

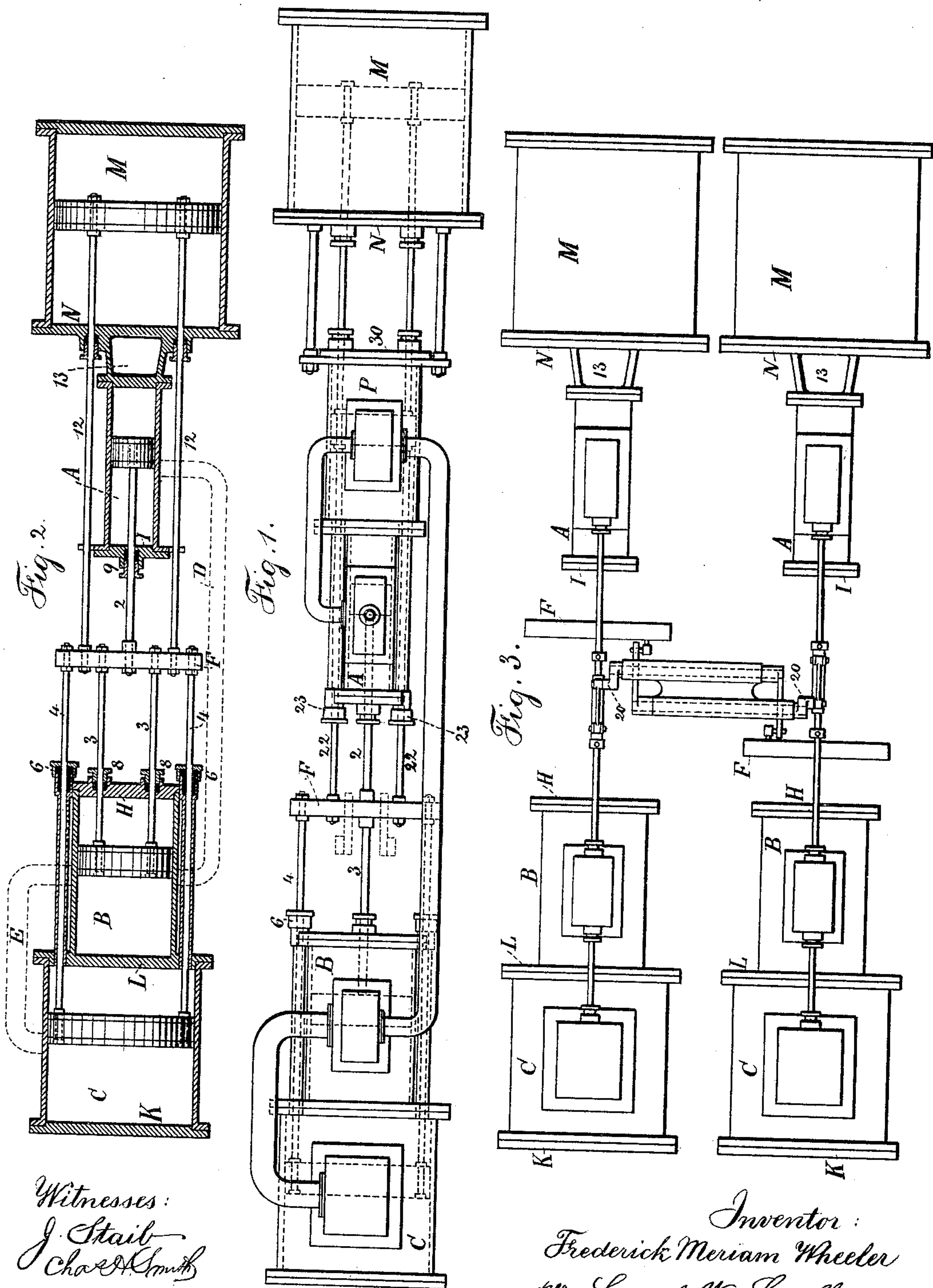
(No Model.)

