

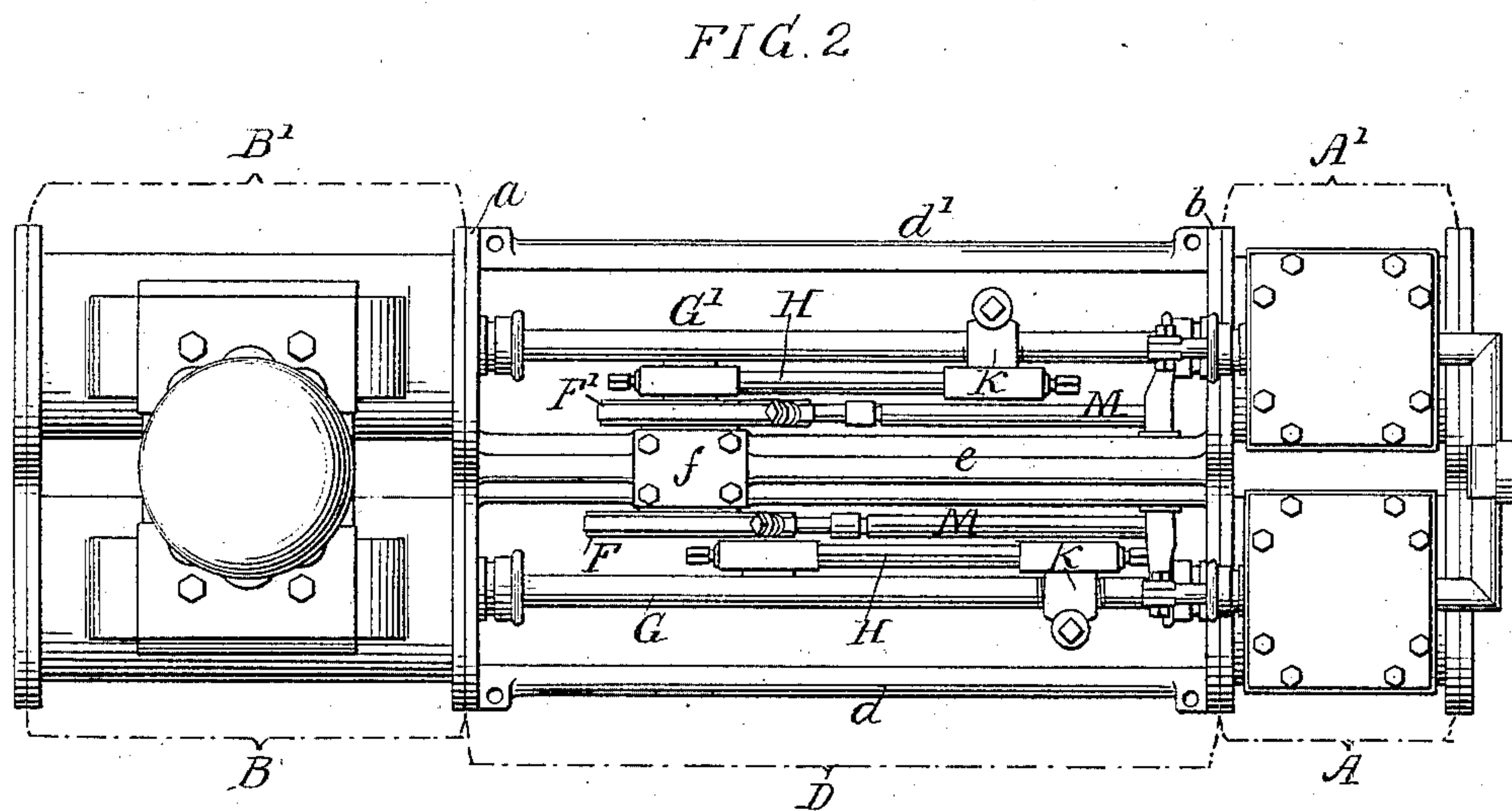
