

(No Model.)

5 Sheets—Sheet 1.

H. F. SHAW.
LOCOMOTIVE ENGINE.

No. 252,331.

Patented Jan. 17, 1882.

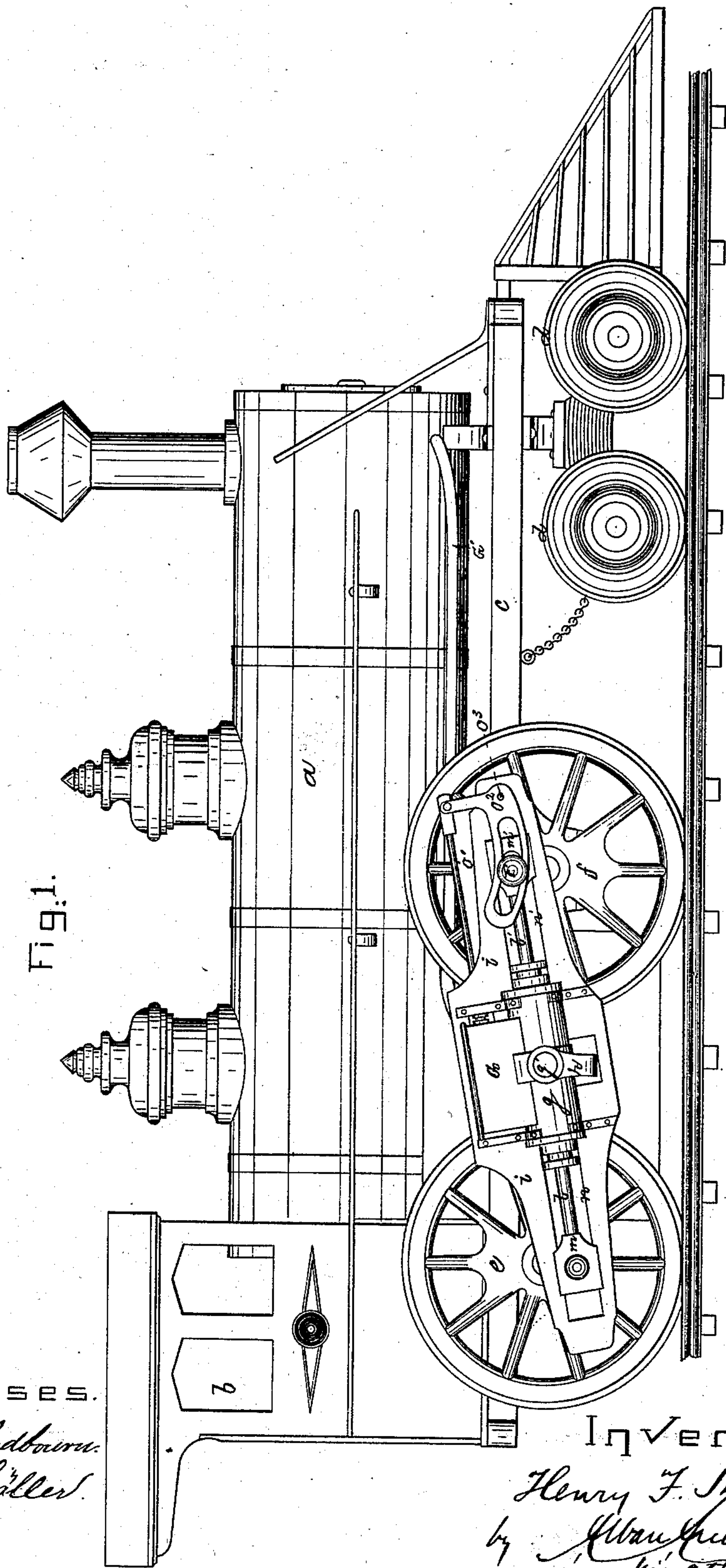


Fig. 1.

Witnesses.

Henry Chadbourne.
L. N. Haller.

Inventor.

Henry F. Shaw.
by *Alvan Andrews.*
his atty.

