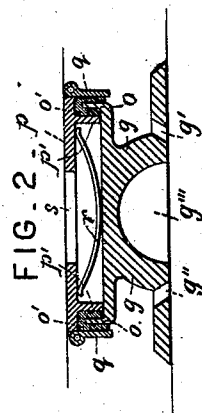
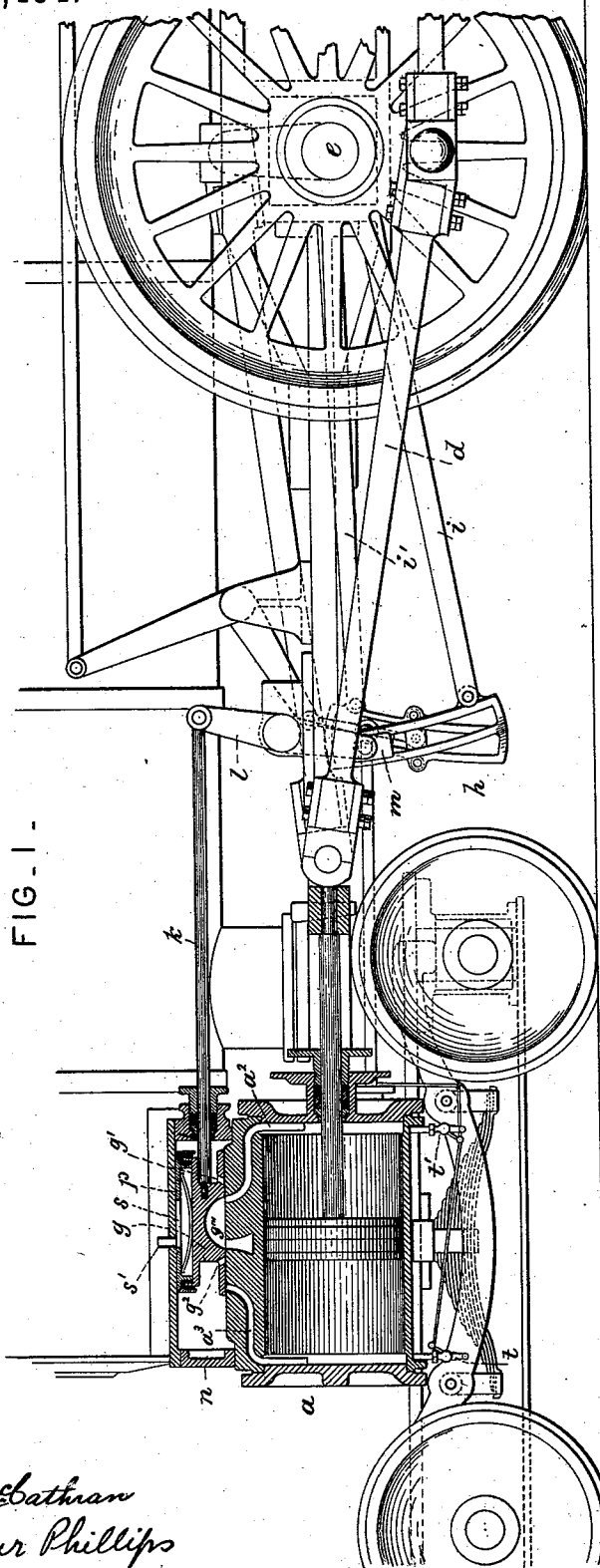


J. S. BYERS.
STEAM ENGINE.

No. 466,454.

Patented Jan. 5, 1892.



Attest:
Jas. H. McLathran
Vandeleur Phillips

Inventor:
Jesse S. Byers
by Geo. T. Smallwood
his atty.

