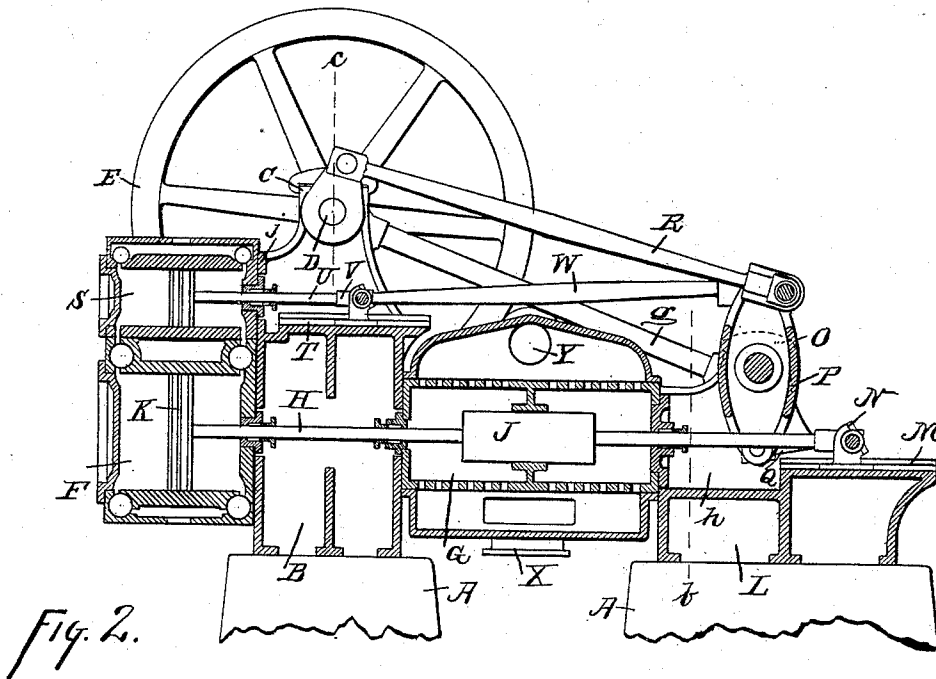
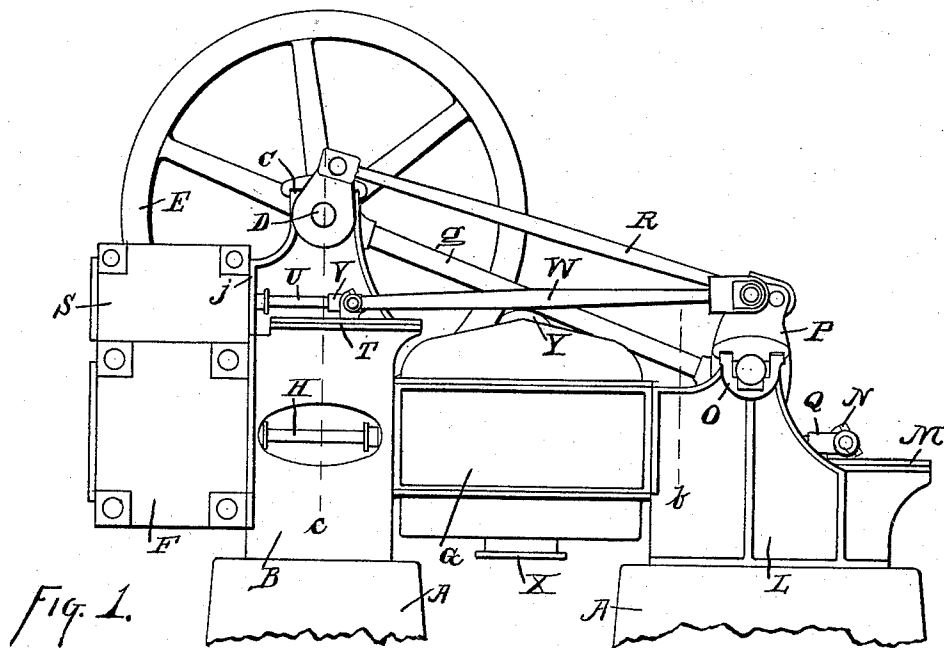
(No Model.)

