3 Sheets—Sheet 1.

J. F. THOMAS.

Dummy-Engine.

No. 208,213.

Patented Sept. 17, 1878.

Fig. 1.

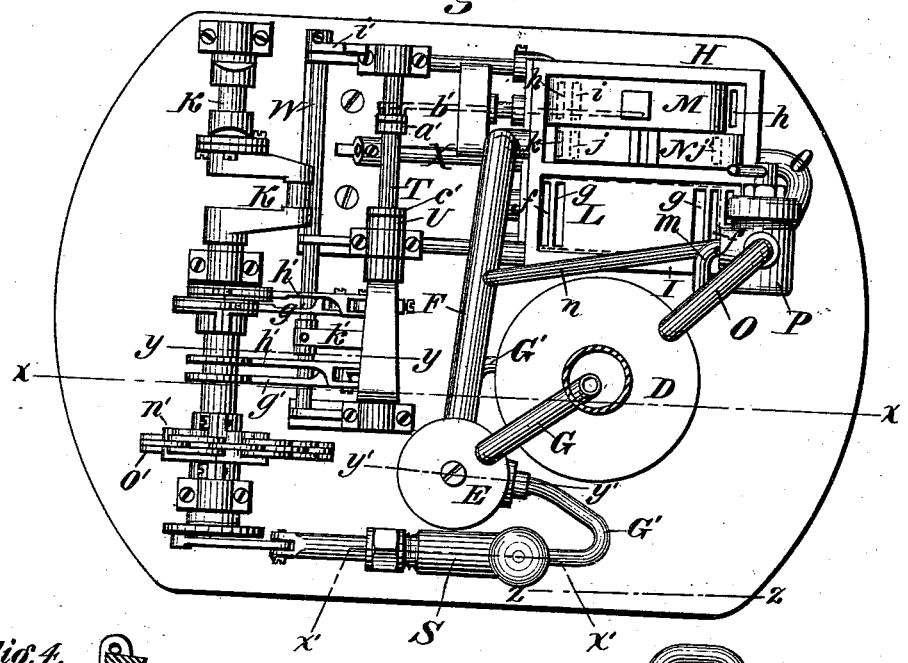


Fig. 4.

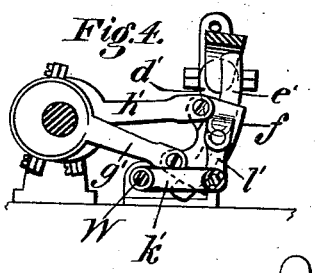


Fig. 2.




Witnesses:

Donn S. Turtchell.

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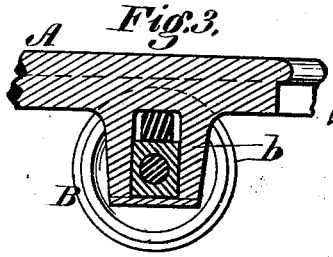
Fig. 3.




Inventor:

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3 Sheets—Sheet 2.

# J. F. THOMAS.

## Dummy-Engine.

No. 208,213. Patented Sept. 17, 1878.

Fig. 5.

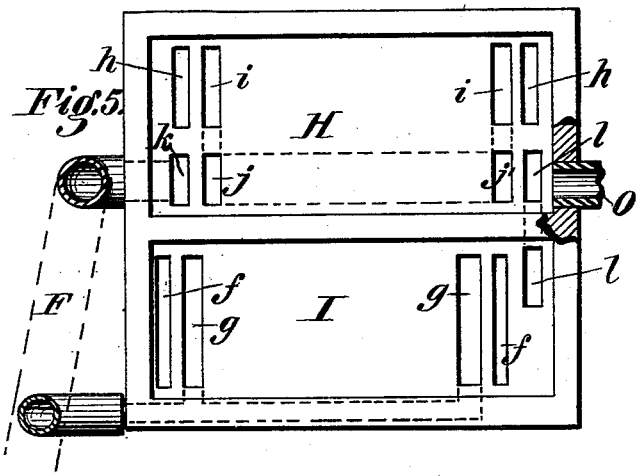



Fig. 6.

