

J. Ferguson,
Steam Cut-Off.
N^o 21,295. Patented Aug. 24, 1858.

Fig. 1

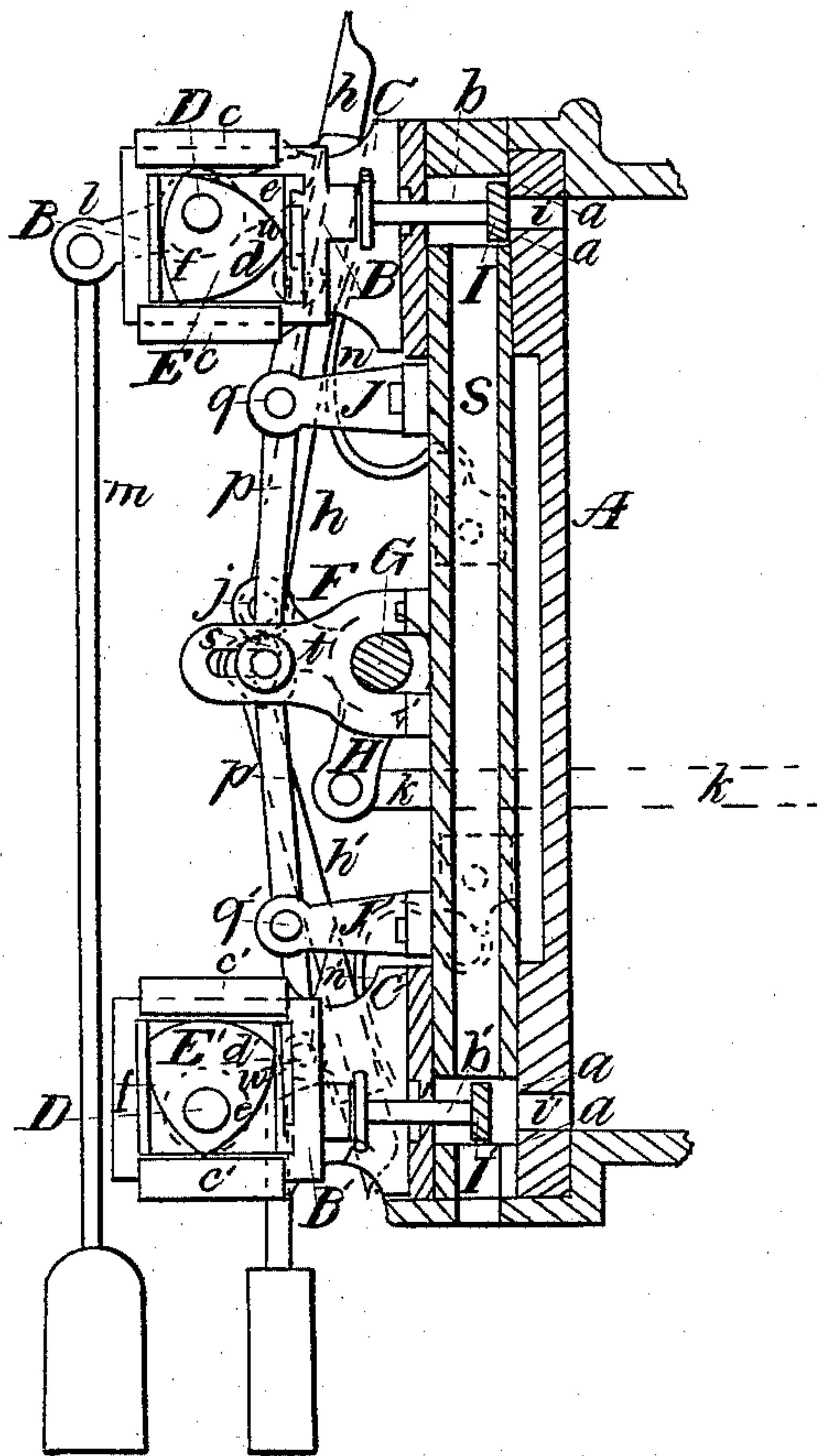
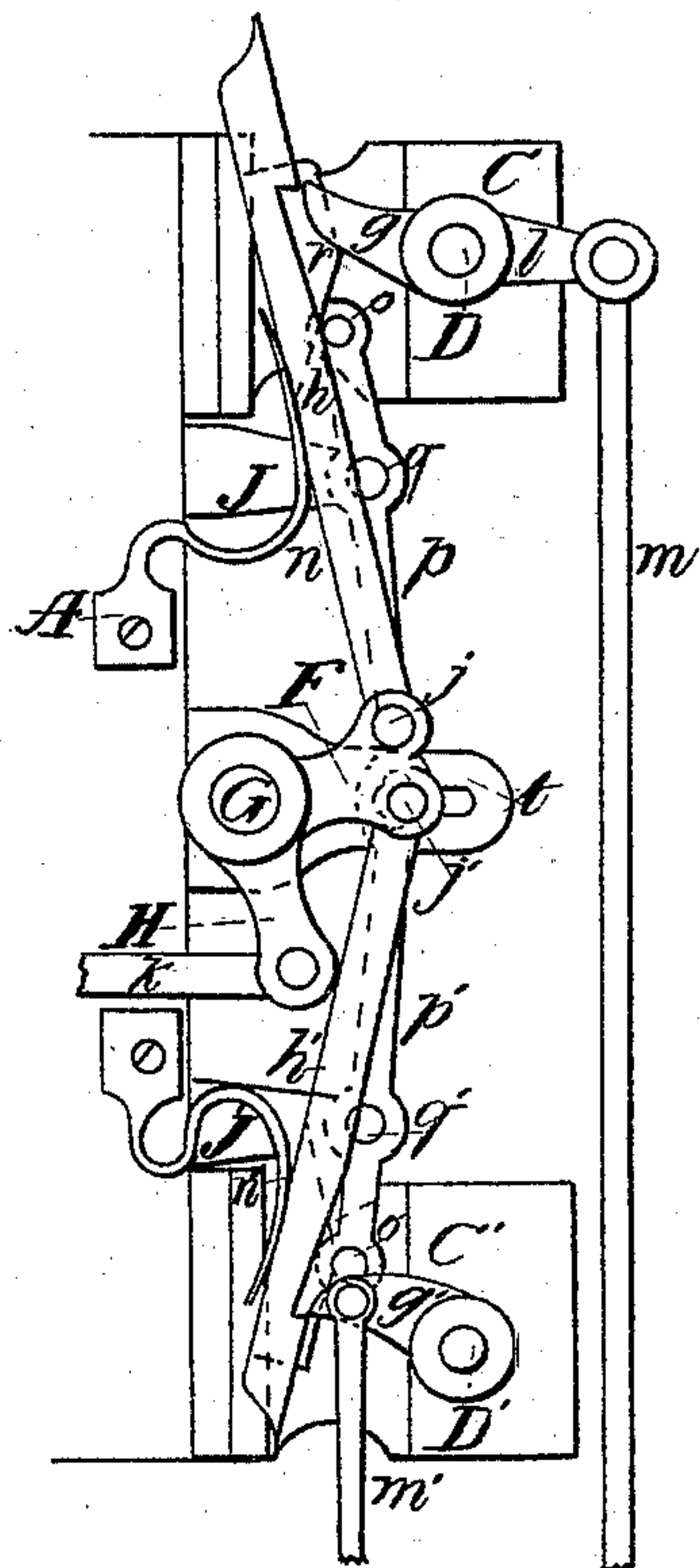


