

(No Model.)

J. W. DEARDORFF,  
STEAM ENGINE.

2 Sheets—Sheet 1.

No. 544,806.

Patented Aug. 20, 1895.

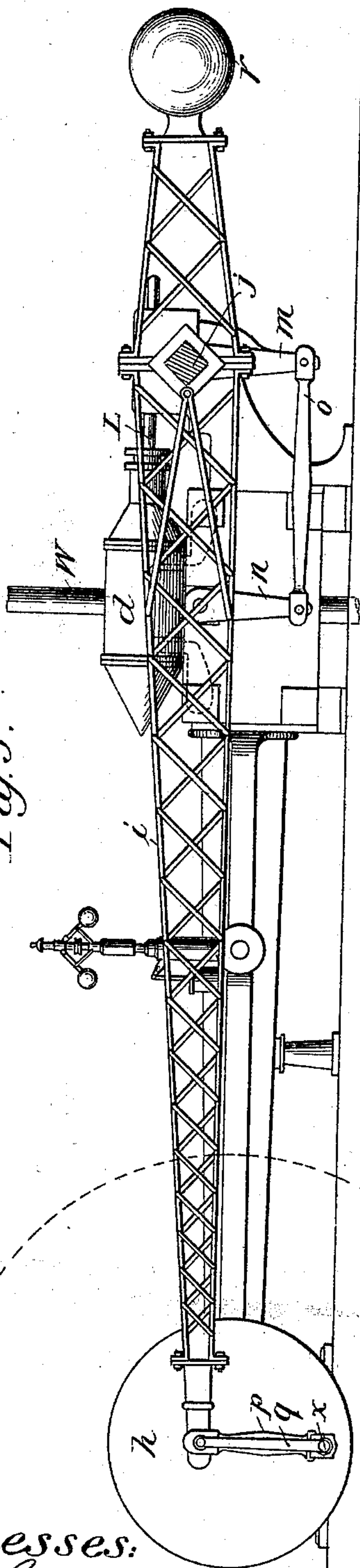


Fig. 3.

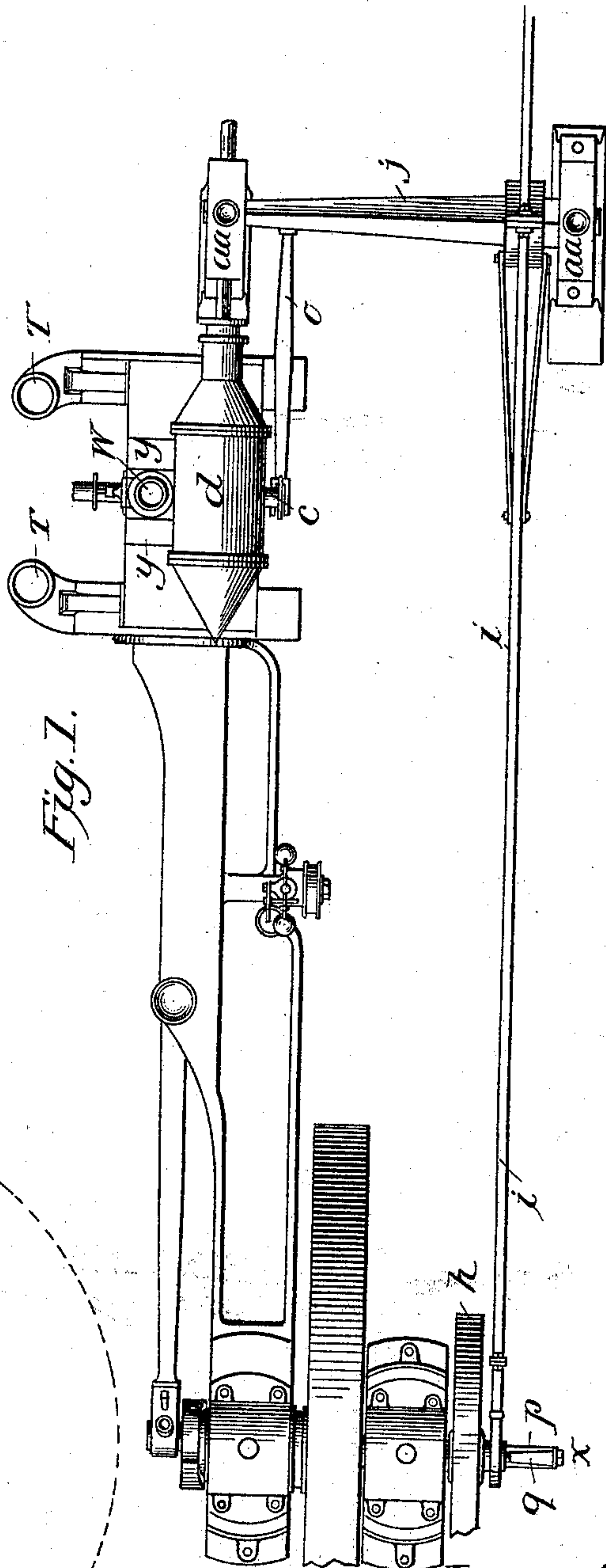


Fig. 1.