3 Sheets—Sheet 1.

J. R. MAXWELL.
STEAM ENGINE.

No. 498,806.

Patented June 6, 1893.



Witnesses:
M. S. Bebb
P. P. Sheehan

James R. Maxwell Inventor
by James W. See
Attorney

(No Model.)

3 Sheets—Sheet 2.

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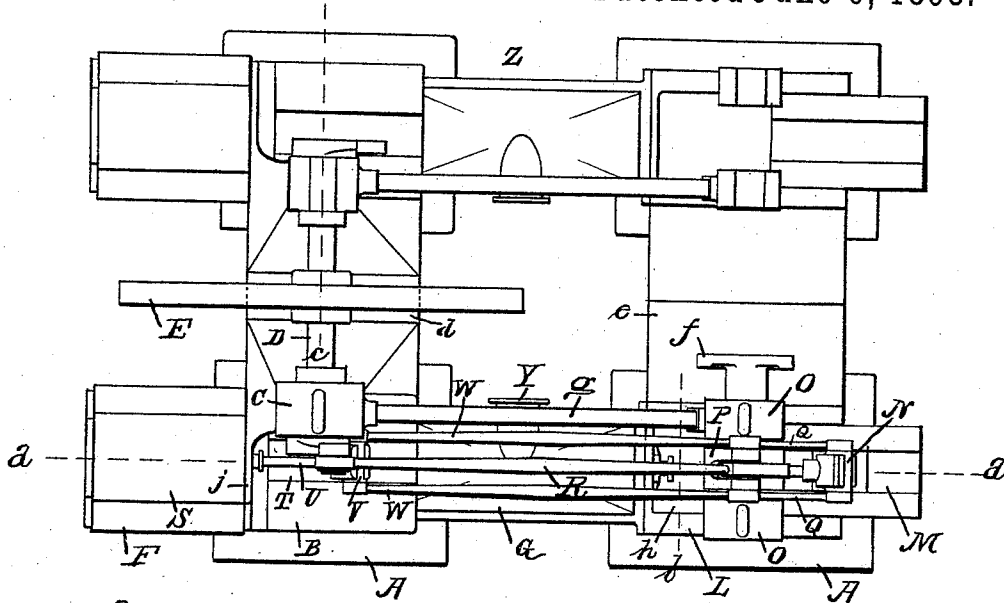


Fig. 3.

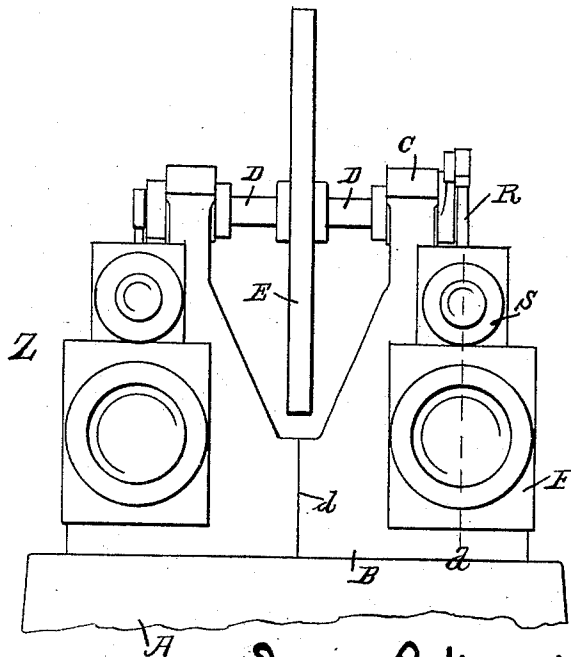


Fig. 4.

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(No Model.)

