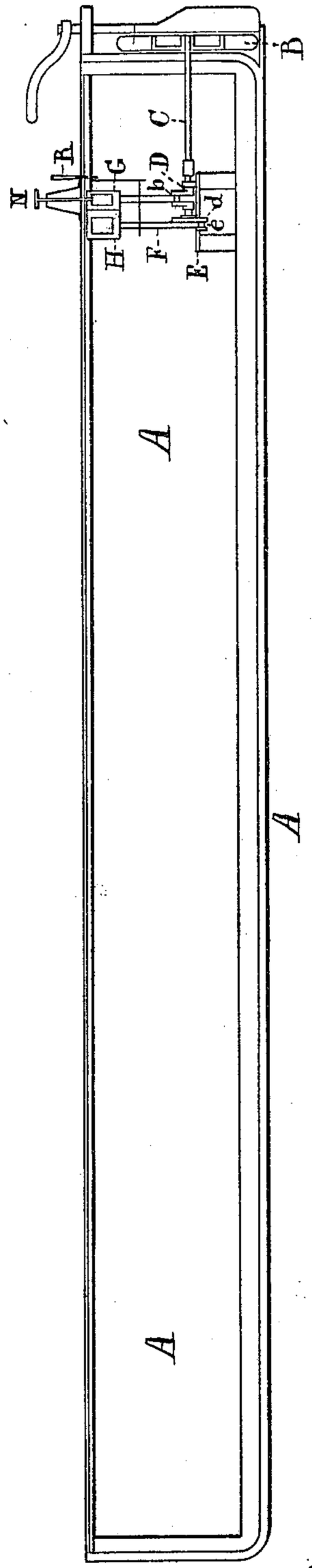
2 Sheets—Sheet 1.

H. H. BURRITT.

Compound Engine for Canal Steamers.

No. 230,737. **Patented Aug. 3, 1880.**

Fig. 1.



Attest:

W. F. Howe.

C. C. Bonneau

Inventor.

H. H. Burritt, per

Thos. S. Crane, Atty.

2 Sheets—Sheet 2.

H. H. BURRITT.

Compound Engine for Canal Steamers.

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Fig. 2.

