(No Model.) 2 Sheets—Sheet 1.

H. & P. NADIG.

SINGLE ACTING STEAM ENGINE.

No. 573,030. Patented Dec. 15, 1896.

Fig. 1.

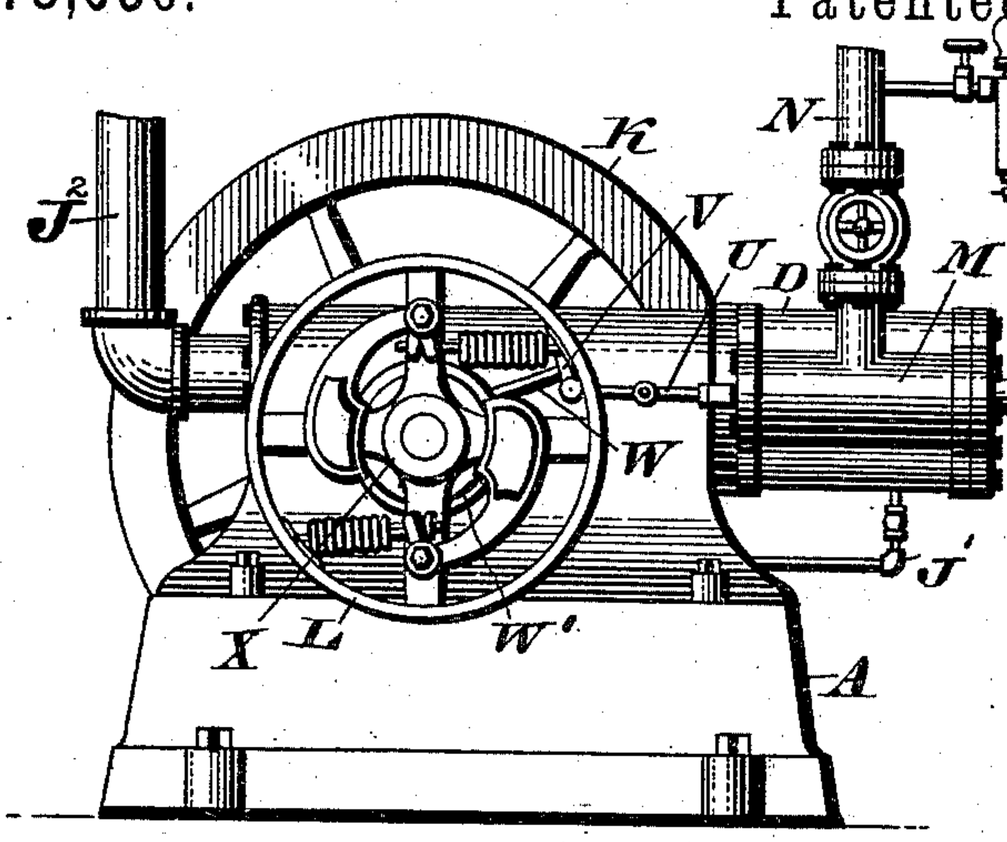


Fig. 2.