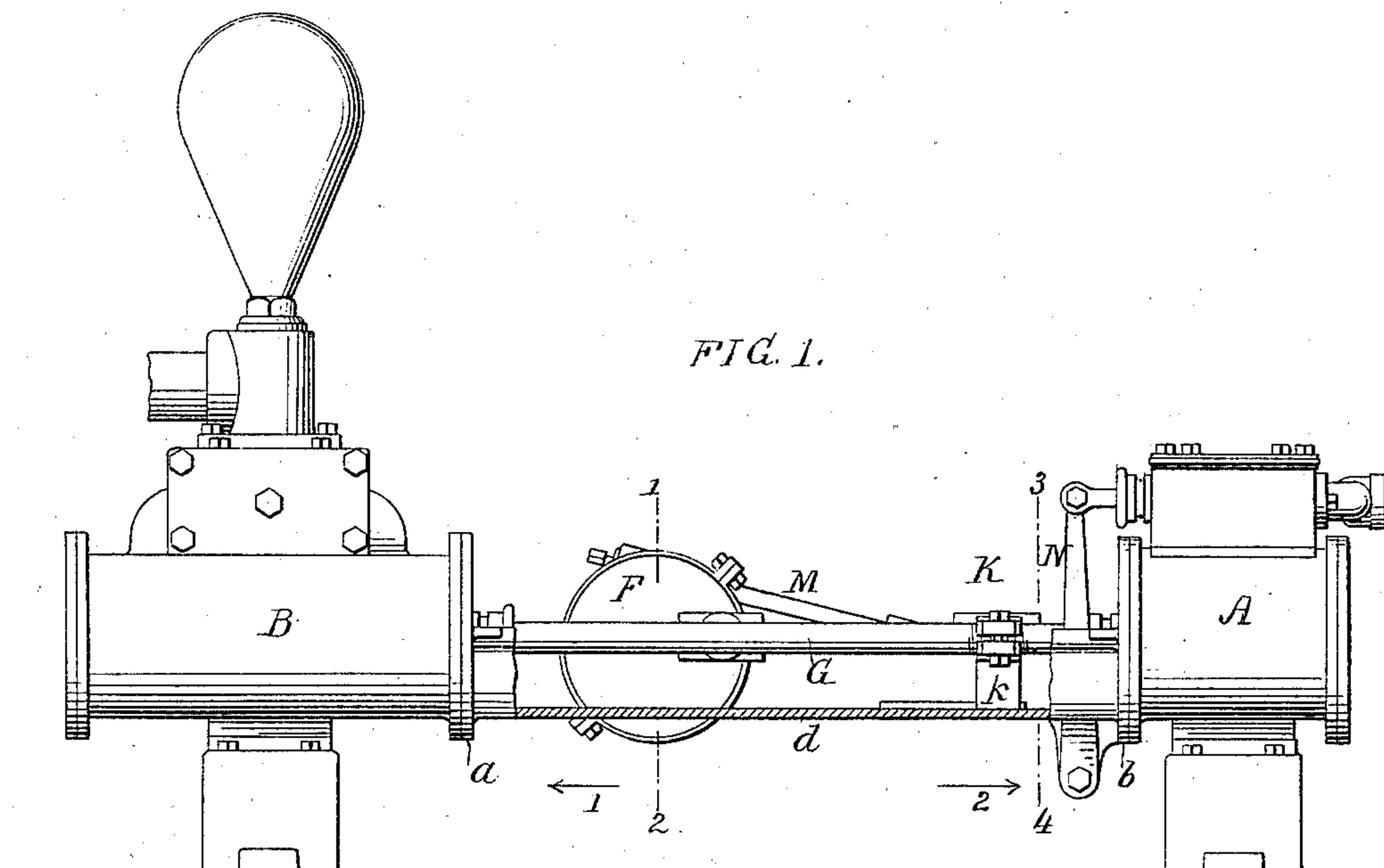
(No Model.)

