(No Model.) 4 Sheets—Sheet 1.

F. H. MOREL.

SLIDE VALVE.

No. 524,180. Patented Aug. 7, 1894.

FIG. 6.

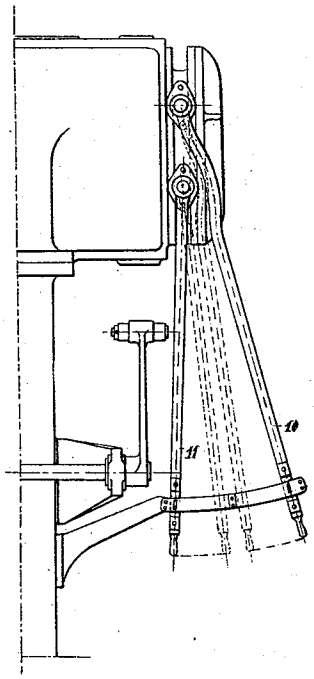


FIG. 11.

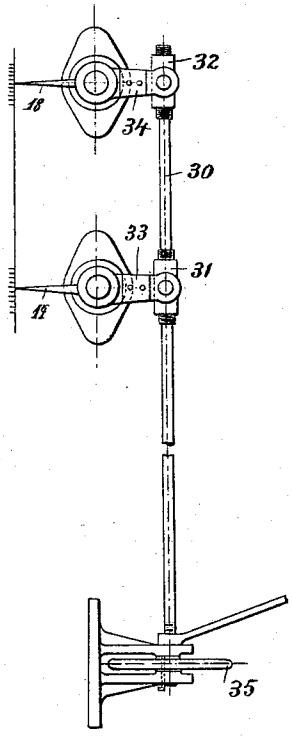
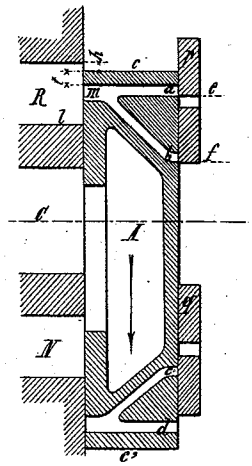


FIG. 1.



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(No Model.) 4 Sheets—Sheet 2.

F. H. MOREL.

SLIDE VALVE.

No. 524,180. Patented Aug. 7, 1894.

FIG. 2.

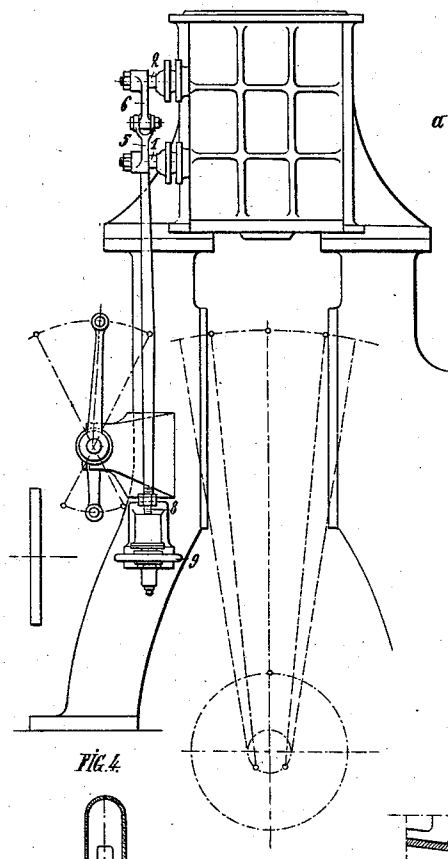


FIG. 3.

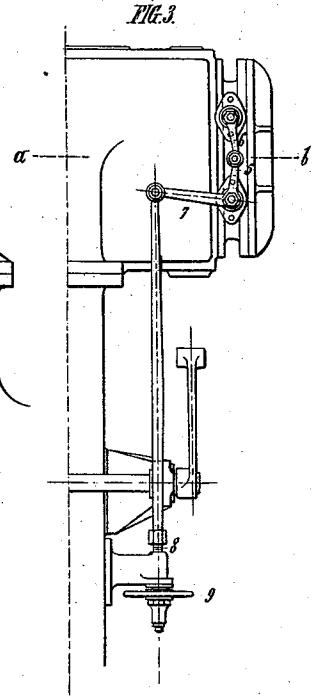


FIG. 4.