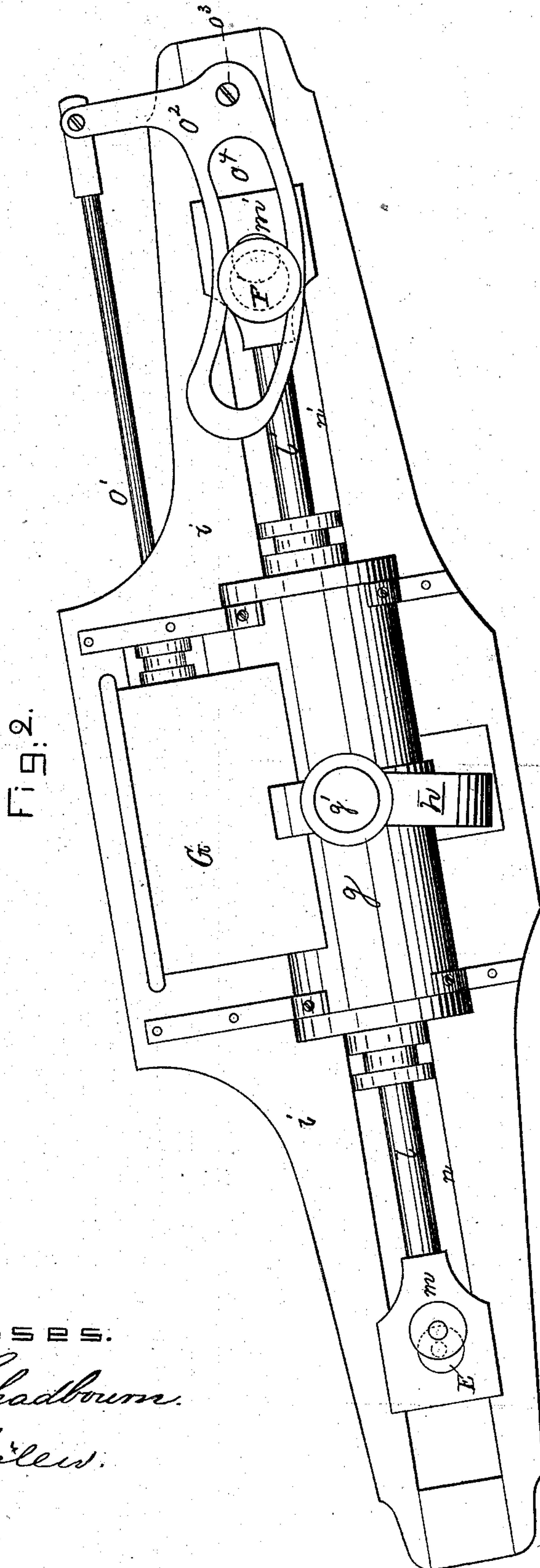
(No Model.)

5 Sheets—Sheet 2.

H. F. SHAW.
LOCOMOTIVE ENGINE.

No. 252,331.

Patented Jan. 17, 1882.



Witnesses.

Henry Chadbourn.
L. N. Moore.

Inventor.

Henry F. Shaw.
by *W. W. Andrew*
his atty.

