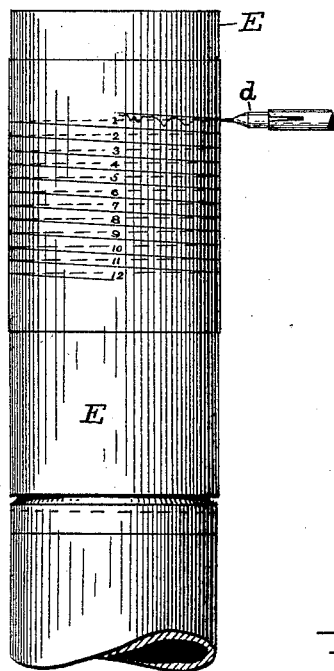
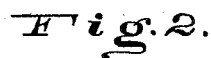
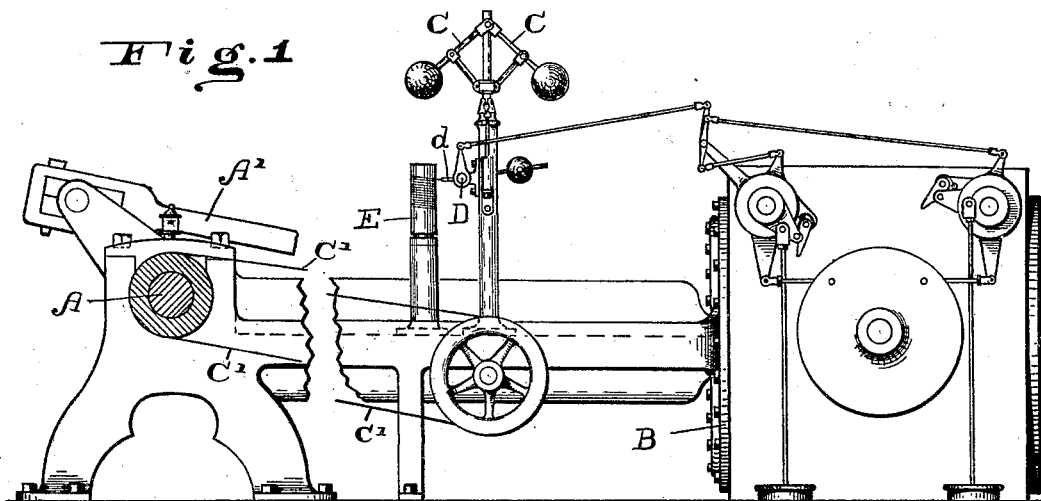


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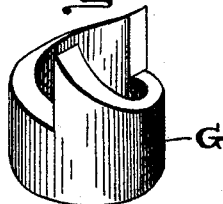
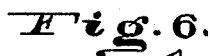
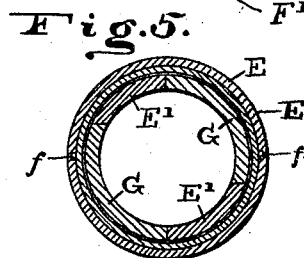
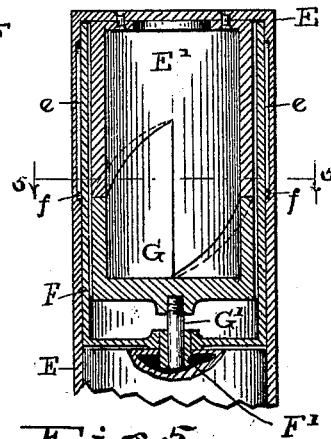
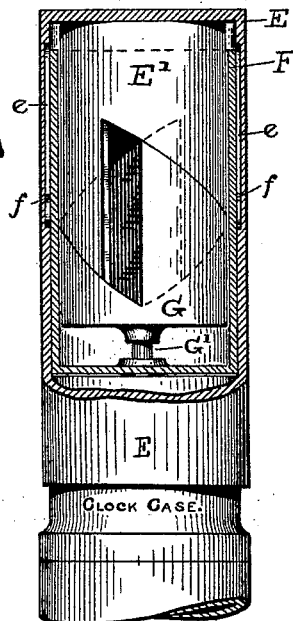
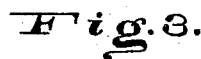
### CONTINUOUS CUT-OFF REGISTER FOR STEAM ENGINES.