2 Sheets—Sheet 1.

F. M. WHEELER.
EXPANSION ENGINE.

No. 410,722.

Patented Sept. 10, 1889.



Witnesses:
J. Stail
Chas. A. Smith

Inventor:
Frederick Meriam Wheeler
per Lemuel W. Serrell atty.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

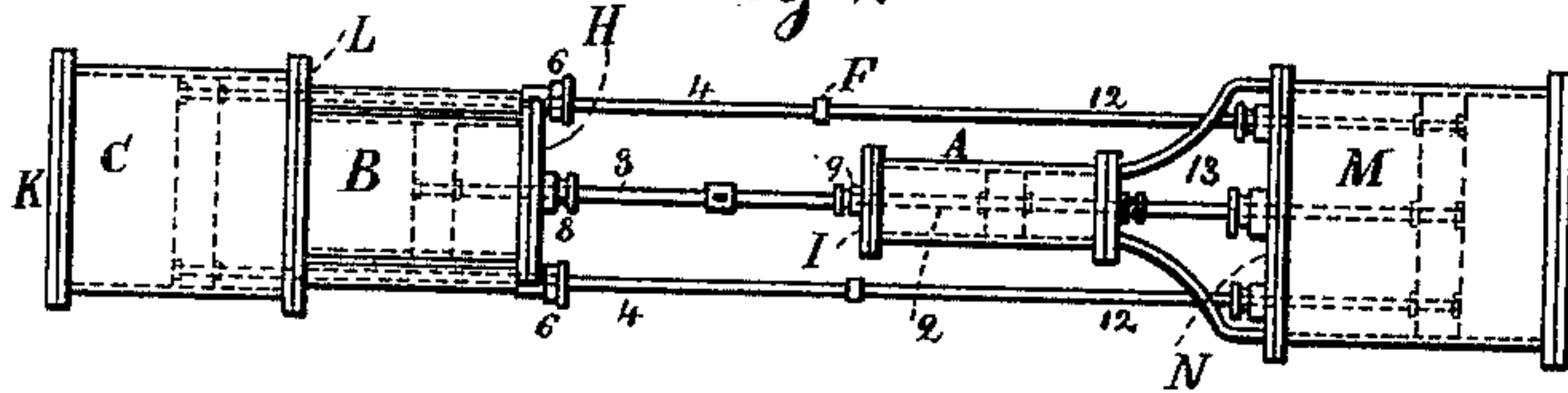


Fig. 5.

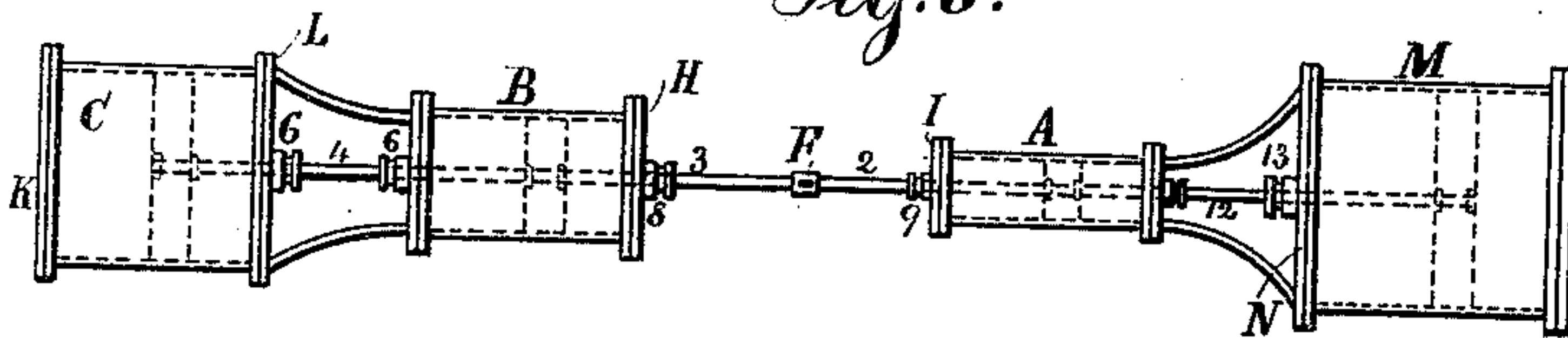


Fig. 8.