3 Sheets—Sheet 3.

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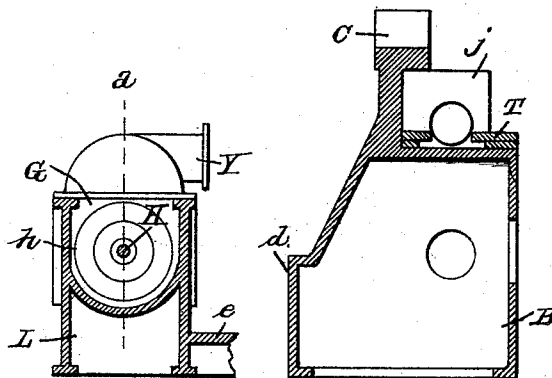
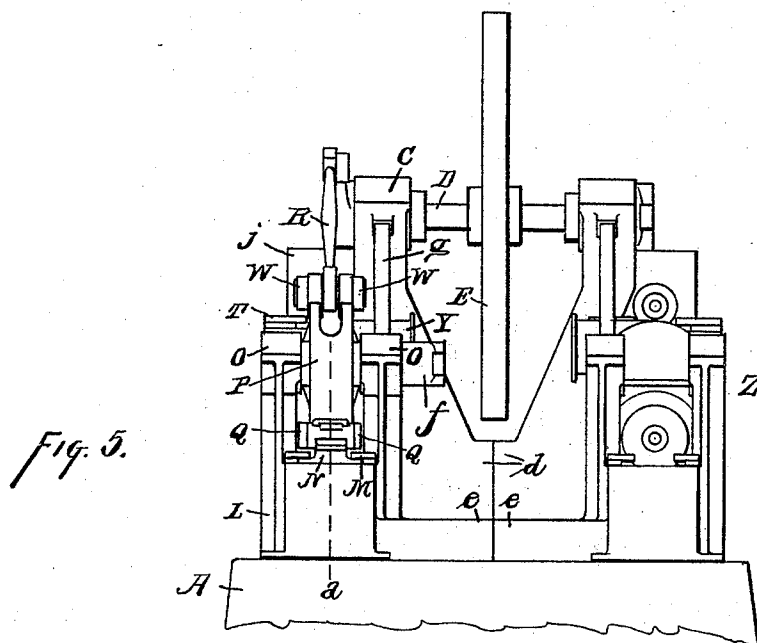


Fig. 6.

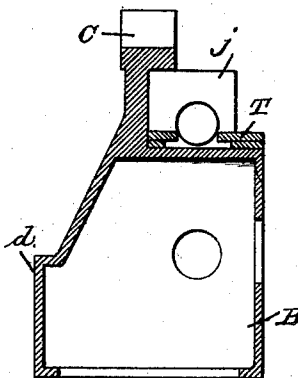


Fig. 7.

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UNITED STATES PATENT OFFICE.

JAMES R. MAXWELL, OF CINCINNATI, OHIO.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 498,806, dated June 6, 1893.

Application filed June 29, 1892. Serial No. 438,482. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. MAXWELL, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

This invention pertains to improvements in the general construction of steam engines and the improvements will be readily understood from the following description taken in connection with the accompanying drawings in which—

Figure 1, is a side elevation of a steam engine exemplifying my present improvements in connection with a twin compound steam pumping engine; Fig. 2, a vertical transverse section of the same in the plane of line *a* of other figures; Fig. 3, a plan of the engine with the moving parts of the farther twin removed; Fig. 4, an end elevation at the steam end of the engine, being the left hand end of the figures previously referred to; Fig. 5, an end elevation at the beam end of the engine, the motion work of the farther twin being omitted; Fig. 6, a vertical transverse section of the beam-housing L of the nearer twin, taken in the plane of line *b* of other figures; and Fig. 7, a vertical transverse section of the crank-housing of the farther twin, taken in the plane of line *c* of other figures.

I illustrate my improvement in connection with two engines arranged as twins operating upon a single crank-shaft. The literal description will be generally confined to that one of the twins nearest the spectator as the machine appears in Figs. 1 and 2.