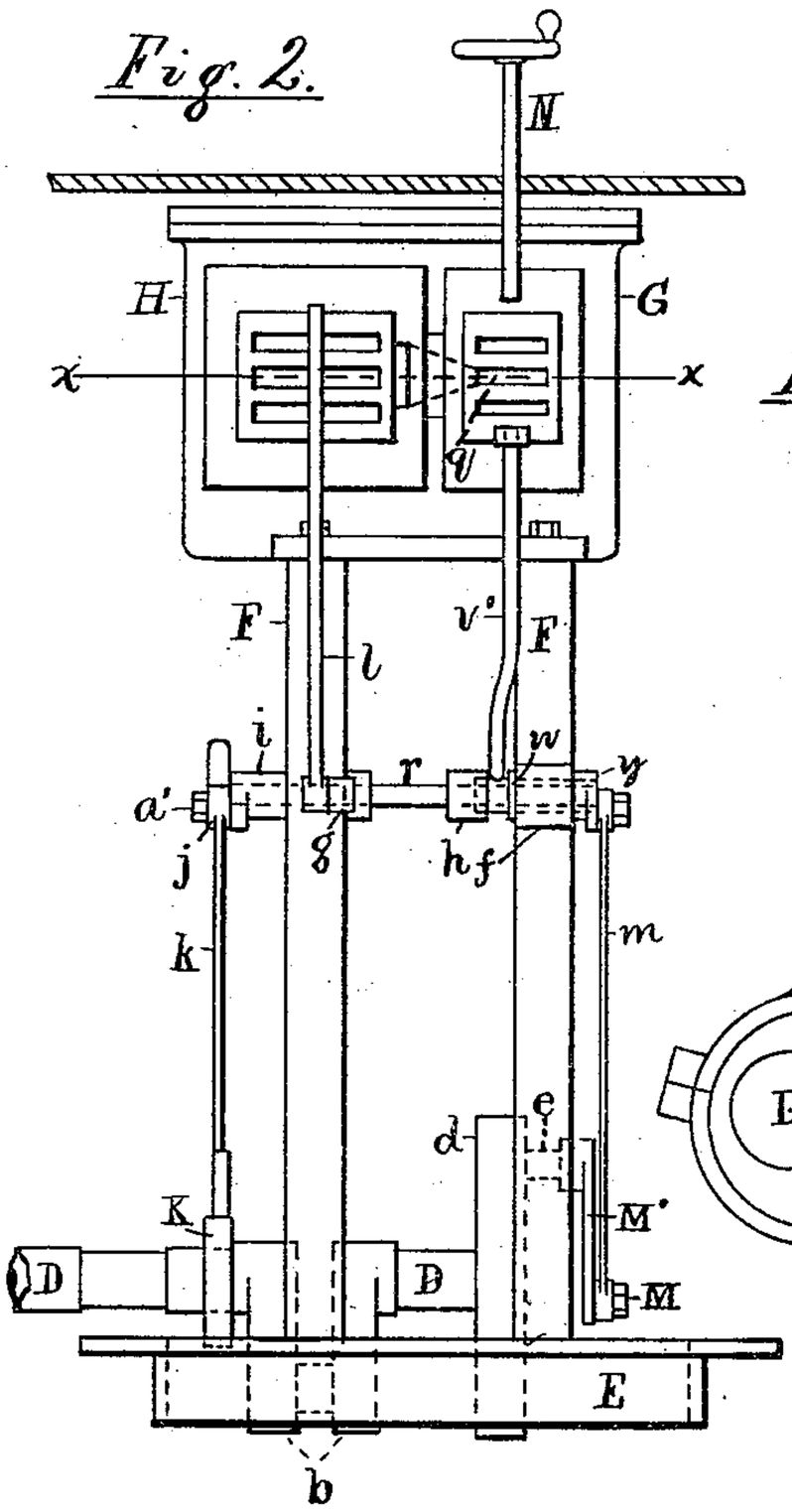


Fig. 3.

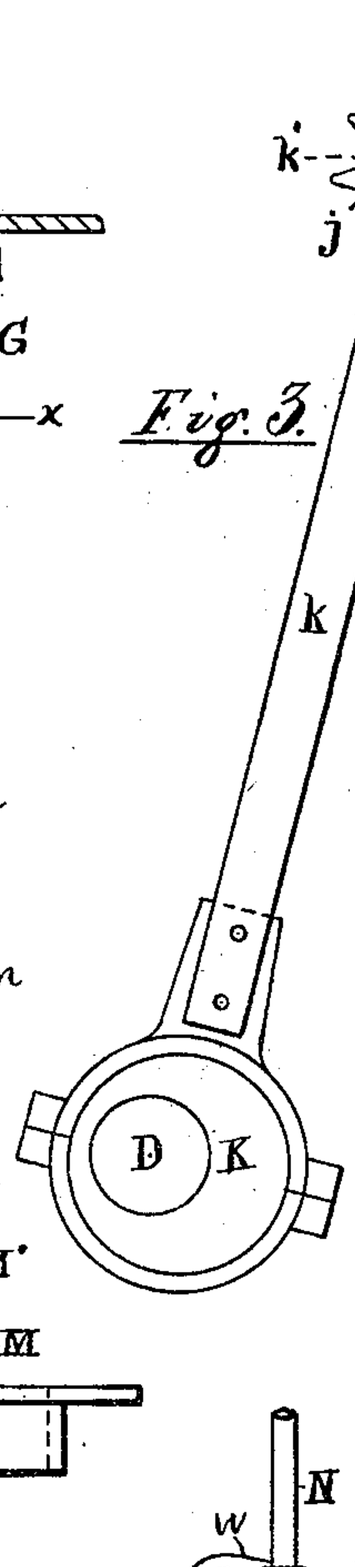


Fig. 4.

