

(No Model.)

4 Sheets—Sheet 1.

H. A. LUTTGENS.
LOCOMOTIVE.

No. 533,544.

Patented Feb. 5, 1895.

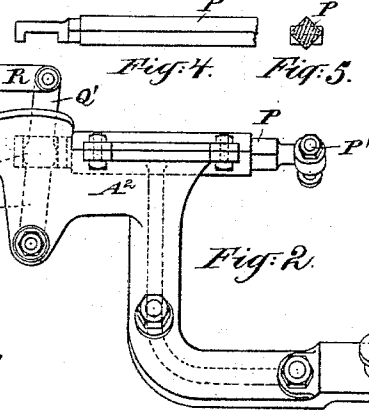
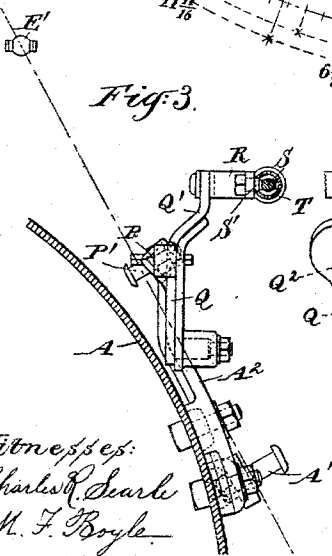
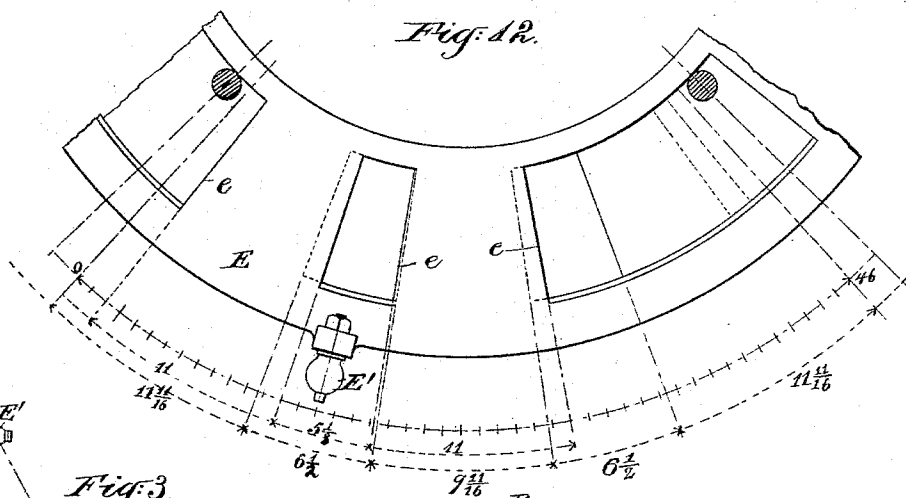
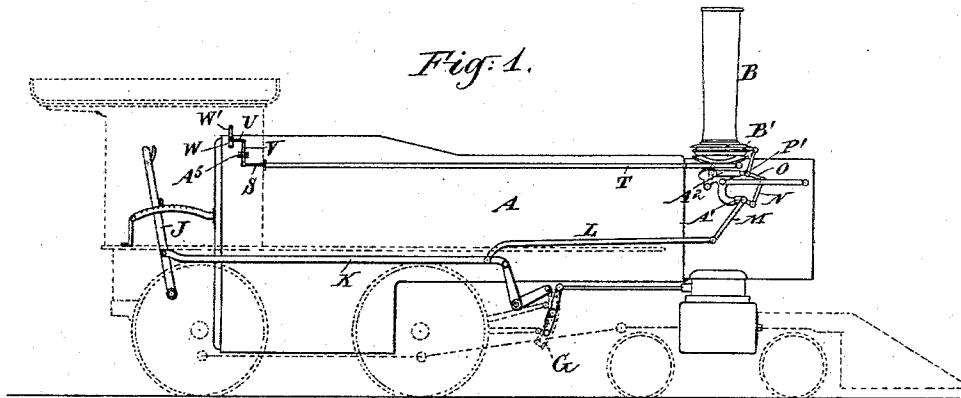


Fig: 2.