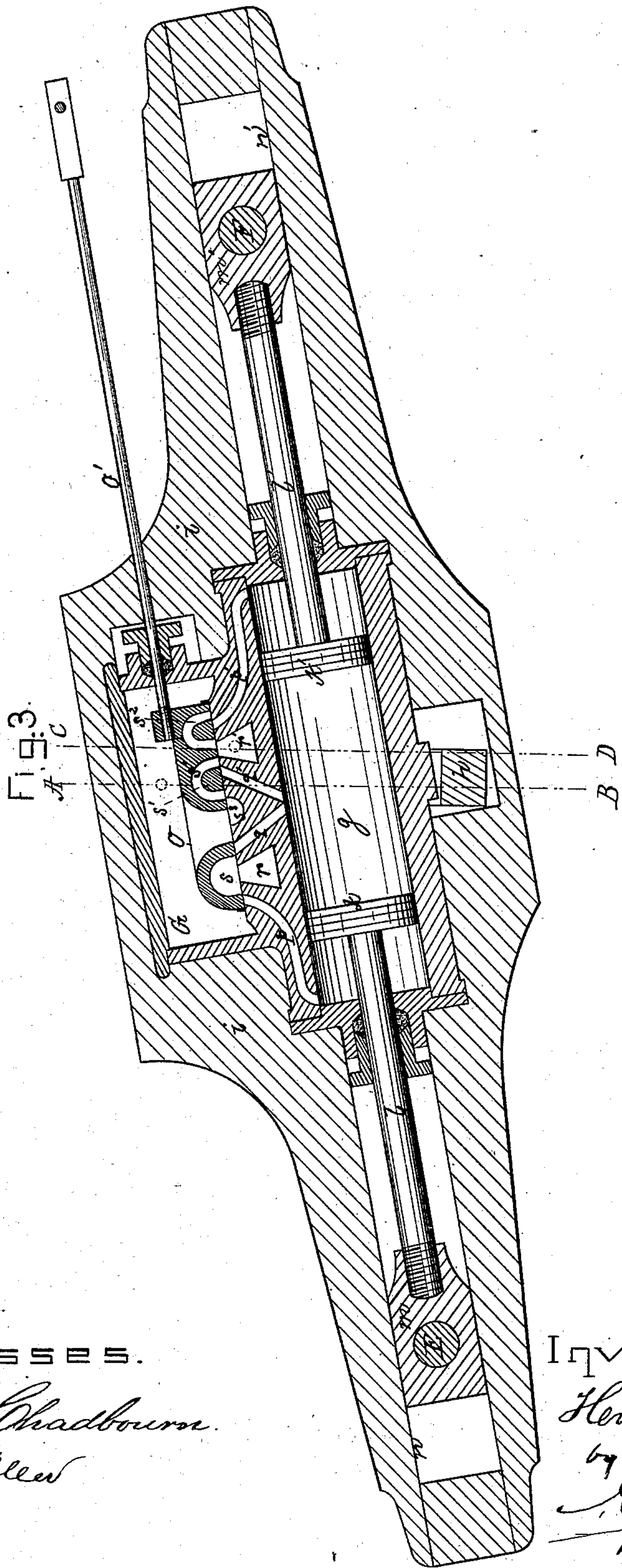
(No Model.)

5 Sheets—Sheet 3.

H. F. SHAW.
LOCOMOTIVE ENGINE.

No. 252,331.

Patented Jan. 17, 1882.



Witnesses.

Henry Chadbourn
L. A. Hölren

Inventor

Henry F. Shaw.

by *Wm. Audren*
his atty.

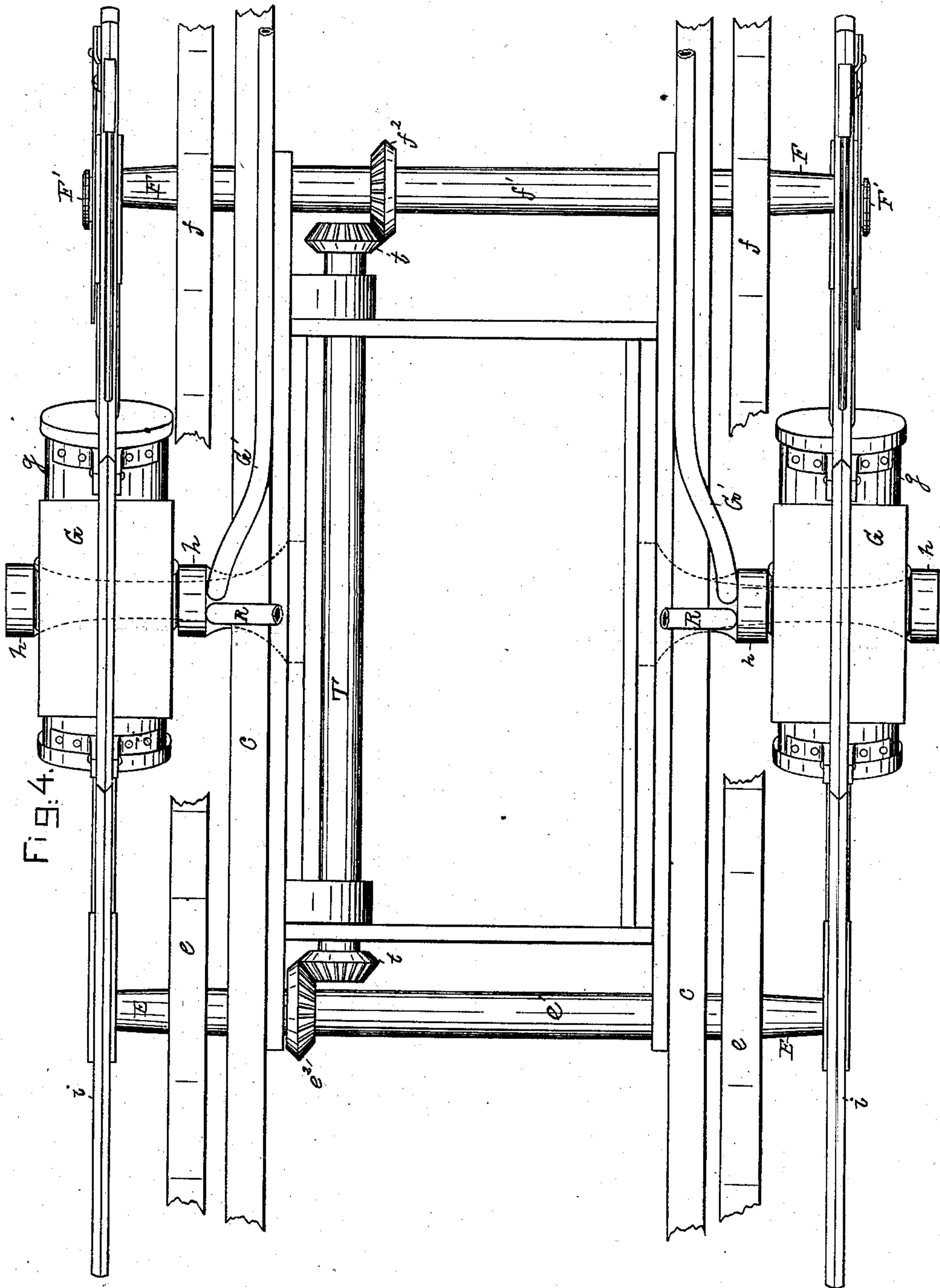
(No Model.)

