J. Storer,

Direct Acting Engine.

No. 106,886. Patented Aug. 30. 1870.

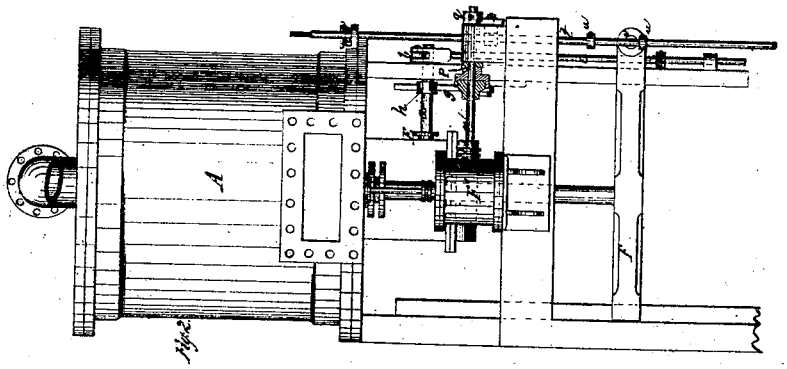

Fig. 2.

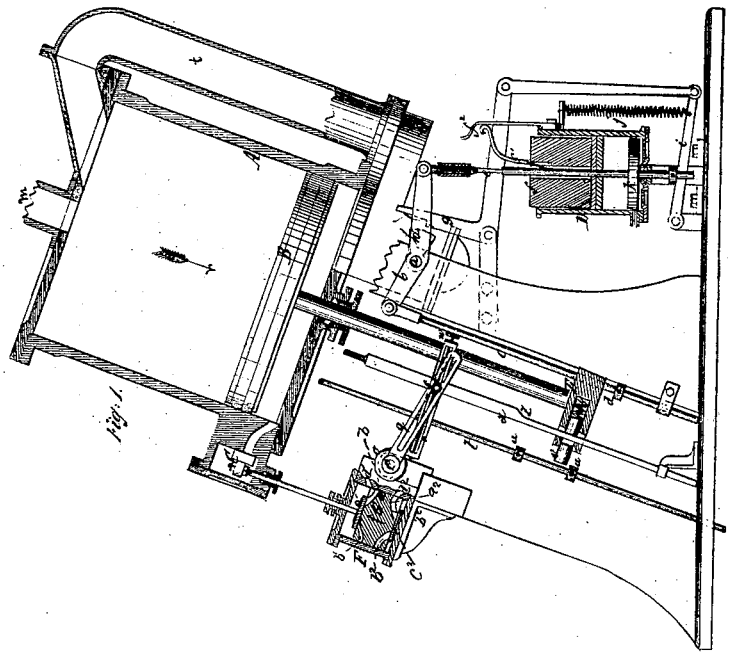

Fig. 1.

Witnesses.

C. Wahlers

C. F. Kastenhuber

Inventor:

John Storer

by Van Santvoord & Hopkins

Attys

United States Patent Office.

JOHN STORER, OF PEEKSKILL, NEW YORK.

Letters Patent No. 106,886, *dated August* 30, 1870; *antedated August* 18, 1870.

IMPROVEMENT IN CORNISH ENGINES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, JOHN STORER, of Peekskill, in the county of Westchester and State of New York, have invented a new and useful Improvement in Cornish Engines; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which dwawing—

Figure 1 represents a sectional side elevation of this invention.

Figure 2 is a front view of the same.

Similar letters indicate corresponding parts.

This invention consists in the arrangement of an adjustable tappet in combination with the exhaust-valve of the main steam-cylinder and with the cataract-cylinder in such a manner that, by the action of the cross-head on the tappet the exhaust-valve of the main cylinder is closed and the weight of the cataract-cylinder is raised and retained by a stop, and by changing the position of the tappet the main piston can be arrested in its downward stroke at any desired point.