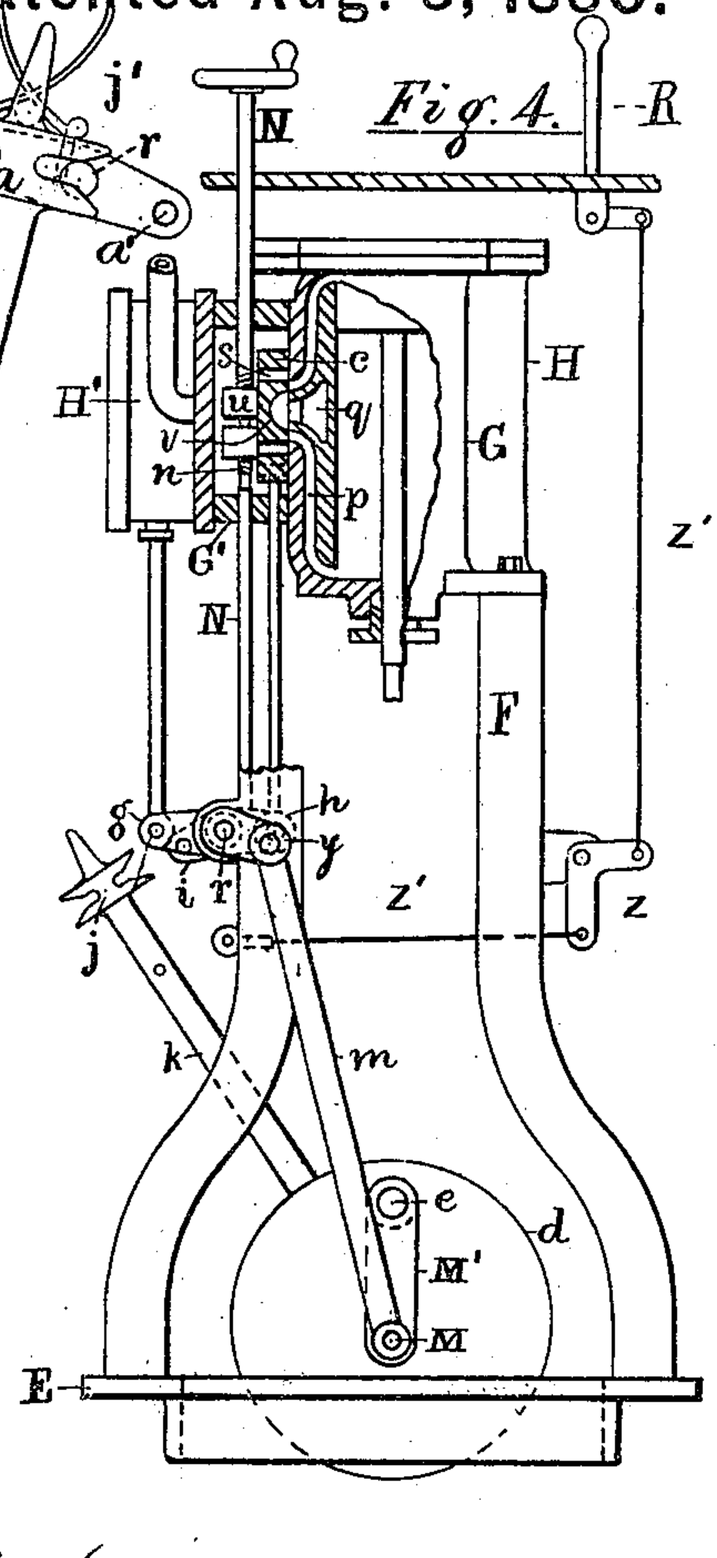
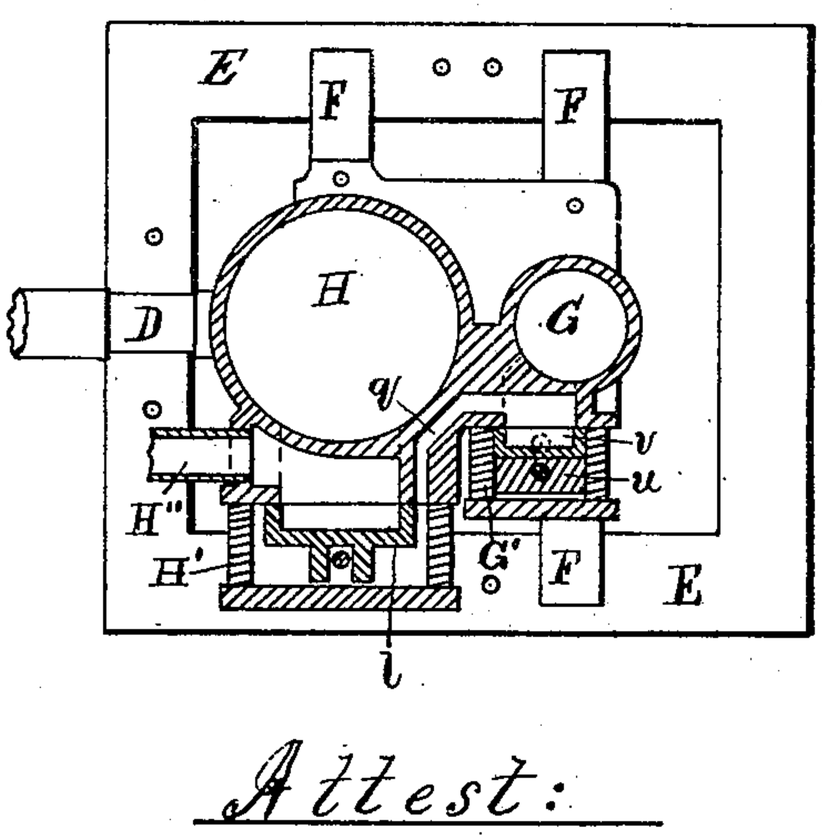