5 Sheets—Sheet 4.

H. F. SHAW.
LOCOMOTIVE ENGINE.

No. 252,331.

Patented Jan. 17, 1882.



Witnesses.

Henry Chadbourne
L. N. Hollen.

Inventory

Henry F. Shaw.
by Evan Andrews

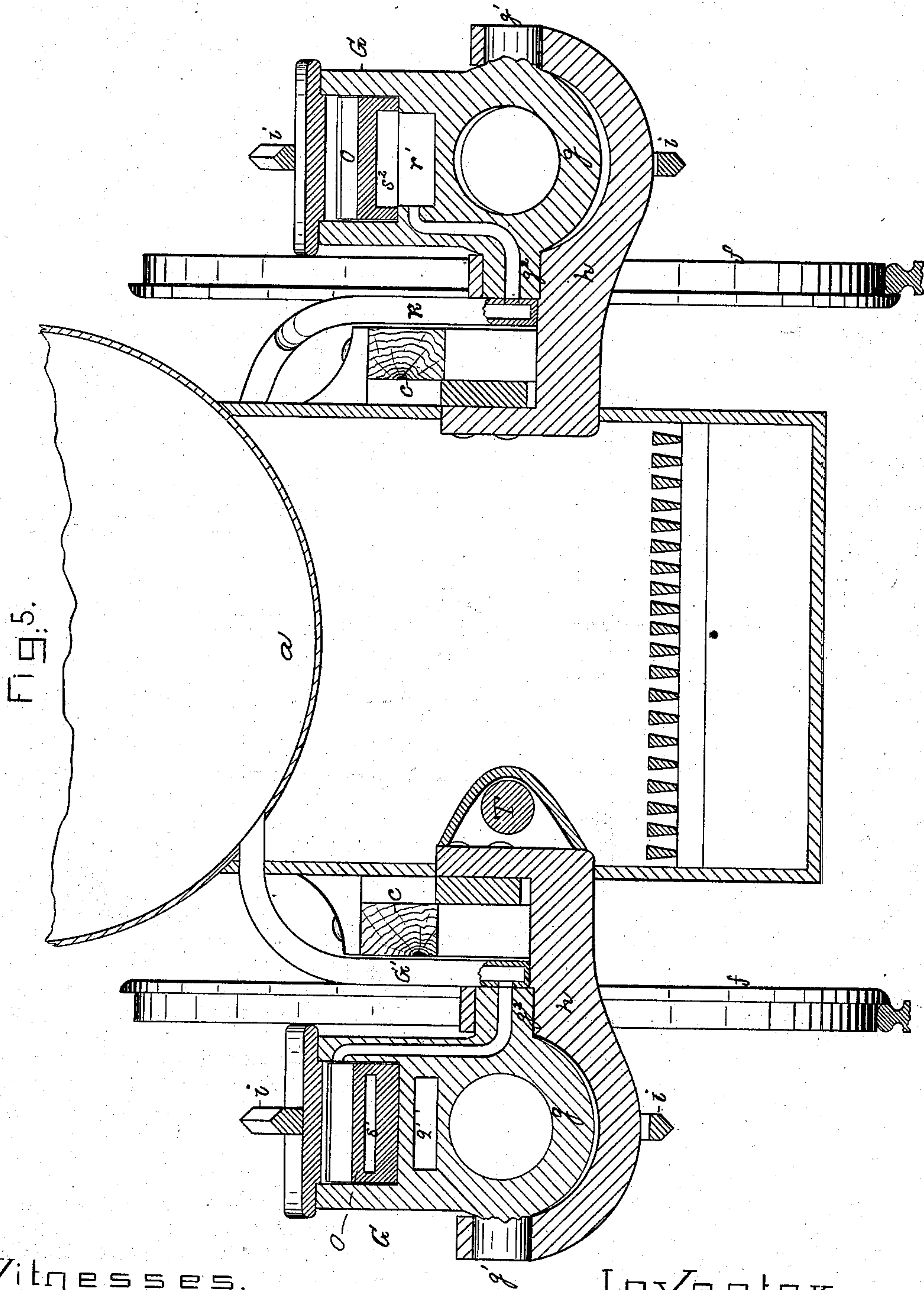
(No Model.)

