2 Sheets—Sheet 1.

C. G. COOPER.

Traction-Engine.

No. 218,714. Patented Aug. 19, 1879.

Fig. 2.

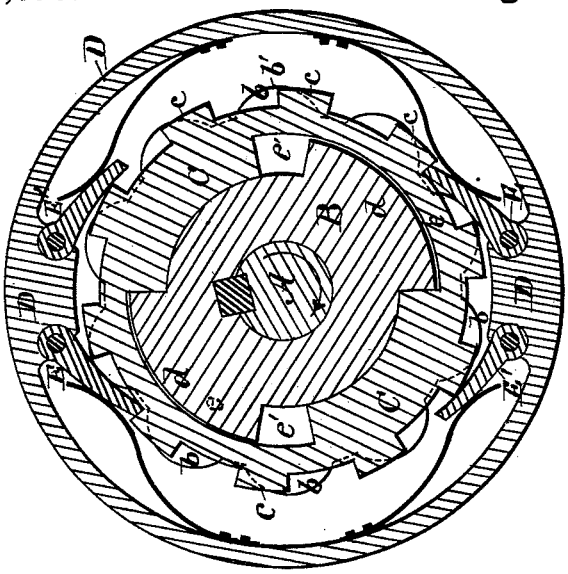

Fig. 3.

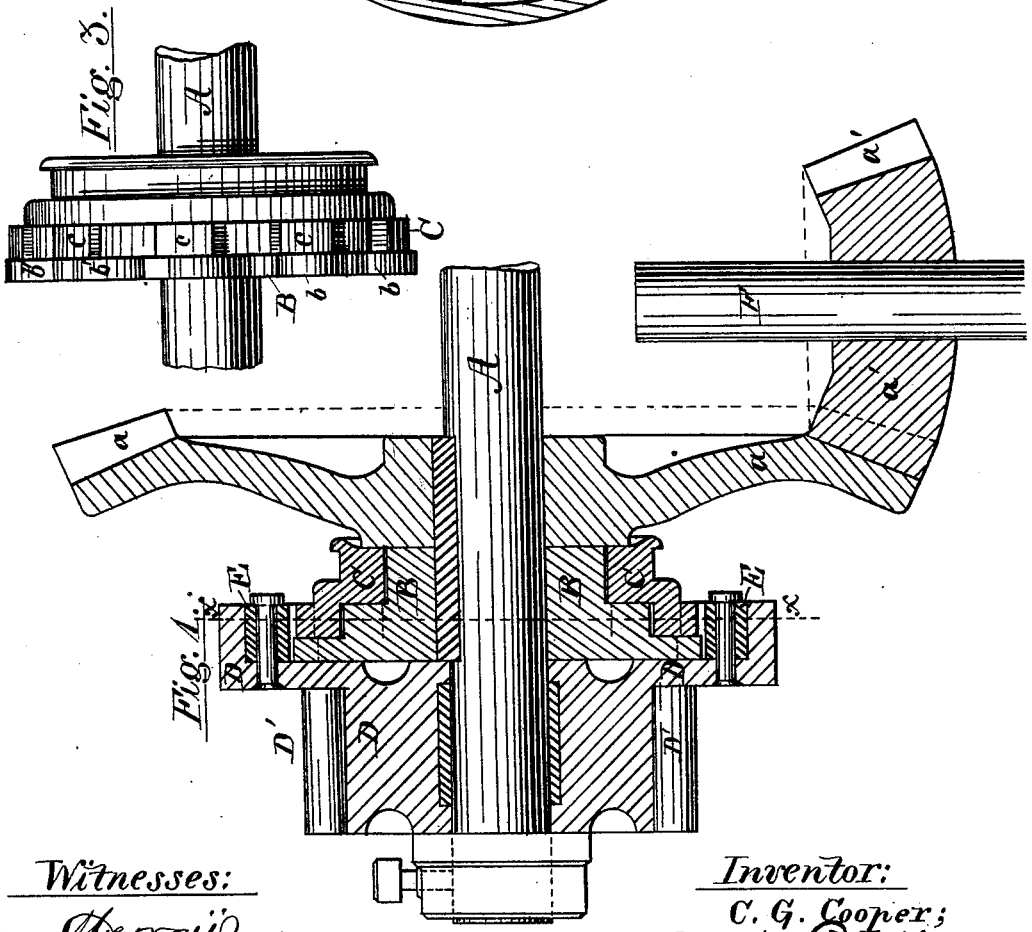

Fig. 4.