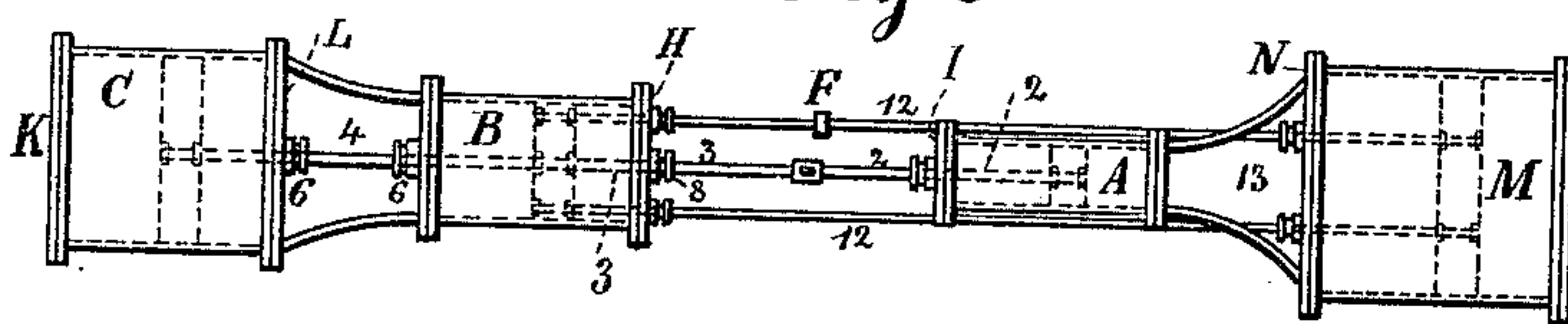


Fig. 9.

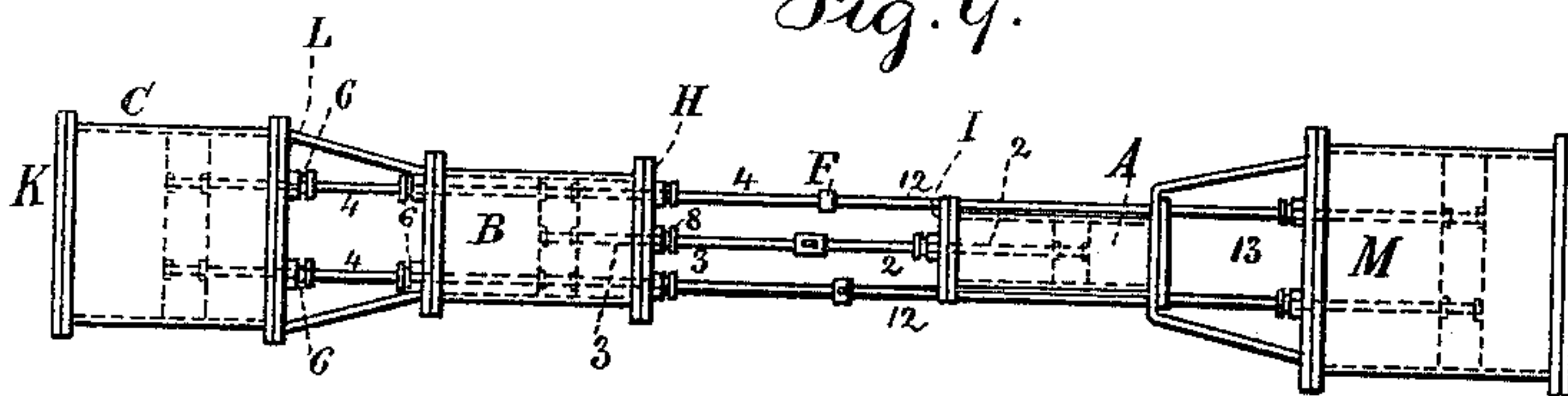


Fig. 6.