Fig. 6

Fig. 5.



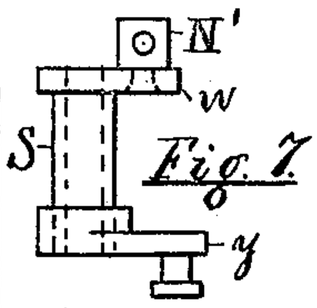
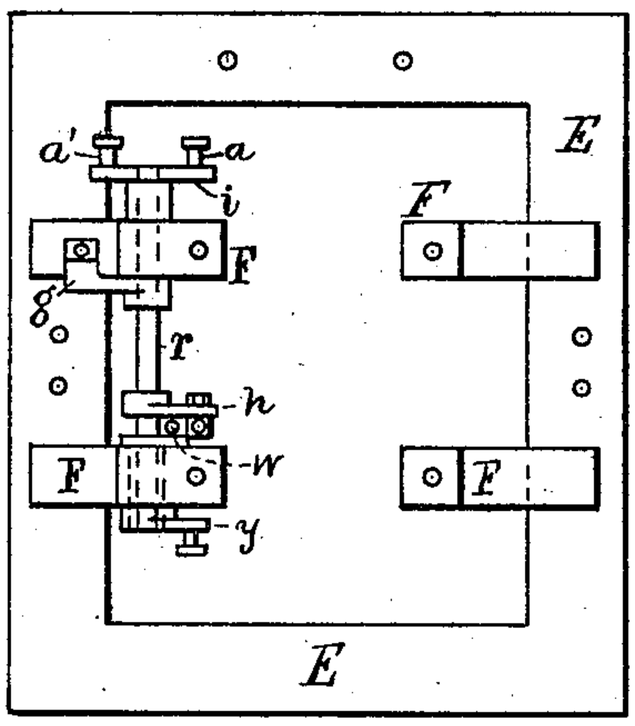


Fig. 7.

Fig. 8.



Attest:

H. F. Howe.

Edwin L. Bonneau

Inventor.

H. H. Burritt, per

Thos. S. Crane, Atty.

UNITED STATES PATENT OFFICE.

HARVEY H. BURRITT, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO WILLIAM A. THOMPSON, OF SAME PLACE.

COMPOUND ENGINE FOR CANAL-STEAMERS.

SPECIFICATION forming part of Letters Patent No. 230,737, dated August 3, 1880.

Application filed February 28, 1880.

To all whom it may concern:

Be it known that I, H. H. BURRITT, a resident of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Compound Engines for Canal-Steamers, of which the following is a specification.

