S. D. Tillman,

Steam Engine.

No. 113,818. Patented Apr. 18, 1871.

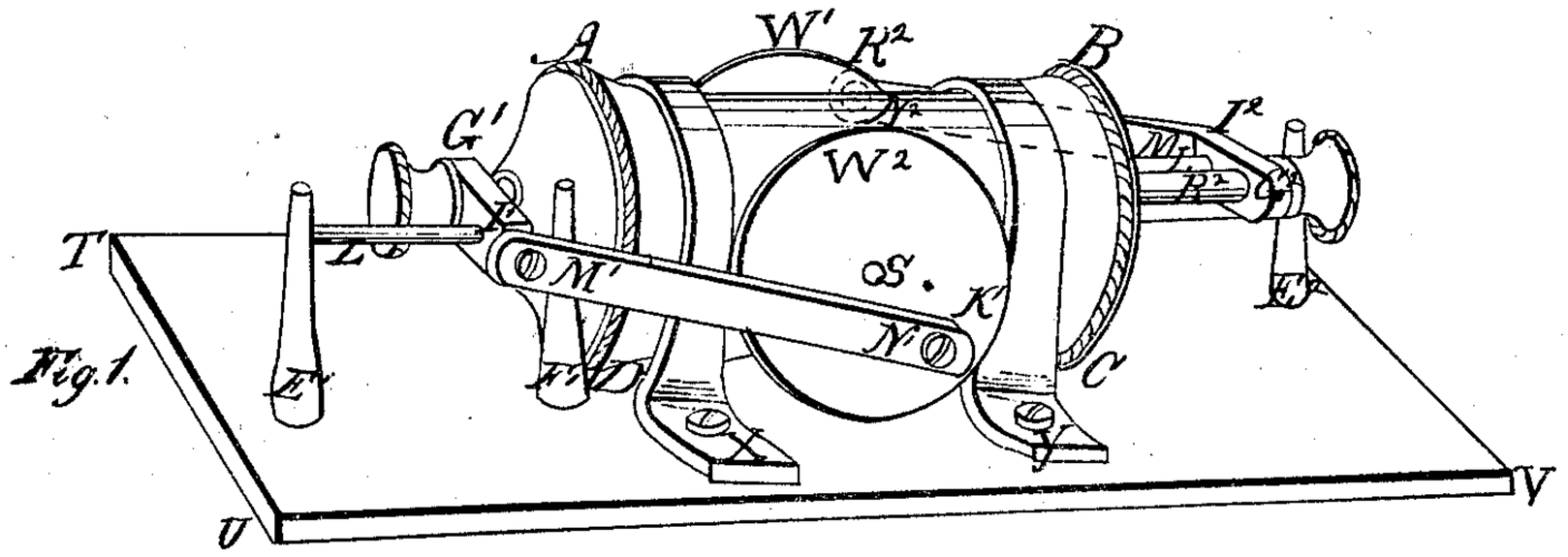

Fig. 1.