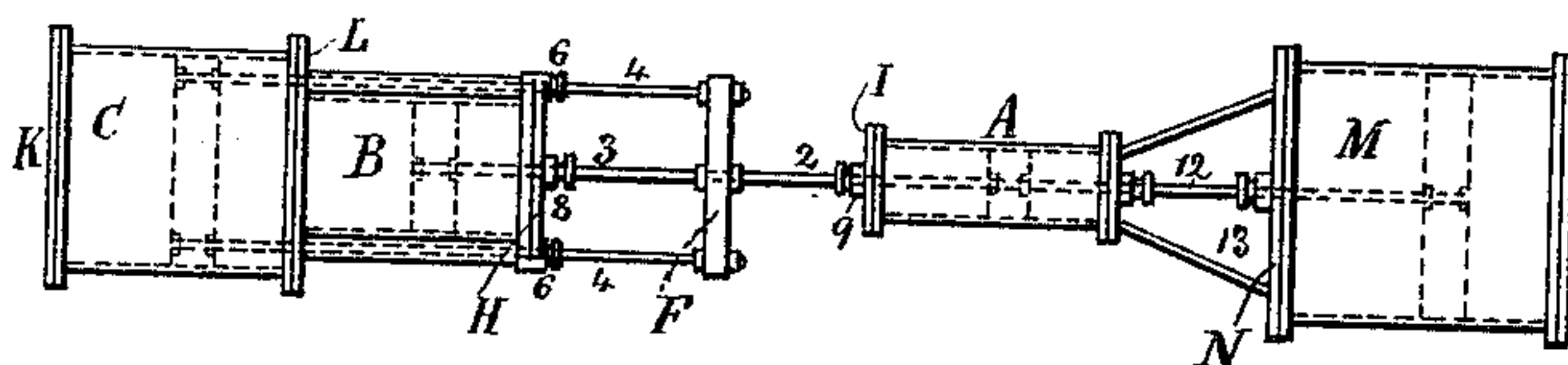
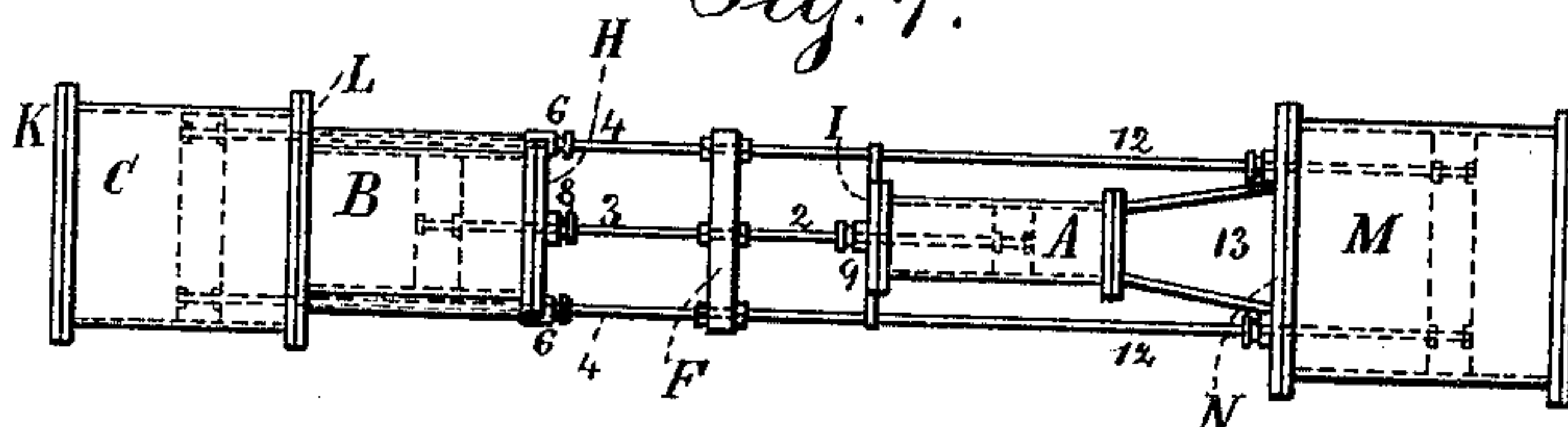