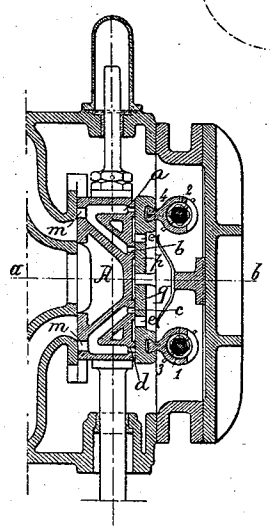
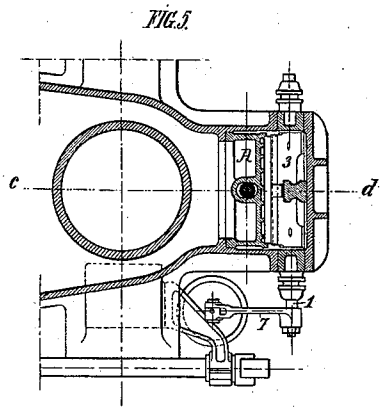


FIG. 5.



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(No Model.) 4 Sheets—Sheet 3.

F. H. MOREL.

SLIDE VALVE.

No. 524,180. Patented Aug. 7, 1894.

Fig. 7.

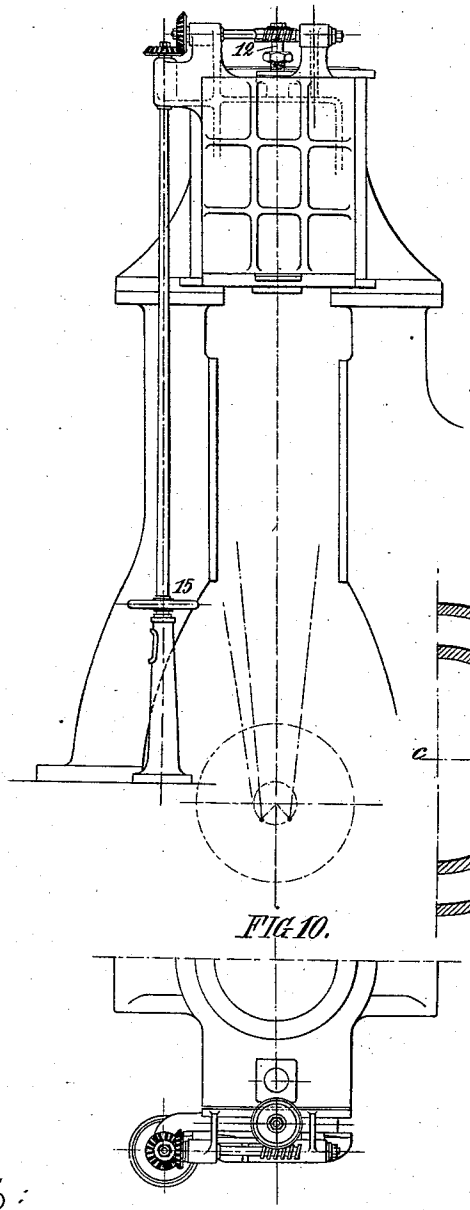

Fig. 8.

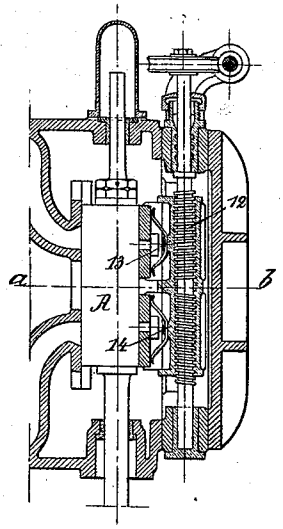

Fig. 9.

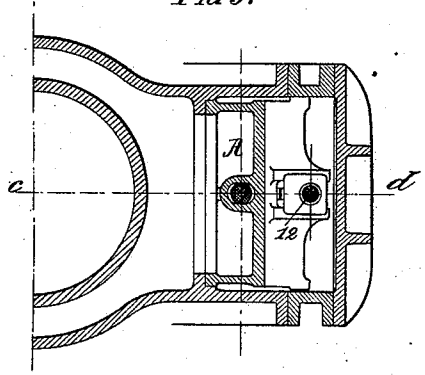

Fig. 10.

