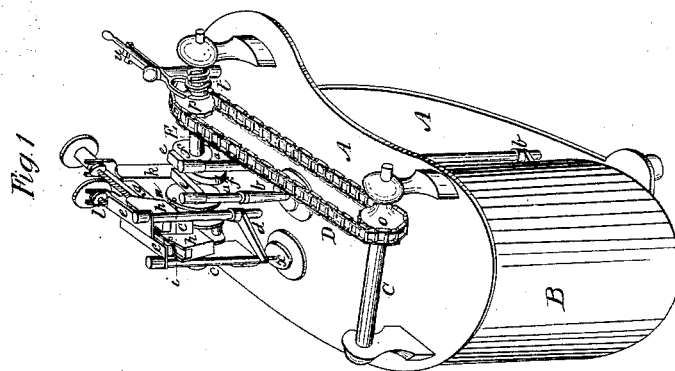
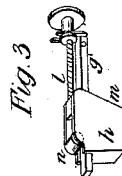
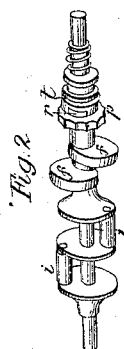
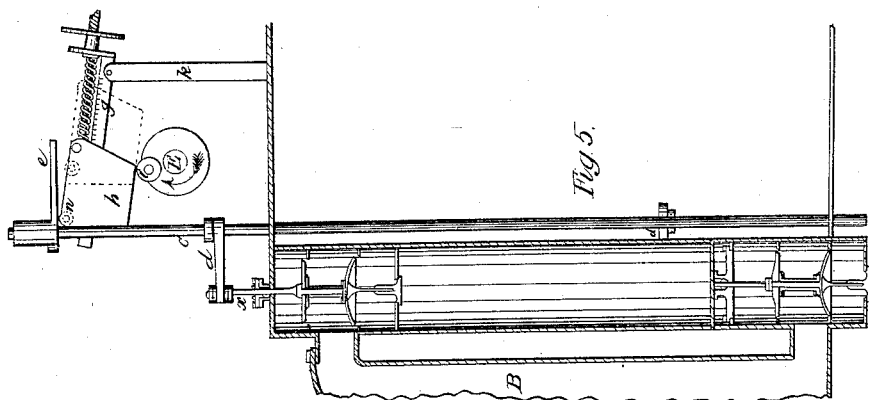


J. King,
Steam Cut-Off.
N^o 6,209. Patented Mar. 20, 1849.



UNITED STATES PATENT OFFICE.

JULIUS KING, OF BORDENTOWN, NEW JERSEY.

ADJUSTABLE CUT-OFF.

Specification of Letters Patent No. 6,209, dated March 20, 1849.

To all whom it may concern:

Be it known that I, JULIUS KING, of Bordentown, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Machinery for Working the Cut-Off Valves of Steam-Engines, of which the following is a full and exact description, reference being had to the annexed drawings of the same, making part of this specification, in which—

Figure 1 is a perspective view of the apparatus for operating the valves and of those parts of the engine with which it is more immediately connected. Fig. 2 is a perspective view of the shaft which carries the cams and tappets that lift the steam and exhaust valves detached from the rest of the engine. Fig. 3 is a view of one of the adjustable vibrating levers which open the steam valves by motion received from the tappets, and shut off the steam at any desired point in the stroke of the piston. Fig. 4 is a view of the two parts of the disengaging coupling, separated from each other and detached from the shaft. Fig. 5 is a vertical section through the steam chest and valves and partly a fragment of the cylinder attached.

The same letters indicate the same parts in all the figures.

The nature of my invention and improvement consists in so constructing and arranging the lever which lift the valves, and the cams and other apparatus which operate them, that they will open the steam valves, and then close them again to cut-off the steam when the piston has accomplished any definite portion of its stroke, the feet of the lifting levers being susceptible of such adjustment as will vary the point at which the steam is cut-off at pleasure, without either stopping the engine or changing the lead of either the steam or exhaust valves. If it is found that the crank passes the upper harder than it does the lower center, which frequently happens, this mode of operating the valves, admits of an easy correction of the difficulty, by increasing the steam on that stroke of the piston which works hardest or diminishing it on the other, so as to produce an equilibrium of action.

The steam can be worked by expansion

with equal advantage, whichever way the crank turns, so that a ferry or other steam boat, which it is required to move either end first, can be run in one direction as well as in the other, and the only adjustment that is necessary in order to effect this change is that of the feet of the lifting levers, and the catch of the clutch coupling.

In the accompanying drawings A A are platforms which constitute a part of the frame work of the engine to which the apparatus which operates the valves is in part secured.

B is the steam cylinder.

C is a shaft from which motion is transmitted through the endless chain D to the valve shaft E which carries the tappets or cams that lift the valves.

The lifting rods *a* have a vertical motion parallel to that of the exhaust valves, to the stems of which, the arms *b* of these sliding rods are attached. The lifting rods *c* have a similar motion and the lifters *d* (*d* not seen in drawing) projecting from them, are attached to the stems *x* (*x* not seen in drawing) of the steam valves. To the upper end of each of these lifting rods a toe *e* is attached, which projects over the valve shaft E immediately above the tappet or cam which lifts it. The toes *e* on the rods which raise the exhaust valves are acted upon directly by the revolving tappets *f*, but the lifting arms on the rods which raise the steam valves are acted upon by the intermediate hinged lever *g* whose adjustable feet *h* are acted upon by the tappets *i*. Each steam and exhaust valve has its own separate tappet and lifting rod, and can therefore be arranged so as to have as little or as much lead as may be deemed proper. As the lead of the exhaust valves when once properly adjusted, never requires changing, the cams and lifting arms which operate these valves are so firmly fixed in their respective places, as not to admit of adjustment.