In the drawings, confining attention to Figs. 1 and 2, as far as practicable:—A, indicates the foundation: B, a vertically disposed crank-housing consisting of a columnar box-like structure standing upon the foundation: C, a pillow-block formed in an upward extension from the inner portion of the top of the crank-housing: D, a crank-shaft journaled in this pillow-block and finding its outboard bearing in the pillow-block of the second engine, in case the engines are arranged as twins, as in the exemplification: E, a fly-wheel on the crank-shaft, between the two bearings of the shaft: F, a horizontal steam cylinder secured against one of the end faces of the crank-housing B, this cylinder, in the exemplifica-

tion, being the low-pressure cylinder of a compound engine: G, a pump-barrel secured against the end face of the crank-housing B 55 opposite the cylinder F and in axial line with that cylinder: H, the piston-rod of the cylinder F, forming also the pump-rod, and extending from the cylinder F through the crank-housing B and through the pump-barrel and 60 outwardly beyond the pump-barrel: J, the pump plunger, fast on this piston-rod: K, the piston of the cylinder F: L, a beam-housing, consisting of a low box-like structure resting upon the foundation and secured to the end of 65 the pump-barrel opposite the crank-housing. M, a crosshead-guide formed in the beam-housing L parallel with and below the axis of the pump-barrel and some distance outward from the end of the pump-barrel: N, a cross- 70 head secured to the outer end of the piston-rod H and arranged for reciprocation in the guide M: O, a pair of pillow-blocks formed in upward extensions of the beam-housing L, one at each 75 side of the piston-rod of the pump: P, a beam having centrally disposed trunnions carried by the pillow-blocks O, the beam being disposed, when in central position, substantially vertically, the lower end of the beam being 80 notched or gapped to permit of the presence of the piston-rod H and the upper end being similarly gapped to receive a connecting-rod between its two side webs: Q, a pair of links 85 connecting the lower end of the beam with the crosshead N, there being a link outside each side of the beam and crosshead and equi-distant from the axial line of the pump-barrel: R, a connecting-rod connecting the 90 upper end of the beam and the crank of the shaft B, this rod being disposed in the same vertical plane with the piston-rod H: S, a steam cylinder mounted above the low-pressure cylinder F and secured at its forward end to a flange projecting upwardly from the 95 crank-housing, this cylinder, in the present case, being the high-pressure cylinder of the compound engine: T, a crosshead-guide formed in the upper portion of the crank-housing D: U, the piston-rod of the high- 100 pressure cylinder S: V, a crosshead on this piston-rod and arranged for reciprocation in the guide T: W, a pair of connecting-rods connecting the crosshead V with the upper end of the beam P, there being a rod at each

side outside the crosshead and beam and equi-distant from the vertical plane of the piston-rod H: X, suction-connection for the pump: Y, discharge connection for the pump: Z, (Fig. 3) the farther engine of the pair, in all respects like the engine just described except that one may be called right-handed and the other left-handed, this second engine operating on a second crank on the crank-shaft D set about quartering to the first crank: *a*, *b* and *c*, dotted lines indicating the planes of cross-section views in the drawings: *d*, (Fig. 4) projections from the inner faces of the crank-housings to a point of juncture unifying the two crank-housings in the case of twin engines: *e*, similar projections from the inner faces of the beam-housings L to unify the two beam-housings: *f*, a rocker on the inner trunnion of beam P to serve, if desired, as a means for operating an air pump or feed pump setting upon the extension *e* below the rocker: *g*, a diagonal stretcher-rod or tie extending from the pillow-block C diagonally downward to the inner one of the pillow-blocks O: *h*, (Fig. 6) a trough formed in the upper portion of the beam-housing I between the two upward extensions thereof which carry the pillow-blocks, the inner wall of this trough clearing the periphery of the cylinder-head of the pump at the beam end of the pump: *j*, the flange previously referred to as projecting upwardly from the crank-housing to engage the forward end of the high-pressure cylinder, this attaching flange being formed with the upward projection of the crank-housing which carries the pillow-block C.