Fig. 2



UNITED STATES PATENT OFFICE.

JAS. FERGUSON, OF BRIDGEWATER, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND LAZELL, PERKINS & CO., OF SAME PLACE.

VALVE-GEAR OF STEAM-ENGINES.

Specification of Letters Patent No. 21,295, dated August 24, 1858.

To all whom it may concern:

Be it known that I, JAMES FERGUSON, of Bridgewater, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Induction Valve-Gear for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side view of an induction valve gear, with my improvement. Fig. 2 exhibits the opposite side.

Similar letters of reference indicate corresponding parts in both figures.

This invention relates to engines in which a separate induction valve is used for each end of the cylinder, and is more particularly applicable in connection with valves which open and close by a movement from and toward their seats.

It consists in operating each of such induction valves by means of a cam of peculiar form on one of two rockshafts which are connected with the driving eccentric by tripping mechanism; said cam working in a yoke attached to the stem of the valve. The effect of the cam is such, that a very great force is brought into action upon the valve to start it, but that, after it has been started, its motion will be constantly accelerated and its full opening will be effected during a small part of the stroke of the piston, also that, in closing, the motion of the valve will be gradually diminished in velocity, so that though it is closed by the sudden action of gravitation or of a spring, it is prevented from slamming violently, as when the force of gravitation or of a spring acts directly upon the valve or through a simple lever.

To enable others skilled in the art to apply my improvement, I will proceed to describe its construction and operation.

A, represents part of the cylinder of an engine of the upright kind.

