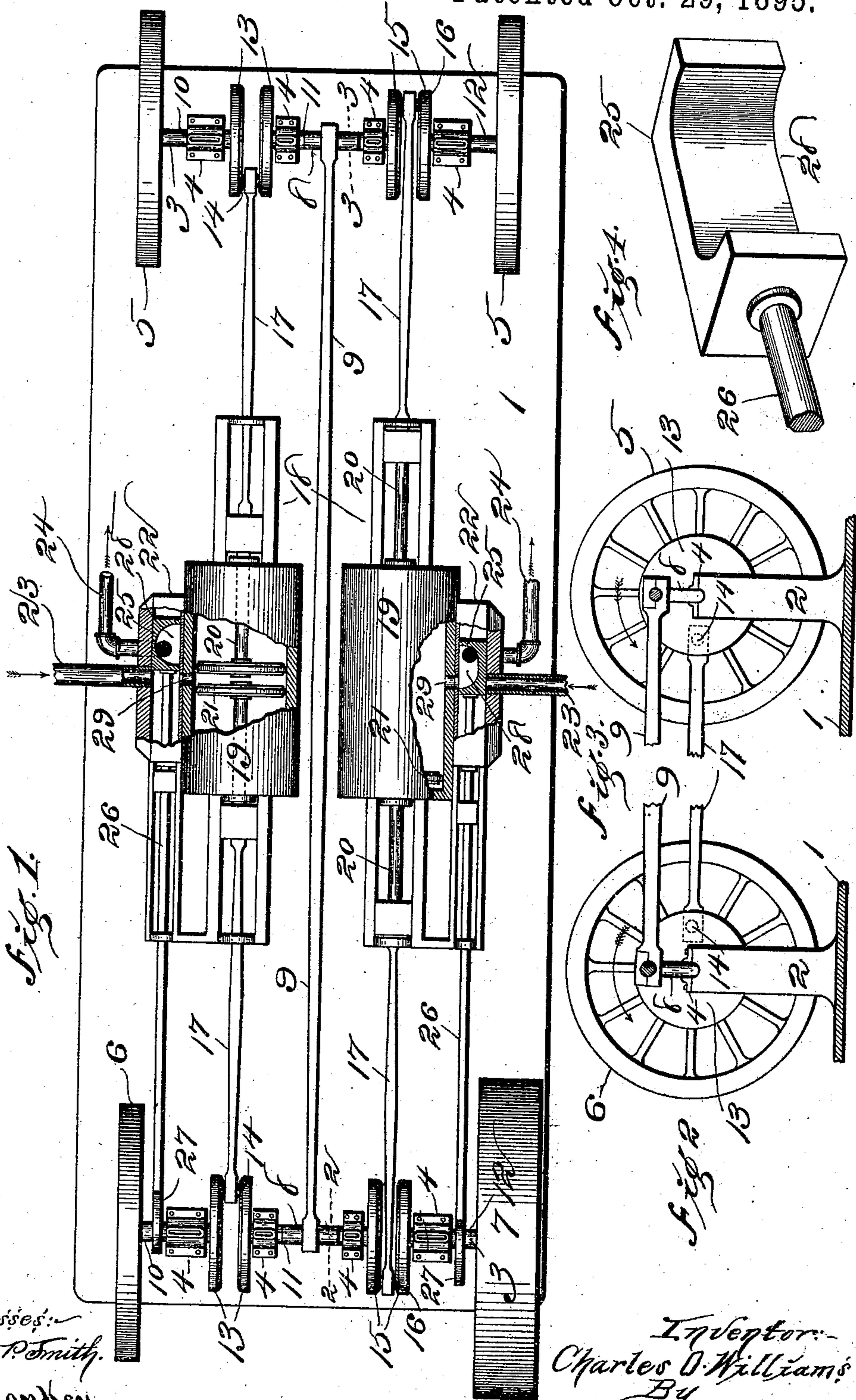


(No Model.)

C. O. WILLIAMS.  
STEAM ENGINE.

No. 548,859.

Patented Oct. 29, 1895.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

CHARLES O. WILLIAMS, OF ST. LOUIS, MISSOURI.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 548,859, dated October 29, 1895.