2 Sheets—Sheet 1.

J. HENWOOD.
DIRECT ACTION STEAM PUMP.

No. 284,010.

Patented Aug. 28, 1883.



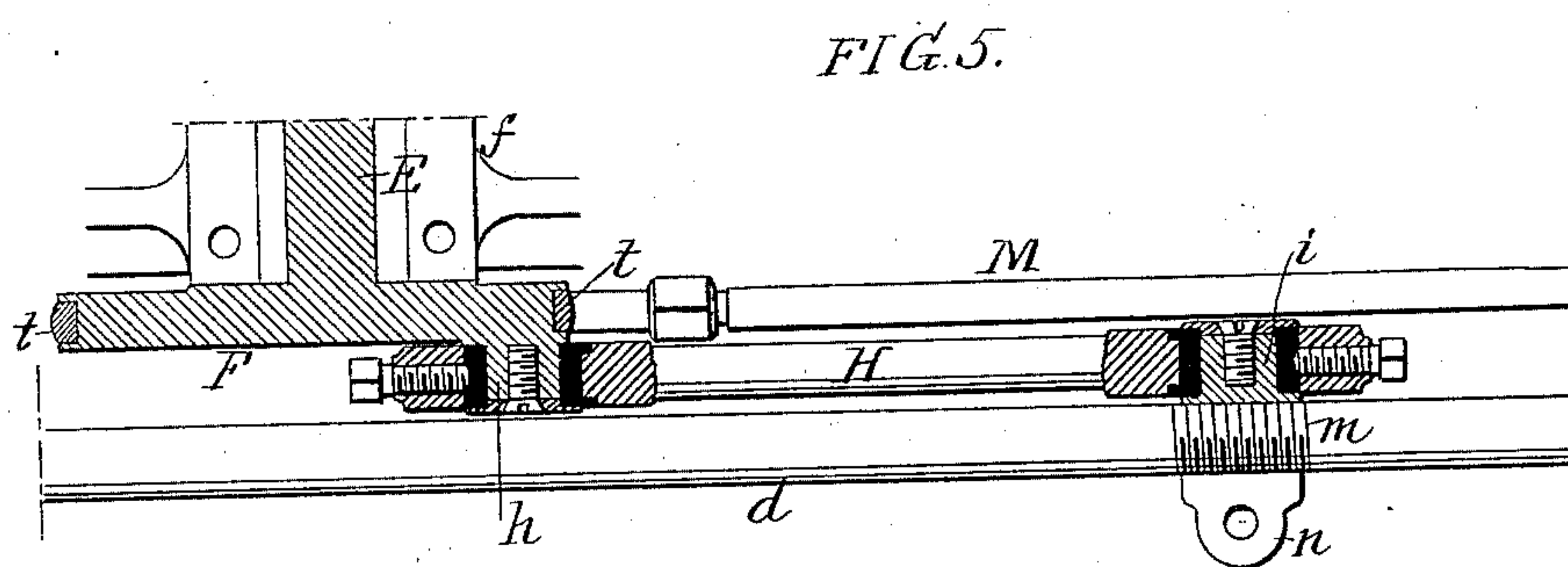