Inventor:

H. A. Lutgens
by his attorney
Wm. Greer Stetson

Witnesses:
Charles C. Clark
M. F. Boyle

(No Model.)

4 Sheets—Sheet 2.

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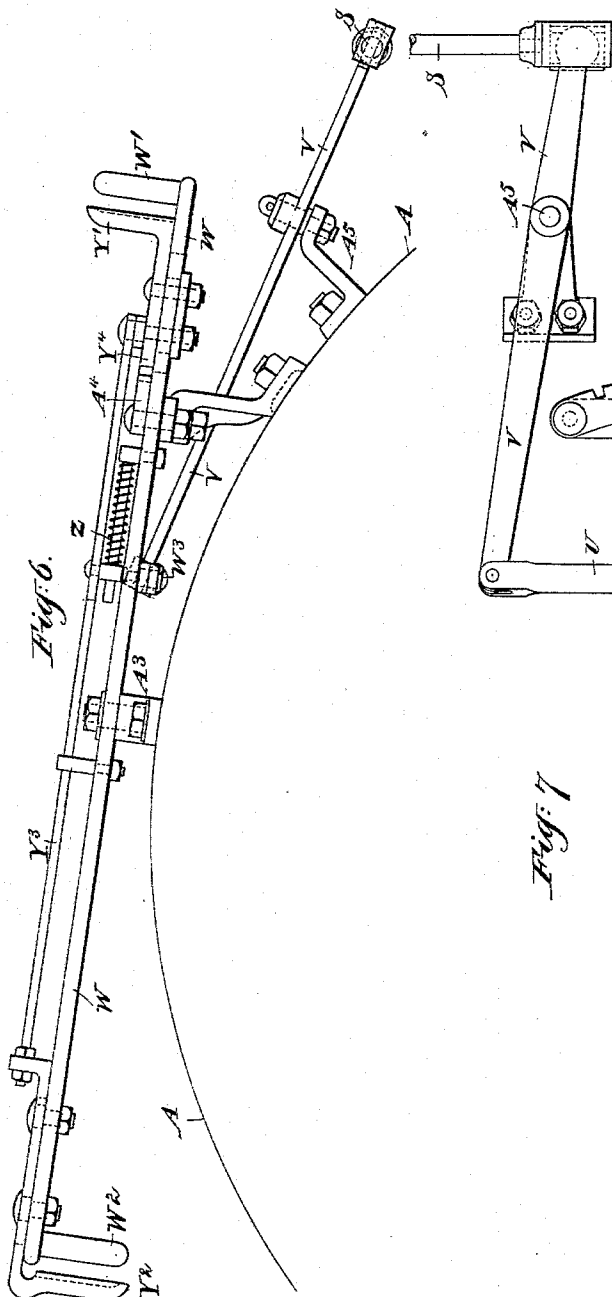


Fig. 6.

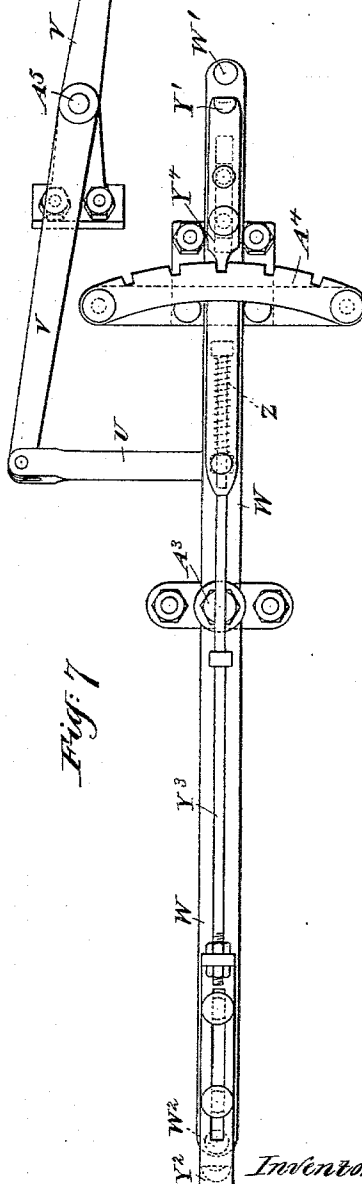


Fig. 7.