My invention relates to an improvement in compound engines for canal-steamers; and it consists in a special construction of compound steam-engines.

The object of my invention is to secure the utmost economy in propelling the boat and the utmost durability in the hull by preventing the jars and vibrations incident to other high-speed engines.

The disagreeable vibrations felt in boats moved by screw-propellers are due to the high speed of an unbalanced engine, while the high expense for propulsion can only be remedied by the use of the compound engine now generally employed in ocean-steamers.

My invention is designed to secure for canal-steamers a compound steam-engine of the very simplest form, and to prevent the jars common to ordinary propeller-engines, by connecting the pistons by opposed crank-pins to propeller-shaft, thus balancing the forces produced by the two cylinders.

The importance of a balanced engine for a canal-boat is greater than for any other class of vessels, because the hull, as ordinarily constructed, is designed only to be drawn through still water, and is constructed of a poor class of material, by cheap labor, and in a poor manner; and as at present canal-boats are taken from canals into bays and other large waters, where they have to resist the strain on them caused by waves and the motion of the water, it is of the utmost importance that the additional strain, jar, and vibrations produced by the engine should be reduced to a minimum. These objects I accomplish by the use of my compound balanced engine.

In the accompanying drawings, Figure 1 is a longitudinal section of my canal-steamer, and Figs. 2 to 8 are details of the engine. Fig. 2 is a front elevation with the chests removed. Fig. 3 is an enlarged elevation of the eccentric rod and hook. Fig. 4 is a side elevation of the engine with the small cylinder, steam-chests, and valves in section. Fig. 5 is a horizontal section on the line *x x* in Fig. 2. Figs. 6 and 7 are enlarged views of the cut-off sleeve. Fig. 8 is a plan of the engine-framing with the rock-shaft mounted thereon.

In Fig. 1, A is the hull of the steamer, provided with a propeller-wheel, B, having vanes or blades attached to a cylindrical body about one-half the diameter of the wheel, such having proved least injurious to the banks of a canal.

C is the propeller-shaft, and D the shaft of the engine, to which it is coupled. E is the bed-plate of the engine, carrying the frame F, upon which I mount the high and low pressure cylinders G and H, the pistons of which, with their connections to the driving-cranks, are made in the usual manner, and are not therefore shown in the drawings.

The crank *b* nearest the stern is bent in the crank-shaft D, while the one on the other side of the frame is attached to the end of the shaft at *d* and provided with a crank-pin, *e*, upon the opposite side of the crank-shaft from the crank *b*.

The pistons in the two cylinders are thus reciprocated in opposite directions, and the movements of the engine balanced in such a manner as to obviate most of the jars caused by single-piston engines.

Owing to the arrangement of the cranks the valves require to be moved in opposite directions; and to effect this object by the same rock-shaft and eccentric I provide valve-levers or rocker-arms upon opposite sides of the rock-shaft and arrange the steam chests and valves so that they are vertically over the extremity of these arms.

In Fig. 8 is shown the rock-shaft *r* supported upon the frames F by boxes *f*, and provided at *g* with the rocker-arm for the large cylinder-valve *l*, and at *h* with the arm for the small cylinder-valve *v*.

In Fig. 5 is shown the valve-seat of the small cylinder G set as close to the cylinder as possible and the seat for the valve *l* extended a considerable distance from the body of the large cylinder, to bring that valve over the extremity of the arm *g*.

The rock-shaft *r* is provided at one extremity with a two-armed reverse-crank, *i*, having a pin at each extremity (at *a a'*) to receive the hook *j*, formed upon the upper end of the ec-

centric-rod *k*. The eccentric K will thus operate the rock-shaft and engine-valves in opposite directions, as it may be placed upon the pin *a* or *a'*.

The valves *l* and *v* are ordinary slide-valves of the D form; but the latter I make with extension-piece *c* at each end, and admit the steam to the cylinder-ports *p* through passages *s* at the ends of the valve. I am thus enabled to apply cut-off blocks *u u* to the back of valve *v* and regulate the admission of steam to the cylinder at any desired point.