Patented Sept. 25, 1894.



WITNESSES:

F. H. Warner.  
J. A. Walsh-



INVENTOR  
*Charles H. Dale,*

BY  
Chester Bradford,  
ATTORNEY.

(No Model.)

2 Sheets—Sheet 2.

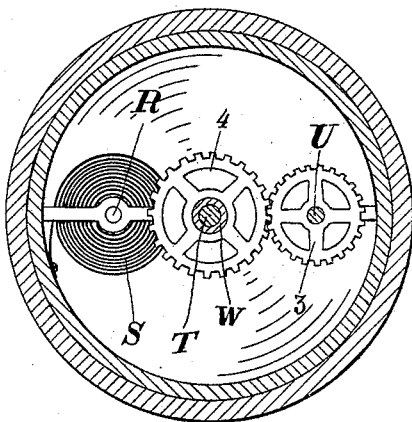
C. H. DALE.

CONTINUOUS CUT-OFF REGISTER FOR STEAM ENGINES.

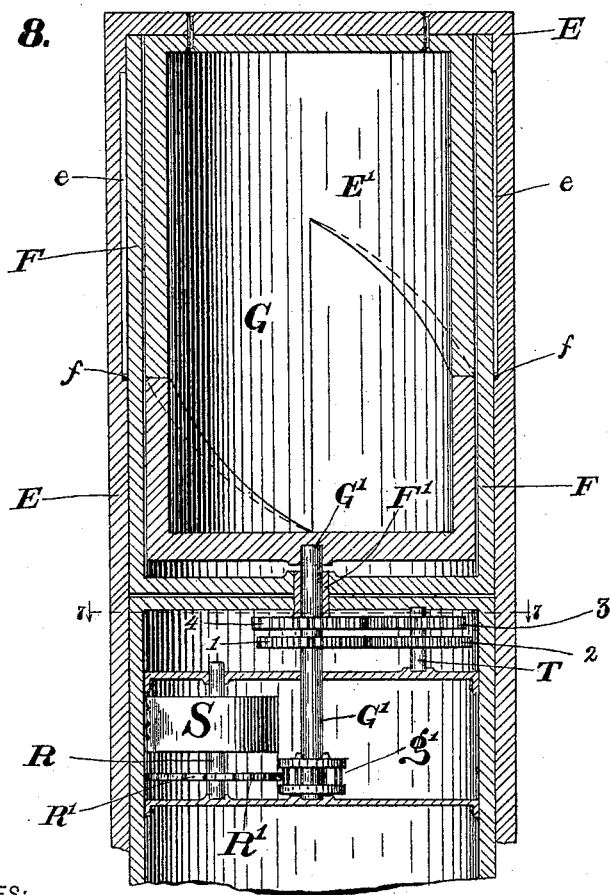
No. 526,383.

Patented Sept. 25, 1894.

*Fig. 7.*



*Fig. 8.*



WITNESSES:

*Edgar Kingsley*  
*J. A. Walsh*

INVENTOR

*Charles H. Dale,*

BY

*Chester Bradford,*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

CHARLES H. DALE, OF HARTFORD CITY, INDIANA.

## CONTINUOUS CUT-OFF REGISTER FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 526,383, dated September 25, 1894.

Application filed February 17, 1894. Serial No. 500,544. (No model.)

### *To all whom it may concern:*

Be it known that I, CHARLES H. DALE, a citizen of the United States, residing at Hartford City, in the county of Blackford and State of Indiana, have invented certain new and useful Improvements in Continuous Cut-Off Registers for Steam-Engines, of which the following is a specification.