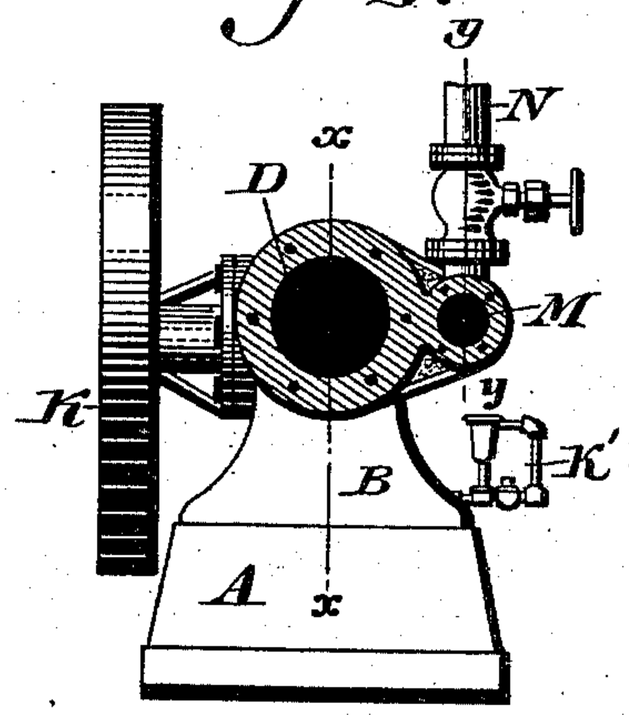


Fig. 3.

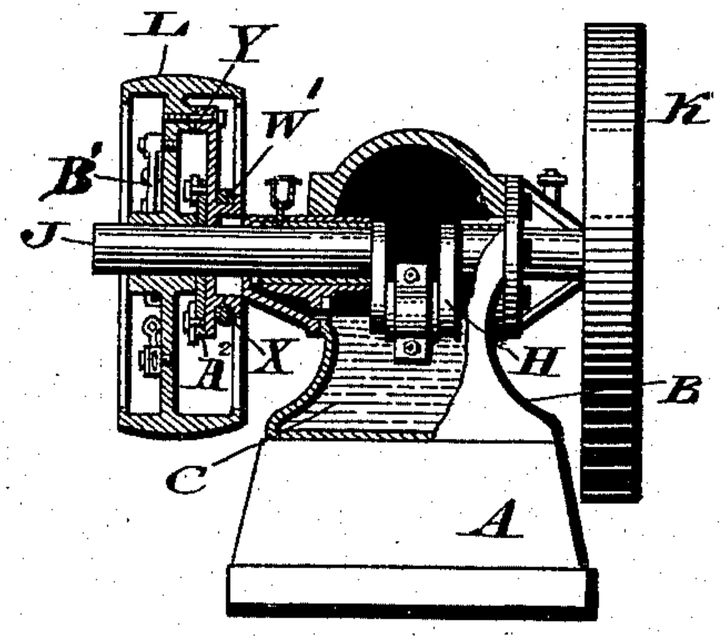
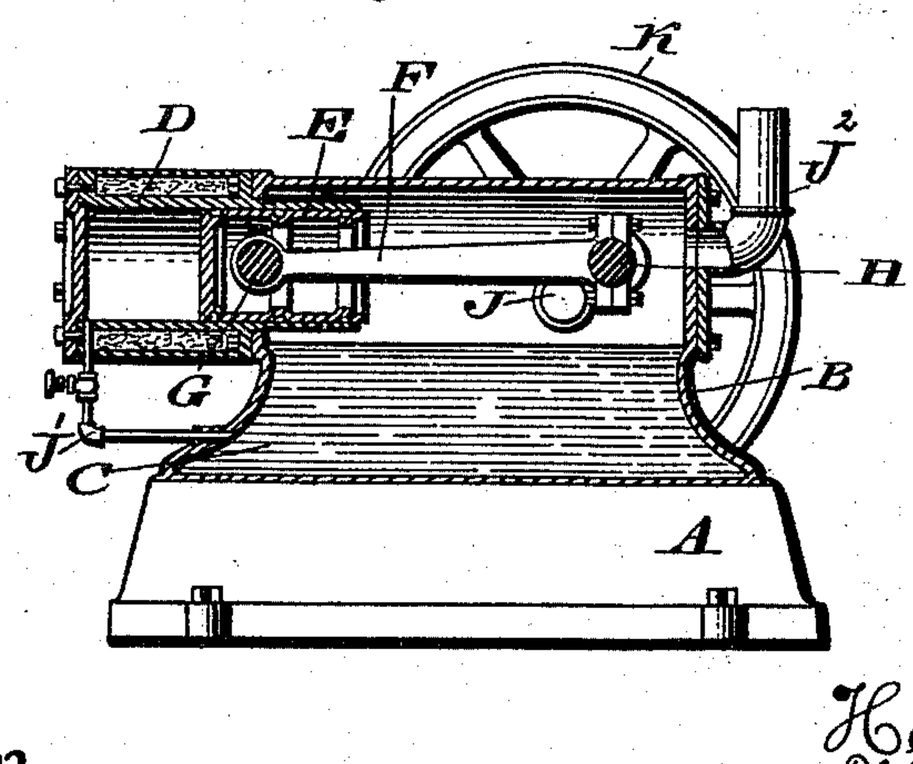