S, is the side pipe or steam chest.

i, i , are the induction ports; a, a , the valve seats; and I, I', the induction valves which consist of flat plates of metal working perpendicularly to their seats, which are also flat.

b, b' , are the valve stems, supposed to work through stuffing boxes in the back of

the steam chest, and B, B', are the cam yokes attached to the said stems, said yokes being square and fitted to work in guides c, c, c', c' , in stationary brackets C, C', bolted to the cylinder or steam chest. The said brackets C, C', also contain the bearings for the rockshafts D D', on which are secured the cams E, E', which work in the yokes B, B', for the purpose of operating the valves. These cams are both alike, viz., three-sided, one side d , of each being an arc described from the center of its respective rockshaft, and the other two sides e , and f , are arcs described with a radius equal to the chord of the arc d , from opposite extremities of the said arc. The peculiarities of this form of cam are that it will rotate for a considerable distance within a yoke and only produce a rectilinear motion and while doing so will continue to fit to opposite sides of the yoke, so that the rectilinear motion is reversed at once by reversing the motion of the cam, also that from a certain position it begins to move the yoke very slowly, so that a short lever on the shaft is capable of producing a powerful leverage to start the valve, but that when the valve has started, its motion is accelerated progressively for some distance and vice-versa; the effect of which motion when said cams are employed to combine the valves with the eccentric and tripping apparatus will be hereinafter explained.

The rockshafts D, D', are furnished respectively with lever arms g , and g' , (shown best in Fig. 2) having broad but sharp-edged extremities for the purpose of engaging the rockshafts with two notched latch bars h, h' , which are connected by separate pins j, j' , with the arm F, of a rockshaft G, which works in bearings attached to the cylinder or steam chest. This rockshaft G, derives motion through a rod k , from an eccentric on the crank shaft of the engine, connecting with its arm H. The rockshaft D has a second arm l , from which is suspended a weighted rod m , which operates to turn the said rock-shaft and its cam E, in a direction to suddenly close or as it is termed "trip" the valve I, when the arm g , is disengaged from the latch bar h ; and the arm g' , has suspended from it a weighted rod m' , which operates in a similar manner on the rockshaft D', and cam E', to effect the tripping of the valve I', when the arm g' , is disen-

gaged from the latch bar h' . Just before the termination of the stroke of the piston of the engine in either direction, the lever arm g , or g' , of the valve at the end of the cylinder which the piston is approaching, is caused to engage with its respective latch bar h , or h' , by one of two springs n , n' , applied to the said bars for that purpose, and when thus engaged, the latch bar operates on the cam shaft D or D' , as the case may be, to cause the opening of the valve I or I' , as the stroke terminates. The disengagement of the arms g , g' , is effected at the required time for the cutting off the steam by means of two inclined projections r , r' , on the sides of the latch bars and two pins o , o' , secured in the sides of two levers p , p' , which work on fulcrum q , q' , in brackets J , J' , secured to the cylinder or steam chest; the said projections coming in contact with the said pins and, by sliding over the said pins, causing the latch bars to be gradually forced off the extremities of the arms g , g' . These levers p , p' , are either adjusted permanently by a set screw s , fastening them to a stationary plate t , or controlled by the connection of a governor with their adjacent ends to set the pins o , o' , more or less backward or forward for the purpose of causing the disengagement of the arms g , g' , and tripping of the valves to take place earlier or later in the stroke of the piston.

The cams E , E' , should be so set on their respective shafts that when either of the valves is closed, the side of its respective cam yoke upon which the cam acts to open the valve, viz., the side farthest from the valve, should touch that part of the side f , of its cam, that is nearest the axis of the shaft. The cam E and yoke B , are repre-

sented in this condition in Fig. 1. By this arrangement, when either of the latch bars h , h' , comes into operation on the arm g , or g' , to start the valve, a very great leverage is exerted by the arm and though the valve opens at first very slowly, its motion is accelerated as the cam moves, the cam, in fact, acting in this respect like a toe; and when the arm is liberated, the action of the cam is quite the reverse, that is to say it operates to move the valve with a gradually diminishing velocity; and though the valve is tripped and closed very suddenly instead of very slowly as when a toe is used in the common way, it is prevented slamming with such violence as when it is acted upon directly or through a simple lever by the agency of gravitation or a spring.

To counteract still further the tendency of the valves to slam on their seats, I apply springs u , u' , in the side of the yokes on which the cams act in closing them.

I do not claim any of the mechanism herein described for operating the cam shafts, as it differs little from the mechanism commonly employed for working valves with a tripping motion; nor do I claim, generally, operating valves by cams and yokes. But—

What I claim as my invention, and desire to secure by Letters Patent, is:—

The employment of cams E , E' , of the form herein specified, applied in the manner described, to connect the valve stems with the rockshafts D , D' , which receive the tripping motion, for the purposes herein set forth.

JAMES FERGUSON.

Witnesses:

LAFAYETTE KEITH,
GEORGE B. STETSON.