Witnesses:

George H. Scott

Inventor:

C. G. Cooper;

by M. Bailey

his Attorney.

C. G. COOPER.
Traction-Engine.

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Fig. 4.

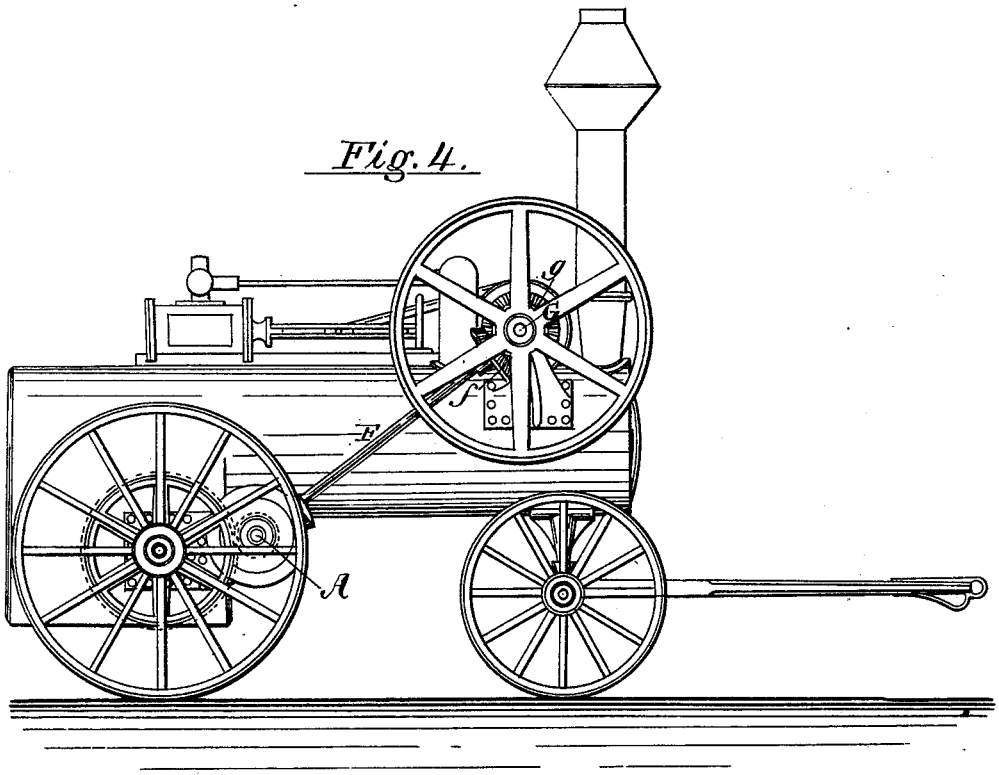
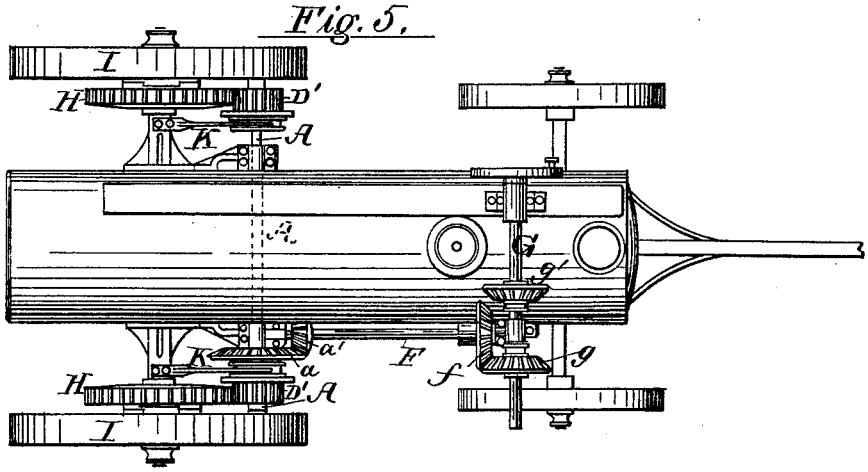


Fig. 5.



Witnesses:

A. Geo. Gill.
A. Scott

Inventor:

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by W. Bailey
his Attorney.

UNITED STATES PATENT OFFICE.

CHARLES G. COOPER, OF MOUNT VERNON, OHIO.

IMPROVEMENT IN TRACTION-ENGINES.

Specification forming part of Letters Patent No. **218,714**, dated August 19, 1879; application filed July 7, 1879.