Fig. 4.



WITNESSES:

P. F. Eagles.

L. Douville.

INVENTORS.

Henry Nadig.

Philip Nadig.

BY

J. Edward Siebenthaler.

ATTORNEY.

(No Model.) 2 Sheets—Sheet 2.

H. & P. NADIG.

SINGLE ACTING STEAM ENGINE.

No. 573,030. Patented Dec. 15, 1896.

Fig. 5

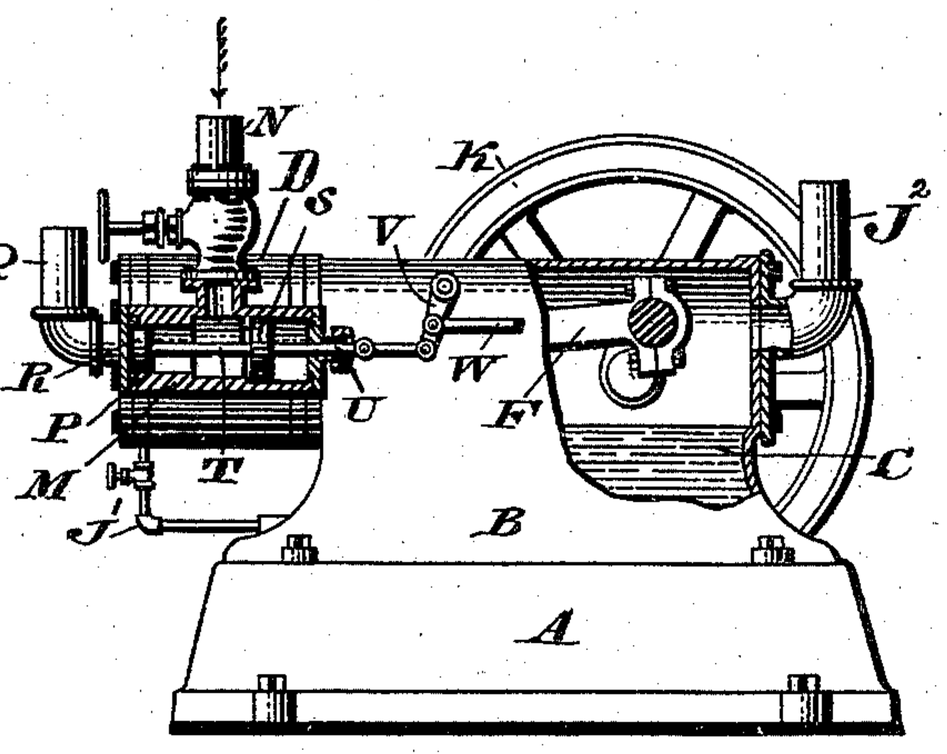


Fig. 6.

