(No Model.) 2 Sheets—Sheet 1.

# B. V. NORDBERG.

## CUT-OFF FOR STEAM ENGINES.

No. 384,213. Patented June 5, 1888.

Fig. 1.

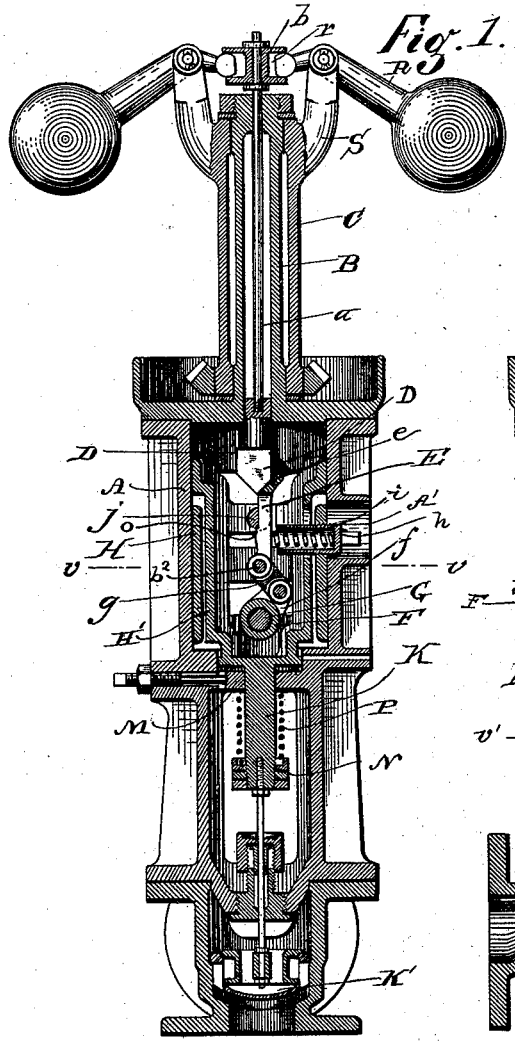



Fig. 2.

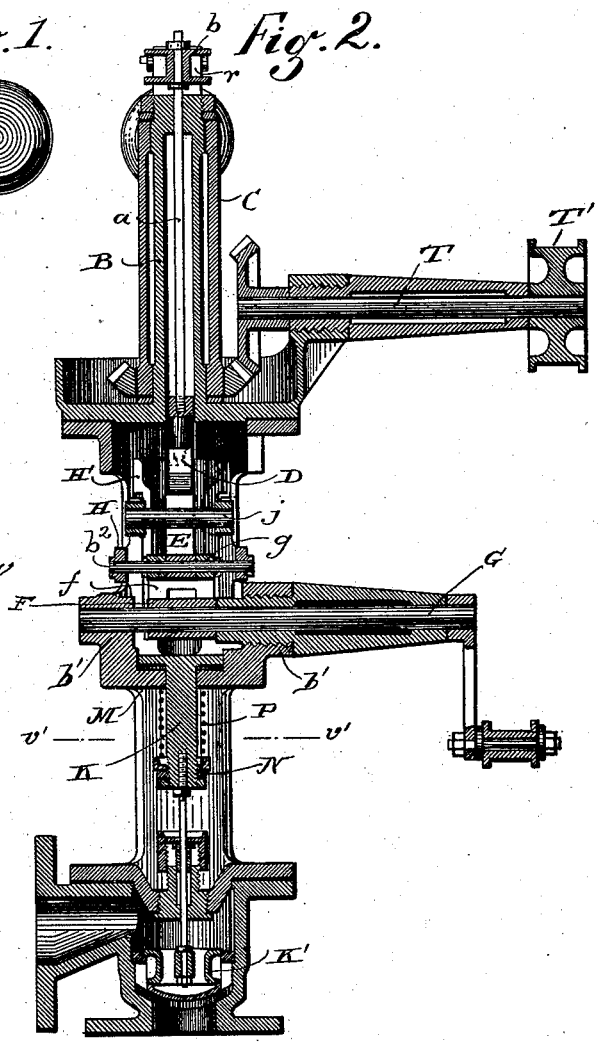



Fig. 3.

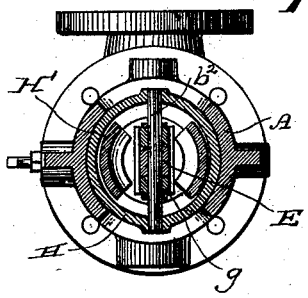
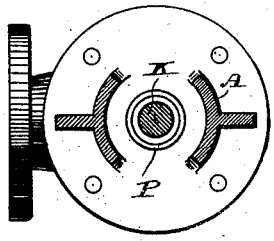



Fig. 4.