5 Sheets—Sheet 5.

H. F. SHAW.
LOCOMOTIVE ENGINE.

No. 252,331.

Patented Jan. 17, 1882.



Witnesses.

Henry Chadbourne.
L. W. Bolles.

Inventor.

Henry F. Shaw.

by *Alban Andrieu*
his atty.

UNITED STATES PATENT OFFICE.

HENRY F. SHAW, OF BOSTON, MASSACHUSETTS.

LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 252,331, dated January 17, 1882.

Application filed September 15, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. SHAW, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Locomotive-Engines; and I do hereby declare that the same are fully described in the following specification and illustrated in the accompanying drawings.

This invention relates to improvements in locomotive-engines, and it is carried out as follows, reference being had to the accompanying drawings, on which—

Figure 1 represents a side elevation of the improved engine. Fig. 2 represents a detail side elevation of one of the balanced vibratory trusses and its oscillating steam-cylinder. Fig. 3 represents a central longitudinal section of the truss, cylinder, and valves shown in Fig. 2. Fig. 4 represents a detail plan view, showing the connection between the axles of the driving-wheels. Fig. 5 represents a cross-section of the cylinders and valves, the left-hand side of said figure representing a section on the line A B, shown in Fig. 3, and the right-hand side of Fig. 5 representing a section on the line C D, also shown in Fig. 3.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

In the drawings, *a* represents the steam-boiler; *b*, the cab; *c*, the frame, and *d d* the forward truck-wheels, as usual.

e and *f* represent a pair of driving-wheels on each side of the locomotive.

e' represents the axle to which the wheels *e* are secured, and *f'* represents the axle to which the wheels *f* are secured. The axles *e'* and *f'* are loosely journaled in bearings on the frame *c*, as usual. Midway between each set of wheels *e* and *f* is located the oscillating steam-cylinder *g*, having its journals *g'* and *g''* supported in the stationary arm *h*, which is secured in a suitable manner to the frame *c*. To each cylinder *g* is secured or cast in one piece therewith a balanced vibratory beam or truss, *i*, as shown. Within the cylinder *g* are two movable pistons, *k* and *k'*, provided with piston-rods *l* and *l'* and cross-heads *m* and *m'*, as shown.

n n are slides for the cross-head *m* on the

insides of one end of the truss or beam *i*, and *n' n'* are similar slides in the other end of said truss or beam, for the cross-head *m'*. To the driver-wheel *e* is attached a crank-pin, *E*, passing through the cross-head *m*, and to the driver-wheel *f* is attached a similar crank-pin, *F*, that passes through the cross-head *m'*.

O is the slide-valve within the steam-chest *G*, which slide-valve is operated forward and back by means of the valve-rod *O'*, the outer end of which is hinged to the upper end of the slotted lever *O''*, that is hung at *O'''* on the end of the balanced and vibratory beam or truss *i*, as shown. On the crank *F* is secured an eccentric, *F'*, that works within the slot *O''* of the slotted lever *O''* during the revolution of said crank *F*, and in this manner imparts the requisite motion to the slide-valve *O* to admit the steam into the cylinder *g* alternately between the pistons *k* and *k'*, and at the ends of said cylinder *g*, so as to alternately force the pistons *k* and *k'* from and toward each other, and thus, in combination with the vibratory motion of the truss *i*, impart a rotary motion to the driver-wheels *e* and *f*.