Fig. 7.



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UNITED STATES PATENT OFFICE.

FREDERICK MERIAM WHEELER, OF MONTCLAIR, NEW JERSEY.

EXPANSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 410,722, dated September 10, 1889.

Application filed December 31, 1888. Serial No. 295,017. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MERIAM WHEELER, of Montclair, in the county of Essex and State of New Jersey, have invented
5 an Improvement in Expansion-Engines, of which the following is a specification.

This engine is especially intended for direct-acting pumps; but it is available for driving other machinery. In my present improve-
10 ments I make use of a cross-head or connection for receiving the piston-rods of the high-pressure and expansion cylinders, there being an open space between two of the cylinders, so that the cylinders can be opened to give
15 access to the pistons for packing or repairing the same, the heads that are upon the ends of the cylinders near the cross-head being removable to give access to the pistons of those cylinders and the back heads, or heads at the
20 distant ends of the cylinders being also removable to give access to the pistons of the cylinders farthest away from the cross-head.

My improvement is available with one high-pressure cylinder and either two or three
25 cylinders into which the steam is allowed to expand.

In the drawings, Figure 1 is a plan view representing four steam-cylinders and a pump-cylinder. Fig. 2 is a sectional plan of three
30 steam-cylinders and a pump-cylinder, and Fig. 3 is a diagram illustrating the position and mode of operation of duplex pumping-engines. Figs. 4 to 9 are diagrams showing slight modifications.

35 The cylinder A is to receive steam under a high pressure, and the steam is allowed to exhaust from this cylinder A into the cylinder B, and to expand therein and act upon the piston, and from the cylinder B the steam is al-
40 lowed to pass into the cylinder C and act upon its piston as such steam expands.

In Fig. 2 I have represented by dotted lines a steam-pipe D, to connect the steam-chest of the cylinder A to the steam-chest of the cyl-
45 inder B, and a pipe E, to connect from the steam-chest of the cylinder B to the steam-chest of the cylinder C, and I remark that the valves in the respective steam-chests are all to be moved simultaneously first one way and
50 then the other. These valves may be of any desired character, and it is not necessary to

show the details of the same herein. I how-
ever refer to my application, Serial No. 291,671, filed November 23, 1888, for an illus-
tration of valves that might be employed in 55
this engine.

The cross-head F is shown in Figs. 1, 2, and 3 as between the cylinders A and B, and to the same the piston-rod 2 from the piston in the cylinder A is connected, also the piston-
60 rods 3 3 from the piston in the cylinder B, and the rods 4 4 are also connected to the cross-head F, and they pass to the piston in the cylinder C. It is preferable to make use of tubular cases extending along the sides of 65
the cylinder B, and provided at their outer ends with glands or stuffing-boxes 6, through which the piston-rods 4 pass, and there are glands or stuffing-boxes 8 upon the head H of the cylinder B, through which the piston-rods 70
3 pass, and there is a gland or stuffing-box 9 upon the head I of the cylinder A for the piston-rod 2. It will now be apparent that, the cross-head F being between the cylinders A and B, the heads H or I can be unbolted and
75 slipped toward the cross-head to give access to the pistons in either cylinder A or B for packing or repairing such pistons, and the back head K of the cylinder C can be removed to give access to the piston in such cylinder 80
C, and neither of the cylinders will have to be unbolted or removed in packing or repairing the pistons, and the head L, which is between the cylinders B and C, may be either a separate head to which the flanges of the 85
cylinders B and C are bolted, or a head L can be cast with the cylinder B; but I prefer to cast both the cylinder B and the head L in one, so as to avoid the use of packing or the bolting of the parts together. 90

