

(No Model.)

R. LINDNER.

STARTING GEAR FOR COMPOUND ENGINES.

No. 404,295.

Patented May 28, 1889.

Fig. 2.

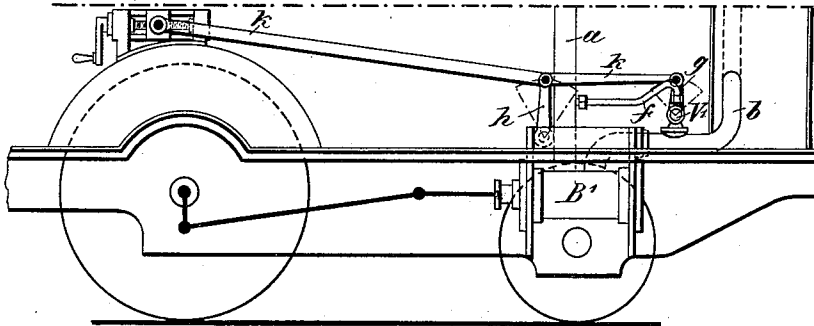


Fig. 5.

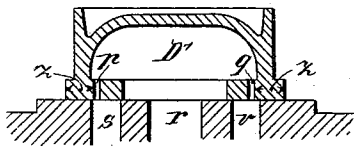


Fig. 6.

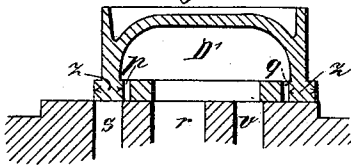
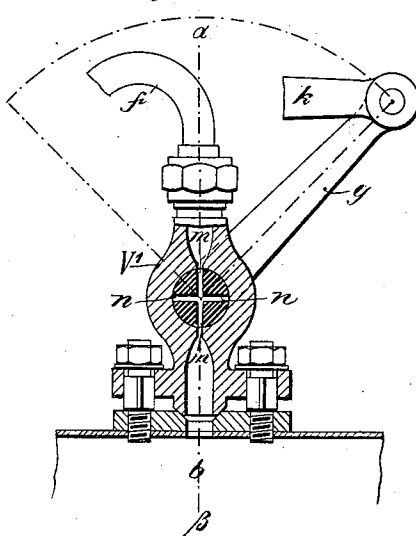


Fig. 3.



Witnesses:

Norman Linn
Gustav Linn

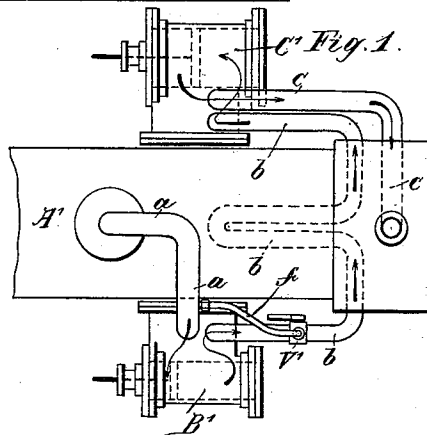
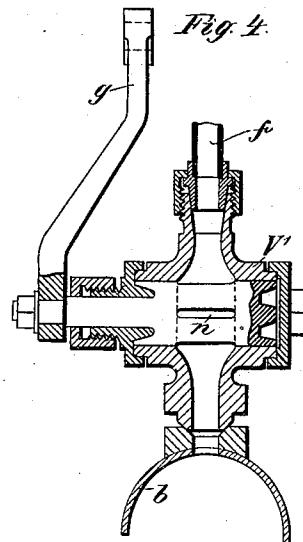


Fig. 4.



Inventor:

Robert Lindner
by *A. M. Linn*
Attorneys.

UNITED STATES PATENT OFFICE.

ROBERT LINDNER, OF CHEMNITZ, SAXONY, GERMANY.

STARTING-GEAR FOR COMPOUND ENGINES.

SPECIFICATION forming part of Letters Patent No. 404,295, dated May 28, 1889.

Application filed February 21, 1889. Serial No. 298,648. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LINDNER, a subject of the King of Saxony, and a resident of Chemnitz, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Starting-Gears for Compound Engines, the following being a full and clear description of the same.