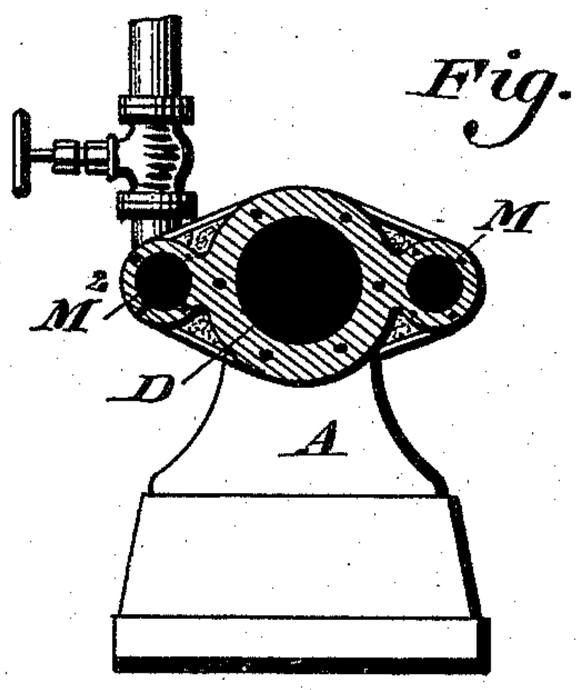


Fig. 7.

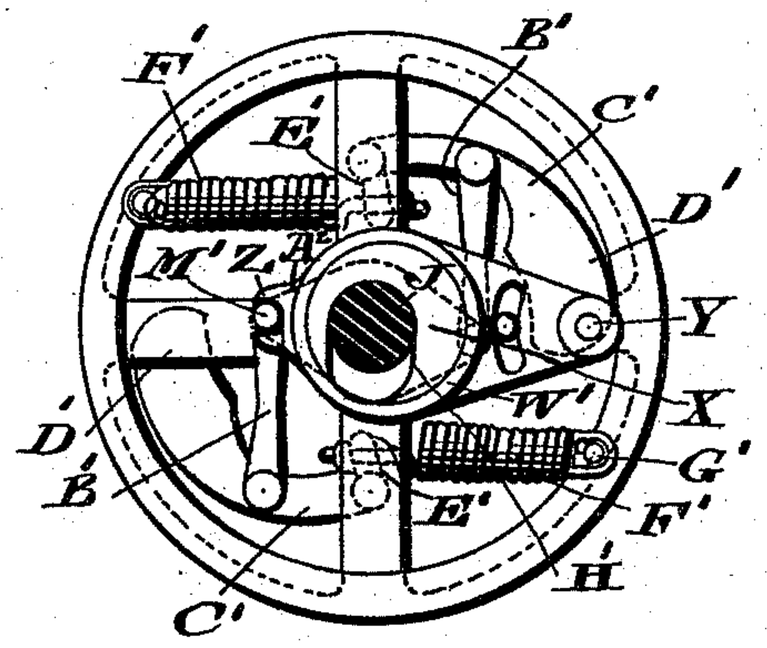
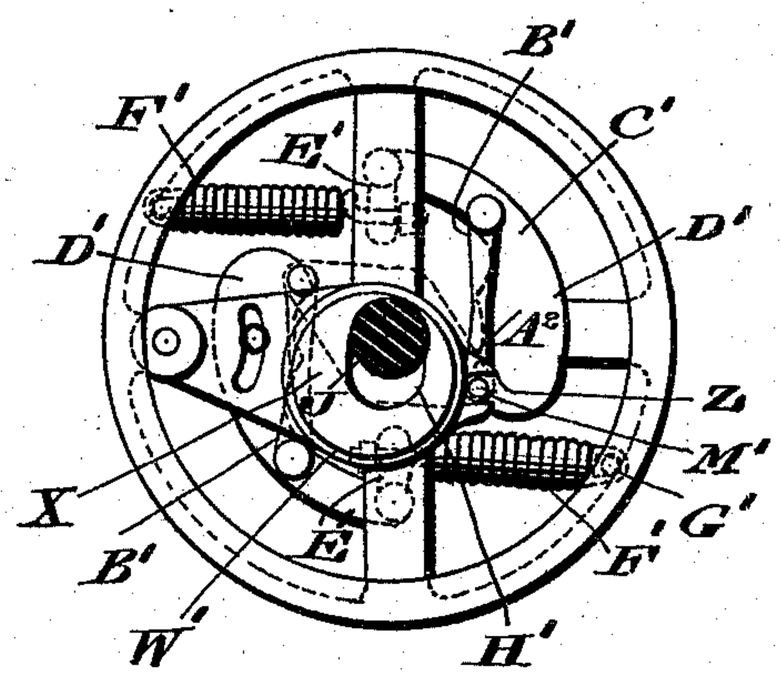


Fig. 8.