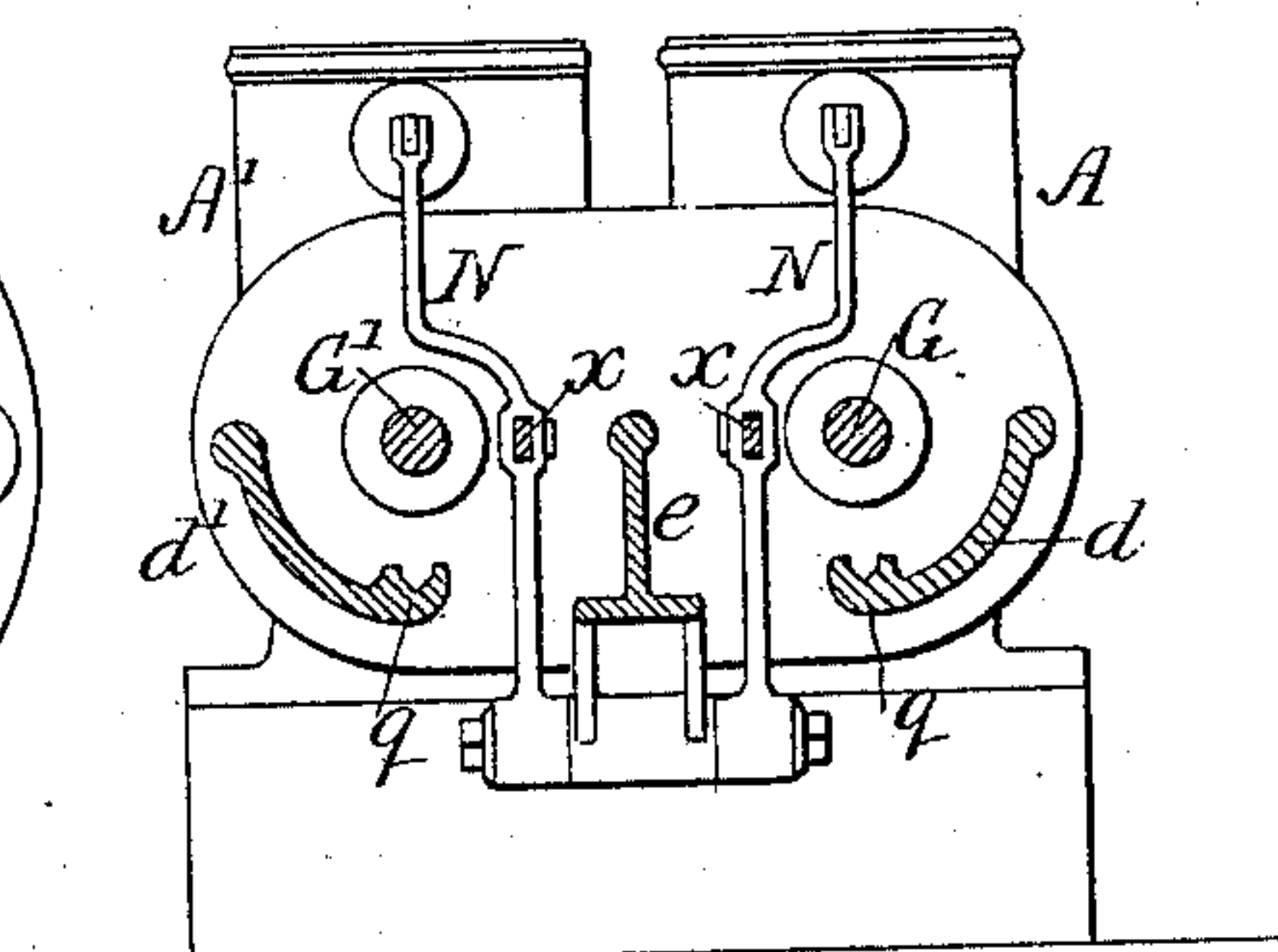
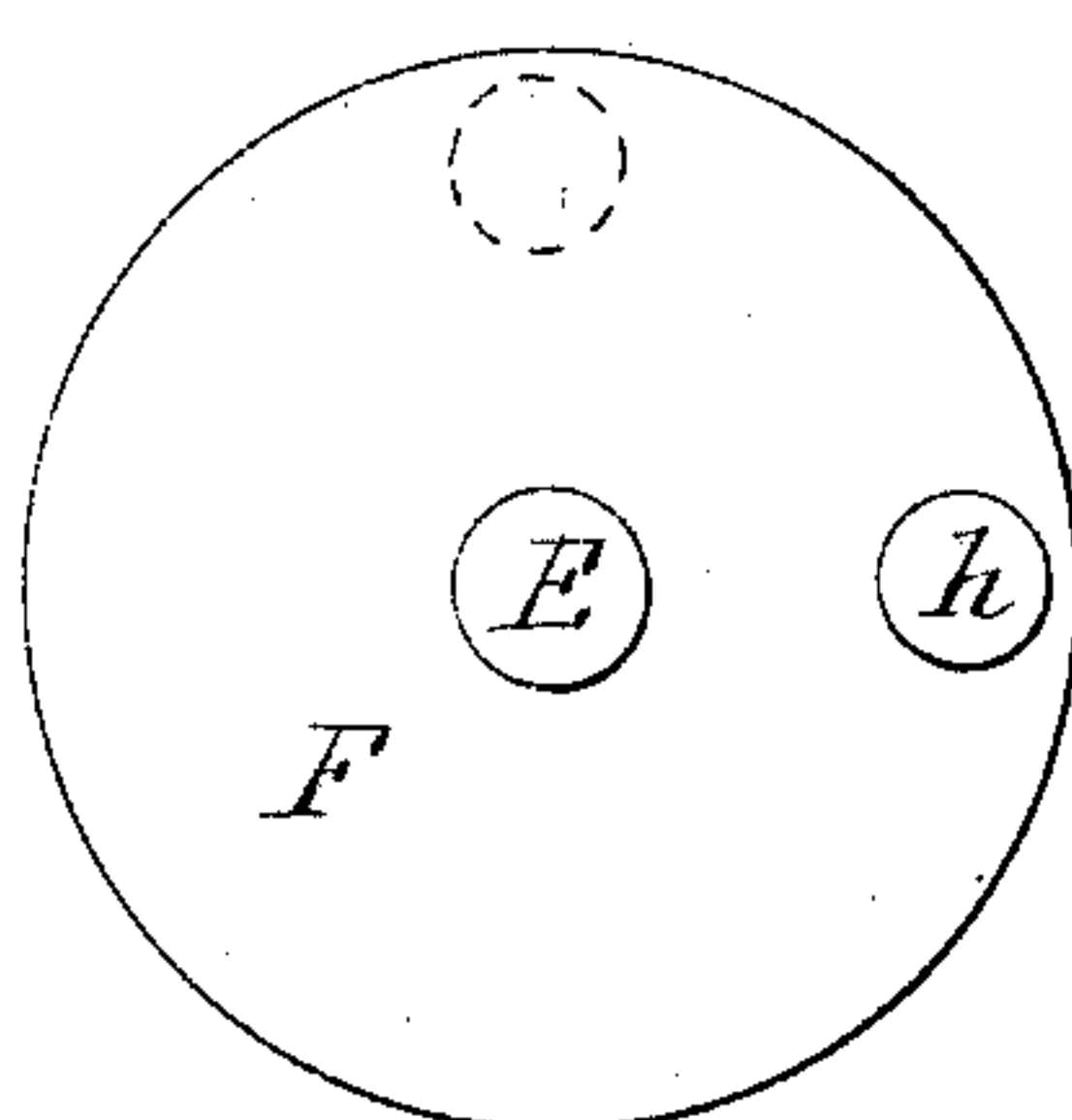
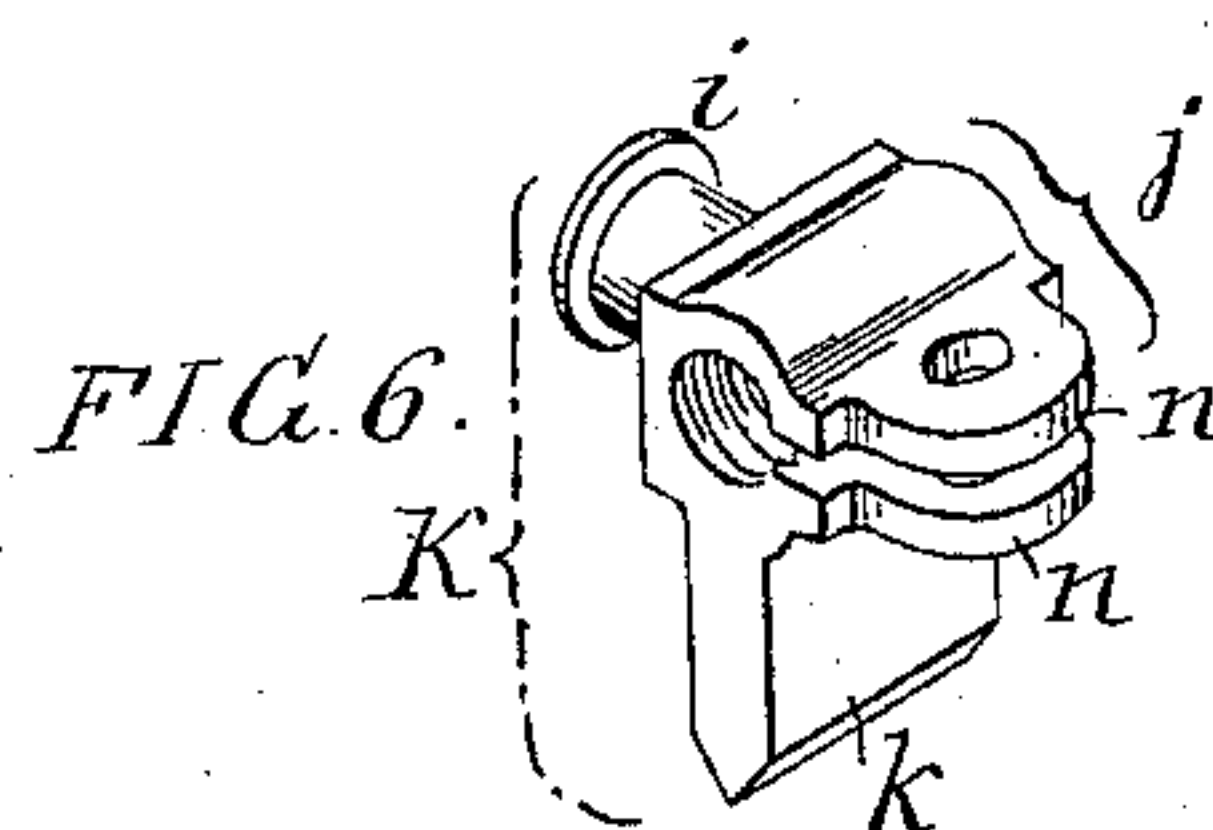
WITNESSES:
Harry Dwyer,
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INVENTOR:
John Henwood
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2 Sheets—Sheet 2.