Witnesses:

*Alex. Scott*

*R. A. Balderson.*

Inventor.

*John William Deardorff*

(No Model.)

**2 Sheets—Sheet 2.**

**J. W. DEARDORFF.**  
**STEAM ENGINE.**

No. 544,806.

Patented Aug. 20, 1895.

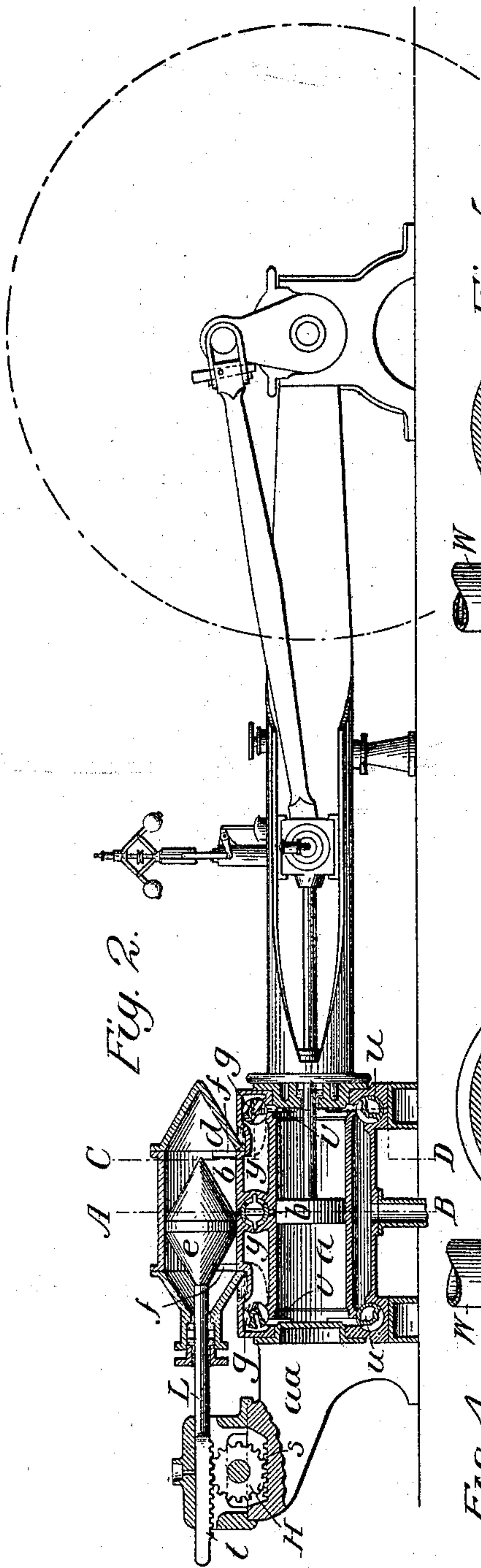


Fig. 2.