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SLIDE VALVE.

No. 524,180. Patented Aug. 7, 1894.

FIG 12.

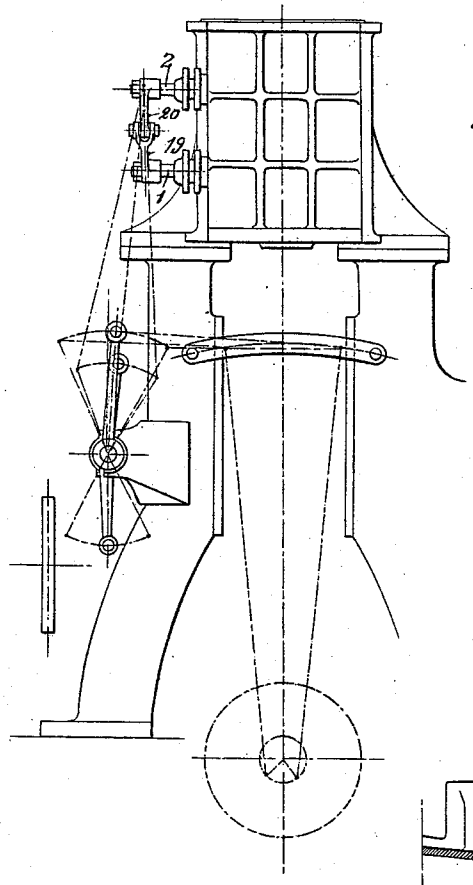


FIG 13.

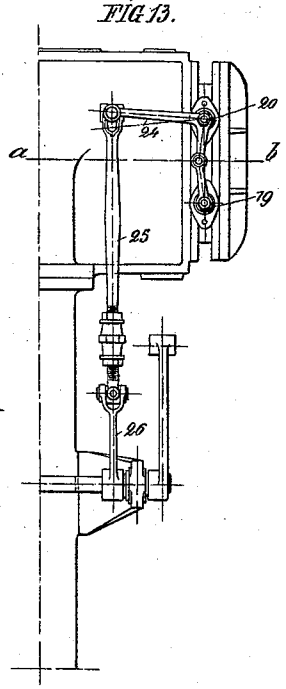
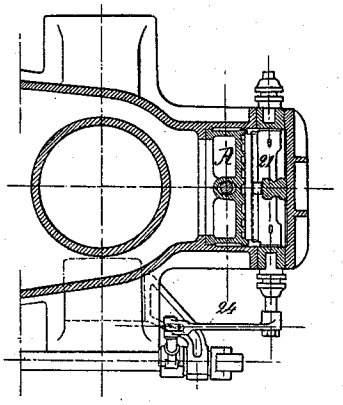


FIG 14.



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UNITED STATES PATENT OFFICE.

FREDERIC HENRI MOREL, OF DUNKERQUE, FRANCE.

SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 524,180, dated August 7, 1894.

Application filed May 27, 1892. Serial No. 434,687. (No model.) Patented in France March 19, 1892, No. 220,281.

To all whom it may concern:

Be it known that I, FREDERIC HENRI MOREL, residing at Dunkerque, in the Republic of France, have invented a new and useful Improvement in Slide-Valves, (for which I have obtained a patent in France, dated March 19, 1892, No. 220,281,) which is fully set forth in the following specification.

The distribution of steam by ordinary, or eccentrically operated slide valves should in order to operate under favorable conditions, always give a certain lead, which is capable of adjustment or regulation. The openings for passage of steam should be as wide open as possible, and the pressure in the cylinder should vary as little as may be from that of the generator.

In ordinary steam distribution by slide-valves, particularly known as the Stephenson slide-valves, inconveniences are encountered, when such valves are employed to produce a cut-off with small introductions, and these inconveniences are: First. The lead is variable increasing with the cut-off in the case as a slide-valve having bars which are not crossed, whereas in the case of valves having cross-bars, the lead diminishes, and becomes *nil* at the point of actual cut-off. Second. The steam inlet ports diminish as the degree of lead decreases, and cut-off increases, resulting in a diminution of the pressure relatively to that of the generator, which is detrimental in that it neutralizes the ordinary advantages of the cut-off.