The motion of the main piston is produced by means of an auxiliary cylinder, and the steam-valve of this auxiliary cylinder receives its motion through the cross-head and a tapper-rod, which connects with the valve-stem by a slotted bracket carrying an adjustable slide, in such a manner that, by adjusting the slide in the slotted bracket, the rapidity of the valve motion of the auxiliary cylinder can be adjusted to the desired speed of the main piston.

With the tappet-rod is combined an adjustable cam and a trip-dog secured in the cross-head, in such a manner that the steam in the main cylinder can be cut off at any desired part of the stroke.

The piston in the auxiliary cylinder is provided with grooves and steam-passages, which are closed by suitable valves, and the steam-ports open into the cylinder, at certain distances from its heads, in such a manner that the steam in the ends of the cylinder is cushioned, and at the same time the steam is enabled to act on the piston at either end of its stroke.

In the drawing—

The letter A designates the steam-cylinder of a Cornish engine, which is provided with a piston, B, and which receives steam through a slide-valve, C.

This valve is so adjusted that it opens when the piston has arrived at the lower end of its stroke, the steam being employed to raise the piston, while said piston descends by its own gravity, combined with the gravity of the machinery attached to it.

In order to regulate the descent of the piston, a cataract-cylinder, D, is combined with the exhaust-valve E.

On the stem of this exhaust-valve is mounted a double-armed lever, *b*, which connects at one end with a rod, *c*, that carries a tappet, *d*, and on its other end with a rod, *e*, from which is suspended the trip-weight *f* of the cataract-cylinder.

The tappet-rod *c* passes through the cross-head F of the main piston, and, as this piston approaches the lower end of its stroke, the cross-head strikes the tappet *d*, and the exhaust-valve is closed. At the same time the trip-weight *f* is raised, and a stop-lever, *g*, catches under a dog, *h*, projecting from the stem of the exhaust-valve, said stop-lever being connected to a lever, *i*, which is subjected to the action of a spring, *j*.

The lever *i* supports the plunger *k* of the cataract-cylinder, and as this plunger descends gradually and forces out the fluid contained in the bottom part of said cataract-cylinder, the weight of the plunger depresses the lever *i* and releases the dog *h*, and the exhaust-valve is suddenly opened by the action of the trip-weight.

The time when the exhaust-valve is opened depends upon the velocity with which the fluid is displaced from the bottom part of the cataract-cylinder, and as soon as the exhaust-valve is open the main piston begins to descend.

The plunger *k* is raised by the action of the weight *f* against a spring catch, *f'*, which is attached to a rod, and extending from said plunger up through the weight.

When the plunger has been lifted to the required height, the spring catch is forced back by the action of a cam, f^2, attached to the cataract-cylinder, and the weight is permitted to rise the required distance, independent of the plunger.

The height to which the weight is thus raised may be regulated by a screw-thimble that serves to regulate the length of the rod *e*, and the correct position of the exhaust-valve can thus be insured.

The exhaust steam is carried through a pipe, *t*, into the upper part of the main cylinder, whence it passes off through a pipe, *m*, so that the cylinder is not allowed to cool off.

By adjusting the tappet *d* on its rod *c*, the time when the exhaust-valve is closed can be adjusted, and the main piston can be cushioned in its downward stroke to any desired extent, or its downward motion can be arrested sooner or later, as may be required.

The motion of the main valve is produced by an auxiliary cylinder, F', the valve of which is provided with a stem, *n*, that connects, by a friction-clutch, *o*, with a rock-shaft, *p*.

On this rock-shaft is mounted a lever, *q*, which connects with a slide, *r*, that is adjustable in a slotted bracket, *s*.

This bracket is mounted on a rod, *t*, which slides up and down in suitable guides, and which carries two tappets, *u*.