No. 284,010.

Patented Aug. 28, 1883.



INVENTOR:

~~John Benwood~~
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David Williams

UNITED STATES PATENT OFFICE.

JOHN HENWOOD, OF PHILADELPHIA, PA., ASSIGNOR TO HIMSELF, JOSEPH C. WHITAKER, AND CHARLES R. SCULL, ALL OF SAME PLACE.

DIRECT-ACTION STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 284,010, dated August 28, 1883.

Application filed March 9, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN HENWOOD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain
5 Improvements in Direct-Action Steam-Pumps, of which the following is a specification.

My invention relates to improvements in that class of direct-action duplex steam-pumps in which the stroke is limited by a crank or
10 cranks; and the object of my improvements, which are fully described hereinafter, is to make a compact, simple, and cheap duplex pump of this class.

In the accompanying drawings, Figure 1,
15 Sheet 1, is a side view of the duplex steam-pump, part of the frame being broken away; Fig. 2, a plan view; Fig. 3, Sheet 2, a transverse section on the line 1 2, looking in the direction of the arrow 1; Fig. 4, a transverse
20 section on the line 3 4, looking in the direction of the arrow 2; Fig. 5, a sectional plan, drawn to an enlarged scale, of part of the operating mechanism; Fig. 6, a perspective view of the cross-head, and Fig. 7 a diagram illustrating the arrangement of the crank-pins.

The two steam-cylinders A A', placed side by side; are preferably made in one casting, each having the usual piston, steam-chest, and slide-valve, which are similar to those of ordinary steam-engines, and therefore need not
30 be minutely described.

The two pump-barrels B and B', also placed side by side and preferably cast in one piece, are provided with the usual plungers or pistons, valve-chests, and suction and exhaust valves, which may be similar to those of ordinary duplex pumps.

The frame-work D, by which the two pumps are connected to the two steam-cylinders, consists of the plate *a*, forming the head for the
40 two pump-barrels, the plate *b*, forming the head for the two steam-cylinders, the opposite side bars, *d* and *d'*, and the intermediate bar, *e*, the whole being cast in one piece.

45 G and G' are the two piston-rods, connected at one end to the plungers or pistons of the pump-barrels, and at the opposite end to the pistons of the steam-cylinders.