The present invention has reference to distribution by ordinary slide-valves, and is designed to overcome the inconveniences above referred to, by modifying the construction of the valve, and combining therewith two controlling or cut-off plates, which are stationary during the running of the engine, which can be adjusted either simultaneously or independently, and by hand or automatically while the engine is in operation.

The invention can be more readily understood with reference to the accompanying drawings, in which—

Figure 1, is a diagrammatical sectional view of my improved slide-valve showing the cut-off plates. Fig. 2, is a front elevation of a valve casing and supports showing mechanism by which the cut-off plates may be adjusted. Fig. 3, is a side elevation of Fig. 2. Fig. 4, is a longitudinal section through the slide valve and casing on line *c*—*d* Fig. 5, and Fig. 5, is a transverse section on line *a*—*b* Fig. 4. Fig. 6, represents a view (similar to Fig. 3,) of a modified form in which the cut-off plates are operated by independent levers. Fig. 7, represents a front elevation of another modified form of adjusting mechanism for the cut-off plates. Fig. 8, is a longitudinal central section through the slide valve and casing of Fig. 7. Fig. 9, is a transverse section on line *a*—*b* Fig. 8, and Fig. 10, is a top plan view of Fig. 7. Fig. 11, represents an outside screw for operating the cut-off plates, which may be used instead of the levers, used in connection with the mechanism shown in Figs. 2, 3, 4 and 5, and Figs. 12, 13 and 14 are views similar to Figs. 2, 3, and 5 respectively, showing connections whereby the cut-off plates are automatically adjusted.

A represents the slide-valve, which is adapted to act as do the ordinary slide-valves, but which is provided with inlet passages *a* and *b*, *c* and *d* therethrough at opposite ends, said inlet passages uniting at their inner ends forming single discharge openings *m*. The passages *a* and *b* are opened and closed by two adjustable plates *p* and *q* which engage against the back of the slide valve A. These plates are adjustable in opposite directions to regulate the admission of steam and are provided with openings *e* at about the middle thereof through which openings steam passes into the passages *a*, *b*, *c* and *d* and thence to the cylinder.

The principle of the invention will be understood by reference to Fig. 1.

The extremities or edges *c*, *c'* of the valve act as do valves of ordinary construction in determining the lead and varying the openings of the admission ports N and R. As shown (in Fig. 1.) the piston is supposed to be at its upper dead point and the slide-valve A has opened the port R to the extent indicated by the letter *h*, which constitutes the lead.

If we suppose the case of a slide-valve with crossed-bars, and that *h* indicates the maximum extent of the lead, it will be seen that the slide is more of its extreme positions. In this position, plate *p* is so placed that the

edges *e f* coincide exactly with the edges of the orifices *a*, *b*. As the piston moves back the slide-valve moves in the direction of the arrow, and when the valve shall have moved a distance *x*, the total opening of the port of admission will be equal to *h* plus 3^{x}; that if we assume that the width of orifices *a*, *b* is at least equal to *x*, that the width of *m* is equal to 2^{x}, and that the orifice *m* has not been closed in part by the edge *l*.

If the position of the valve be changed, the lead would be decreased. Let us suppose it be decreased one-half *h*. To obtain a constant lead or as it may be better expressed, to obtain a constant area of lead opening *h* it becomes necessary to give a lead of one-half *h* to the plate *p*; that is to say one-fourth *h* upon each orifice *a* and *b*. I can obtain the same result by raising plate *p* a distance equal to one-half *h* plus one-fourth *h* equals three-fourths *h*.

When the slide shall have moved a distance *x'*, the total opening of the port of inlet will be *h* plus 3^{x}, that is, the lead or area of lead opening will be constant. The other end of the slide valve will be controlled in like manner by the plate *q*. With this arrangement the lead remains constant while the sectional area of the steam passage is about three times greater than that of ordinary valves.

My system is applicable to existing engines without increasing the height of the valve casing, for the slides being moved by eccentrics capable of effecting expansion, whether in marine engines, or double or triple expansion, or locomotives with two or four cylinders, are always provided with excess of room in the casing.

The degree of adjustment of the plates *p*, *q* depends on the lead given by the ordinary valve in different positions of the eccentric.