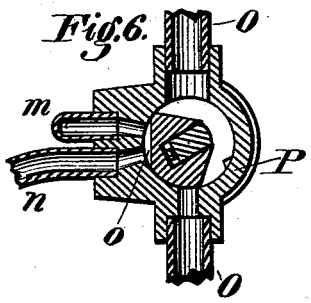
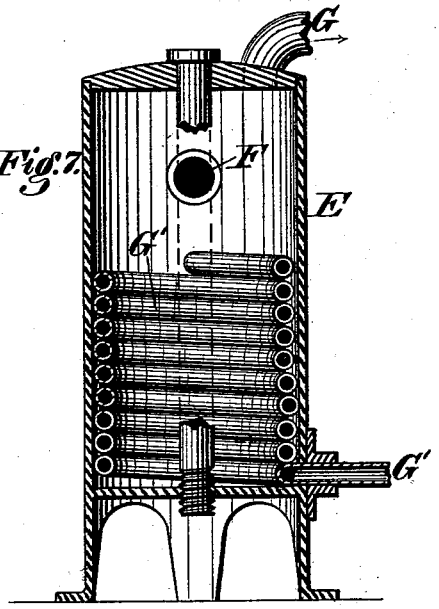



Fig. 7.

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## Dummy-Engine.

No. 208,213. Patented Sept. 17, 1878.

Fig. 8.

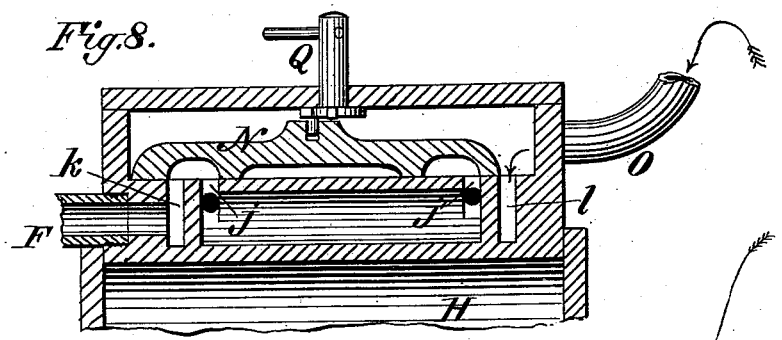



Fig. 9.

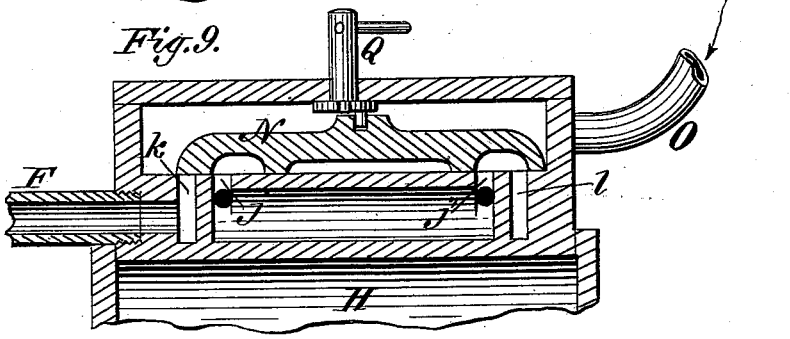
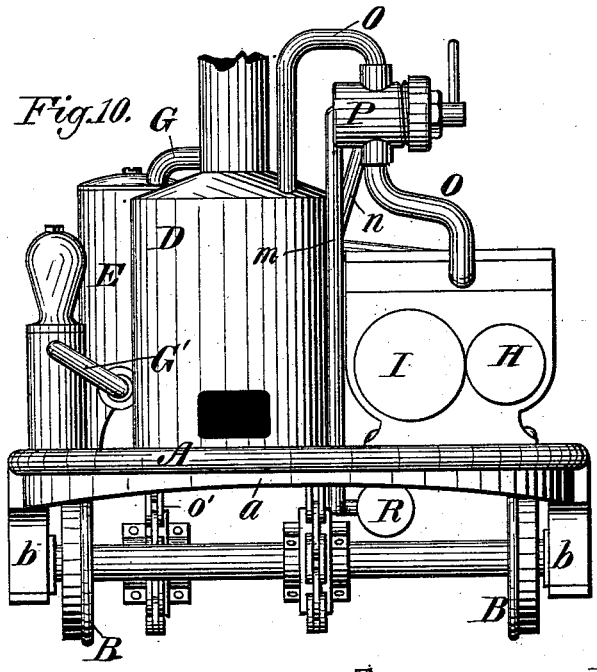



Fig. 10.