Application filed January 29, 1894. Serial No. 498,295. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES O. WILLIAMS, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in steam-engines; and it consists in the novel construction, combination, and arrangement of parts hereinafter described, and designated in the claim.

Referring to the drawings, Figure 1 is a top plan view of my improved steam-engine, parts being broken away to more clearly show the construction of same. Fig. 2 is a vertical longitudinal central section of a portion of the engine, showing the manner in which the drive-lever is connected to the crank-shaft, said section being taken on the line 2 2 of Fig. 1. Fig. 3 is a like view showing the opposite end of the engine, said section being taken on the line 3 3 of Fig. 1. Fig. 4 is an enlarged perspective view showing the manner in which the exhaust-valve is constructed.

The object of my invention is to construct an engine with two cylinders and each cylinder provided with two pistons so located as to reciprocate in alternate opposition in pairs, power-shafts located adjacent the said pistons and on opposite sides thereof, and a coupling-rod located between said cylinders parallel to the path of reciprocation of the pistons and connecting with said power-shafts, as hereinafter specified, set forth, and claimed.

A further object of my invention is to construct a steam-engine with two cylinders, and each cylinder constructed with two pistons in such a manner that while the pistons in one cylinder are in the center thereof the pistons in the opposite cylinder will be at opposite ends.

The numeral 1 designates the base upon which my engine is mounted. Said base can be constructed of any suitable material and is preferably rectangular in plan view to conform with the engine. Connected to the upper surface of the base 1, adjacent each end thereof, is a series of vertical supports 2, the supports at one end being in transverse alignment with each other relative the base 1,

so that the horizontal shafts 3, which are mounted in the upper end of said supports, will be parallel with each other. These shafts are held in position with the supports by suitable boxings 4, connected to the upper end of said supports by means of screws or bolts. Mounted upon each end of the shaft 3, at the right in Fig. 1, is a balance-wheel 5, while mounted on the shaft at the left of Fig. 1 is a fly-wheel 6 and a belt-wheel 7. Formed on each of the shafts 3, at approximately the center thereof, is a crank 8, to which the coupling-rod 9 is connected. This coupling-rod is connected to each of the cranks 8, so that the shafts carrying said cranks will be rotated at the same rate of speed and in the same direction.

The shafts 3 are each divided into three sections 10, 11, and 12. The adjacent ends of the sections 10 and 11 are each constructed with a crank-wheel 13, and they are connected by a crank-pin 14. The adjacent ends of the sections 11 and 12 are each constructed with a crank-wheel 15, and they are connected by a crank-pin 16. The crank-pins are so located at one side of the center of said wheels so that the crank-pin connecting the wheels 15 is on the opposite side of said wheels from the crank-pin 14, which connects the crank-wheels 13, so that when the connecting-rods 17 of the engines are connected to the crank-pins the piston-rod which carries one of said connecting-rods will be on its outward movement, while the piston-rod carrying the opposite connecting-rod will be on its backward movement. The position of the crank-pins at the left of Fig. 1 is opposite from the pins at the right thereof, so that the connecting-rods 17, which are connected thereto, will move in opposite directions, they moving toward each other and then from each other, and the rotation of the shafts 3 is in the same direction.

18 indicates the engines. They being exactly the same in construction I will describe but one; but I desire to state before proceeding further that the operation of one is exactly opposite that of the other.

19 indicates the cylinder, which is mounted on the base 1 approximately half-way intermediate the shafts 3 and is of such a height that the piston-rods will be in horizontal alignment with said shafts. The cylinder is con-



5 structured with two piston-rods 20 and two  
 pistons 21, so located within the cylinder  
 that they move to and from the center thereof  
 in opposite directions, both being at the cen-  
 10 ter at the same time. Said pistons are so  
 constructed that when at their closest point  
 there will be space enough to allow steam to  
 be forced between them for driving them  
 apart. Connected to one side of the cylinder  
 15 is the steam-chest 22, which is constructed  
 with an induction-pipe 23 leading thereto and  
 an exhaust-pipe 24 leading therefrom. It is  
 also constructed with a valve 25, to which is  
 20 connected the valve-stem 26. This valve-stem  
 leads to and is connected to the eccentric 27,  
 which is mounted on the shaft 3 at the left of  
 Fig. 1. The valve 25 is constructed with a  
 cut-away portion 28 in the side thereof adja-  
 25 cent the cylinder, so that when the valve is  
 drawn over, as indicated by the lower cylin-  
 der in Fig. 1, the steam can pass from the  
 port 29 in the cylinder out through said cut-  
 away portion 28 and out through the exhaust-  
 pipe 24.