On noting the operation of the ordinary Stephenson valve it will be seen, first, for the same position of the slide, the leads at the ports N, R are nearly the same; second, the variations of lead of the same for successive positions of the slide in the forward movement, as well as for corresponding positions of the backward movement; third, for equal and successive movements of the valve, the variations of lead become less as the valve nears the mean position. These remarks apply to valves with or without cross-bars.

In the present invention, the adjustment of the plates may be effected in two ways, first, by mechanism independent of the engine and actuated by hand; or, second, by mechanism connected with and actuated by the engine. Each of these two modes of regulation may be carried out by various mechanisms.

In Figs. 2, 3, 4 and 5 I have shown an adjusting mechanism adapted to be operated by hand and consisting of shafts 1 and 2 passing through and journaled in the valve casing, and carrying (inside of the casing) suitable shifting arms 3 and 4 which loosely engage transverse grooves in the plates *p* and *q*. The shafts 1 and 2 are revolved by suitable levers 5, 6, and 7 and rod 8, in connection with a hand-wheel 9, engaging a screw-thread at the lower end of rod 8. In Fig. 6, I substitute for the levers 5, 6 and 7 and rod 8 two independent levers 10 and 11, so that the plates can be independently adjusted.

Figs. 7, 8, 9 and 10 represent another modification of the adjusting mechanism consisting of a right and left hand screw-threaded shaft 12, which extends through the casing parallel with the slide-valve, the threads engaging in suitable blocks 13 and 14, connected with the respective cut-off plates. This shaft 12 carries a worm-wheel outside of the casing which is operated to revolve the same by suitable connections with a hand-wheel 15. It is evident that when the shaft is revolved the cut-off plates *p* and *q* will be moved in opposite directions, through the medium of the right and left hand threads and the blocks 13 and 14.

In Fig. 11, a right and left hand screw-threaded shaft 30 engaging in blocks 31 and 32 pivoted to arms 33 and 34, which also carry indicating hands 17 and 18 is revolved by hand wheel 35. This form of mechanism may be used to revolve the shafts 3 and 4 in place of levers 5, 6 and 7 and rod 8 (as shown in Figs. 2, 3, 4, and 5), the hands serving to indicate the amount of adjustment of the plates, upon a suitable scale.

Instead of adjusting the cut-off plates *p* and *q* by hand, as heretofore described, I may accomplish the desired result automatically by means of suitable connection with the engine, and preferably with the governor, so that when the speed reaches a certain predetermined limit, the cut off plates will be operated to diminish the supply of steam in the cylinder. Such mechanism is shown in Figs. 12, 13 and 14, in which I show an interior mechanism for operating the plates similar to that shown in Figs. 4 and 5, the shafts 1 and 2 carrying at their outer ends the lever 19 and bell-crank lever 20, respectively. The free end of the bell crank lever 20 is joined to lever 26 on shaft 24 by a connecting rod 25. The shaft 24 is operated by any suitable connection with the engine as mentioned above.

What I claim is—

1. The combination with a flat slide-valve, having steam passages at its opposite ends, of controlling plates arranged upon the rear face of said valve, and also provided with steam passages, said plates being stationary during the normal operation of the engine, and means for adjusting said plates to different positions to regulate the normal area of lead opening as may be required in the different conditions of running, substantially as described.

2. The combination with a slide-valve having at each end two steam passages diverging toward the rear face of the valve, of controlling plates arranged upon the rear of said

valve, and regulating both of said passages, said plates being stationary during the normal running of the engine, and means for adjusting said plates to different positions, whereby a constant area of lead opening during normal running is obtained with a steam inlet of large sectional area, substantially as described.

3. The combination with a slide-valve having a steam passage at each end, of controlling plates also having steam passages and arranged on the rear surface of said valve, said plates being stationary during the operation of the engine, and means independent of the valve-actuating mechanism for adjusting said plates independently in opposite directions to regulate the area of lead opening, substantially as described.

4. The combination with a slide-valve provided with steam passages, of controlling plates also provided with steam passages, said plates being arranged on the surface of the valve and being stationary during the normal running of the engine, and means actuated by a working part of the engine for shifting said plates automatically upon abnormal change of speed in the running of the engine, to regulate the area of lead opening substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FREDERIC HENRI MOREL.

Witnesses:
DR. V. GREISER,
FLENN MERLEN.