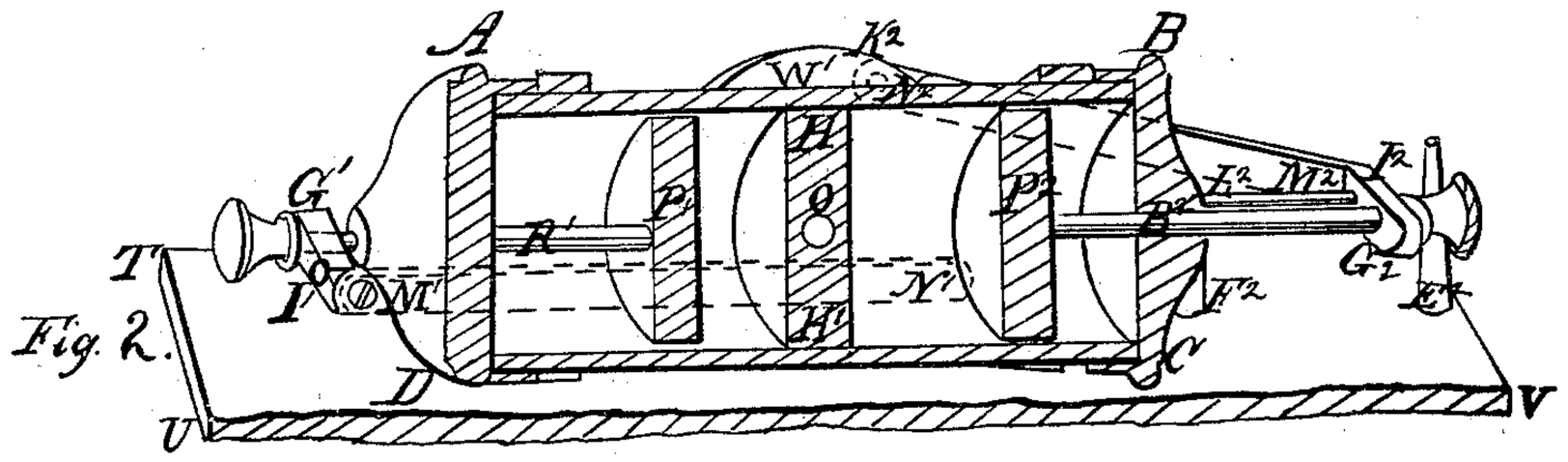

Fig. 2.

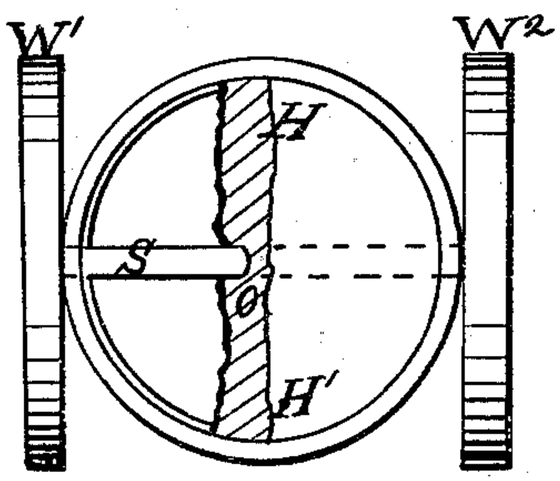

Fig. 3.

Witnesses.

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SAMUEL D. TILLMAN, OF NEW YORK, N. Y.

Letters Patent No. 113,818, dated April 18, 1871.

IMPROVEMENT IN STEAM-ENGINES.

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

Be it known that I, SAMUEL D. TILLMAN, of the city, county, and State of New York, have invented a new and useful Improvement on the Steam-Engine; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings making a part of this specification, in which—

Figure 1 is a perspective view;

Figure 2 is a longitudinal elevation; and

Figure 3, a transverse section in all like letters refering to like parts.

A B C D is a compound cylinder made of metal and fastened firmly to the iron bed-plate T U V by means of the connections X Y. Each end of tne double cylinder is closed by means of the heads A D and B C.

Midway between them is another head or permanent partition, H H′, which divides the cylinder into two equal parts, thus forming two separate and distinct cylinders having no direct connection with each, by means of three heads.

P^1, fig. 2, is a reciprocating piston moving in the cylinder A H D H′.

R^1 is the piston-rod attached to the piston P^1 and passing through a steam-tight opening in the head A D.

To the end of this rod R^1 is attached the cross-bar G^1 I^1. At or near I^1 is an opening to receive the stationary rod L^1, which is parallel with the piston-rod R^1, and permanently fixed by means of the pillars E^1 F^1.

The cross-bar G^1 I^1 moves by means of its connection with the piston-rod R^1, and, sliding on the stationary rod L^1, is kept constantly in the same right line.

At the extremity of the cross-bar G^1 I^1 is a pin passing through the connecting-rod M^1 N^1, near the end M^1, so arranged that the rod may move freely on the pin. Near the end N^1 the connecting-rod is attached to the crank-pin K^1 in the wheel W^2, around which pin it is free to move.

P^2 is a reciprocating piston moving in the cylinder B H H′ C, fig. 2.

R^2 is the piston-rod attached to P^2, and passing through a steam-tight opening in the head B C.

G^2 I^2 is a cross-bar connected with the piston-rod R^2.

At or near the point I^2 is an opening, through which passes the stationary rod L^2, fastened permanently by means of the pillars E^2 F^2.

The cross-bar G^2 I^2, when moving with the piston-rod R^2 is thus kept in the same right line.