I dispense with a fly-wheel, as unnecessary
50 in duplex pumps of this class, and use a short crank-shaft, E, adapted to a short central bear-

ing, *f*, on the central bar of the frame—an arrangement which enables me to contract the pump-structure laterally, the shaft having two crank-wheels, F F', one at each end of and
55 preferably cast in one piece with the shaft, as best observed in Fig. 3; and in order to further save space laterally the two crank-wheels are in the present instance eccentrics for operating the slide-valves of the two cylinders. 60

On each eccentric crank-wheel is cast a crank-pin, *h*, adapted to one stub end of a connecting-rod, H, this plan of casting the pin on the wheel obviating the necessity of making the eccentric of undue diameter. The opposite
65 stub end of the connecting-rod is adapted to a pin, *i*, on a cross-head, K, which is constructed in the peculiar manner illustrated in Fig. 6. This cross-head consists of the clamp *j*, the rib *k*, and the aforesaid pin *i*, all being cast in
70 one piece, the clamping portion being adapted to the piston-rod, and being secured thereto by a bolt passing through lugs *n n*, which causes the clamp to tightly embrace the piston-rod, thereby securing the cross-head there-
75 to. To prevent all possibility of the sliding of the cross-head on the piston-rod, I cut a screw-thread on a portion of latter, as shown in Fig. 5, the clamp being internally threaded accordingly. 80

On the inner side of each of the opposite side bars, *d* and *d'*, of the connecting-frame is formed a guide, *g*, and into the groove of each guide fits the lower end of the rib *k* of one of the cross-heads. It should be understood that this
85 guide is for the sole purpose of preventing the cross-head and piston-rod from turning.

The periphery of each eccentric crank-wheel is grooved for the reception of a strap, *t*, to which is secured a rod, M, the outer end of
90 the latter being connected at *x* to a lever, N, hung to a stud which is secured to the under side of the central bar, *e*, of the connecting-frame. There is a lever, N, for each eccentric, and the upper end of one lever is connected
95 to the valve-spindle of one steam-cylinder, the upper end of the other lever being connected to the valve-spindle of the other steam-cylinder. The cranks are at right angles, or thereabout, as in other coupled engines. Thus, as
100 shown in the diagram Fig. 7, when the pin *h* of the crank-wheel F is in the position there

shown, the pin of the other crank-wheel will be in the position indicated by the dotted circle.

The main object of my invention has been to bring two steam-cylinders as close together as possible, and the same with the pump-barrels, so as to insure compactness and lightness, and at the same time to control the limit of the movement of the pistons by a crank-shaft and cranks, which do not require the aid of a cumbrous fly-wheel. Further compactness laterally is obtained by the manner of constructing the clamping cross-head, by which the pin *i*, forming part of the clamp, is brought very near to the piston-rod.

It will be seen that the connecting-frame is of the simplest construction, and that the middle bar of the frame serves to carry the crank-shaft and its eccentric crank-wheels, as well as the stud for the valve-levers. The crank-shaft is necessarily short, but long enough for the duty which it has to perform.

Eccentrics separate from the crank-wheels might be used; but this would involve the necessity of arranging the steam-cylinders and pump-barrels farther apart from each other, and this would result in increased bulk, which I am anxious to avoid.

I claim as my invention—

1. The combination, in a duplex steam-pump, of the following elements, namely: first, two steam-cylinders placed side by side, and

two pump-barrels, also placed side by side; second, two piston-rods connecting the pistons of the cylinders to those of the pump-barrels; third, a crank-shaft situated between the pump-barrels and cylinders; and, fourth, a single bearing, *f*, for the crank-shaft, all substantially as set forth.

2. The combination of the two pump-barrels and two steam-cylinders with a connecting-frame composed of the two side bars, *d d'*, and the central bar, *e*, having the single bearing *f* for the crank-shaft, as set forth.

3. The combination of the two steam-cylinders, the two pump-barrels, the crank-shaft, and two eccentric wheels, forming parts thereof, for actuating the valves, with the two crank-pins attached directly to or forming a part of the said wheels, substantially as described.

4. The combination of the crank-shaft and the two piston-rods, each provided with a clamping cross-head having a projection, *k*, adapted to a guide, and a pin, *i*, and the projection and pin forming parts of the said clamping cross-head, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN HENWOOD.

Witnesses:

HARRY L. ASHENFELTER,
HENRY HOWSON, Jr.