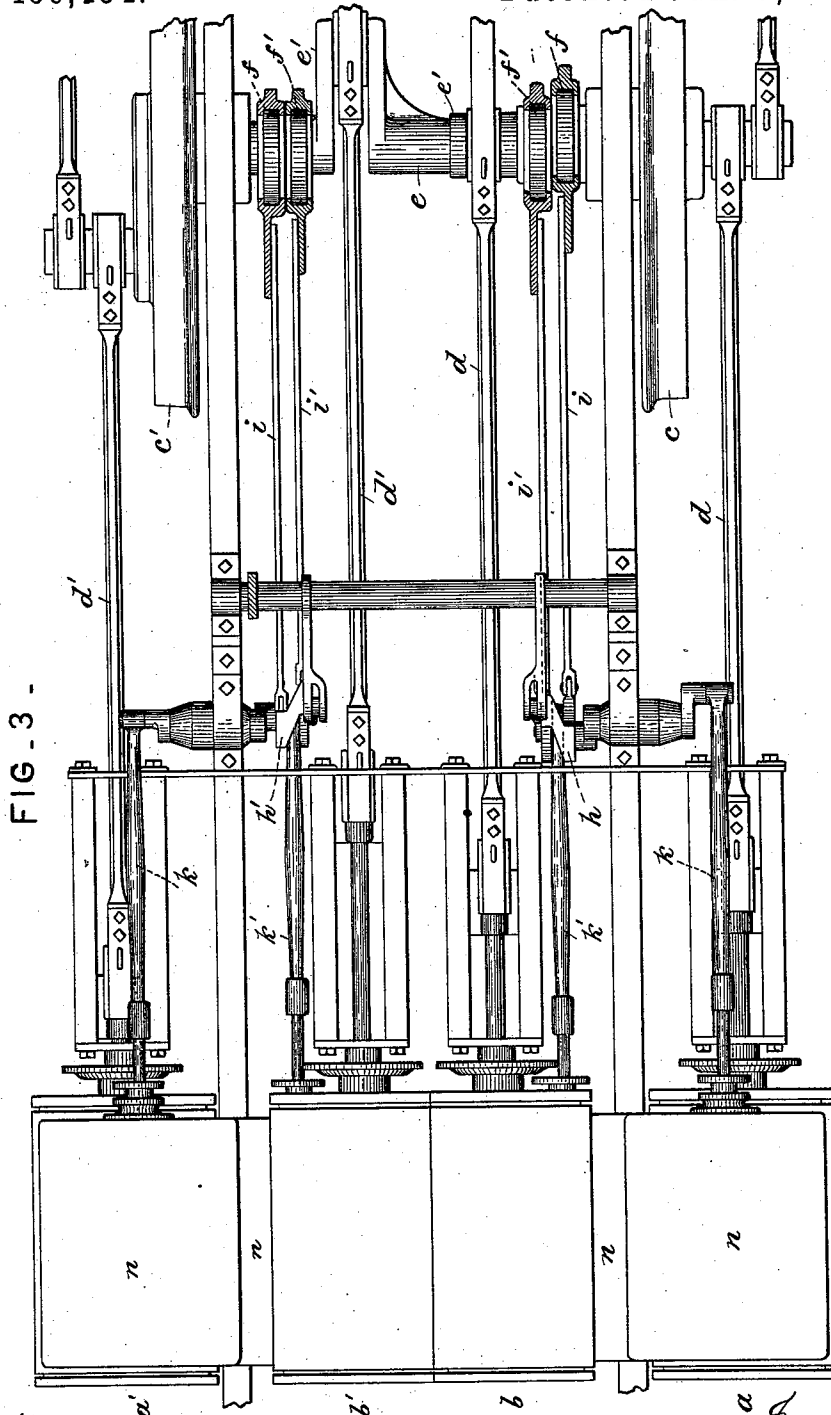
(No Model.)

