G. B. Whiting,

Steam-Engine Valve-Gear.

No. 51,886. Patented Jan. 2, 1866.

Fig 6.

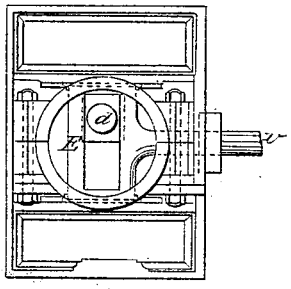


Fig 3.

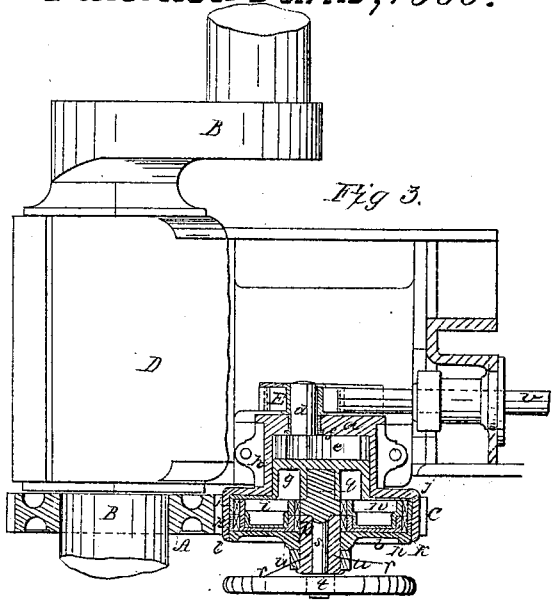


Fig 2.

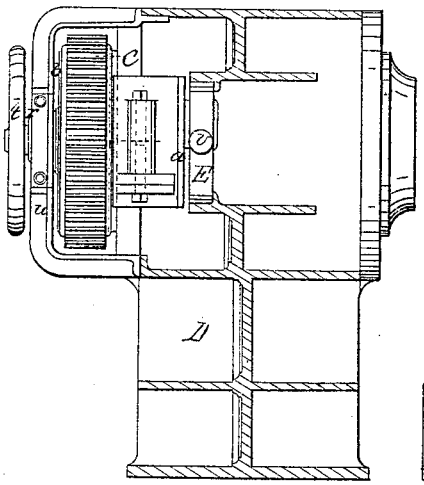


Fig 1.

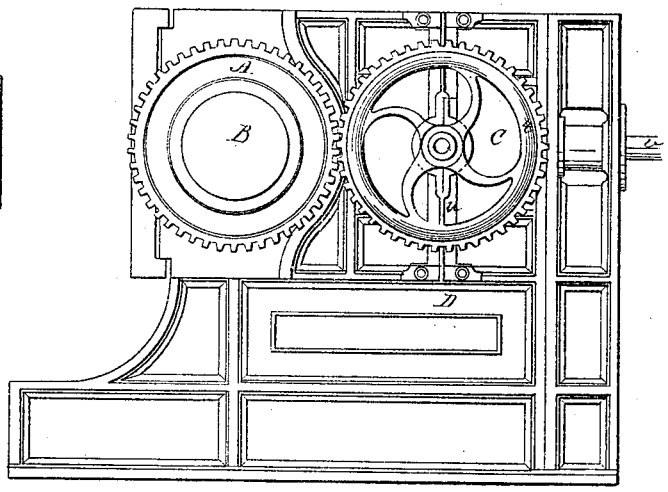


Fig 7.

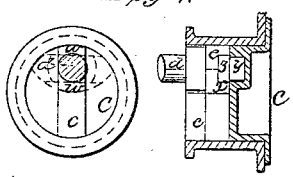


Fig 5.

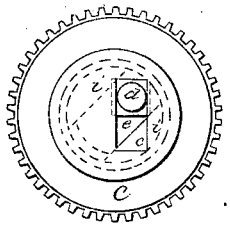
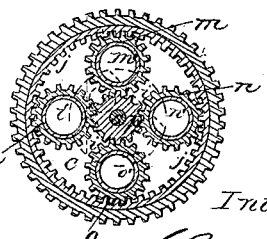


Fig 4.



Witnesses.

C. D. Smith

James H Gridley

Inventor.

Geo B Whiting

AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS.)

UNITED STATES PATENT OFFICE.

GEO. B. WHITING, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN VALVE-GEARS.

Specification forming part of Letters Patent No. **51,886**, dated January 2, 1866.

To all whom it may concern:

Be it known that I, GEO. B. WHITING, of the city of Washington, in the District of Columbia, have invented a new and useful Improvement in Valve-Gears and Adjustable Eccentrics; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is an outside elevation; Fig. 2, an end elevation, and Fig. 3 a transverse section. Fig. 4 is a vertical section of cylinder C; Fig. 5, an inside elevation of the same.

Similar letters of reference indicate corresponding parts of the several figures.

My invention comprises an adjustable eccentric, by which I am enabled to obtain an accurate and reliable cut-off and reversing motion for steam-valves of every description.