WITNESSES:

P. F. Eagles

L. Douville.

INVENTORS:

Henry Nadig.

Philip Nadig.

By Church & Siedenstein.

ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY NADIG AND PHILIP NADIG, OF ALLENTOWN, PENNSYLVANIA.

SINGLE-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 573,030, dated December 15, 1896.

Application filed June 16, 1896. Serial No. 595,721. (No model.)

To all whom it may concern:

Be it known that we, HENRY NADIG and PHILIP NADIG, citizens of the United States, residing at Allentown, in the county of Lehigh, State of Pennsylvania, have invented a new and useful Improvement in Single-Acting Steam-Engines, which improvement is fully set forth in the following specification and accompanying drawings.

Our invention consists of a novel construction of single-cylinder single-acting engine which is self-adjusting and self-lubricating and provided with a steam-distributing valve and a release or exhaust valve acting independently of each other and driven by separate eccentrics to secure a high efficiency in distribution and releasing of exhaust steam, and so arranged, as shown in the present instance, that the independent exhaust-valve can be dispensed with in small-sized engines, if desired, and a single distributing-valve allowed to do the service of both distributing and releasing the steam from the cylinder.

It further consists of a novel construction of shifting eccentric and its adjuncts, whereby the proper throw is imparted to the valve under all variations of load.

It further consists of novel details of construction, all as will be hereinafter set forth, and specifically pointed out in the claims.

Figure 1 represents a side elevation of a single-cylinder single-acting steam-engine embodying our invention. Fig. 2 represents an end elevation of the same, showing the cylinder and valve-chest heads removed. Fig. 3 represents a transverse sectional view through the casing which incloses the crank-shaft, showing also the shifting eccentric employed. Fig. 4 represents a longitudinal vertical section on line *x x*, Fig. 2. Fig. 5 represents a longitudinal vertical section on line *y y*, Fig. 2. Fig. 6 represents an end elevation showing a modified form of engine in which a separate inlet and exhaust valve is employed. Fig. 7 represents a side elevation of a shifting eccentric employed, showing the position the parts assume at the point of earliest cut-off. Fig. 8 represents a side elevation of the shifting eccentric with its adjuncts, showing the relative position of the parts at the point of latest cut-off.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates the bed of the engine, upon which the frame or casing B is supported, the lower portion of the same serving as a receptacle for the lubricating material C, which may be oil or other lubricant.

D designates an engine-cylinder which is suitably attached to said frame B and in which the piston E is adapted to be reciprocated, the same having therein a pin G, upon which one end of the connecting-rod F is mounted, the other end of the latter engaging the crank H of the crank-shaft J, which is mounted in suitable bearings in the frame or crank casing B, said shaft carrying upon one end thereof the fly-wheel K and on the other end a pulley L, within which the different elements of the automatic shifting eccentrics are located.

M designates a valve-chest which is located at a side of the cylinder D, one chest being employed in the present instance, although it is evident that two valve-chests may be utilized, as shown in Fig. 6, one chest M, as in the present instance, serving for the inlet, and the opposite one M^2 serving for the outlet, for the motive fluid.

N designates an inlet-pipe by which the steam or other motive fluid is introduced into the chest M, which latter has near its forward end a port P, which communicates with the interior of the cylinder D, the exhaust from said cylinder being allowed to flow through the same port after the piston-valve R is moved to the right of the position seen in Fig. 5, thereby closing said port P to live steam, said exhaust being conducted from the valve-chest to the atmosphere through the exhaust-pipe Q.