Witnesses:
Charles R. Sharle.
M. F. Boyle.

Inventor:
H. A. Lutgens
By his attorney
James D. Sisson

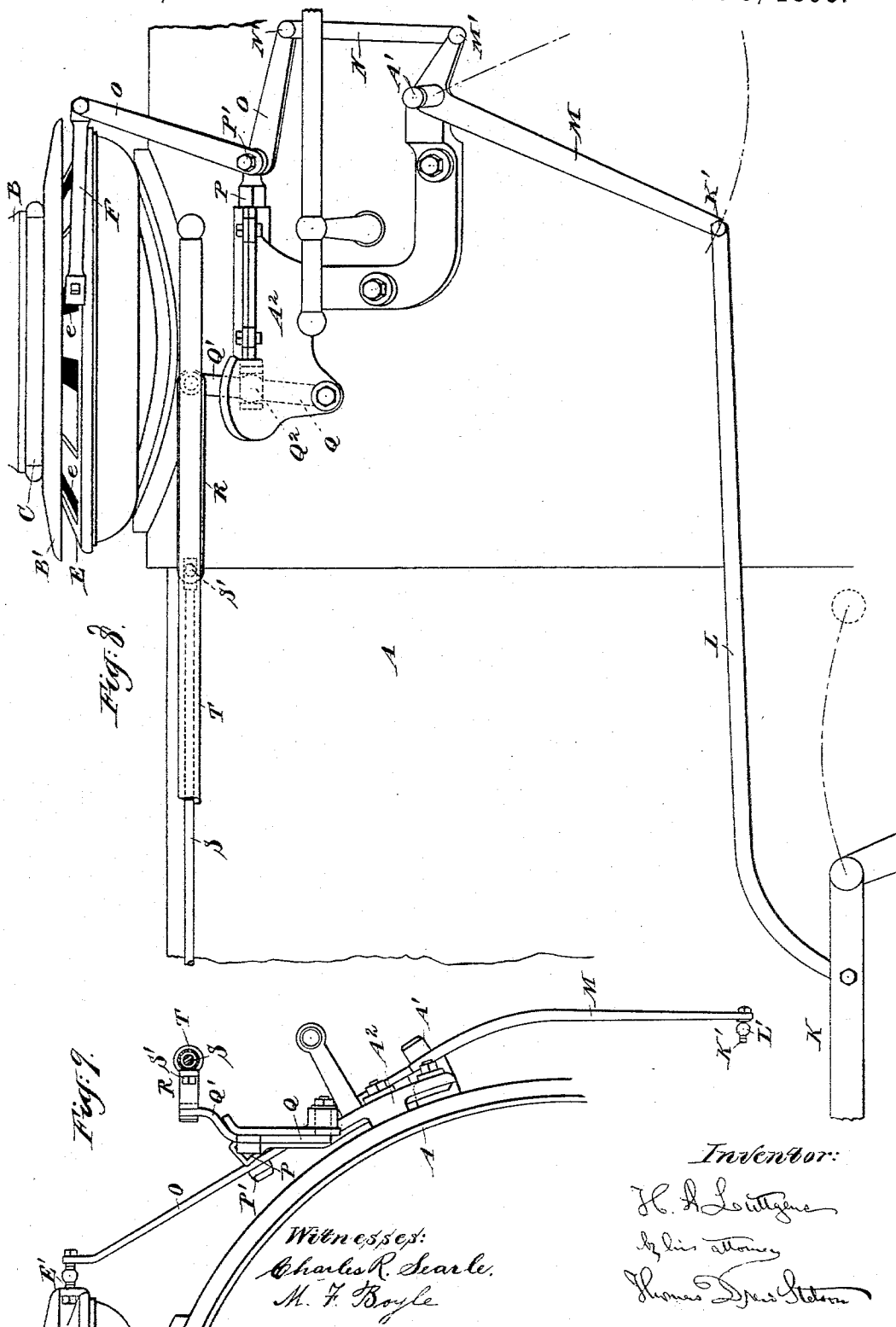
(No Model.)

4 Sheets—Sheet 3.

H. A. LUTTGENS.
LOCOMOTIVE.

No. 533,544.

Patented Feb. 5, 1895.