The tappets for lifting the steam valve may be provided with rollers on their ends to diminish the friction against the bottom of the feet (*h*) of the arms *g*, or rollers *i* mounted upon a shaft supported between two flanches, or otherwise secured upon, and

eccentric to the shaft E. The lifting levers *g* are hinged by one end to the post *h* and at such a height above the valve shaft E that the lower side of the feet *h* will be in the same horizontal plane with the upper side of the shaft, in order that however the position of these adjustable feet may be changed upon the levers, the lead of the valves may not thereby be disturbed. The feet *h* are flat on their under surface with perpendicular sides, and slanting ends which prevent them from dropping too suddenly from the tappet down upon the shaft, this slant which is shown at *m* will have to be greater or less according to the velocity with which the tappet revolves. The feet slide upon the levers, and are moved backward and forward for the purpose of adjustment by means of the screws *l*. Upon the upper side of these feet friction rollers *n* are placed, which act against the under side of the toes *e* to raise them, but these rollers may be transferred to the end of the arms if such an arrangement be deemed preferable, the levers *g* will be raised with greater or less suddenness as the joint on which the lever turns, and the point where the tappet strikes the foot are nearer or more remote, so that under all circumstances the opening of the valves may be sufficiently sudden to prevent the force of the steam from being wasted by the process of wire-drawing.

Upon the shaft C a cog wheel *o* is firmly secured the teeth of which fit into the interstices between the links of the endless chain D and thus take hold to carry it, upon the valve shaft a similar cog wheel *p* is placed, but it turns loose around the shaft, being however guarded from sliding longitudinally upon it. On the side of this wheel a catch *r* is fixed, being a projection which fits into either of the cavities *s* in the side of the clutch *t*. The clutch *t* is free to slide longitudinally on the shaft E, but is prevented from turning around it by a fether key which fits into parallel sunken grooves made respectively in the surface of the shaft, and of the eye of the clutch. The clutch is thrown into, and out of gear with the catch *r* by the forked lever *u* and may be held in gear by a spring or other suitable device, and out of gear, by a catch which engages the lever. One of the notches *s* of the clutch is so situated that when the catch *r* is in gear with it, the tappets will operate the valves suitably for the crank to turn one way, and the other notch is placed so that when the catch is in gear with it, the valves will operate suitably to turn the crank in the other direction. When it is desirable for the engine to be self acting, the clutch is engaged with the wheel *p*; but when it is required to take the engine in hand, then

the coupling is disengaged. By adjusting the feet *h* upon the levers *g* so that the tappets will strike the bottom near one end, and slide along its entire length to the other end, the steam will not be cut off until seven eighths of the stroke has been made, such would be the case if the foot occupied the position indicated by the dotted lines in Fig. 5, but the position in which the foot is shown in the black lines would cut off the steam at half stroke, as the cam first strikes it about its middle, and therefore only holds it up half as long as it does in the former case. By moving the foot still further toward the outer end of the lever the steam would be cut-off proportionately sooner, in this case the valve shaft revolves in the direction shown by the arrow, which would give the proper motion of the crank and paddle wheels of a steam boat, to propel her forward. If the cam shaft revolved in the other direction it would reverse the action of the valves, and of course the crank and paddle wheel also, and propel the boat backward, in this case the feet would have to be placed as far on the forward side of the valve shaft as they are now on the rear side, in order to cut off the steam the same, and for the greater convenience of making the requisite adjustments of the feet I have graduated the sides of the levers. The position of these feet relative to the tappets may be changed by moving the lever back and forth by means of a screw, rack and pinion and many other devices well known to mechanics; and the foot upon the lever may be in various ways adjusted, and many other equivalent mechanical devices other than those described, but embodying the same principle, might be adopted. Instead of the endless chain a series of cog wheels might operate the valve shaft.

The various parts of this apparatus should be made of metal, which may be either cast or wrought at the option of the constructor.

Having thus described my improved method of operating the valves of steam engines, what I claim therein as of my invention and discovery and for which I solicit Letters Patent is—

1. Raising the valves by means of the tappets of a revolving shaft, acting against the adjustable sliding feet of horizontal vibrating levers which raise the valves, whereby the steam can be cut off at any point in the stroke of the piston that may be desired, and the point of cutting it off changed from time to time, without stopping the engine. I desire it to be understood that I do not limit myself to the precise arrangement of parts herein represented, but claim the right of varying the same to any extent that may be deemed advisable, while I accomplish the same results by essentially analogous means.

2. I likewise claim reversing the motion
of the engine by means of the clutch cou-
pling, arranged and operated substantially
as herein set forth, and also by the same
5 means throwing the chain which operates
the valves, out of gear, when it is required
to work them by hand.

In testimony whereof I have hereunto set
my hand this twenty-second day of Decem-
ber, A. D. 1848.

JULIUS KING.

Witnesses:

THEODORE BAXTER,
P. H. WATSON.