To all whom it may concern:

Be it known that I, CHARLES G. COOPER, of Mount Vernon, in the county of Knox and State of Ohio, have invented certain new and useful Improvements in Traction-Engines, of which the following is a specification.

My invention relates to double-acting automatic pawl-and-ratchet devices for communicating movement to the power-driven truck-wheels of a traction-engine, said devices being so arranged and combined as to automatically act in either direction, whether forward or backward, and at the same time to leave the said truck-wheels free to move independently of one another and at different rates of speed, as is required when the engine turns or moves in a curved path.

A double-acting automatic pawl-and-ratchet device thus combined with the truck-wheels is, broadly considered, not new with me, the same being shown and described in Letters Patent to Francis Alger, No. 117,958, dated August 15, 1871. My invention is directed to an improved construction of the device itself, and also to improvements in the manner of combining or arranging it with respect to both the driving mechanism, from which it receives movement, and the truck-wheels, to which it imparts movement.

These improvements can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a section of the pawl-and-ratchet mechanism, the plane of section passing through the axis of the shaft on which the mechanism is mounted. Fig. 2 is a transverse vertical section on line *x x*, Fig. 1. Fig. 3 is a side elevation of the ratchet part of the mechanism. Fig. 4 is a side elevation of a traction-engine embodying my improvements; and Fig. 5 is a plan of the same.

My improvements are particularly adapted to that kind of traction-engine in which steam and animal power may be used interchangeably or simultaneously and together to move the engine, and it is such an engine that I have represented in the drawings. It will, however, be understood that said improvements are equally adapted to other kinds of traction-engines.

The pawl-and-ratchet mechanism may be applied to the axle of the power-driven truck-wheels or to the truck-wheels, or it may be mounted upon what is known as the "intermediate shaft." I prefer the latter arrangement for several reasons, and have represented the same in the drawings.

The intermediate shaft is marked A. It is supported in proper bearings on the boiler, and, in this instance, extends thereunder, just in front of the fire-box, across the engine. At each end it carries a pawl-and-ratchet mechanism, and as these mechanisms are counterparts of one another a description of one will answer for both.

The details of construction are shown clearly in Figs. 1, 2, and 3.

The first member of the mechanism is the sleeve or disk B, which I shall term the "reversing-disk." This member is connected with and receives motion from the driving mechanism of the engine. It is in this instance keyed on the rotary intermediate shaft A, on which is also keyed the bevel-gear wheel *a*, which meshes with a corresponding gear, *a'*, in the lower end of the inclined shaft F. The reversing-disk is provided on its periphery with a series of rounded or convex guide-teeth, *b*, whose function will be presently described.

Upon the hub of the reversing-disk is mounted loosely the disk C, provided on its periphery with ratchet-teeth *c*. The ratchet-disk and reversing-disk are connected by what may be considered a tongue-and-groove connection, tongues *d* on the hub of the reversing-disk projecting into grooves or recesses *e* in the ratchet-disk, the grooves being wider than the tongues, as shown at *e'*, so that the reversing-disk may rotate to a certain extent without influencing or moving the ratchet-disk, this being necessary in reversing the movement in order to shift the guide-teeth *b* with respect to the ratchet-teeth before putting the ratchet-disk in motion. The width of the space *e'* will be determined by the extent of movement of the guide-teeth necessary in order to shift them into their new position with relation to the ratchet-teeth.

Loosely mounted on the shaft A is the pawl hub or wheel D, provided with a laterally-pro-

jecting rim, on which are hung one or more pairs of pawls, E E′, in position to engage the ratchet, the acting ends of said pawls being, by spring-pressure, pressed toward the ratchet-teeth. The pawls of each pair are placed in opposition, so that one will engage and act on the ratchet in a direction opposite to that in which the other will act. The pawls overhang both the ratchet-teeth and the guide-teeth, and are of a width or thickness to rest on both.

I find it desirable to have the guide-teeth equal in number to the ratchet-teeth. Peripherally, however, they are considerably longer than the ratchet-teeth, and they are also of such height that their crowns are at least flush with and, preferably, a little above the outer faces of the ratchet-teeth, as shown in the drawings.

The mode of operation of the mechanism is as follows: Suppose the parts to be in the position represented in Fig. 2, and the shaft A to be rotating in the direction of the arrow. Through the instrumentality of the reversing-disk, which is keyed to the shaft, the ratchet-disk is caused to revolve in the same direction, and in so doing engages the pawl E, thus causing the revolution of the wheel D.