3 Sheets—Sheet 2.

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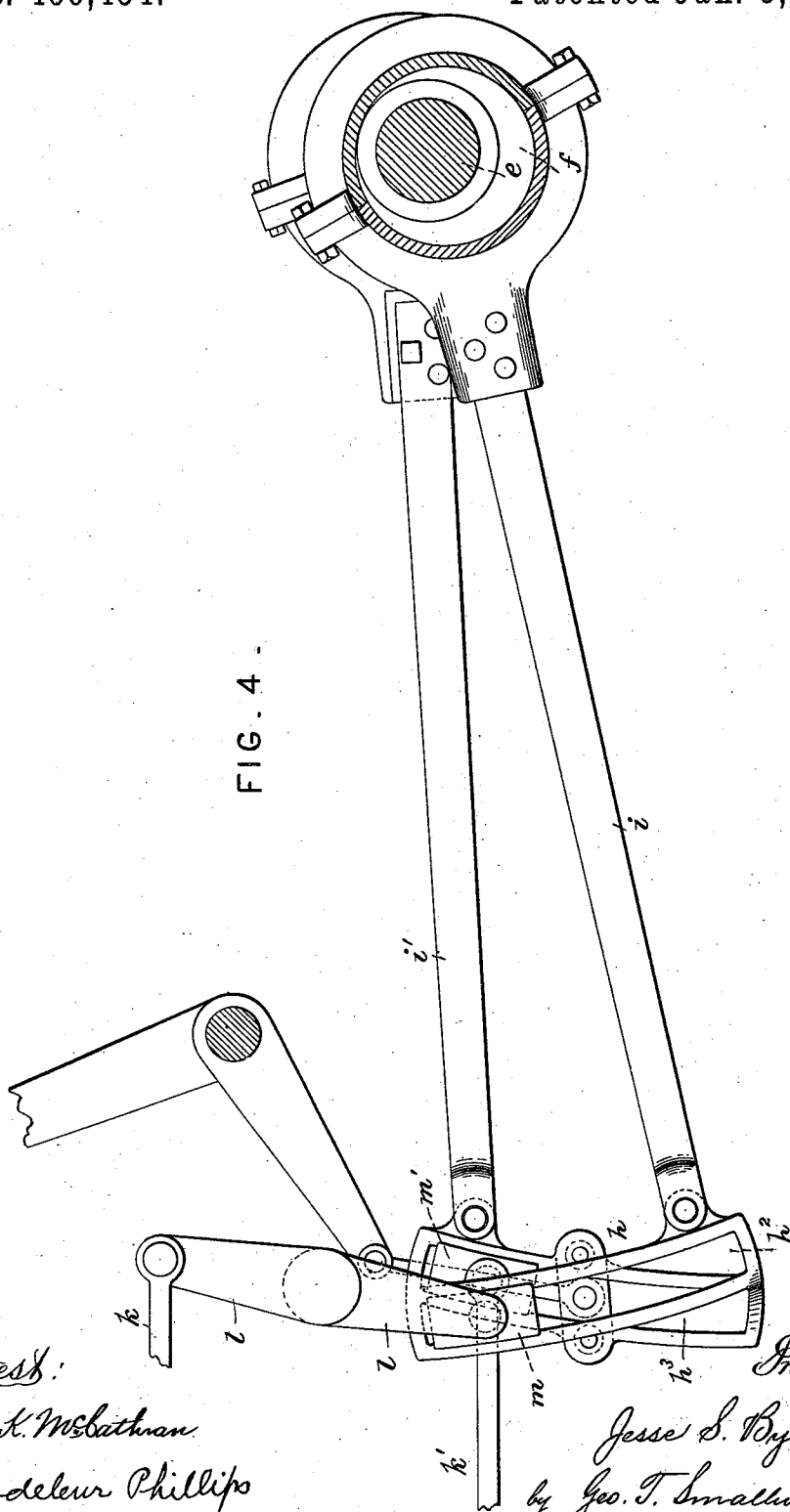
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FIG. 4 -



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UNITED STATES PATENT OFFICE.

JESSE S. BYERS, OF KNOXVILLE, ILLINOIS.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 466,454, dated January 5, 1892.

Application filed March 12, 1889. Serial No. 302,984. (No model.)

To all whom it may concern:

Be it known that I, JESSE S. BYERS, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Illinois, have
5 invented certain new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it
10 appertains to make use the same.

This invention relates to improvements in steam-engines, either stationary or locomotive, its object being to derive a greater power than is at present obtained in the engines now
15 in use by providing a link-motion and valve of novel construction in combination with two or more single-acting cylinders.

The invention consists in certain features of novelty, which are particularly pointed out in the claims, being first described with reference to the accompanying drawings, which
20 illustrate the application of the invention to a locomotive-engine, in which—

Figure 1 is a partial side elevation, the cylinder being shown in section to illustrate the form of slide-valve. Fig. 2 is a detail view of the valve. Fig. 3 is a plan view. Fig. 4 is an enlarged detail view of the link-motion.

In constructing my invention I preferably
30 employ four steam-cylinders $a a' b b'$, as seen in Fig. 3. The outer cylinders $a a'$ are connected outside to the main driving-wheels $c c'$ by the main connecting-rods $d d'$, and the inner cylinders $b b'$ are connected inside to
35 cranks e' on the main driving-axle e . These valves are arranged to act alternately and drive the pistons only in the direction of motion of the engine, so that steam is only admitted to one end of the cylinder and ex-
40 hausts at the same end, the piston being moved on its back-stroke by the other cylinders and the momentum of the engine. Thus power is only applied when the crank-pins are at top and in position to give the greatest power.
45 The eccentrics $f f'$ are the same as in use at present on locomotive-engines, and they operate the slide-valves g through the medium of a link-motion of peculiar construction, hereinafter described, said link $h h'$ being op-
50 erated by the eccentrics $f f'$ and customary eccentric-rods $i i'$.