In Fig. 2 I have shown a pump-cylinder M and the piston-rods 12 passing through glands or stuffing-boxes upon the head N, and fast-
ened at one end to the piston in the cylinder M and at the other end to the cross-head F, 95
so that the steam-pistons and the pump-pistons are moved simultaneously and in the same alternating directions, and by fastening the steam-cylinder A to the head N of the pump-cylinder M it becomes unnecessary to 100
provide a pedestal or support below the cylinder A, as the head of the cylinder M furnishes

the necessary support; but it is advantageous to provide a space 13 between the back head of the cylinder A and the head N of the pump M to prevent the steam-cylinder being cooled by the close proximity of the pump-cylinder.

This arrangement of steam-cylinders and pump can be duplicated, as illustrated in Fig. 3, and worked in the manner common in duplex pumps—that is to say, the cross-head of one engine moves the valves of the other engine at the ends of the strokes—so that one engine remains quiescent, or nearly so, during the stroke of the other engine. In Fig. 3 the levers 20 are represented for giving motion at the ends of the stroke to the valve-rods of one engine by the cross-head of the other engine.

In Fig. 1 I have represented four steam-cylinders A, B, C, and P. In this case the actions of the cylinders A B C and the arrangement of the cross-head and connecting-rods correspond to that shown in Fig. 2, with the exception that I have shown the piston-rod 2 of the cylinder A in line with the piston-rod 3 of the cylinder B, the same being attached at their ends to the respective pistons and to the cross-head F; and I have represented the piston-rods 22 as extending from the cross-head F to the piston in the cylinder P, such piston-rods passing through cases at the sides of the cylinder A, which cases are provided at their ends with the glands or stuffing-boxes 23. Where the four steam-cylinders are used, as in Fig. 1, it is preferable to pass the steam from the cylinder A to the cylinder P, and thence to the cylinder B, and from there to the cylinder C, so as to make the steam-pipes as short as possible.

It will be apparent that in either form of expansion-engine shown a connection can be made from the cross-head F to a bell-crank lever or to a walking-beam by links passing off from the cross-head, as shown by dotted lines in Fig. 1, and that the pump may be vertically driven by walking-beams, such as shown in Letters Patent No. 306,467; or when the four cylinders are made use of, as shown in Fig. 1, the rods 22 may be extended to the rear through the back cylinder-head 30 and be connected to a pump M, there being sufficient space between the cylinder P and the pump M for allowing the cylinder-head 30 to be slipped back to give access to the piston in the cylinder P.

Upon reference to the diagrams it will be observed that Fig. 4 is the same as Fig. 2, except that the piston-rods 2 3 and 4 12 are in line with each other and extended to the piston M in the pump-cylinder.

Fig. 5 shows the piston-rods all in line; but to introduce the proper packing around the piston-rod of the cylinder C it is necessary to separate this cylinder C from the cylinder B sufficiently for the glands 6.

Fig. 6 corresponds to Fig. 2, except that the piston-rods 2 and 3 are in line and prolonged

as the rod 12 to the piston of the pump-cylinder M.

Fig. 7 corresponds to Fig. 2, except that the piston-rods 2 and 3 are in line with each other, and so also are the rods 4 and 12.