Inventor:

H. A. Lutgens
By his attorney
James D. S. S. S.

Witnesses:
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M. F. Boyle

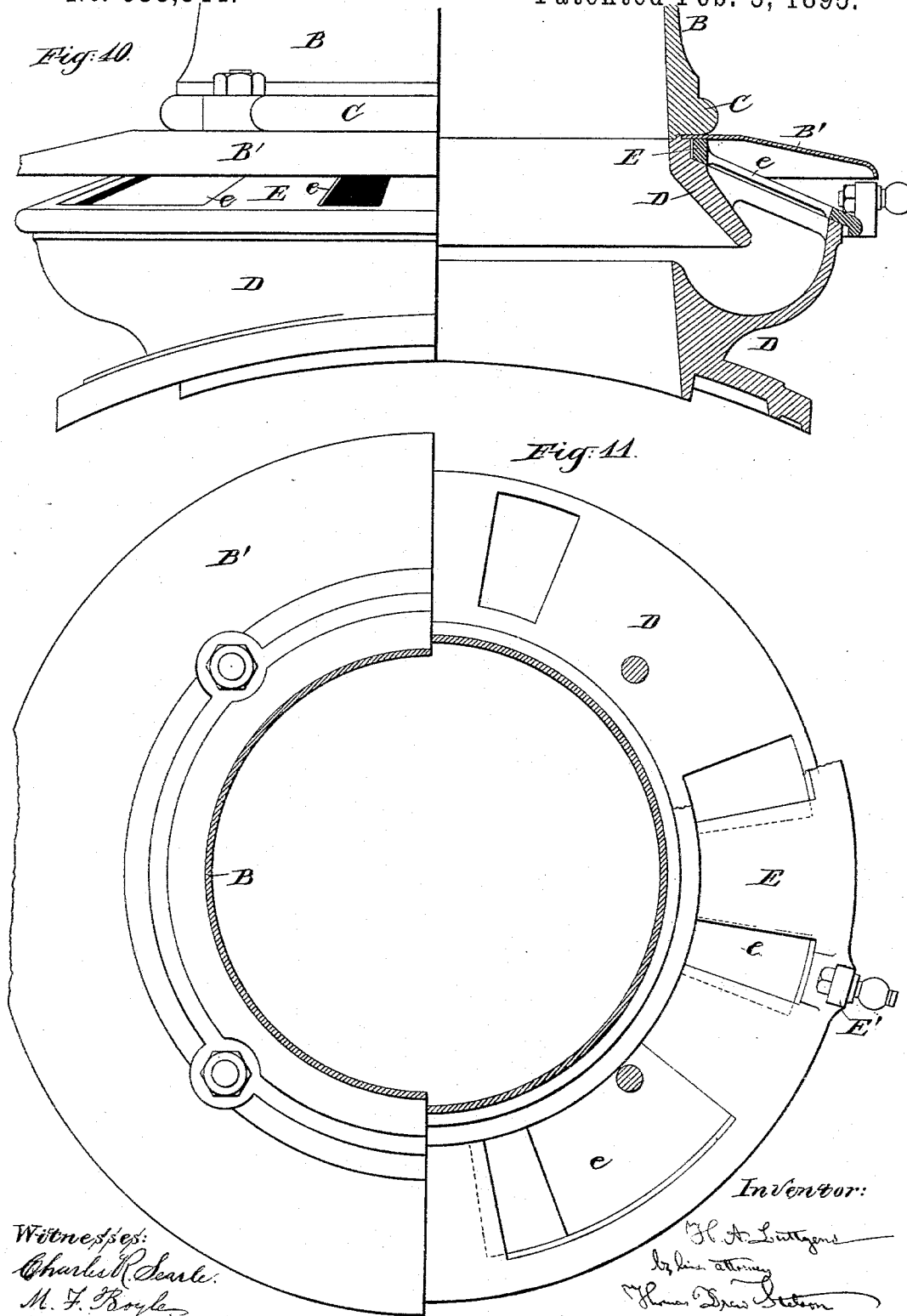
(No Model.)

4 Sheets—Sheet 4.

H. A. LUTTGENS.
LOCOMOTIVE.

No. 533,544.

Patented Feb. 5, 1895.



Witnesses:
Charles R. Seale.
M. F. Boyle.