Witnesses:
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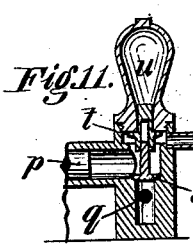
Will W. Dodge

Fig. 11.




Inventor:
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# UNITED STATES PATENT OFFICE.

JOHN F. THOMAS, OF ILION, NEW YORK.

## IMPROVEMENT IN DUMMY-ENGINES.

Specification forming part of Letters Patent No. **208,213**, dated September 17, 1878; application filed June 14, 1878.

*To all whom it may concern:*

Be it known that I, JOHN F. THOMAS, of Ilion, in the county of Herkimer and State of New York, have invented certain Improvements in Dummy-Engines, of which the following is a specification:

My invention relates to a self-propelling engine intended more especially for the purpose of drawing street-cars, and similar uses.

The invention consists in the construction of the frame and the application and arrangement of the boiler, the construction and arrangement of the steam-valves, the construction of the link-motion, and in other details hereinafter described.

Figure 1 represents a top-plan view of my engine and car; Fig. 2, a vertical longitudinal section of the same on the line *x x;* Fig. 3, a section on the line *z z;* Fig. 4, a section on the line *y y;* Fig. 5, a plan view, showing the ports of the two cylinders; Fig. 6, a section of the throttle-valve; Fig. 7, a section of the condenser and feed-water heater on the line *y' y'* of Fig. 1; Figs. 8 and 9, sectional views of the auxiliary slide-valves; Fig. 10, a rear-end elevation of my engine and car; Fig. 11, a vertical central section of the feed-pump on the line *x' x'* of Fig. 1.

Hitherto it has been customary to construct the body or car of dummy-engines with a frame composed of timber or timber and metal, and provided with braces and with a floor or platform, all modes of construction heretofore in use producing heavy and expensive cars, and rendering the application of the various parts of the machinery thereto a troublesome and expensive matter.

The object of the first feature of my invention is to produce a car-truck of less weight and cost than those hitherto employed, and which shall at the same time permit the ready and secure attachment of the mechanism; and to this end it consists in a frame and platform cast complete in one piece, with standards to receive the axle-bearings, and with strengthening ribs and braces adapted to receive the various parts of the machinery.

In constructing my motor I provide a base-frame or platform, A, cast complete in one piece of iron, with strengthening and stiffening ribs *a* on its under side at the outer edge, and also with transverse stiffening-ribs *c*, and with depending hangers *b*, as shown in Fig. 3, to receive and hold axle-boxes, which, in turn, receive the ends of axles provided with wheels B, four of which are arranged beneath the platform or bed to sustain the same.

At a suitable point in the platform A, near the center, I form an opening of suitable size to receive the lower end of an upright boiler, D, and around said opening form a depending flange, *d*. The base of the boiler, being inserted through the opening from above, is secured in place by means of rivets or bolts *e* passed through its lower edge and through the flange *d*, as shown in Fig. 2. This arrangement serves to secure the boiler firmly in position at a very trifling cost and without subjecting it to any strain whatever.

By the side of the boiler D, I mount an upright cylindrical body, E, serving as a condenser and feed-water heater. As shown in Fig. 7, the body E is closed at top and bottom and mounted upon sustaining-legs, so that it is exposed to the air on all sides. The exhaust-steam from the engine is discharged into the body E by a pipe, F, and the condensed portion, if any, escapes through the pipe G into the stack of the boiler to assist in producing a draft therein. The feed-water is conveyed through the pipe G', which is passed into the base of the body E and coiled around therein, as shown in Fig. 7, and thence passed to the boiler. The feed-pipe, being subjected to the action of the exhaust-steam within the body E, is heated thereby, and the feed-water consequently delivered to the boiler at an elevated temperature. The exhaust-steam, in consequence of the action of the cold air upon the exterior of the body E, and of the passage of the cold water through the coiled pipe within the same, is almost wholly condensed within the body, little or no steam escaping through the pipe G. The body E serves not only as a condenser, but also as a muffling-drum to deaden the sound of the discharge of the steam, the instantaneous expansion of the steam as it enters the body E avoiding almost wholly the production of the usual report or noise caused when the steam is discharged into the air or directly into the stack of the boiler.