At the extremity of the cross-bar G^2 I^2 is a pin passing through the connecting-rod M^2 N^2, near the end M^2, so that the rod may move freely around the pin.

Near the end N^2 the connecting-rod passes over the crank-pin K^2, which is free to turn within said rod. This connection is shown by the dotted lines in figs. 1 and 2.

The crank-pin K^2 is fixed permanently to the shaft S, figs. 1 and 3, and exactly at right angles with the crank-pin K^1. To accomplish this the shaft S is permanently fixed in the wheels W^1 and W^2, and the crank-pin on the outside of each wheel in radial lines, ninety degrees apart, is at such distance from the center of the shaft that it will make just half a revolution around the shaft with each full stroke of the piston with which it is connected. When one piston is at the end of its stroke and the crank-pin connected with it is at the dead-point, the other piston is in the middle of its stroke and at its maximum velocity, exerting its power on the crank-pin connected with it at the position of greatest leverage. The steam is applied to each piston in the usual way. The valves and passages for regulating the admission and exhaustion of the steam are not represented because they are precisely like those in ordinary use, and of the number required for two separate engines.

In the most compact form of my engine, as represented in the drawings, where the shaft S passes through the H H′ head, the steam-chest and valves are on the top, and extending from A to B, fig. 1.

When the shaft S is placed over the cylinders, which requires the cross-bar G^1 I^1 and G^2 I^2 to stand in a vertical position, the steam-chest may be on either side of the cylinders.

In constructing very small engines on my plan the cylinders, center-head, and bed-plate may be cast in one piece; but in large engines the size of the shaft may require the center head to be constructed of two similar disks fastened firmly together.

The power of the engine may be applied through either wheel W^1 or W^2 by bands or gearing.

The advantages gained by my invention are—

First, a great saving of power by preventing the loss of heat by radiation, for were the two cylinders entirely separated, one side of two heads would radiate heat outward; but in my arrangement the center head is constantly in contact with steam either on one or both sides, and the heat radiated from the side not in contact with steam assists in keeping a cylinder hot.

Second, some of the heat generated by friction of the shaft in the center-head is communicated to the steam in contact with this head, thus illustrating, on a small scale, an interesting anomaly in the reconversion of heat expended into mechanical power.

Third, the saving in material, in substituting for two heads one, which also forms the journal for the revolving shaft.

Fourth, the stability and durability of the engine secured by this close proximity of parts, especially when the main portion is cast in one piece.

Fifth, the necessity for a fly-wheel is obviated. This engine can be started from any position of rest, which

is a very important advantage in small engines. There are many uses for the steam-engine where certain and instantaneous action is the greatest *desideratum*.

Although the arrangement described is especially adapted for the use of steam, yet common air or any other gaseous compound used as a motor may be substituted.

It is evident that the means employed for guiding the piston-rods may be greatly varied by the designer. In some cases I propose to use rock-shafts as substitutes for the cross-heads. These rock-shafts would lie parallel with the main shaft, and either above or below the piston-rods, and be provided each with two arms, the inner ones to connect by links to the piston-rods and the outer ones to the connecting-rods.

I am aware that engines have previously been made with two cylinders lying in the same line, and having a common or two abutting cylinder-heads. In one case the two pistons are connected together by side rods and operate one crank, which arrangement has no advantage over a common single engine. In another case the pistons connect directly in the usual way to separate shafts placed beyond the ends of the double-length cylinder, and the two shafts are connected by belts on their fly-wheels, or other extraneous means. In my engine the power of both cylinders is transmitted outward by the piston-rods and back toward the center again by the connecting-rods. I use, therefore, two "back-acting engines," so called.

Captain Ericsson, in one of his patents, uses also two back-acting engines with the cylinders arranged similar to those above described, but he connects through bent levers to a single crank, on one side of the engine, the operating ends of the bent levers being arranged about ninety degrees apart with relation to the main shaft. In my engine the operating ends of the cross-heads and the main shaft are in the same plane, and the connection is made to separate cranks placed at right angles on the main shaft.

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

Two back-acting engines, having cylinders in the same line and one common cylinder-head, when such engines are connected to separate cranks set at right angles on the same shaft, and are arranged and combined substantially as described.

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Witnesses:

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