The steam is admitted to and from the cylinder *g* as follows: When the pistons *k* and *k'* are at the outer ends of their stroke the steam enters through the channel *p*, back of the piston *k*, and at the same time through the channel *p'*, back of the piston *k'*, and thus causes both pistons to move toward each other, the steam between them being at the same time exhausted through the channels *q* and *q'*, the former communicating with the exhaust *r* by means of the space *s* in the valve *O*, and the latter communicating with the exhaust *r'* through the channels *s'* in the said valve *O*. The steam that passes to the back of the piston *k* comes direct from the steam-chest *G* through the open end of the channel *p*, the valve *O* being at this time moved to one side to leave the port *p* open. The steam is admitted to the back end of the piston *k'* from the steam-chest *G* through the channel *s''* in the valve *O*, and from thence to the channel *p'*. When the pistons *k* and *k'* have reached their inner positions the live steam is admitted through the channels *q* and *q'* direct from the steam-chest *G* to the former, and through the recess *s'''* and channel *s'* in the valve *O* to the latter, the exhaust-steam back of the piston

K passing out through the channel *p* to the recess *s* in the valve O, and thence to the exhaust *r*, the exhaust-steam back of the piston *k'* passing out through channel *p'* and
5 through channel *s''* in the valve O, and thence to the exhaust *r'*.

In Fig. 5, R is the exhaust-pipe leading from the exhaust-spaces *r* and *r'*, and G' is the steam-supply pipe leading from the steam-boiler to
10 the steam-chest G, as shown.

For the purpose of holding the driving-wheels *ee* in their proper relations to the driving-wheels *ff*, I secure to the axle *e'* a bevel-gear, *e''*, that is made to engage with a bevel-gear, *t*, secured to the shaft T, to the other end of
15 which is secured another bevel-gear, *t'*, that gears into a bevel-gear, *f''*, secured to the axle *f'*. The shaft T is located in bearings secured firmly in a suitable manner to the frame-work
20 of the engine. It will be seen by reference to Fig. 4 that the bevel-gears *e''* and *f''* are arranged on two opposite sides of the shaft T for the purpose of gearing the driver-wheels *ee* and *ff* so together that they will all move in the
25 same direction, forward or back, as may be desired.

The valve-rod O' is to be connected to a link and reversing-lever, as usual, such being, however, omitted in the drawings.

30 This my improved engine is very advantageous, as it is composed of very few parts, and it is very powerful on account of its having a separate steam-actuated piston for each of its driving-wheels. It has great strength and resistance, owing to the fact that no pressure is
35 exerted on the journals *g'* and *g''*, on which the steam-cylinder *g* oscillates, and all the press-

ure from the steam-pistons *k* and *k'* is directly transferred to the crank-pins on the driving-wheels. The only pressure the journals *g'* *g''* 40 are called upon to sustain is the weight of the oscillating steam-cylinder and its vibratory balanced truss *i*. The engine is perfectly balanced in any position during the stroke, and it may therefore be run at a much higher speed 45 than the common engines now in use.

I am aware of English Patent No. 10,793 of 1845, in which oscillating cylinders are used and the driving-shafts connected by links; but such is not my invention, and I do not claim 50 such an arrangement and combination as my invention; but

What I wish to secure by Letters Patent, and claim, is—

1. In combination, the balanced vibratory 55 trusses *ii* and oscillating steam-cylinders *gg*, with their pistons, piston-rods, and cross-heads, connected respectively to the driver-wheels *e* and *f* on the outside of the latter, as described, the axles *e'* and *f'*, connected together 60 by means of the bevel-gears *e''*, *t*, *t'*, and *f''*, as and for the purpose set forth.

2. The eccentric F' upon the crank-pin F, in combination with the slotted lever O'', hinged to the end of the balanced vibratory beam *i*, 65 and having valve-rod O', attached to the valve O, to give proper motion to the latter, in a manner as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

HENRY F. SHAW.

Witnesses:

ALBAN ANDRÉN,

HENRY CHADBOURN.