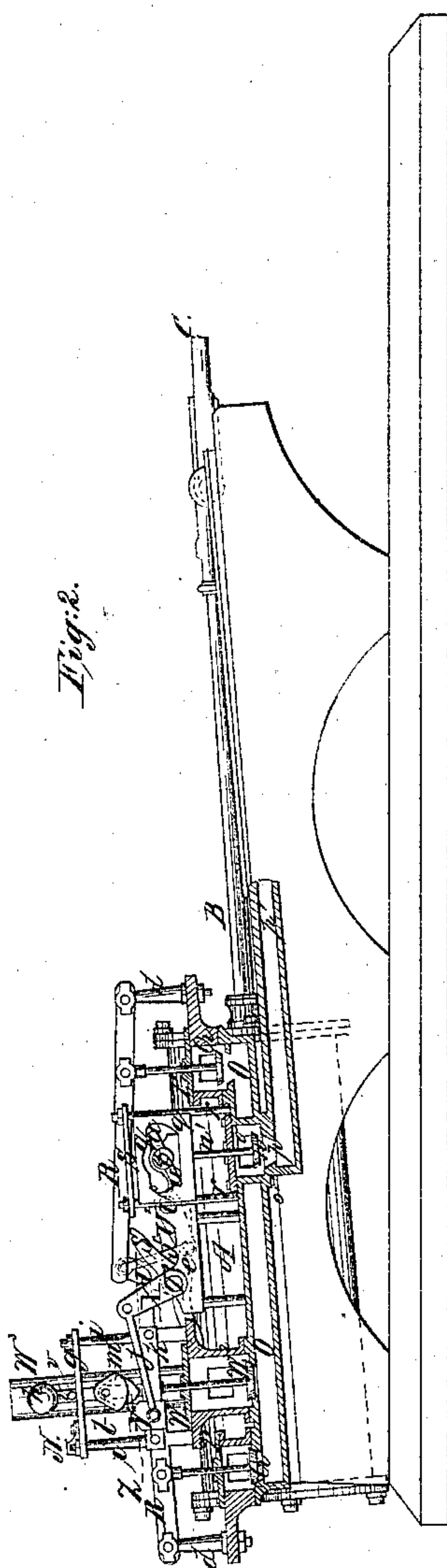
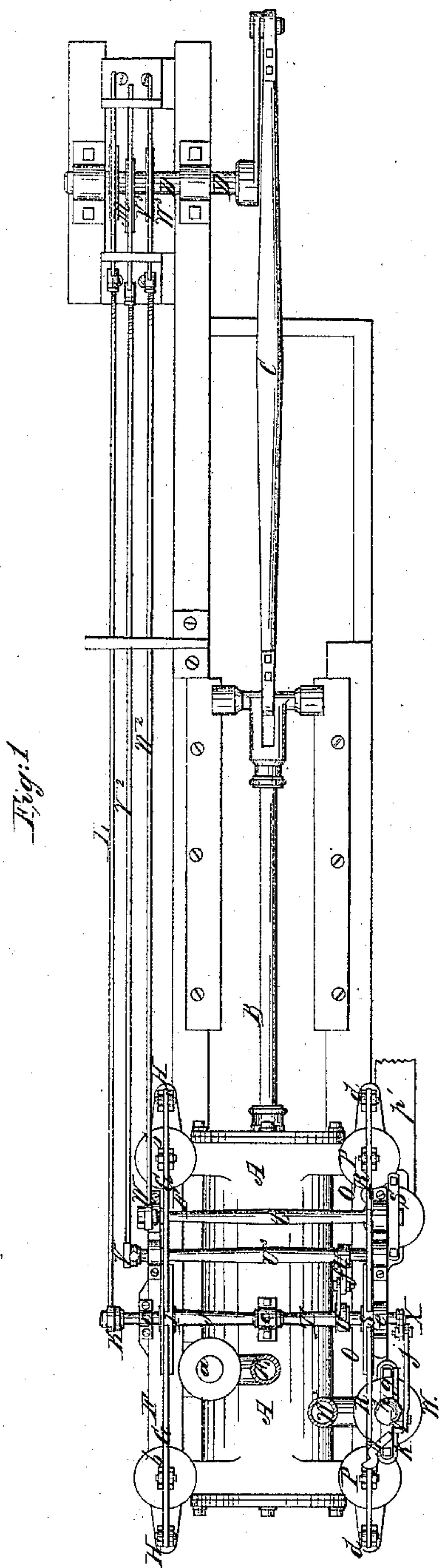


W. FEW & F. ARMSTRONG.
STEAM ENGINE.

No. 8,684.

Patented Jan. 27, 1852.



UNITED STATES PATENT OFFICE.

WM. FEW, OF ST. LOUIS, MISSOURI, AND FRANCIS ARMSTRONG, OF NEW ORLEANS,
LOUISIANA.

MECHANISM FOR OPERATING RELIEF-VALVES IN PARTIALLY-CONDENSING ENGINES.

Specification of Letters Patent No. 8,684, dated January 27, 1852.

To all whom it may concern:

Be it known that we, WILLIAM FEW, of the city and county of St. Louis and State of Missouri, and FRANCIS ARMSTRONG, of the city and parish of New Orleans and State of Louisiana, have invented a new and useful Improvement in Steam-Engines Possessing the Combined Characters of the Condensing, the Partial Condensing, and the High Pressure Entirely Independent of the Condensing Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the construction and operation thereof, reference being had to the annexed drawings, forming part of this specification.