The object of my said invention is to provide a means for taking a continuous "card" from a steam engine for any predetermined period of time. I have illustrated and will describe a construction adapted for a "twelve hour run," and whereby a correct time record will be taken throughout a period of twelve hours, but any other period might, of course, have been shown.

The particular features of this invention will be hereinafter fully described, and then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a side elevation of a steam engine showing the parts or features which are connected with or relate to the governor, and the means by which said governor is driven, (a considerable portion of the structure between the governor and the crank-shaft being, however, broken away) my improved registering or card apparatus being shown as mounted upon the frame alongside the governor; Fig. 2, a side elevation of the "card" or registering apparatus separately, on an enlarged scale; Fig. 3, a view with one side of the cylinders of said registering apparatus broken away, and the outer cylinder raised somewhat, as when it has been in operation for a short time; Fig. 4, a central sectional view; Fig. 5, a horizontal sectional view; Fig. 6, a perspective view further illustrating the lower cam portion; Fig. 7, a horizontal sectional view as seen from the dotted line 7 7 in Fig. 8, showing the clock-work mechanism in plan, and Fig. 8 a vertical sectional view showing said clock-work mechanism in side elevation, being otherwise substantially the same as Fig. 4, but on a larger scale.

In said drawings the portions marked A represent the crank-shaft of the engine; B, the steam cylinder; C, the governor; D, the rock-shaft controlled by the governor, (and which

has an arm or crank to which the rods leading to the valves are connected;) E, the cylinder carrying the card or sheet upon which the record is to be made; F, a cylinder within the cylinder E upon which the latter is mounted, and G the lower cam or cam portion. All these parts except the cylinders and their attachments are or may be of a usual and well known construction.

The crank-shaft A is driven from the cylinder B through the pitman A', and the governor is driven from the crank-shaft by means of a belt C', and the governor C controls the rock-shaft D, and through it the valves, in the ordinary and well known manner. As all these parts and their operation are familiar to those skilled in the art, they, therefore, will not be further described herein, except incidentally in describing the invention.

Upon the shaft D is secured a pencil or point *d* which comes in contact with the register-sheet or card, and makes the inscription, as will be hereinafter described.

The clock-work mechanism by which the cylinder carrying the registering sheet or card is given its peculiar movement, is preferably situated within the base upon which the cylinder is mounted. Such clock-work mechanism is generally of an ordinary and well known construction, but it may be of any construction desired. That shown consists of the ordinary main shaft R, the ordinary main spring S, the ordinary driving shaft G', the ordinary counter-shaft T, and the ordinary sleeve shaft F'; the shaft G' being driven from the main shaft R by the ordinary spur gear wheel R' and pinion *g'*; and the sleeve shaft F' being driven through the counter-shaft T by the ordinary spur gears 1, 2, 3, and 4; the latter being the only things which are different from the most common clock-work mechanism, and they being only different in the size and number of teeth. As shown, the gears 1, 2, and 4, have twenty-four teeth each, while the gear 3 has twenty-three teeth, thus producing the eleven-and-one-half-to-twelve relation of movement between the shafts G' and F' required by the particular arrangement of this mechanism, elsewhere more fully described. The speed of this mechanism is governed by an ordinary escapement. (Not shown.)

The cylinder E is mounted upon and surrounds a second or inner cylinder F, (or an equivalent frame) which inner cylinder (or frame) is mounted upon a shaft F' connected to the clock-work, whereby it is driven. The cylinder E is so connected to the cylinder F, by means of grooves *e* and dowels *f* or otherwise, as to revolve therewith, while permitted an independent longitudinal movement. A cam part E' is secured to and within the cylinder E and extends down inside the cylinder F, the lower edge of said cam being the cam face. A second cam part G is secured to a second shaft G' extending from the clock-work, and said clock-work, in the arrangement illustrated, is so timed that while the cylinders E and F are revolving twelve times, the cam part G will revolve eleven and one-half times, being just one-half hour or one-half revolution slower in the twelve hours than the upper cam part E' and the cylinder E attached thereto. The cam faces in this arrangement are formed to extend throughout one-half the circumference of the structure, and are made of considerable height. The consequence is that the outer cylinder E, in its travel, is gradually raised as its cam part E' travels up the incline of the cam part G, and will finally reach its extreme height in twelve hours from the time the mechanism is started, when it will immediately drop back to the bottom or lowest position, as the lowest point of the cam part E' passes the highest point of the cam part G, bringing the two straight faces of said cam parts in line;—and from this point the device is ready to begin a new ascent.