The nature of my invention consists in having a gear-wheel of suitable dimensions fixed on the crank-shaft and working into another gear-wheel of the same pitch diameter, which is made or secured on the circumference of a cylinder which rotates in suitable bearings and incloses a system of gear-wheels, disk, and an adjustable wrist-pin in such combination as to enable the operator to adjust the latter, while the engine is in motion, from the position which would cause the valve to follow the farthest through any intermediate point of cutting off to that position which would reverse the engines, and through the intermediate and extreme points of cutting off in the reverse direction.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A represents a spur-gear of a convenient diameter and suitable proportions to do the work required, secured to the crank-shaft B.

C represents the cylinder of an adjustable eccentric, of a convenient size and form to inclose the several parts hereinafter specified. On the circumference of the cylinder C is a spur-gear of the same pitch diameter as the one keyed to the shaft, and by means of which the cylinder is revolved. The cylinder C is made with one fixed head, *a*, and one movable head, *b*. The fixed head *a* has an oblong, rectangular slot, *c*, through it, the width and length of the slot depending upon the size of the wrist-pin and the required throw of the valve, the center-line of the slot lengthwise to be at a distance from the axis of the cylinder equal to that of the lap and lead of the valve. The length of the slot *c* determines the external diameter of that section of the cylinder C, which is used as a journal and upon which it revolves.

The wrist-pin *d* is made with a rectangular T-head, *e*, and rests in a block, *f*, which is fitted in the slot *c* in the head *a*, and is made so as to be capable of moving from one end of it to the other, the pin *d* projecting outside the head a sufficient distance to connect with the valve-stem or valve-stem link.

A disk, *g*, of suitable proportions, is made to fit the inside of the cylinder C at *h*. Upon the face of this disk are two segmental lugs, *i i*, forming a groove between them for the T-head *e* of the wrist-pin to work in, and serving as the means of communicating motion to it.

Two internal gears of the same pattern, the length and pitch of the teeth depending upon the work to be performed, are fitted to the largest inside diameter of the cylinder. One of these gears, *j*, is clutched with the disk *g*, the other gear, *k*, is fixed to the cylinder C. Two or more intermediate twin gears, *l l′ m m′ n n′ o o′*, work into the internal gears *j k*, and are placed equidistant from each other. Each twin-gear is pivoted upon its mate, as shown in Figs. 3 and 4. The intermediate twin-gears are kept in their relative positions, and in contact with the internal gears, *j k*, by two pinions *p q*, each having the same pitch diameter. One of these pinions, *p*, is made on or fixed to the sleeve *r*. The other pinion, *q*, is secured to the spindle *s*, which is fitted into and made to turn within the sleeve *r*. The spindle *s* projects beyond the sleeve *r* a sufficient distance to receive a lever, gear, or a hand-wheel, *t*, as may be desired. The intermediates *l l′ m m′ n n′ o o′* and pinions *p q* are kept in place by the movable head *b*, which is secured, by bolts or otherwise, to the cylinder C. The sleeve *r* of the pinion *p* is fixed to the bracket *u*, which is secured to the frame or pillow-block D, while the movable head *b*, being fitted on the sleeve *r*, revolves upon it as a journal.

When the arrangement of the engine ad-

mits of but a short connection between the eccentric and valve-stem, as repersented in this case, to avoid the variation of the lead at the opposite ends of the stroke consequent upon the obliquity of short connections, I use, in combination with the wrist-pin *d*, the yoke E, working in guides, and secured to the valve-stem *v*, as shown in Figs. 2, 3, and 6. With this combination the lead of the valve will be the same on either side at any point of cutting off, whether the engine is moving either forward or backward.

If it is required to make an eccentric for a valve having less lap in proportion to the throw than the one represented in this case, or to make an eccentric which can be reduced to a dead-center, it may be constructed as shown in Fig. 7, the wrist-pin *d* at the part *w* being made rectangular and fitted to work in the slot *c*. The head *e* of the pin *d*, being made as large as the case will admit, has a groove, *x*, on the inside, at right angles to the part *w*. A pin, *y*, having a T-head, *z*, is pivoted on the disk *g*, the T-head *z* working in the groove *x*.

Operation: With the cylinder C at rest, by turning the pinion *q*, by means of the hand-wheel *t*, or its equivalent, the intermediates *l m n o* are turned upon their twins *l' m' n' o'*, which also turn the internal gear, *j*, and disk *g*. The T-head of the pin *d*, being clutched with the disk *g*, is turned with it, forcing the wrist-pin along the slot *c*. The operation being the same with the cylinder in motion, the wrist-pin *d* can be moved to any point in the slot *c*, varying the cut-off or changing the direction of the engine accordingly, while the wrist-pin, by the combination, is firmly sustained in any position in which it is placed.

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

1. The intermediate twin gears, *l l' m m' n n' o o'*, either one or more of them, in combination with the pinions *p q*, internal gears, *j k*, and disk *g*, substantially as described.

2. The wrist-pin *d*, or its equivalent, and yoke E, in combination with the disk *g*, intermediate twin gears, *l l' m m' n n' o o'*, either one or more of them, internal gears, *j k*, and pinions *p q*, substantially as described.

GEO. B. WHITING.

Witnesses:
C. D. SMITH,
JAMES H. GRIDLEY.