These tappets are situated in the path of a dog, *v*, projecting from the cross-head of the main piston, and, as the piston approaches the bottom end of its stroke, the dog *v* strikes the lower tappet *u*, the tappet-rod is depressed, the valve of the auxiliary cylinder is moved, steam is admitted to said cylinder, and the main slide-valve is opened, so as to admit steam into the lower end of the main cylinder, and the main piston begins its up-stroke.

The rapidity with which the valve of the auxiliary cylinder is thrown depends upon the position of the slide *r* in the slotted bracket *s*.

If this slide is moved toward the center of the rock-shaft *p*, a smaller portion of the stroke of the main piston is required to throw the auxiliary valve than if the slide is moved further from the center of the rock-shaft.

The slide *r* is adjusted by a screw, *w*, which extends throughout the entire length of the slotted bracket, and the friction-clutch *o* serves to allow the rock-shaft to follow the action of the tappet-rod beyond the stroke of the auxiliary valve.

By shifting the slide in the slotted bracket *s*, the valve-motion of the auxiliary cylinder can be adapted to the speed of the main piston.

The dog *v* which acts on the tappets *u*, straddles a cam-rod, *x*, and it is subjected to the action of a spring, *y*, which has a tendency to force the same out toward the tappet-rod.

As the cross-head rises the dog *v* comes in contact with the cam *z* on the rod *x*, and it is thereby forced back so as to release the upper tappet *u*, and the main piston completes the balance of its stroke without any further effect on the tappet-rod *t*.

The tappets *u* are so adjusted that the valve of the auxiliary cylinder completes its stroke before the trip-dog *v* releases the upper tappet, and the cam-rod *x* is provided with a screw-shank and nut, so that the cam can be raised and lowered, and by these means the steam can be cut off at any part of the stroke of the main piston.

The piston G of the auxiliary cylinder is provided with depressions, a^1 a^2, from which extend one or more openings, b^1 b^2, to the ends of said piston, and these openings are closed by valves c^1 c^2.

The depressions a^1 a^2 are so situated that, when the piston has reached either end of its stroke, the corresponding depression is opposite one of the steam-ports d^1 d^2, these steam-ports being made to pass into the cylinder at a certain distance from its heads.

If the piston G moves in the direction of the arrow marked on it in fig. 1, the port d^1 will be closed before the piston has reached the end of its stroke, and the steam which has not time to exhaust will cushion said piston.

During this motion, the valve c^1 is closed by the pressure of the steam.

If the piston has reached the end of its stroke, the depression a^1 comes opposite the port d^1, and as steam enters through this port it passes through the openings b^1 and lifts the valve c^1, so as to drive the piston down.

By this arrangement a simple way of cushioning the piston is produced, and it is obvious that this arrangement is applicable to all steam-cylinders, provided their ports are properly situated.

I am aware that a compensating mechanism composed of a hinged lever and a tappet-rod, one of which is made adjustable, in combination with an auxiliary cylinder, the piston of which actuates the main valve, is not new, a similar arrangement being shown in my patent of September 7, 1869; I do not, therefore, broadly claim such compensating mechanism without reference to its peculiar construction.

What I claim as new, and desire to secure by Letters Patent, is—

1. The tappet-rod *c*, lever *b*, valve E, and stop-lever *g*, with the cataract-cylinder D, and cross-head F of the main cylinder, substantially as shown and described.

2. The rod *t*, carrying the tappets *u*, and the slotted bracket *s*, in combination with the lever *q*, rock-shaft *p*, friction-clutch *o*, and valve-stem of the auxiliary cylinder F, and with the cross-head of the main cylinder, substantially as set forth.

3. The mechanism herein described for cutting off the steam at any part of the stroke, consisting of a trip-dog secured in the cross-head or any other part attached to the piston-rod, and of a device for releasing said trip-dog at the required point, substantially as herein set forth.

4. The depressions a^1 a^2, openings b^1 b^2, and valves c^1 c^2, in the piston of a steam-cylinder, constructed substantially as set forth.

JOHN STORER.

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.