The register sheet or card upon the outside of the cylinder E is divided into twelve spaces by an inclined line running regularly around it, and this line represents the point at which the point or pencil should rest when the steam is working to exactly the fixed cut off. Should this point or pencil rise above this line it would indicate that the engine was taking more steam than had been determined upon. The point *d* generally, however, travels below this line, and indicates the actual taking of steam within the predetermined limit as arranged for by the fixed cut off. As before stated, this pencil or point *d* extends out from the rock-shaft D and comes in contact with the card or register sheet upon the outside of the cylinder E, and is adapted to make a line thereon as said cylinder revolves. If the operation of the engine is exactly uniform, the resulting line will be a regular line, but as the operation departs from uniformity, so will the line upon the card or sheet. A fresh card being placed upon the cylinder at the beginning of each revolution period, (ordinarily twelve hours,) a continuous record of the work of the engine is thus obtained, and by having the cards with the proper divisional lines or marks, the exact character of the work of the engine at any time desired can be ascertained by reference to the card. The

distance between the helical lines on the card, vertically, is sufficient, when the engine is working with reasonable uniformity, to permit the record to be made between said lines, and such record should always be below the line above the pencil, which, as before stated, indicates the point of fixed cut off. The lines made by the pencil or point will not, therefore, in the ordinary normal work of the engine cross each other; but they may do so when the engine is working defectively or abnormally. As the cylinder revolves once each hour, each revolution, of course, indicates an hour's work, and the circumference can be divided into spaces indicating minutes, or such other periods of time as may be desired; so that a precisely accurate record, not only of the work of the engine, but of the time of such work, can be kept. A superintendent or proprietor can thus, where an engine has been in operation throughout the night, ascertain and read in the morning the work performed at any and all times during the night; and the same can be done for any period of absence, upon return from such absence, or at pleasure.

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

1. The combination, with the governor of a steam engine, of a rock-shaft having a pencil or point secured thereto, a cylinder alongside said point carrying a register sheet or card, a clock-work having two shafts, mechanism attached to said cylinder and operated by one of said shafts, other mechanism within said cylinder driven by the other shaft of said clock-work and operating upon the mechanism attached to the cylinder, whereby the cylinder carrying the card is caused to move longitudinally as well as circumferentially for any predetermined period, substantially as set forth.

2. The combination, in a cut off register for steam engines, of a cylinder carrying the register card or sheet and provided with a cam portion, a second cam portion engaging with the cam portion on said cylinder, and clock-work attached by different shafts to said cylinder and to said second cam portion, and running at different speeds, whereby said cylinder is given a longitudinal as well as a rotary motion, and a continuous record for a considerable period thus secured upon said register sheet or card.

3. The combination, in a register for steam engines, of a clock-work having two shafts running at different speeds, a cylinder secured to one of said shafts, a second cylinder telescopically secured upon the outside of said cylinder, a cam portion secured upon said outside cylinder and extending down to within the inside cylinder, and a second cam portion secured to the other of said shafts, said parts being arranged and operating substantially as set forth.

4. The combination, in a register for steam

engines, of a clock-work having two shafts  
running at different speeds, a cylinder se-  
cured to one of said shafts, a second cylinder  
telescopically secured upon said first cylinder,  
5 and mechanism operated by the other shaft  
by which the telescopic movement is effected.  
In witness whereof I have hereunto set my

hand and seal, at Indianapolis, Indiana, this  
10th day of February, A. D. 1894.

CHAS. H. DALE. [L. S.]

Witnesses:

CHESTER BRADFORD,  
JAMES A. WALSH.