Inventor:
H. A. Luttgens
by his attorney
James D. Brown

UNITED STATES PATENT OFFICE.

HENRY A. LUTTGENS, OF PATERSON, NEW JERSEY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO JOHN H. REYNOLDS, OF SAME PLACE, AND MERCEY R. LUTTGENS, OF GOFFLE HILL, NEW JERSEY.

LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 533,544, dated February 5, 1895.

Application filed May 25, 1894. Serial No. 512,412. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. LUTTGENS, of the city of Paterson, county of Passaic, and State of New Jersey, have invented a certain new and useful Improvement in Locomotives, of which the following is a specification.

My invention is used in combination with provisions for admitting air to the base of the stack of a locomotive to reduce or modify the draft, for which Letters Patent of the United States were granted to me November 10, 1885, No. 330,340. Such consists briefly, of an annular perforated plate which I term a damper plate resting and turning on a perforated seat surrounding the stack. I term the entire device a damper. In the invention as there applied the damper is liable to receive cinders which have been thrown up, and also to be clogged and stuck by paint or oil, and the operation of the damper is made entirely dependent for its adjustment upon the skill and attention of the engineer and fireman.

In my present improvement I connect the damper rod with the reverse lever, the arrangement being so made that without requiring any care, the openings for admitting air to the base of the stack to soften the violence of the draft are largest when the steam is admitted by the valve gear to follow the piston the farthest, and therefore the draft produced by the exhausting steam is the strongest, and is most liable to tear the fire. These openings are gradually diminished by the movement of the reverse lever from either extreme toward the central position—that is to say, the same result is produced when the engine is made to run forward or backward.

When the valve gear is set to follow nearly full stroke in running forward, the damper will be open and the violence of the draft will be greatly reduced by the freedom with which air is allowed to enter through the annular chamber and to flow up the stack with the exhaust steam. As the locomotive acquires speed the reversing lever is usually shifted backward toward the central position with the effect to adjust the valve gear to cut off the supply of steam earlier in each stroke. When the locomotive is running at speed over the main portion of the road, cutting off short but consuming steam rapidly by reason of the

rapid succession of the strokes, my invention insures that my perforated annular damper-plate shall be so held as to entirely shut off the flow of air into the base of the stack, and allow the full effect of the moderate current of exhaust steam up the stack to be utilized in increasing and maintaining the draft. The same effect occurs when the valve-gear is set to follow full stroke or less in going backward. My invention insures that the apertures to admit air to moderate the draft shall be open when the valve gear is set to follow nearly full stroke, and that it shall, without requiring attention, be reduced as the reversing lever is shifted toward the central position, so that in running with a short cut-off, whether forward or backward, the admission of air to diminish the draft shall be entirely suppressed. In addition to this I provide an adjustment easily operated from the foot-board, which, by allowing the engineer or fireman to change the position of the center of a lever, combines with the self-acting regulation thus provided, a further regulation which can be modified at will. By means of this additional adjustment the openings for admitting air to the base of the stack, may be closed sooner or later. In other words, automatic or self-acting regulation obtains under all conditions, but the extent to which it obtains and the point in the adjustment of the cut-off at which it commences to act, may be materially modified at the will of the attendant. This enables the locomotive to operate more successfully with different qualities of fuel, or with changes in the amount of work performed. In the most complete form of the invention I enable such control to be conveniently effected by either the engineer from his side of the locomotive, or by the fireman from the opposite side. This part of the mechanism is operated by the aid of a lever extending horizontally across above the boiler near the rear, within easy reach of the engineer and fireman, having a handle at each end, and provisions for operating a locking bolt therewith by the engineer or fireman. This allows one segment and one set of notches and one sliding bolt to hold the lever when operated from either side.