At its lower end the condenser E will be provided with a discharge-pipe to conduct the water resulting from the condensation of the steam down through the platform or to any other required point. On the platform of the truck, side by side, I mount two horizontal cylinders, H I, as shown in Figs. 1 and 10, the former being a high-pressure and the latter a low-pressure cylinder.

The cylinders are provided, as usual, with pistons and piston-rods connected to cross-heads, which will be connected in turn, by pitmen, to a crank-shaft, K, mounted transversely on the opposite end of the platform, the manner of constructing cylinders and pistons and connecting the same with the crank-shaft forming no part of my invention, any ordinary mode of construction being adopted in this respect.

The arrangement of parts is such that, as in ordinary compound engines, the steam is worked at a high pressure in the cylinder H and then at a low pressure in the cylinder I, after which it is exhausted into the condenser, provision being made, however, for using steam at a high pressure in the cylinder I in the event of an unusual amount of power being required. The construction of the valves and ports by which the admission of steam to the cylinder is controlled forms one feature of my invention.

The cylinders H I are provided, as usual, with the steam or valve chest on top. The cylinder I is provided with inlet-ports *f* and exhaust-ports *g*, opening from the valve-chest into the cylinder in the same manner as those of the ordinary high-pressure engines in common use, an ordinary slide-valve being used in connection with said ports to control the passage of the steam to and from the cylinder I. As shown in Fig. 5, the two exhaust-ports *g* communicate with the exhaust-pipe F leading to the condenser. The cylinder H is provided with two sets or pairs of ports, *h* and *i*, which are arranged in the same manner as those of the cylinder I, and the passage of the steam through them is controlled by a slide-valve of ordinary form, the movement of the valve permitting the steam to enter the ends of the cylinder through the ports *h*, and to escape through the ports *i* at the opposite ends alternately. Between the ordinary ports of the two cylinders, in the chest of the high-pressure cylinder H, I introduce an intermediate set of ports and special slide-valve, the purpose of which is to control the admission of steam to the low-pressure cylinder and cause the delivery thereto of high-pressure steam, or of the low-pressure steam from the first cylinder, as may be required. This valve and its ports I will now describe in detail.

The exhaust-ports *i* communicate by passages or openings with two ports, *j*, which communicate with each other by an intermediate passage, so that the exhaust-steam from the cylinder H is finally delivered through the ports *j*.

By the side of the respective ports *j* there are two ports, *k l*, the former communicating with the exhaust-pipe F and the latter with the steam chest or chamber of the cylinder I, forming a passage through which the live steam from the boiler or the exhaust-steam from the cylinder H, as the case may be, will be delivered from the chest of the cylinder H into that of the cylinder I. Over the ports *j k l*, I place an ordinary slide-valve, N, having cavities or recesses in its two ends, and so arranged that when moved in one direction it will form a communication between the ports *j k* on the one side and cut-off communication to the ports *j'* and *l* on the opposite side, as shown in Fig. 8, and that when moved in the opposite direction it will establish communication between the ports *j'* and *l* and cut off communication between the ports *j k*, leaving the port *l* open and exposed, as shown in Fig. 9, so that steam may pass from the chest of the cylinder H through said port *l* into the chest of the cylinder I.

A hand-crank or spindle, Q, inserted through the top of the chest of the cylinder H, engages with the slide-valve N, and serves as a means by which it may be moved when required. The live steam from the boiler is conducted through the pipe O into the chest of the high-pressure cylinder H, as shown in Figs. 1, 5, 8, and 9, the flow of the steam being controlled by means of a throttle-valve, P, which will be hereinafter fully described.

When the valve N stands in its right-hand position, as represented in Figs. 1 and 8, the live steam is delivered into the chest of cylinder H, and, by means of the slide-valve N, caused to flow into and out of the two ends of the cylinder H alternately. The steam escaping through the ports *i*, and thence to the ports *j j'*, is conducted by the valve N into the port *l*, through which it passes into the chest of the cylinder I, from which it is delivered by the slide-valve L into and out of the two ends of the cylinder I alternately. Escaping from the exhaust-ports *g* of the cylinder I, the steam passes into the exhaust-pipe F, and thence to the condenser.

It will be observed that under the above adjustment the steam is employed in the two cylinders successively, as in the ordinary compound engine, being worked at a high pressure in the first cylinder, and then expansively at a low pressure in the second cylinder.