To vary the point of cut-off I provide right and left hand nuts in the cut-off blocks, which are shown, not in section in Fig. 4, but in full view upon their valve-rod N, which is formed with right and left hand threads at *n n*, where it passes through the blocks *u*, the screw-threads being made larger than the body or stem of the rod in practice to get the blocks both on the rod.

By turning the rod N the point of cut-off may be varied or steam taken at full-stroke when the engine is to be reversed.

To operate the cut-off blocks I provide a sleeve, S, upon the end of the rock-shaft underneath the valve *v*, and form it with a crank, *w*, at one end to operate the rod N, and a crank, *y*, at its outer end to receive the motion of the rod *m*, which is operated by an eccentric-pin, M, on the outer crank-pin, *e*, an arm, M', being keyed on that pin for the purpose.

The rocker-arm *h* lies close beside the crank *w* on the rock-shaft *r*, the rods *v'* and N extending downward from the valve-chest G' to the arm and crank, and the pin of the latter being constructed with a perforated block, N', in which the rod N can be revolved when the cut-off is adjusted. The valve *v* is thus operated in the required direction by the eccentric K, while the cut-off blocks are moved by the eccentric-pin and arm M M' through the medium of the cut-off sleeve S.

The steam is introduced into the chest G' by a suitable pipe, and after passing through the high-pressure cylinder G enters the exhaust-passage *q*, by which it is conducted into the other steam-chest, H'. Here it is distributed to the large cylinder H by the valve *l*, and is then discharged to a condenser or into the air by pipe H''.

I have thus shown how the compound engine having two main steam-valves may be operated in either direction by a single eccentric, K, and how the cut-off valve is operated by a sleeve mounted upon the primary rock-shaft *r*.

The utmost simplicity and cheapness of construction are thus secured, and the arrangement of the cranks *b* and *e* to reciprocate the pistons in opposite directions secures the utmost smoothness of motion in the entire engine.

If desired, two eccentrics and a link can be used and the proper motion given to the valves *l* and *v* through one of the pins *a a'* without modifying the construction and operation of the cranks *b* and *e*, as described above.

In the enlarged view of the eccentric-rod *k* the double hook *j* is shown fitting upon the pin *a* of the reverse-crank *i*. Latches *k'*, operated by handles *j'*, are shown to be used when the hook is to be thrown over by hand; but if the reverse-lever ordinarily employed for reversing a link is used the whole motion of the engine may be regulated from the room of the pilot, as shown in Fig. 1, where the tiller or steering-wheel is shown in close proximity to the reverse-lever R and the top of the cut-off rod N.

In Fig. 4 are shown a bell-crank and connections, *z z' z'*, for moving the hook *j* from the deck of the boat. I am aware that such arrangements are already in use, and do not therefore make any claim to working the hook by such connections.

I am also aware that two cylinders have been used to work two screw-shafts simultaneously in a canal-steamer, as in patent granted to A. T. Nichols on April 16, 1872, and I do not therefore claim the use of two cylinders to propel a canal-steamer, except they are compounded, as herein described, and constructed to operate as a balanced engine by having the two pistons connected to opposite crank-pins on the same driving propeller-shaft. This is the only construction I have specified herein, because it possesses, as shown above, the especial merits of economy, which results from the use of the steam in the manner common to compound engines, and great smoothness of motion, which results from the balancing of the two piston-pressures in the manner described, and which is of the utmost importance in any motor applied to a canal-boat, for the reasons named above.

Having thus described the construction and operation of my canal-steamer, it is evident that with the use of the propeller-wheel adapted for canals it may be operated with much less cost and damage to the boat than with an engine not using the steam in the same economical manner, and not having the propelling-power operating so smoothly.

I therefore claim the same in the following manner:

The compound engine for canal-steamers, consisting of the inverted cylinders G and H, mounted upon the upright frame F, and having their steam-chests constructed with different projections from the same side of the cylinders, and provided with slide-valves operated in opposite directions by arms secured upon opposite sides of the same rock-shaft, as herein shown and described.

In testimony that I claim the foregoing I have hereto set my hand this 24th day of February, 1880, in the presence of two witnesses.

HARVEY H. BURRITT.

Witnesses:

WM. F. HOWE,

EDWIN G. BONNEAU.