Fig. 8 corresponds to Fig. 2, except that the piston-rod 4 of the cylinder C is in line with the rod 2 and 3, and the glands 6 are between the cylinders B and C, as in Fig. 5, and the rods 12 are extended and connected to the piston in the cylinder B, so as to render a cross-head unnecessary.

Fig. 9 shows the piston-rods 2 and 3 in line and the rods 4 as continued through the cylinder B and glands 6 to the piston of the cylinder C, these rods also being fastened to the piston of the cylinder B.

In all these cases the pistons and rods are rigidly connected, so as to move together, and a space is left between the cylinder A and the cylinder B sufficient to allow for the removal of the respective heads one toward the other to give access to the piston of either cylinder.

In some direct-acting engines the device that gives motion to the valve is in the form of a tappet or collar on the piston-rod, and this is the known equivalent of the cross-head, and I remark that in engines such as illustrated in Figs. 4, 5, 8, and 9 the rods are so connected to the pistons that they all move together, and it is not necessary to use the cross-head as a connection, and the tappet at F can be used to operate the valves.

Fig. 3 illustrates how the engines containing my improvement can be operated as duplex engines, and I remark that any of the engines shown in the diagrams can be thus arranged as duplex pumping-engines.

I claim as my invention—

1. The combination, with the high-pressure cylinder A and expansion-cylinders B and C, of the cross-head F between the cylinders A and B, and the piston-rods from the pistons of the respective cylinders connected to the said cross-head F, substantially as set forth.

2. The combination, with the high-pressure cylinder A and the expansion-cylinders B and C, of the cross-head F between the cylinders A and B, the piston-rod 2 to the piston in the cylinder A, and the piston-rod 3 to the piston in the cylinder B, and the piston-rods 4, connected to the piston in the cylinder C, and passing through tubes or sleeves at the sides of the cylinder B and through the stuffing-boxes 6, all of the piston-rods being connected to the cross-head F, substantially as set forth.

3. The combination, with the high-pressure cylinder A and expansion-cylinders B and C, of the cross-head F between the cylinders A and B, and the piston-rods of the respective cylinders connected to such cross-head, and a pump-cylinder M, to which the cylinder A is connected, substantially as set forth.

4. The combination, with the high-pressure cylinder A and expansion-cylinders B and C,

of the cross-head F between the cylinders A and B, the piston-rods to the pistons of the respective cylinders connected to the cross-head F, the pump-cylinder M, connected with the cylinder A, and the piston-rods 12 of a pump-piston connected to the cross-head F, substantially as set forth.

5. The combination, with the high-pressure cylinder A, of the expansion-cylinders P, B, and C, and the cross-head F between the cylinders A and B, and the piston-rods to the pistons of the respective cylinders connected to said cross-head, substantially as set forth.

6. The combination, with the high-pressure cylinder A and expansion-cylinders P, B, and C, of the piston-rods to the pistons in the respective cylinders connected together, and the piston-rods to the two most distant cylinders passing through tubes or sleeves at the sides of the intermediate cylinders, and glands or packing-boxes at the ends of the respective sleeves or tubes, substantially as set forth.

7. The combination, with the high-pressure cylinders A A, of the expansion-cylinders B B C C and cross-heads F F, or equivalents F F, forming duplex expansion steam-engines,

and the connections from the cross-head of one engine to the valves of the other, substantially as specified.

8. The combination, with the pump-cylinder M, of the high-pressure cylinder A and the expansion-cylinders B C, all in line with each other, the heads of the cylinders A and B facing each other and being removable one toward the other, substantially as specified.

9. The combination, with the pump-cylinder M, of the high-pressure cylinder A and the expansion-cylinders B, C, and P, all in line with each other, the heads of the cylinders A and B facing each other and being removable one toward the other, and the head of the cylinder P being removable toward the pump-cylinder M, substantially as specified.

Signed by me this 21st day of December, 1888.

FREDERICK MERIAM WHEELER.

Witnesses:

GEO. T. PINCKNEY,
WILLIAM G. MOTT.