When it is desired to use the steam at a high pressure in both cylinders, the valve N is simply moved to the left, as represented in Fig. 9, whereupon it will be seen the live steam is admitted not only to the chest of cylinder H, but also, through the port *l*, directly into the chest of cylinder I, so that, by means of the slide-valves L M, the high-pressure steam is admitted directly to both cylinders, the exhaust-steam from cylinder H being discharged through the ports *i* and the ports *j j'* to the communicating passage, and thence through the left-hand end of valve N into the port *k*,

whence it finally escapes into the pipe F, the exhaust-steam from cylinder I meantime passing out through the ports *g*, and thence to the pipe F.

The movements of the valves L M may be effected by eccentrics and connecting-rods or any other ordinary mechanism, such as commonly used for operating slide-valves.

For the purpose of arresting the motion of the car, I propose to employ any ordinary form of steam-brake in which a cylinder and piston are used.

The brake-cylinder I locate below the platform, as shown at R, Figs. 2 and 10, and connect the same by a pipe, *m*, with the throttle-valve P on the main steam-pipe, as shown in Figs. 1 and 2. In order that the throttle-valve may control the flow of steam to and from the brake-cylinder as well as to the engine-cylinder, it is constructed in a peculiar manner, as represented in Fig. 6, and connected by a pipe, *n*, with the exhaust-pipe F.

As shown in Fig. 6, the valve-body has a large cylindrical interior, into which the pipes *m n* open on one side, while the two sections of the main steam-pipe open in its top and bottom. The valve-plug, which extends through and has a rotary vibration in the interior of the valve body, has a portion of its surface curved in the arc of a circle and fitted closely against the wall of the chamber, while on one side it is flattened, as shown at *o*. The plug is also cut away on one side in order to leave a large passage through which the steam may pass from the upper to the lower portion or section of the main steam-pipe. When the valve is adjusted in the position shown in Fig. 6, the flow of the steam through the main pipe to the engine is entirely stopped and communication established between the two pipes *m n*, so that the steam may be exhausted from the brake-cylinder through the pipe *m*, and thence through the pipe *n*, into the exhaust-pipe F, to the condenser. It is to be noted that when the valve is in this position there is no communication between the pipe *m* and the live-steam pipe O. By giving the valve a proper rotary motion steam may be admitted to the engine alone, or through the pipe *m* and the brake-cylinder alone, communication in the latter case being cut off between the pipes *m n*.

It will thus be seen that the one valve serves the threefold purpose of controlling the admission of the live steam to the engine-cylinders, of controlling the admission of steam to the brake-cylinder, and of controlling the discharge of steam from the brake-cylinder.

In order to insure a tight fit of the valve-plug, it is mounted loosely upon a central operating stem or spindle, and a spring interposed between the two in order to force the plug outward snugly against the interior of the valve-body.

For the purpose of delivering the feed-water to the heater and boiler, I locate on the outside of the platform a feed-pump, S, the pump being of the common direct-acting plunger pattern. The valves of the pump, however, instead of being arranged as usual, are constructed as represented in Fig. 11, in which figure *p* represents the plunger, *q* the inlet and *r* the outlet ports, *s* a check-valve located below the plunger, and *t* a similar valve located above the plunger. The upper valve is provided with a central upright stem, which has its bearing in and is sustained by the air-chamber *u*. The lower valve is also provided with a central stem, which has its bearing within the stem of the upper valve, as represented in the drawing. By this arrangement of the valves, the stem of one seated in that of the other, the cost of construction is reduced to a minimum, the pump simplified, and a clear unobstructed passage-way for the water permitted.

For the purpose of operating the slide-valves L M of the cylinders H I, I employ, as usual, eccentrics arranged upon a main crank-shaft, and arranged to transmit motion through eccentric-rods to rock-shafts, and thence to the valves; and for the purpose of reversing the motion of the engine I introduce between the eccentric-rods and the rock-shaft the link-motions described below.