The controlling-valve is constructed in the present instance of the two pistons or heads R and S, between which the steam-pressure is confined, thereby causing the valve to be balanced under all conditions, the same being formed of a single piece of material, if desired.

T designates a stem connecting the valve-heads R and S, the same being actuated in unison through the medium of the valve-rod

U, which is connected to the lower end of the rock-arm V, which is fulcrumed upon a suitable support attached to the crank-casing B.

W designates an eccentric-rod leading from said rock-arm V and having a suitable connection to the eccentric-strap W′, which is mounted upon the eccentric X, the same having a slot H′ therein, by means of which a slight movement relative to the shaft J is permitted, said eccentric being pivoted at Y to a suitable portion of the pulley L and being attached to a plate A^2, which has in each extremity a recess or slot engaging with the friction-roller M′ on one end of the links B′, the position of the said eccentric relative to the shaft, according to the varying conditions of the load, being assured by means of said links, which have their ends attached, respectively, at opposite sides of the eccentric to the levers C′, each of said levers having on one end the counterbalance or weight D′, while their other extremities have attached thereto at E′ one end of a spring F′, the other end of each of the latter being attached to a suitable portion G′ of the pulley L.

J′ designates a pipe which conveys the drip from the interior of the cylinder C′ to the interior of the crank-case B, the gases and vapors within the latter being conducted therefrom through the outlet-pipe J^2.

K′ designates a siphon-overflow connected with the casing B for the purpose of withdrawing any surplus accumulation of water within the same.

The operation is as follows: If we assume the parts to be in the position seen in Fig. 5, with the valve-head R in the position shown, it will be evident that the port P will then be open to live steam, and that the piston in the cylinder D is now either near the left-hand end thereof or moving away therefrom. The steam having been admitted through the port P will cause the cylinder-piston to move to the right, and at the proper point of the stroke the valve-heads R and S will also be caused to move to the right by the medium of the eccentric and its adjuncts, (seen in Figs. 7 and 8,) the said head R assuming a position to the right of the port P and intermediate said port and the inlet-pipe N, whereupon it will be seen that the admission of live steam to the port P is cut off, and upon the return movement of the cylinder-piston to the left, which is caused by the momentum of the fly-wheel K, the exhaust-steam will be permitted to flow out through the port P, and thence through the exhaust-pipe Q to the atmosphere or to any desired point. As soon as the cylinder-piston has completed its stroke to the left and is once more ready to move from the left to the right, the valve-heads R and S will assume the position relative to the port P seen in Fig. 5 and the operation above described will be repeated.

The action of the shifting eccentric will, it is thought, be apparent, any increase in the velocity of the engine caused by the lightening of the load from any cause causing the weighted levers A′ to fly outwardly and thereby, through the medium of the intermediate connections, causing the valve-head P to cut off the steam quicker, the speed of the engine being thus automatically reduced or increased according to requirements, the position the parts assume at the point of earliest or latest cut-off being evident from Figs. 7 and 8.

The crank-casing B is in practice filled with a lubricant to about the point indicated in Figs. 3 and 5, whereupon it will be seen that the crank-cylinder piston and its adjuncts will be always positively and effectively lubricated, no oil escaping to the exterior of the engine or being thrown over the floor or walls of the engine-room.

The oil, water of condensation, drip, &c., can be conducted from the end of the cylinder D to the crank-casing B through the pipe J′, thereby making all the parts self-contained and rendering the engine, when once assembled, readily operative without necessitating constant watchfulness on the part of the attendant.

It will be seen from the foregoing that an engine of great simplicity is produced, there being no pounding from lost motion, as is the case with engines taking steam on both sides of the piston, the strain being all in one direction and the engine being thereby self-adjusting, the lubrication being effectively insured by running the parts in oil inclosed in the crank-casing, and there being also an absence of packed steam-joints, whereby the necessity for frequent repairs is reduced to a minimum.