25 It can readily be seen by inspecting Fig. 1  
 that the port 29 is in the center of the cylin-  
 der so that when the valve is in the position  
 illustrated by the upper cylinder and the pis-  
 30 tons are in the position illustrated in said cyl-  
 inder steam will be forced between said pis-  
 tons, which will cause them to separate, and  
 the piston-rods carrying said pistons being  
 connected to the crank-wheels 13 of the shafts  
 35 3 will cause said shafts to rotate, and the  
 coupling-rod 9 being connected to said shafts  
 3 in the manner hereinbefore stated will cause  
 said shafts to rotate in the same direction.

The operation is as follows: When steam is  
 forced through the induction-pipes 23 into the  
 40 cylinders and the pistons are in the position  
 illustrated by the upper cylinder in Fig. 1, the  
 steam will cause said pistons to separate,  
 which will cause the shafts 3 to rotate in the  
 direction indicated by the arrows in Figs. 2  
 45 and 3, and the pistons in the lower cylinder  
 being at the ends of the cylinder the rotation  
 of the shafts 3 will cause said pistons to be  
 drawn to the center of said cylinder, and im-  
 mediately upon their reaching the center  
 50 thereof the eccentric moves the valve 25, which  
 allows the steam to pass into said cylinder,  
 which will force them apart and draw the pis-  
 tons in the upper cylinder together, as illus-

55 trated in Fig. 1. By the construction of the  
 cylinders and pistons when steam is forced  
 into the cylinder the pressure thereof is all  
 utilized, as both pistons move. Therefore ap-  
 proximately double the amount of power is  
 gained than if there was but one piston.

It can readily be seen by inspecting Figs. 2 60  
 and 3 that when the shafts 3 are rotated in  
 the same direction the end of the connecting-  
 rod which engages the crank-pin of the crank-  
 wheels at the right in Fig. 1 will come down,  
 while the end of the connecting-rod which en- 65  
 gages the crank-pin of the crank-wheels at the  
 left of said figure will come up.

In the location of the coupling-rod between  
 the pistons and between the cylinders a great  
 advantage is gained, inasmuch as the recip- 70  
 rocatory motion of one set of pistons is exer-  
 cised in a vertical plane at one side of the  
 axes of connections between the coupling-rod  
 and the power-shafts and the reciprocatory  
 motion of the remaining pistons is exercised 75  
 at a point equidistant on the opposite side of  
 the said axes of connections, thereby prevent-  
 ing abnormal strain on the said coupling-rod.

I hereby disclaim the construction shown  
 in the United States Patent granted to H. F. 80  
 Bayne, June 29, 1886, No. 344,432.

What I claim is—

The improved steam engine having two  
 mating cylinders 19 located parallel, with a  
 free vertical space between them and provided 85  
 each with two pistons, a connecting-rod for  
 each piston, two shafts 3 mounted to freely  
 revolve in their bearings and to which said  
 connecting rods are attached, cranks 8 formed  
 one approximately in the center of each of the 90  
 shafts 3 in alignment with the said free ver-  
 tical space between said cylinders and with  
 each other, and a single long coupling-rod 9  
 located in said free space between said cylin-  
 95 ders and connecting each of said cranks so  
 that said shafts 3 may both be turned through  
 complete revolutions in the same direction,  
 all arranged and combined to operate in the  
 manner set forth and for the purposes stated.

In testimony whereof I affix my signature 100  
 in presence of two witnesses.

CHARLES O. WILLIAMS.

Witnesses:

M. GRIFFIN,

JNO. C. HIGDON.