T represents a rock-shaft, provided with an arm, *a'*, connected to the valve-stem *b'* of valve M, and U represents a second rock-shaft, of tubular form, mounted upon and around one end of the rock-shaft T, and provided with an arm, *c'*, to which the valve-stem of the slide-valve L will be connected. The shaft U has at one end a depending crank-arm, *d'*, on which there is pivoted at its middle a bar, *e'*, curved in the arc of a circle and made of a dovetailed form in cross-section, on which bar there is mounted a sliding block, *f'*, the ends of which are connected to rods *g'* and *h'*, the opposite ends of which latter are provided with yokes mounted on eccentrics on the main shaft of the engine. The eccentrics are set diametrically opposite to each other, so that by moving the block *f'* up and down one or the other of the eccentrics may be brought into play, as required, the operation being similar to that of the ordinary link-motion. The shaft T is curved upward over the link of shaft U and downward on the outside, where it is provided with a crank-arm provided with a link and eccentric connections similar to those above described.

For the purpose of operating the two links, a transverse rock-shaft, W, is mounted on the platform, and provided at its outer end with an operating-lever, *i'*, and also provided with two arms, *k'*, united by a pivoted connection, *l'*, to the link blocks or slides *f'*, as shown in Figs. 2 and 4. The slides or blocks *f'* of the links are provided with adjustable gibs and set-screws for forcing the same inward against the arms *e'* as the parts wear away.

By constructing the link of the sliding curved bar *e'* of a dovetailed form, and combining therewith the sliding block *f'*, with its

adjustable gib, I produce a link-motion which is exceedingly strong and durable, which costs far less to construct than the ordinary slotted links, and which can be readily kept tight and close in the joints.

The cross-heads of the two piston-rods are mounted, as shown in Figs. 1 and 2, upon round guides X, seated at one end in sockets on the cylinder-heads and at the opposite ends in standards or brackets on the platform, the rods being held in place by set-screws, which admit of their being loosened and rotated to present a new surface as they wear away.

Motion is transmitted from the engine to the wheels by means of a sprocket-wheel, *n'*, and a chain, *o'*, extending therefrom to a corresponding wheel on one of the main axles.

I do not claim, broadly, the idea of making an engine-frame of metal, as I am aware that skeleton frames of cast metal, generally, if not always, made in sections and bolted together, have been used for marine engines, and also that locomotive-frames have been made of wrought metal in many pieces; but I am not aware of any frame in the least resembling mine, or of any frame adapted for the same use, having been made of metal.

Hitherto dummy-engine frames have been composed of heavy wooden or metal skeletons, made of many pieces, fastened together and strengthened by girders, struts, and braces. To the frame or skeleton thus constructed the platform of wood or sheet metal, the hangers, the boiler-supports, and other parts were attached. This mode of construction, requiring as it does the manufacture and fitting together of many parts and pieces, rendered the cost very great, and gave to the engine an excessive weight, and in practice much difficulty was experienced from the tendency of the parts to become loose and shaky. Now, by my method of construction, making the platform or bed itself constitute the main frame and giving it the required strength and stiffness by casting the ribs and flanges thereon, I am enabled to produce a frame which is materially lighter and far cheaper, and which is practically indestructible.

Having thus described my invention, what I claim is—

1. The herein-described frame for a dummy-engine, consisting of the bed or platform and strengthening ribs or flanges thereon, the whole cast complete in one piece, in substantially the form shown and described.

2. The herein-described dummy-engine frame, consisting of the bed or platform, the strengthening ribs or flanges, and the hangers, the whole cast in one piece, as shown.

3. The combination, in a dummy-engine, of the cast-metal frame, constructed substantially as described, having a flanged opening therein, and a vertical steam-boiler applied to said opening and secured by rivets or bolts, substantially as shown.

4. In a compound engine, the combination of two cylinders, H I, provided with ports and slide-valves of ordinary construction, in combination with a port extending through the steam chest of one cylinder to that of the other, and a movable valve, N, substantially such as shown, whereby live or dead steam may be delivered to the second cylinder at will.

5. The cylinder I, having the ports *g* and valve L, and the cylinder H, having ports *h* and valve M, in combination with the ports *j* *j'*, *k*, and *l* and the valve N, as shown.

6. In a dummy-engine, the combination of the engine-cylinders, the brake cylinder, the pipes for conveying the steam to both the engine and brake cylinders, and the throttle-valve P, constructed substantially as shown, adapted to control the admission of steam to the engine-cylinders, and also to discharge the steam into and from the brake-cylinder.

7. In a compound engine, the combination of a valve-operating shaft, T, for one cylinder with a second valve-operating shaft, U, for the other cylinder, the latter made tubular and mounted around the former, as shown.

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