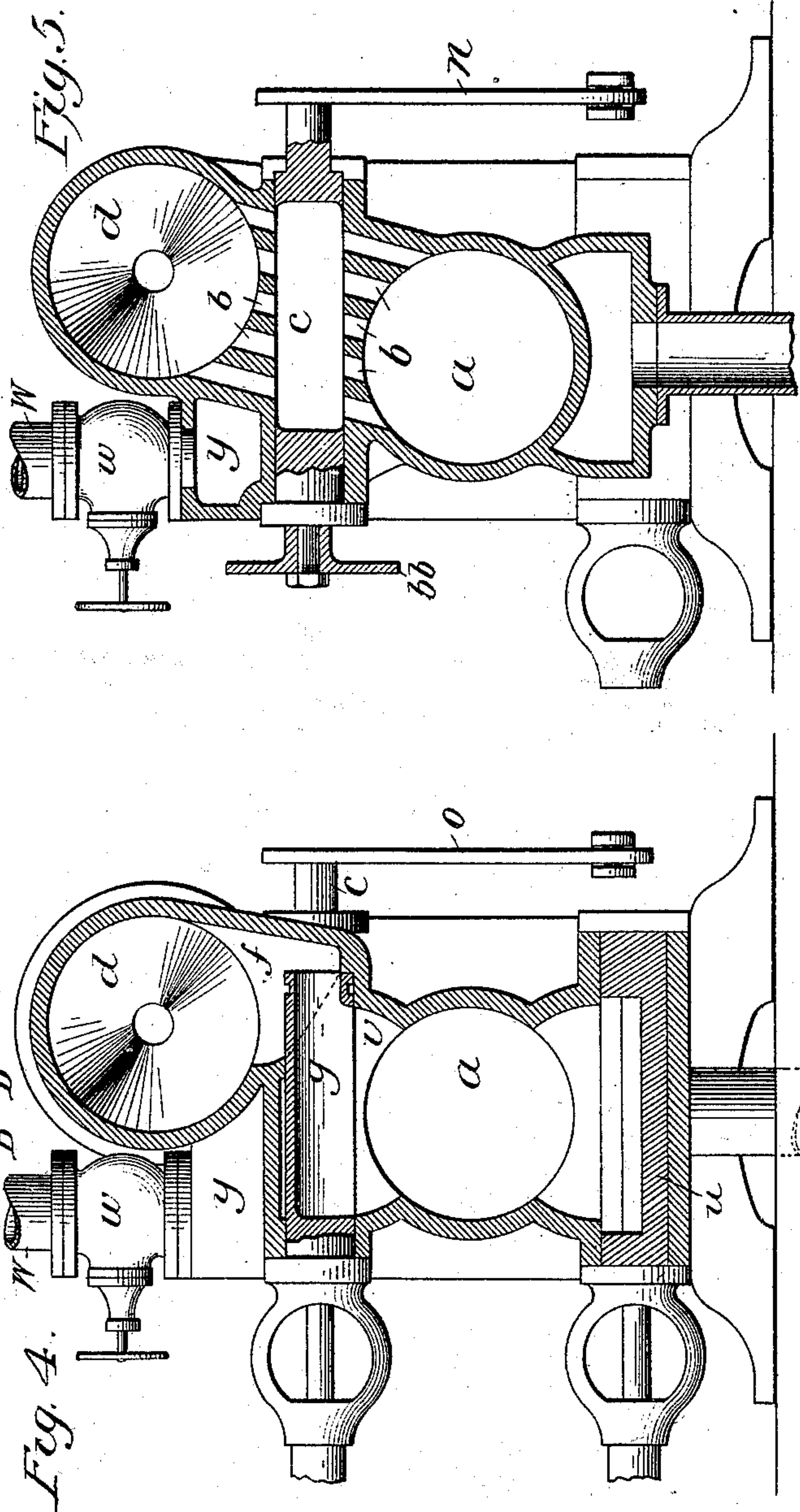


Fig. 5.

Fig. 4.

Witnesses.

Alex. Scott

R. A. Balderson.

*Inventor.*

John William Deandorff



# UNITED STATES PATENT OFFICE.

JOHN WILLIAM DEARDORFF, OF WAYNESBOROUGH, PENNSYLVANIA.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 544,806, dated August 20, 1895.

Application filed February 1, 1895. Serial No. 537,033. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN WILLIAM DEARDORFF, a citizen of the United States, residing at Waynesborough, in the county of Franklin, in the State of Pennsylvania, have invented a new and useful Improvement in Steam-Engines, of which the following is a specification.

My invention is intended to provide an engine (preferably of the Corliss type) in which the power of the steam acts more equably than in the usual style of engine; and to this end my invention consists in the construction hereinafter more particularly described, and then definitely claimed at the end hereof.

In the accompanying drawings, Figure I is a top view of the compensating cylinder upon the cylinder of Corliss type, with rocker-shaft and fulcrum-arm connected. Fig. II is a side sectional view of cylinder, showing shape and construction of compensating cylinder, piston, and piston-rod with its attachment to pinion, also improved valve connection in middle of compensating cylinder and connecting same with cylinder of Corliss type, said last-mentioned cylinder being provided with improved balance-valves which are cored, as shown in Figs. II and IV. Fig. III is a side view of compensating cylinder, showing fulcrum-arm attached to rocker-shaft with pinions on either end, and also fulcrum-arm connection to disk on end of crank-shaft of engine, said Fig. III also showing rocker-arm and valve-arms, with connections. Fig. IV is a section of cylinders at C and D of Fig. II, showing the port connection between the compensating cylinder and improved cored balance-valves, also showing valve-arm connected with center valve. Fig. V is a sectional view of cylinder at A and B in Fig. II, showing port connection between the two cylinders and center valve, and also showing the center valve connected to wrist-plate.

In carrying out my invention I prefer to use a cylinder and valves of the Corliss type; but the inlet-valves are modified by providing them with an additional port, which will admit steam from the compensating cylinder to the main cylinder. This compensating cylinder is set above and slightly to one side, and besides the connection by the valves at the ends of the main cylinder is further con-

nected to it by a valve at the center of its length, which admits steam from the main to the compensating cylinder. The compensating cylinder is preferably made with hollow conical heads, as shown, and the piston is made in the form of a double cone to fit the heads or substantially so. When in operation, steam passing through steam-pipe and valve W into steam-chest Y passes over valve *g* into port *v* and cylinder *a*, and after piston has traveled desired distance discharges through port *b* and valve *c* into compression or compensating cylinder *d*, and compressed by piston *e* into port *f* enters improved balance-cored valve *g* on the end, and passing through inside of said valve into port *v* or cylinder *a* and exhausts, passing through port *u*.