I provide a hood or cover, in the form of a

tight and slightly conical plate held immovably at such height above the damper as leaves an annular opening between sufficient to admit air to the apertures in the annular damper, but standing in such position that it defends such apertures from the cinders which may descend under any conditions. Another useful effect of this hood is to prevent paint or oil from being daubed upon the damper plate.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a general side elevation showing all the parts pertaining to my invention with so much of the ordinary parts of the locomotive as is necessary to indicate their relation thereto. Figs. 2, 3, 4 and 5 show certain portions on a larger scale. Fig. 2 is a side elevation; Fig. 3, a corresponding end elevation, a portion being in section. Fig. 4 is a plan view of a portion of a slide which is shown in dotted lines in Fig. 2. Fig. 5 is a cross section through the midlength of this slide. Fig. 6 is an elevation seen from the rear. Fig. 7 is a corresponding plan view. Fig. 8 is a side elevation; Fig. 9, an end elevation; Fig. 10, a vertical cross section partly in elevation; Fig. 11, a horizontal section partly in plan. Fig. 12 is a plan view of a portion detached, on the same scale as Fig. 11.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

The damper may be in all respects as shown in the patent of 1885 referred to, excepting the arrangement of holes for admitting air into the stack. These are modified as to size and position, as shown, to suit the valve gear. For a piston stroke of twenty-six inches, my device may provide that the damper shall be open until the reversing lever is so placed that the steam is cut off at about seventeen inches; or it can be so adjusted by operating from the cab that it shall remain open for the admission of air to reduce the draft until the reversing lever is shifted into such position as to cause the steam to be cut off at about seven inches.

The four pairs of holes *e* in the damper plate *E*, have a uniform position, that is to say, the edges of each pair of holes are placed equi-distant from the four studs or bolts which secure the stack base to the top of the smoke box. Some clearance should be allowed in addition to its movement, by making the large apertures in the damper plate so large that the plate will not strike the studs. The movement resulting is due to that of the reverse-lever, increased by the adjustment from cab, and increased by the expansion of the boiler.

Fig. 12 represents a quarter segment of the stack base. It is divided into a number of equal parts. I have shown forty-six. This gives eleven and eleven-sixteenths parts to

the edge of each long hole, and eight and one-half parts for each short hole. This leaves a little less than nine and eleven-sixteenths parts for the space between the holes. The damper-plate holes *e* may also be arranged with the help of the above forty-six parts, the two solid parts in each quarter of the plate occupying each eleven, and the intermediate hole five and one-eighth parts, the four sets of holes in the top of the base and also in the damper plate being arranged uniformly.

The total movement by means of the reversing lever with this division of forty-six parts, is about fourteen and one-fourth parts, and the movement necessary to vary the range of adjustment from the cab referred to these same parts, is about one and three-fourths parts.

In the drawings *A* is the boiler and *B* the smoke stack. A circular covering plate or hood *B'* is fixed above the perforated damper-plate *E*, *e* being fitted in a recess turned in the top of the base *D*, so that a portion of the stack-ring *C* rests upon the plate *B'*, which latter is made slightly conoidal, and is sufficiently high to freely admit air to pass through the apertures in the damper when the damper plate *E* is adjusted for its admission.

The difficulties in communicating the motion on the cylindrical side of the locomotive boiler are surmounted by levers and universal joints. In Fig. 1 the reversing rod *K* connects by a rod *L*, pin *K'* and ball joint *L'*, to the bell crank lever *M*, turning on a center *A'* fixed on the boiler *A*. The upper arm of this lever *M* connects by a rod *N* and pins *M'*, *N'*, to a second lever *O*, turning on a center *P'*. The upper arm of this latter connects by means of a rod *F*, which latter has a ball joint at each end, to an arm *E'* on the damper plate *E*, and thus communicates the movement of the reversing rod *K* thereto.

The fulcrum *P'* of the lever *O* is pivoted on the end of a horizontally movable sliding bar *P*, which is fitted to slide within a casting *A²* bolted on the boiler *A*. The opposite end of the bar *P* is formed with a slotted recess in which is received a pin *Q²*, from the lever *Q*, which latter is fulcrumed on the casting *A²* and is connected at its upper end *Q'* to a rod *R*, which engages it with a pin *S'* fixed in the rod *S*, inclosed loosely within the hand rail *T*. This hand rail is slotted longitudinally to allow the pin *S'* sufficient liberty to be traversed forward and backward. The rod *S* leads rearward to the cab and is connected to the transverse lever *W*, which will be presently described.