The slide-valve employed in my invention

is constructed with two steam-ports $g' g''$ and an exhaust-port g''' , and these ports operate, in connection with the ports of the steam-cylinder, according to the adjustments given the slide-valve g by the link h . 55

Referring to Figs. 1 and 3 of the drawings, the engine is supposed to be running forward, the piston in cylinder a has returned half-way back and is exhausting, (see Fig. 1,) while piston in cylinder b is on half its stroke forward, and by the time its stroke is finished the piston in cylinder b' will act and a' will exhaust. When b' has finished its stroke, a will act, and so the successive action will follow, each piston in its forward stroke returning one backward. 65

The link-motion employed and forming part of my invention I term the "X-link." It is operated and suspended in the same manner as links now in use, and is connected to the outside valve-rods K through the customary rocker l . The lower rocker-arm l' carries the block m , upon which the link slides. This link
75 h is practically a double-link joined at its ends and having its central openings cross each other, as seen in Figs. 1 and 4. The opening h^2 acts upon block m and operates valve g through the medium of rod k and rocker $l l'$, 80 while the other opening h^3 acts upon block m' and operates valve in cylinder b through rod k' .

In Fig. 1 the link is down and eccentrics $f f'$ are operating to connect port a^2 of cylinder a alternately with ports g' and g''' , of valve g , 85 thus supplying and exhausting steam at the back of the piston and driving the engine forward. Should the engineer desire to drive backward, he draws his reverse-lever and raises the link h , which will shift the position
90 of blocks $m m'$ in the links and operate the slide-valves g , so as to bring port g'' to register with port a^3 of cylinder a , and the same reverse motion takes place with all of the valves g , which will admit and exhaust steam
95 forward of the piston and cause the engine to run backward.

The valve g (see Figs. 1 and 2) is provided with a central exhaust-port g''' and two supply-ports $g' g''$, and steam is admitted to the cylinder only through one or the other of these supply-ports. It is desirable to relieve the valve of downward pressure of steam in the chest n , and to this end I provide the top 100

of the slide with a flange or rib *o*, which supports a packing *o'*. Upon this valve is placed a plate *p*, formed with a flange *p'* on its under side, which confines the packing against the flange *o*. The outer edge of the plate *p* may be provided with hinged plates *q* to enable the steam-pressure to assist in a tight packing. A spring *r* is placed between plate *p* and the top of the valve, so as to keep a perfectly tight-fitting relation between the plate *p* and the under side of the steam-chest top.

The plate *p* may be provided with a slot *s* to register with opening *s'* in the cover of steam-chest *n*, so that in event of the packing *o'* leaking no pressure will be brought to bear on the valve. By this arrangement it will be seen that the valve will receive pressure of steam only upon the sides, and spring *r* will keep it to its seat, thus making a balance-valve.

The "cylinder" or "blow-off" cocks *t t'* are arranged to close and open alternately, or also to be closed at the same time, so that in running forward the forward cock *t* is open to admit air behind the piston-head, thus preventing a vacuum, while the cock *t'* will be closed to make a steam-tight chamber for the piston. In running backward the action of cocks *t t'* would be reversed.

In some cases it might be desirable to use a vacuum at the back of the piston to assist in drawing it forward, and in such cases the cocks *t t'* may be both closed. This vacuum is produced when the main crank-pins are on their short leverage and is brought into action when said pins are on their long lever-

age. Thus the vacuum will draw to better advantage when the crank-pin is above the axle.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination, with the slide-valves of an engine and the valve-rods, of a double-reversing link having slide-blocks arranged to move past each other a distance sufficient to shift the valves connected to the blocks by said rods to reverse position when said link is raised or lowered, substantially as shown and described.

2. The combination of a reversing-link of a steam-engine, a slide-valve formed with two steam-ports and an exhaust-port, and two or more steam-cylinders arranged to operate successively and only in the direction of travel, substantially as shown and described.

3. In a steam-engine, the combination, with the herein-described double link provided with crossed openings, eccentric rods connecting it with the axle, and the reversing device connected to the link, of a pair of slide-valves, their valve-rods, and the blocks at the ends of the latter, each working in one of said openings, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JESSE S. BYERS.

Witnesses:

THOMAS W. SORAN,
J. S. BRADFORD.