Disk *h* is connected on the end of crank-shaft of engine, having on the outer edge a wrist-pin *x*, to which connecting-rods *p* and *q* are attached, said rods extending to end of lever-arm *i*, which extends to rocker-shaft *j*, and said rocker-shaft having on each end a pinion *H*, gearing in rack *s* in bottom of boxes *a a*, and gearing also into piston-rod *L*.

The relative operation of the compensating cylinder and the cylinder of Corliss type, above referred to, consists in the arrangement of improved cored balance-valves *g* and center valve *C*, by which arrangement steam passing over valve *g* from chest *y* passes through port *v* into cylinder *a*, said valve *g* cutting off live steam over port *v* after piston in cylinder *a* has traveled its desired distance, due to direct pressure. Then after certain expansion the same valve *g* opens, admitting the compressed steam from compensating cylinder *d* through ports *f* and *v*, driving piston in cylinder *a* to end of stroke, and shortly prior to end of stroke of said piston in cylinder *a* center valve *c* opens and admits the steam between the two cylinders, equalizing the same in the two cylinders. Then the piston *e* in compensating cylinder *d* compresses the equalized steam into cylinder *a*, as above described. These valves are operated by the wrist-plate *b b*, which is connected with center valve *c*, and center valve *c* is connected with rocker-shaft *j* with valve-arm *n* and rocker-arm *m* and connection *o*, and rocker-shaft *j* is connected with lever-arm *i*, which is operated by disk *h* on end of crank-shaft



of engine. Thus these valves are operated without the use of an eccentric, which is essential to all other engines now in use, as the above-described lever-arm connection com-  
 5 presses the steam, controls the valve motion, and dispenses entirely with an eccentric.

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

1. The combination with a main steam cyl-  
 10 inder, of a compensating cylinder, a piston in said compensating cylinder arranged to compress the steam therein, and an automatically operated valve for admitting said steam to the main cylinder, substantially as de-  
 15 scribed.

2. The combination with a main steam cyl-  
 inder, of a compensating cylinder, a valve for admitting steam from the main cylinder into the compensating cylinder, a piston in said  
 20 compensating cylinder arranged to compress the steam therein, and an automatically operated valve for admitting said steam to said main cylinder, substantially as described.

3. The combination with a main cylinder,  
 25 of a compensating cylinder, a valve to govern the admission of steam from the main cylinder to the compensating cylinder, a piston in said compensating cylinder arranged to compress the steam therein, valves for admitting  
 30 steam from the compensating cylinder to the main cylinder, and means for automatically operating said valves at each stroke of the piston substantially as described.

4. The combination with main and compen-  
 35 sating cylinders, of a valve at each end of the main cylinder, each of said end valves having a port for the admission of steam from the boiler to the main cylinder, and another port for the admission of steam from the compen-  
 40 sating cylinder into said main cylinder, substantially as described.

5. The combination with main and compen-

sating cylinders, of a central valve to allow of the passage of steam from the main cylinder into the compensating cylinder, and a  
 45 valve at each end of the main cylinder, each of said end valves being provided with ports to admit steam from the boiler to the main cylinder and also from the compensating cylinder to said main cylinder, substantially as  
 50 described.

6. The combination with the main cylinder of a steam engine, of a compensating cylinder, a valve for admitting steam from the main to the compensating cylinder, and valves  
 55 having passages on the outside for the admission of live steam to the cylinder, and through their center for the admission of steam from the compensating cylinder, substantially as described.  
 60

7. The combination with a cylinder, piston, and main shaft of an engine, of the lever-arm *i* connected therewith, a rocker-shaft *j* carrying said lever-arm, pinions *H*, racks *s*, and toothed piston-rod *L*, substantially as de-  
 65 scribed.

8. In an engine, and in combination with a cylinder, piston and a valve thereof, a rock-shaft, a pinion thereon, a fixed rack on which  
 70 said pinion rocks, and intermediate connections between the valve and the pinion for giving motion to the valve, substantially as described.

9. In an engine and in combination with a cylinder, piston, and valve thereof, a rock-  
 75 shaft *j*, rocking pinions *H* on the ends thereof, an arm *m* attached to said rock-shaft, an arm *n* connected with the shaft, and a connecting rod *o* between the arms *m* *n*, substantially as described.

JOHN WILLIAM DEARDORFF.

Witnesses:

ALEXANDER SCOTT,  
 THAD M. MAHON.