

(No Model.)

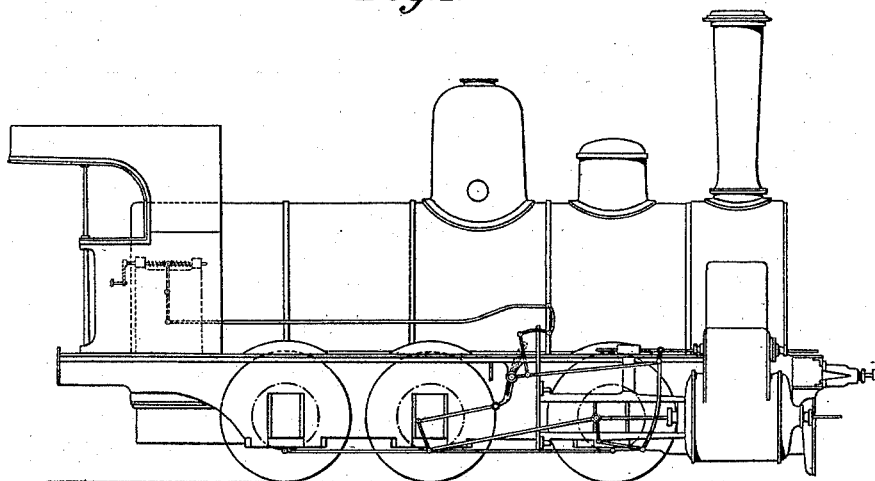
2 Sheets—Sheet 1.

K. GÖLSDORF.  
COMPOUND LOCOMOTIVE ENGINE.

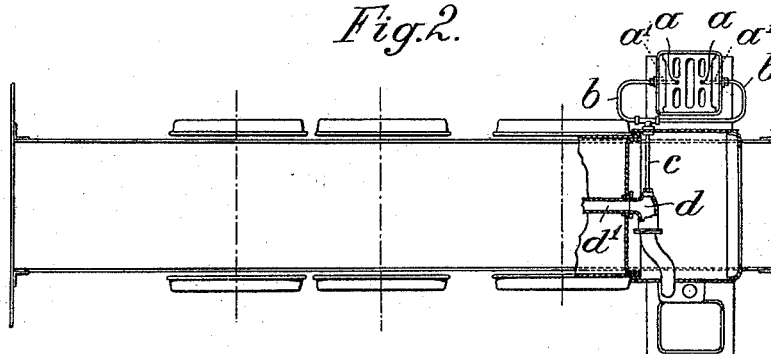
No. 526,778.

Patented Oct. 2, 1894.

*Fig. 1.*



*Fig. 2.*



*Witnesses:*  
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*Inventor:*  
*Karl Gölsdorf*  
*By J. W. Orth atty.*

(No Model.)

K. GÖLSDORF.

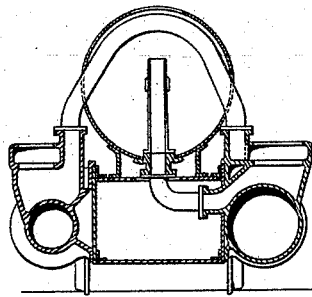
2 Sheets—Sheet 2.

COMPOUND LOCOMOTIVE ENGINE.

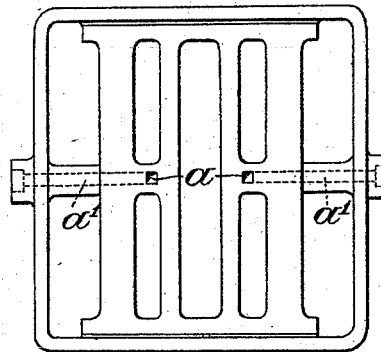
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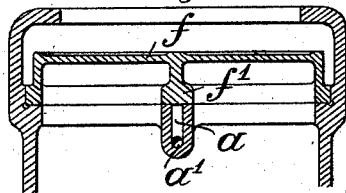
*Fig.3.*



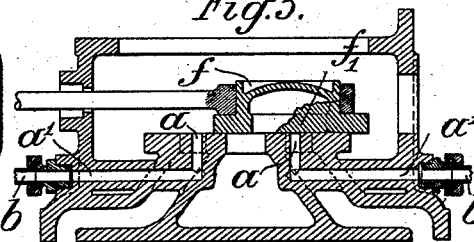
*Fig. 4.*



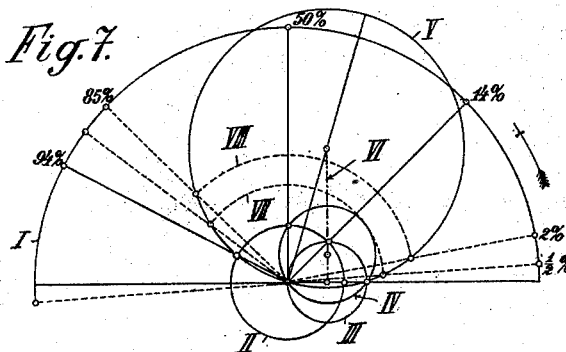
*Fig. 6.*



*Fig.5.*



*Fig. 7.*



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# UNITED STATES PATENT OFFICE.