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(No Model.) 2 Sheets—Sheet 2.

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## CUT-OFF FOR STEAM ENGINES.

No. 384,213. Patented June 5, 1888.

Fig. 5.

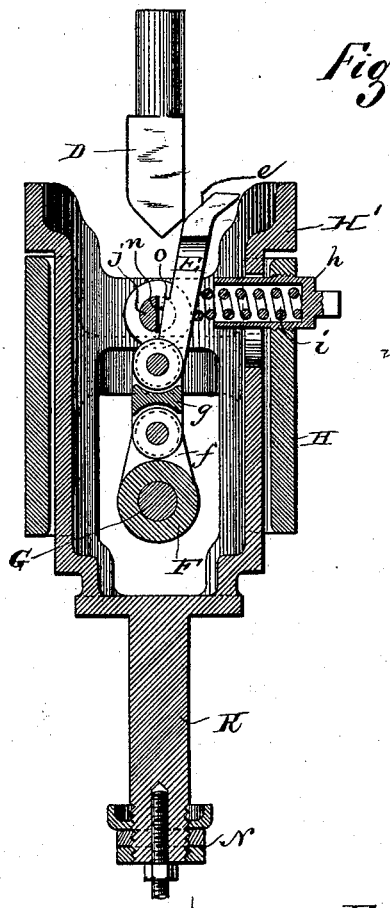



Fig. 6.

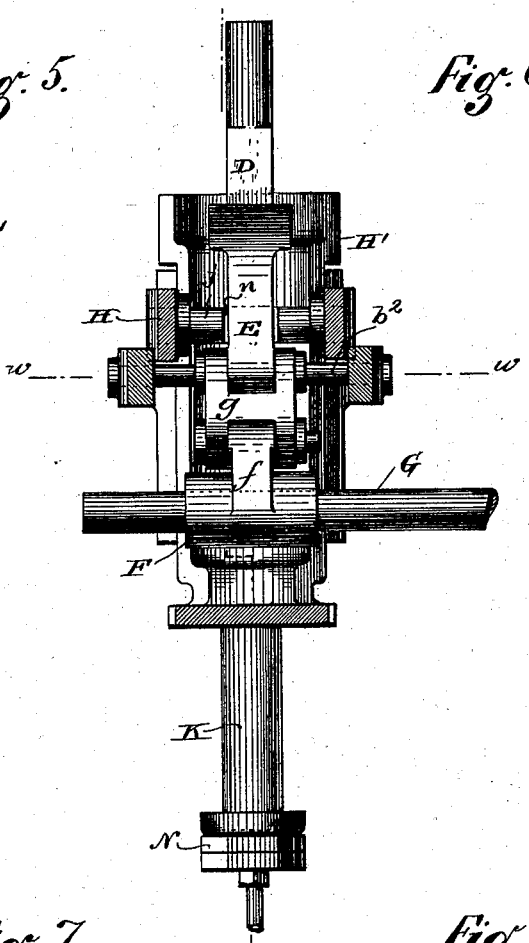



Fig. 7.

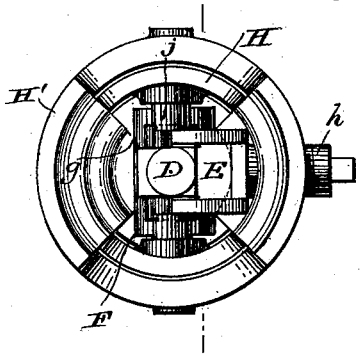
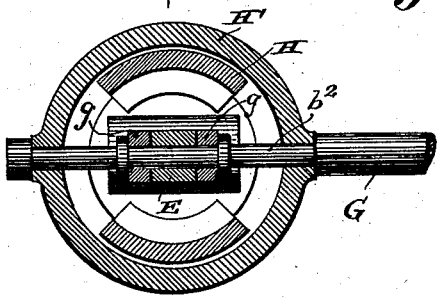



Fig. 8.

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# UNITED STATES PATENT OFFICE.

BRUNO V. NORDBERG, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE BRUNO NORDBERG COMPANY, OF SAME PLACE.

## CUT-OFF FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 384,213, dated June 5, 1888.

Application filed December 20, 1887. Serial No. 258,463. (No model.)