Under these conditions all the parts B C D move together, the pawls E′ being held up out of engagement with the ratchet. If, for any reason the pawl, wheel, or hub should move faster than the ratchet-disk and its actuating mechanism, this is permitted by reason of the guide-teeth *b*. The pawl E will, of course, slip easily over the ratchet-teeth, even without assistance of the guide-teeth. The pawl E′, as it advances, will ride up over the exposed slanting or curved face *b′* of each guide-tooth *b*, and will be so carried up and over the ratchet-teeth without engaging any one of them. Thus slip-motion of the pawl-wheel is provided for, which will permit that wheel to revolve independently of the pawl-and-ratchet mechanism.

If, now, the motion of shaft A be reversed, the first effect of the reversal will be to move the reversing-disk independently of the ratchet-disk through a distance equal to the space *e′*, and in so moving it shifts the position of the guide-teeth *b*, lifting the pawls E out of engagement, and bringing the guide-teeth relatively to that pawl into a position similar to that which they before occupied with relation to the pawl E′.

By the time the guide-teeth have been thus shifted the reversing-disk has again engaged and put in motion the ratchet-disk, which at once is engaged by pawl E′. In this reverse movement, however, the wheel D has the same capacity for slip motion or movement independent of the pawl-and-ratchet mechanism. I thus obtain a double-acting automatic pawl-and-ratchet mechanism, which can be used to effect both forward and backward movements at pleasure, while the wheels at the same time retain capacity for movement independent of and unaffected by the driving mechanism.

The intermediate shaft A, as above specified, receives movement from the inclined revolving shaft F, which at its upper end is provided with a beveled gear, *f*, so positioned as to engage one or the other of the beveled gears *g g′* on the engine-shaft G. The gears *g g′* are united by a spline-and-groove or equivalent connection with the engine-shaft, and can slide lengthwise thereon. They are to be connected with a suitable system of levers or shipping devices, by which either one, at pleasure, can be brought into engagement with the gear *f*, in order to reverse the movement of the inclined shaft whenever desired, as will be understood without further explanation.

The pawl wheels or hubs D are provided with pinions D′, which mesh with the toothed wheels H, by which the rear truck-wheels, I, are driven.

I find it desirable to use in connection with each ratchet-hub a brake or friction device, with a view to preventing the disk from moving during the independent movement of the disk B in reversing, or when the truck-wheel is moving faster than the shaft A.

There are numerous ways in which friction can be applied. That shown in the drawings is perhaps as simple and effective as any. As there shown, the device consists of a stiff elastic bar, K, of metal or other suitable material, which bears upon the hub of the ratchet-disk, a groove being formed in said hub to receive the end of the brake-bar.

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

1. The power-driven reversing-disk provided with peripheral rounded or curved guide-teeth, the ratchet-disk, and the pawl-wheel, with one or more pawls thereon, these members being combined and arranged for joint operation, substantially as set forth.

2. The reversing-disk and guide-wheel thereon, and the pawl-wheel, in combination with the ratchet-disk mounted loosely on the hub of said reversing-disk, and connected therewith by a tongue-and-groove connection, which will permit the independent movement of the reversing-disk requisite to the proper shifting of the guide-teeth when movement is reversed, substantially as set forth.

3. In combination with the ratchet-disk, arranged to operate in connection with the reversing-disk and pawl-wheel, substantially as described, a brake or friction device, substantially as and for the purpose set forth.

4. The automatically double-acting pawl-and-ratchet mechanism, composed of the reversing-disk, the ratchet-disk, and the pawl-wheel, mounted on the intermediate shaft, and arranged to operate together as specified, in combination with the engine-shaft provided with reversing or shifting gears, and the inclined shaft geared on the one hand to the intermediate shaft, and on the other hand to the engine-shaft, substantially as and for the purposes set forth.

5. The automatically double-acting pawl-and-ratchet mechanism, composed each of the reversing-disk, the ratchet-disk, and the pawl-wheel, mounted on the intermediate shaft, and arranged to operate as described, in combination with the independent rear truck-wheels geared to and receiving motion from their respective pawl-wheels, the inclined shaft, and the engine-shaft, provided with reversing or shifting gears, under the arrangement and for joint operation as set forth.

6. The automatically double-acting pawl-and-ratchet mechanisms and the intermediate shaft, on which the same is mounted, in combination with the engine-shaft, the independent power-driven truck-wheels, and mechanism whereby power from the engine-shaft is transmitted through said pawl-and-ratchet mechanism to the truck-wheels, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES GRAY COOPER.

Witnesses:
DESAULT B. KIRK,
LYNN M. MURPHY.