With the reversing lever *J* and an ordinary segment and slide and locking means, to operate and hold the reversing rod *K*, it will be understood that when the engineer operates such lever, and thereby shifts the position of the reversing rod forward and backward to the extents required to shift the main link *G*, sometimes called the Stevenson link, and

change the condition of the engine with regard to the degree of expansion, it will shift the rod L to a corresponding extent forward and backward, and will thereby correspondingly shift the first bell-crank lever M, the rod N, the second bell-crank lever O, and the rod F, and thus turn the damper plate E. The effect, other things being equal, is always to shift the damper plate E according as the reversing lever K is shifted, giving more opening to the apertures in the annular damper-plate E, and consequently reducing the force of the draft on the fire, when the reversing rod K is either in its extreme forward position to go ahead full stroke, or in the extreme rear position to run backward full stroke; but this may be modified by the adjustment of the rod S which is regulated by the transverse lever W at the will of the attendants.

When the damper plate E is moved by means of its connection with the reversing rod K, it will open or close the apertures in the damper plate E differently according as the rod or slide S is adjusted.

When the slide P is, by the hand of the engineer or fireman in the cab, shifted forward, it carries the center P' of the lever O forward and allows a greater movement of the starting rod K forward (when operated in the back-motion of the engine) before the damper plate E will be turned so far as to close the apertures in the base and prevent air from entering at the base of the stack to diminish the draft.

When the reversing rod K is subsequently shifted rearwardly from its extreme forward position (in the forward motion of the engine), and the center P' of the lever O, operated by adjustment from the cab, remains in the same position as before, it requires less movement of the reversing rod K backward to induce a closing of the apertures.

The lever W, above referred to, extends across nearly horizontally, and is capable of adjustment either from the engineer's or fireman's side. It turns on a fulcrum A³, secured to the top of the boiler, and is fitted with a rigid handle at each end, handle W' pointing upward and handle W² downward, the lever being inclined enough to carry the handles about even. Each handle is accompanied by a movable handle, marked respectively Y' and Y², which are attached to slides carried on the lever W, connected by a rod Y³, and bearing a latch Y⁴, which latter can, by properly operating the handles, be made to engage with any required notch in the horizontal segment A⁴ fixed on the boiler. A spring Z urges this latch into engagement except when it is drawn out by a grasp of the handles, drawing the handles Y', Y² into closer contact with their associated handles W' and W², against the force of the spring Z, as will be readily understood.

A pin W³ set in the lever W, receives a rod U, which unites it to one end of a plain lever

V, which is fulcrumed on the boiler at A⁵, and the other end of which lever is rounded and inserted in a box arranged to slide a little transversely in a slot in the rod S, before described.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention.

I claim as my invention—

1. In a locomotive having provisions for admitting air to the base of the stack to reduce the draft, and a variable valve gear, a damper E adapted to control such admission, and a connection therefrom to the valve gear arranged to automatically adjust the damper by the changes in the adjustment of the valve gear, all substantially as herein specified.

2. In a locomotive having a variable valve gear, provisions as the damper D, E for varying the force of the draft in the furnace, a connection from the valve gear thereto so as to vary the draft, automatically increasing the draft as the degree of expansion of the steam is increased, all substantially as herein specified.

3. In a locomotive having provisions for admitting air to the base of the stack to reduce the draft, and a variable valve gear, a damper E adapted to control such admission and a connection therefrom to the valve gear arranged to automatically adjust the damper by the changes in the adjustment of the valve gear, and means as the slide F and connections therefrom to allow it to be controlled from the foot-board, whereby the relations of the valve gear and damper may be changed at the will of the attendant, all substantially as herein specified.

4. In a locomotive having a variable valve gear provisions as the damper D, E, for varying the force of the draft in the furnace, and a connection from the valve gear thereto so as to vary the draft, automatically increasing the draft as the degree of expansion is increased, the transverse lever W, and handles W', W², Y', Y², carried thereon, latch Y⁴ and segment A⁴, in combination with the rod U held and operated by such lever W, and connections to a changeable center P in the train of mechanism adapted to allow the ratio of one adjustment to the other to be regulated at will as herein specified.

5. In a locomotive having an annular damper giving adjustable openings for the admission of air to the base of the stack to reduce the draft, the hood or covering plate B' arranged to defend the said damper, as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

HENRY A. LUTTGENS.

Witnesses:

D. L. CAMPBELL,
JOHN H. REYNOLDS.