Especial attention is called to the valve employed, which, as stated, can be single or double, one only of these valves being influenced by the governor and having its stroke vary in proportion as the load carried by the engine varies, and in case a separate exhaust-valve is employed, as has been referred to in connection with Fig. 6, the same is driven by a fast eccentric on the driving-shaft, its stroke being invariable and the steam not being released until the piston has reached the end of its stroke, said valves being perfectly balanced under every steam-pressure and controlling the whole steam distribution by their inside edges in a very effective manner.

In the preferred embodiment of our invention the center of the crank-shaft is located part way below the center of the cylinder when the engine is running forward, the above construction aiding greatly in attaining a favorable position for the connecting-rod during the forward half-stroke of the engine, the effect being to push more nearly in a horizontal or central line to the motion of the piston, the contrary being observed in engines running backward.

It will further be noted that the valve-head

S is preferably slightly larger than the other head, in order to enable the steam to move the valve in the desired direction to automatically take up all wear upon the valve-gear on the same principle as the connecting-rod is adjusted by the single action.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a single-acting steam-engine, a substantially horizontal crank-casing, a steam-cylinder attached to one end thereof and forming a continuation of said casing, the lower portion of the latter being adapted to be filled with a suitable lubricant, a valve-chest adjacent said cylinder, a port near the extremity of said chest leading into said cylinder, a valve in said chest, consisting of a plurality of heads of different diameters suitably connected, an inlet-port for live steam opening into the space between said heads, one of the latter being adapted to open and close the inlet-port to the cylinder, an exhaust connection leading from the outer end of said valve-chest, a rod extending from said valve, a rock-arm to which said rod is attached, an eccentric-rod also attached to said rock-arm, and means for actuating said eccentric-rod.

2. A single-acting steam-engine having a substantially horizontal crank-casing, a cylinder mounted thereupon, and forming a continuation thereof, and having one end open to the interior of said casing, the latter being adapted to receive a suitable lubricant, a valve-chest adjacent said cylinder, a port intermediate the latter and said chest, a controlling-valve mounted in the latter, consisting of a plurality of balanced pistons, a port in said chest for the admission of live steam opening into the space between said pistons, a rock-arm fulcrumed on the crank-casing, a valve-rod intermediate said rock-arm and valve, and a shifting eccentric mounted on the crank-shaft and adapted to actuate said rock-arm.

3. In a single-acting steam-engine, a horizontally-extending closed crank-casing, a crank-shaft having bearings therein, a cylinder mounted on said casing, having one end open to the interior thereof, a valve-chest located adjacent said cylinder, an exhaust connection leading from the end of said chest, a valve composed of a plurality of heads joined together, live steam being admitted between said heads, a piston within said cylinder, a connecting-rod intermediate said crank-shaft and piston, a rod leading from said valve to a rock-arm, connections from said rock-arm to a shifting eccentric, and weighted levers and springs for imparting the proper movement to said eccentric, according to different variations of the load.

4. In a single-acting engine, a horizontally-extending closed receptacle serving as a crank-casing, the sides of the latter serving as bearings for a crank-shaft, an outlet from said crank-casing for the escape of vapors therefrom, a cylinder mounted on said casing, and having an end open to the interior thereof, a drip leading from an end of said cylinder to the interior of said casing, a siphon-overflow connected with said casing, a valve-chest adjacent said cylinder, a controlling-valve therein, said valve having a plurality of heads suitably connected, an inlet-port for live steam opening into the space between said heads, one of the latter being adapted to control the inlet-port to the steam-cylinder, and an exhaust connection leading from the outer end of said valve-chest.

HENRY NADIG.
PHILIP NADIG.

Witnesses:
EVAN HOLBEN,
L. F. NADIG.