Figure 1 represents a top view of the engine. Fig. 2 is a vertical longitudinal section showing the exhaust chamber, its valves communicating with either end of the cylinder; also the relief or partial escape, and condenser valves.

The same letters occurring in the different figures indicate the same parts.

Not deeming it necessary to represent the boiler, condenser, and air pump, in order to show the application of our improvement the representations of these parts have been omitted.

Our improvements and their advantages over other steam engines, are in an arrangement for operating the valves of egress.

A, is the cylinder of the engine.

B, is the piston rod. C, the pitman connecting it with the crank on propelling shaft D.

E, is the induction pipe, leading from the boiler, provided with a throttle valve *a*, and connecting with the side pipe F, at either end of which are the ingress valves, which are opened alternately, to admit the steam into the cylinder, and are actuated by levers G, G, having their fulcra in studs H, H, mounted on projections from the side pipe E, and are connected with the valves by rods *b*, *b*, said levers extending toward each other, in a position to be operated on alternately, by the double crank lever I, on a rock shaft J, which is supported in boxes *c*, *c*, one of which is on the cylinder, and the other on a projection from the side pipe F, on the outer end of said rock shaft is a crank lever K, connected with an eccentric cam M, on the main shaft D, by a connecting rod L, said cam M, being so adjusted,

as to operate the ingress valves alternately, at proper time. O, is the exhaust side pipe, arranged on the other side of the cylinder, and communicating with either end thereof through valves Q, Q, in chambers P, P, these valves are actuated by levers R, R, having their fulcra in studs *d*, *d*, arranged similar to the ingress valves and are operated alternately, by the double crank lever S, on the rock shaft T, having one of its bearings in the box *c*, on the cylinder, and the other in box *e*, on the exhaust side pipe O. On this rock shaft T, is a crank lever U, connecting by a rod *f*, with a similar crank lever U², on a rock shaft U³, having its bearings on the ingress and egress side pipes F, and O, and a crank lever V on its end, which being connected by the rod V², with the eccentric cam V³, on the main shaft D, receives a reciprocating motion, and operates the exhaust valves Q, Q, alternately, in proper time. Near the rearward end of the exhaust side pipe O, is a cylindrical chamber W communicating with the side pipe, and provided with a relief valve W², to allow a portion of the exhaust steam to escape through the pipe W³. This relief valve has a stem projecting upward through a guide bar *g*, and weighted with a ball *h*, of sufficient gravity to retain said valve in its seat, it is to be opened simultaneously with the opening of either of the exhaust valves Q, by the reciprocating motion of the lifting box Y, connected by rod *j*, to a crank lever X on the end of rock shaft T, the lifting box Y, passing under an inverted double inclined plane Z, attached to the stem of the valve W², by a pin *l*, and on which it vibrates to a limited extent, and lifts said valve, and allows it to close again gradually.

Near the front end of the exhaust side pipe O, is a valve *n*, communicating by an opening *o*, with the side pipe, and by an opening *p*, with a pipe *p*¹, leading to the ordinary condenser. To the stem *n*¹ of the valve *n*, is attached an open frame *q*, which slides between two upright guides *r*, *r*, which guides are connected by a cross bar *s*, at their top; within the opening of the frame *q*, works a double crank lever *u*, on the end of the rock shaft *t*, which is so operated by a crank lever *w* on the other end of rock-shaft, connecting rod *w*², and eccentric cam *w*³, on main shaft D, as to open it a little before the closing of the relief valve W², to

allow the remainder of the steam to pass off to the condenser. By this arrangement it will be seen, that the two inductive valves are each alternately opened, at the moment
5 the piston commences its stroke, toward the opposite end of the cylinder, and closes when the piston passes about half way of its stroke, and the steam acts expansively during the remainder of its stroke, and the
10 two exhaust valves q , q , are alternately opened, as soon as the piston has reached the end of the stroke, and remain open during the entire stroke, to allow the steam to pass off from the cylinder, at the moment
15 that either of the exhaust valves Q , is opened, the relief valve W^2 , is opened, by the reciprocating lifting box Y , to allow a portion of the exhaust steam to escape, through the pipe W^3 , into the air, (or else-
20 where as desired,) and almost instantly closes again by its own gravity, at the moment this valve closes, the condenser valve n , is opened, and a direct communication made between the cylinder and condenser,
25 and remains open during the remainder of the stroke of the piston, to allow the re-

mainder of the steam to pass into the condenser.

Having thus described the construction and operation of our invention what we claim therein as new and desire to secure by Letters Patent is—

The arrangement and combination of the partial escape or relief valve W^2 , plate Z , reciprocating lifting box Y , connecting rod
35 j , crank lever X , and rock shaft T , whereby the said relief valve W^2 , is actuated simultaneously with the opening of either of the exhaust valves and allowed to close again as herein set forth. 40

In testimony whereof we have hereunto signed our names before two subscribing witnesses.

WILLIAM FEW.

FRANCIS ARMSTRONG.

Witnesses to the signing of William Few:

NATHAN GRISMORE,

JAMES R. STROTHER.

Witnesses to the signing of Francis Armstrong:

EDWARD LAVELLE,

H. BENSE.