*To all whom it may concern:*

Be it known that I, BRUNO V. NORDBERG, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Cut-Offs for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to automatic cut-offs for steam-engines, and will be fully described hereinafter.

In the drawings, Figure 1 is a vertical central section of my device, taken on a line at right angles to the crank-shaft that connects my device with the eccentric of the engine. Fig. 2 is a vertical central section taken at right angles to that in Fig. 1. Fig. 3 is a section on line *v v*, Fig. 1. Fig. 4 is a section on line *v' v'*, Fig. 2. Fig. 5 is a detail in section of the main working parts. Fig. 6 is a detail in elevation. Fig. 7 is a plan or top view, and Fig. 8 is a section on line *w w*, Fig. 6.

A is the stand of my cut-off, and B is a hollow stem of the stand about which the governor-sleeve C revolves.

D is a trip-head that is suspended through the stem B by a rod, *a*, and keeper *b*. The lower end of the trip-head is beveled, as shown in Figs. 1 and 5, and one face of this bevel is designed for engagement with the inclined surface *e* of a trip-lever, E. This trip-lever E is toggled at its lower end to the arm *f* of a crank-sleeve, F, by a link, *g*, and the crank-sleeve F is keyed onto the rock-shaft G, which latter has bearings *b'* in each side of the stand A. The ends of pin $b^2$, that connect the link *g* and trip-lever to each other, extend across the jacket H, and are secured in the sides thereof, so that when the trip-lever reciprocates the jacket H and spring-barrel *h* will reciprocate with it.

H' is an upright cylinder that is fitted in stand A so as to be capable of vertical reciprocation therein, and the pin $b^2$, that connects the link *g* with trip-lever E, passes through openings in the sides of this cylinder and into the sides of the loose jacket H.

The stand A has a slot, A', in one side, and through this slot the barrel *h* is screwed into a screw-threaded opening in jacket H, and projects through a slot into cylinder H', and in this barrel a spring, *i*, is housed, that one end will bear against the trip-lever E and force it into the path of a lifting-pin, *j*, that projects from one side to the other of cylinder H'. The lifting-pin *j* has a recess, *n*, on one side, in which the lever E fits loosely, and at this point presents a plane surface to the adjacent vertical face of lever E, and the face of said lever is formed with a shoulder, *o*, for engagement with the under side of said pin *j*.

The cylinder H', which forms the valve-hanger, has a stem, K, that projects down through a partition, M, in the stand A, where it is provided with nuts N, between which and the partition M a spring, P, is interposed for retracting the valve hanger after it is lifted.

The governor-arms R are pivoted to brackets S, that project from the sleeve C, and the rounded ends of their inner arms fit loosely in slots *r* in keeper *b*, so that as the balls fall the stem *a* will be lifted, and as they rise the stem *a* will be depressed. The sleeve is connected with the pulley-shaft T by suitable gearing, and the pulley T' is belted to the engine, as usual.

The operation of my device is as follows: When the parts are in the position shown in Fig. 1, the engine has just completed a stroke and the valve K is closed. Now, as the shaft G is turned back by the eccentric, (not shown,) the arm *f* of sleeve F will lift upon link *g*, and as the arm *f* and link *g* approach a vertical line they will by toggle action lift the trip-arm E and cause it to lift upon pin *j*, and the cylinder H' will be raised to open the valve until the inclined face *e* of the trip-head D wedges the trip far enough to one side to disengage notch *o* from pin *j*, when the cylinder H' will be dropped, while arm *f*, passing the dead-center, will draw the trip-arm down in position for its notch to again engage the pin *j*. This tripping will occur sooner or later in the stroke of the engine, according to the position of the governor-arms. When the balls are raised, the head D, being depressed, will act on the trip-arm quickly, and vice versa.

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

1. The combination, in a cut-off for steam-engines, of a tripping-head connected with the governor-arms, a lifting trip-lever toggled to a rock-shaft that is operated by the eccentric of the engine, and a valve-hanger having a pin for engagement with a notch on the lifting trip-lever, as set forth.

2. The combination, with the lifting trip-lever and the trip-head and operating mechanism, of the valve-hanger and its engaging-pin, and a spring for forcing the lifting trip-lever into engagement with the engaging-pin, substantially as described.

3. The combination, with the valve-hanger and its engaging-pin, of the jacket, the rock-shaft and lifting trip-lever toggled to the rock-shaft, and the spring for forcing the lifting trip-lever into engagement with the pin of the valve-hanger, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

BRUNO V. NORDBERG.

Witnesses:
S. S. STOUT,
N. E. OLIPHANT.