Piston K operates the pump plunger and oscillates the beam and turns the crank-shaft in an obvious manner. The high-pressure piston, acting through rods W, also oscillates the beam, and the reciprocations of the two pistons are in opposite directions appropriate to this type of compound engine. All of the working strains applied to and through the beam O are centrally or symmetrically applied, there thus being no twisting strains upon the beam, and the thrusts upon the two beam-trunnions are equal. The crank-housing and beam-housing rest directly upon the foundation and support the working parts of the engine entirely independent of the steam-cylinder and pump-barrel, the pump-barrel acting merely as a bracing stretcher between the crank-housing and the beam-housing. The tie *g* introduces strength in the direct line of strain between the crank-bearing and the beam-bearing. Remove the high-pressure cylinder S, with its connections W, and the structure, consisting of one of the twins only, becomes a simple engine instead of a compound. Remove the low-pressure cylinder F, retaining the cylinder S, and the structure becomes a simple engine. Remove the pump-barrel G, and the structure becomes a compound motive power engine, or a simple one in case one of the steam cylinders is re-

moved. The parts are accessible to a peculiar degree, for inspection and repair, owing largely to the fact that neither of the steam-cylinders or the pump-barrel engage the foundations direct or themselves form the foundations for the other parts. By disconnecting the rods and links which engage the beam, the beam may be turned horizontally and then piston K may be removed and the front cylinder-head of the pump may be unbolted and the piston-rod H and the plunger J may be withdrawn endwise from the machine. The steam cylinder or the pump-barrel, or the crank-shaft, or the beam may be readily removed separately and without general disturbance of other heavy parts of the machine.

When twin engines are employed, as in the exemplification, the peculiar disposition of the pump-barrels between the housings which rest upon the foundation provide excellent facility for arranging the water connections which may be coupled as desired across the machine from one twin to the other without interfering with the main parts of the machine.

I claim as my invention—

1. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block in its upper part, a crank-shaft journaled in such pillow-block, a beam-housing resting on the foundation apart from the crank-housing and having a crosshead-guide and a pillow-block, a crosshead in said guide, a removable tie or stretcher between said crank-housing and beam-housing, a beam mounted in said beam-housing, a connection from the upper end of said beam to the crank, a steam-cylinder secured against the face of said crank-housing farthest distant from said beam-housing, a piston-rod extending from the piston of said cylinder through said crank-housing to said crosshead-guide, and links connecting said crosshead with the lower end of said beam said piston-rod being disposed at right angles to said crank-shaft and in the vertical plane of its crank and a distance below said shaft in excess of the length of said crank.

2. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block and crosshead-guide in its upper part, a crosshead in said guide, a crank-shaft journaled in such pillow-block, a beam-housing resting on the foundation apart from the crank-housing and having a pillow-block, a removable tie or stretcher between said crank-housing and beam housing, a beam mounted in said beam-housing, a connection from the upper end of said beam to the crank, a steam-cylinder secured against the face of said crank-housing farthest distant from said beam-housing, a piston-rod extending from the piston of said cylinder to said crosshead, and rods connecting said crosshead with the upper end of said beam said piston-rod being

disposed at right angles to said crank-shaft and in the vertical plane of its crank and a distance below said shaft in excess of the length of said crank.

3. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block in its upper part, a crank-shaft journaled in such pillow-block, a beam-housing resting on the foundation apart from the crank-housing and having a crosshead-guide and a pillow-block, a crosshead in said guide, a removable pump secured to and between said crank-housing and beam-housing, a beam mounted in said beam-housing, a connection from the upper end of said beam to the crank, a steam-cylinder secured against the face of said crank-housing farthest distant from said beam-housing, a piston-rod extending from said cylinder through said crank-housing and pump to said crosshead-guide, and links connecting said crosshead with the lower end of said beam.

4. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block and crosshead-guide in its upper part, a crosshead in said guide, a crank-shaft journaled in such pillow-block, a beam-housing resting on the foundation apart from the crank-housing and having a pillow-block, a removable pump secured to and between said crank-housing and beam-housing, a beam mounted in said beam-housing, a connection from the upper end of said beam to the crank, a steam-cylinder secured against the face of said crank-housing farthest distant from said beam-housing, a piston-rod extending from the piston of said cylinder to said crosshead, and rods connecting said crosshead with the upper end of said beam.

5. In a steam engine, the combination, substantially as set forth, of a vertically-disposed crank-housing standing on a foundation and having a pillow-block and crosshead-guide in its upper part, a crank-shaft journaled in such pillow-block, a beam-housing resting on the foundation apart from the crank-housing and having a crosshead-guide and a pillow-block, a removable pump secured to and between said crank-housing and beam-housing, a beam mounted in said beam-housing, a connection from the upper end of said beam to the crank, a steam-cylinder secured against the face of said vertically-disposed crank-housing farthest distant from said beam-housing, a piston-rod extending from the piston of said cylinder through said crank-housing and pump to a crosshead in the crosshead-guide of the beam-housing, links connecting said crosshead with the lower end of said beam, a second cylinder secured to said crank-housing above the first cylinder, a second crosshead on the piston-rod of said second cylinder and working in the crosshead-guide of the crank-housing, and rods connecting the upper end of said beam with said second

crosshead said piston-rod being disposed at right angles to said crank-shaft and in the vertical plane of its crank and a distance below said shaft in excess of the length of said crank.

6. In a steam engine, the combination, substantially as set forth, of a pair of vertically disposed crank-housings standing on a foundation side by side and secured together at their bases and provided each with a pillow-block in its upper part, a crank-shaft journaled in said pillow-blocks and carrying a fly-wheel between the pillow-block, a beam-housing in line with and forward of each crank-housing and provided with a pillow-block, a beam mounted in each of said beam-housings, removable ties or stretchers between said beam-housings and crank-housings, a steam cylinder secured against the outer face of each of said crank-housings, and connections from said beams to the cranks and to the pistons of the cylinders the axes of said steam cylinders being located in the vertical planes, respectively, of the cranks of said crank-shaft and below said shaft a distance in excess of the length of the cranks.

7. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block in its upper part, a crank-shaft journaled in such pillow-block, a steam-cylinder secured against one face of said crank-housing, a pump secured against the opposite face of said crank-housing, a beam-housing resting on the foundation and secured to the opposite end of the pump and having its upper portion trough-shaped and having a pillow-block in the upper portion of each side wall of the trough, a beam mounted in the pillow-blocks of said beam-housing, and connections from said beam to said crank and pump and steam cylinder.

8. In a steam engine, the combination, substantially as set forth, of a vertically disposed crank-housing standing on a foundation and having a pillow-block at its upper part, a steam cylinder secured against one face of said crank-housing, a beam-housing disposed forward of the crank-housing and having a pillow-block, a removable tie or stretcher between said beam-housing and crank-housing, a beam mounted in said beam-housing, a crank-shaft mounted in the pillow-block of said crank-housing, a connecting-rod engaging said crank with the wrist in said beam in the central vertical plane of the beam, a piston-rod and cross-head for said steam-cylinder, and connecting-rods or links engaging said crosshead and beam at each side of said first mentioned connecting-rod said piston-rod being disposed in the vertical plane of the crank of said crank-shaft and below it a distance in excess of the length of said crank.

9. In a steam engine, the combination, substantially as set forth, of a crank-housing standing on a foundation and having a pillow-block in its upper part, a steam-cylinder

secured against one face of said crank-housing, a crank-shaft mounted in said pillow-block, a beam-housing disposed forward of said crank-housing and having a pillow-block in its upper portion, a removable stretcher or tie connecting said beam-housing and crank-housing below the level of said pillow-blocks, and a tie extending from one of said pillow-

blocks to the other the axis of said cylinder being disposed in the vertical plane of the crank of said crank-shaft and below it a distance in excess of the length of said crank.
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PERLEY. P. SHEEHAN.