The object of my invention is to be able to start a compound engine at any position of the high-pressure piston, for, as is well known, when the high-pressure piston is within a certain distance of the cylinder ends and both parts closed by the steam-valve, the engine will not start. In order to get over this drawback, I fit a pipe fitted with a cock or valve leading from the high-pressure steam-pipe to the high-pressure exhaust-pipe, which is the low-pressure-cylinder steam-pipe, and by opening this valve I admit steam direct into the low-pressure cylinder, and as the cranks of all compound steam-engines are placed one in advance of the other they are never in such a position at the same time that their slide-valves cover both ports of both cylinders, so that if steam cannot be admitted to the high-pressure piston it can be admitted to the low-pressure one and so start the engine, when after a couple of revolutions the valve can be shut off.

In order to make my invention more clear, I refer to the accompanying drawings, which form part of this specification, and in which similar letters denote similar parts throughout the different figures.

Figure 1 shows my invention as fitted to a compound locomotive and as seen from the top. Fig. 2 is a side elevation, on a larger scale, of a locomotive fitted with my improvement. Fig. 3 is a cross-section of the steam valve or cock for admitting high-pressure steam into the low-pressure-cylinder steam-pipe direct from the main steam-pipe. Fig. 4 is a longitudinal section through the line α β , Fig. 3. Figs. 5 and 6 are sections of the high-pressure slide-valve.

Steam is admitted to the high-pressure cylinder B' from the boiler A' through the steam-pipe a , and exhausts into the low-pressure cylinder C' through the pipe bb , which at the

same time serves as a receiver. The steam, after being expanded in the low-pressure cylinder C', exhausts through the pipe c either into a condenser or into the air, as the case may be.

It is necessary (especially in locomotives) in starting the engine that steam of a reduced pressure direct from the boiler be admitted to the low-pressure cylinder, in order that the low-pressure cylinder should start the engine when the high-pressure crank is at or near the dead-point, as the pistons are generally placed the distance of half a stroke from each other.

The high-pressure slide-valve D' is provided with ports p q on the exhaust side, Figs. 5 and 6, in order to relieve the high-pressure piston from unequal strain, as the steam from the low-pressure cylinder has admission to both sides of the piston.

The lever g of plug d in the cock V' is connected to the reversing-lever h by a rod, k . By the full throw of the reversing-lever from full forward to full back the lever g is moved through an angle of ninety degrees, so that when the lever h is in the forward position the port m is in communication with the steam-way, and when in the backward position the port n is in communication with the same.

The ports p and q in the slide-valve D' place the exhaust-port r in communication with the two steam-ports s and v as soon as the valve D' shuts off. The bar Z is either equal to or greater than the breadth of the ports, Fig. 6, so that steam cannot pass from the valve-chest into the exhaust-port, but allows of steam passing from the exhaust-port into the back and front side of the cylinder.

In starting the engine the reversing-lever h , as is generally the practice, is thrown full over, and at the same time the valve V' is opened to the low-pressure steam-pipe b and to the exhaust-port r of the high-pressure cylinder B'.

The steam enters the low-pressure steam-chest through the pipe b , and at the same time has admission to both sides of the high-pressure piston through the ports p and q . As soon as the engine has been started the links are "notched up" and the valve V' thereby closed.

Having now fully described and ascer-

55

60

65

70

75

80

85

90

95

100

tained the nature of my invention, what I desire to secure by Letters Patent in the United States is—

1. In a starting-gear for compound engines,
5 the slide-valve *D'*, with the ports *p q* on the exhaust side of the same fitted to the high-pressure cylinder, in combination with a high-pressure cylinder, *B'*, and low-pressure cylinder *C'*, and a steam-pipe, *a*, fitted with a suitable valve leading into the receiver-pipe *b*,
10 substantially and for the purpose as described.
2. In a starting-gear for compound engines,

the combination of the valve *D'*, cylinders *B'* and *C'*, valve *V'*, with plug *d*, having the ports *m* and *n* at right angles to each other, lever 15 *g*, and rod *k*, connecting the said lever *g* to the reversing-lever *h* and pipe *b*, substantially and for the purpose as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ROBERT LINDNER.

Witnesses:

W. B. MURPHY,

RICHARD E. ZAHN.