KARL GÖLSDORF, OF VIENNA, AUSTRIA-HUNGARY.

## COMPOUND LOCOMOTIVE-ENGINE.

**SPECIFICATION** forming part of Letters Patent No. 526,778, dated October 2, 1894.

Application filed June 7, 1893. Serial No. 476,808. (No model.) Patented in Belgium April 8, 1893, No. 104,218; in Germany April 8, 1893, No. 75,023; in Switzerland April 8, 1893, No. 6,855; in France April 8, 1893, No. 229,232; in England April 8, 1893, No. 7,279; in Italy June 30, 1893, XXVII, 34,143, LXVII, 38, and in Austria-Hungary July 28, 1893, No. 19,354 and No. 33,962.

### *To all whom it may concern:*

Be it known that I, KARL GÖLSDORF, engineer, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower-Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Compound Locomotive-Engines, for which I have obtained Letters Patent in Belgium, No. 104,218, dated April 8, 1893; in Austria-Hungary, No. 19,354 and No. 33,962, dated July 28, 1893; in Germany, No. 75,023, dated April 8, 1893; in Switzerland, No. 6,855, dated April 8, 1893; in France, No. 229,232, dated April 8, 1893; in Great Britain, No. 7,279, dated April 8, 1893, and in Italy, Reg. Gen. Vol. XXVII, and Reg. Gen. Vol. LXVII, No. 38 and No. 34,143, dated June 30, 1893; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Hitherto it has been necessary for the purpose of enabling compound locomotive engines to be started in whatever position the crank of the high pressure cylinder may be at the time, to provide in the pipe or passage connecting the high pressure cylinder with the receiver, special closing or cut off devices such as cocks, valves or dampers, that are operated, at the moment when the engine is to be started, in such a manner as to prevent the fresh steam supplied from the boiler and entering the receiver and low pressure cylinder from exercising an injurious counter-pressure in the high pressure cylinder on the side opposite to that in which the high pressure piston moves when the distributing valve of such cylinder is closed.

This invention has for its object to enable compound locomotive engines to be started without the employment of any special devices such as referred to, however unfavorable the position of the cranks may be at the moment, as for example when the crank of the high pressure piston is nearly horizontal and that of the low pressure piston is practically

vertical. For this purpose the valve face of the low pressure cylinder is formed with orifices or ports that are in communication with the main steam pipe or boiler and are so arranged that during the ordinary operation of the engine they will be effectually closed, while when the engine is to be started, in which case the ordinary working point of cut off (corresponding to form about fifty to sixty per cent. of the piston stroke) is exceeded, one of these ports will be uncovered or opened whereby steam will be admitted to that end of the low pressure cylinder corresponding to the required direction of motion, with the result that the low pressure piston will be set in operation. From the steam chest of the low pressure cylinder the live steam passes into the receiver and thence into the high pressure cylinder entering on that side of the piston therein which is opposite to that in which the movement of the piston ought to take place. Thus the steam entering the high pressure cylinder will exercise a certain counter-pressure, which however will be overcome by live steam from the boiler as soon as the position of the cranks undergoes the slightest alteration, such live steam from the boiler entering direct into the high pressure cylinder. When the low pressure slide valve assumes such a position that the port, which until then has been open, is closed, the direct admission of steam into the low pressure cylinder will be discontinued and therefore any injurious counter-pressure that might otherwise result therefrom is completely obviated, so that the locomotive engine can then be started by the steam pressure exerted upon the high pressure piston alone. This arrangement is applicable to compound engines with two or more cylinders and may be used in conjunction with any form of link motion for the purpose of starting engines, provision being made for all the conditions on which the point of cut off depends (such as the extent of motion of the eccentric, the effective length of the link, the angle of lead, &c.) to be fulfilled as to allow of a maximum point of cut off (corresponding say to about ninety per cent. of the stroke of the engine).

In order that the invention may be fully un-

derstood, reference is had to the accompanying drawings, in which—

Figure 1 is a side elevation, Fig. 2 a horizontal section, and Fig. 3 a vertical cross section of a compound locomotive engine constructed in accordance with this invention. Fig. 4 is a plan to a larger scale, of the slide valve face of the low pressure cylinder; and Figs. 5 and 6 are respectively a longitudinal and transverse section of the valve chest of the low pressure cylinder. Fig. 7 is a diagram (on the Zeuner system) for a link motion arranged in accordance with this invention.

From the drawings it will be seen that the slide valve face of the low pressure cylinder is provided with two orifices or ports *a a*, that are connected by channels *a' a'* and pipes *b b* to a common pipe *c* that is in communication with a cross pipe *d* and the main steam pipe *d'*. The ports *a* of the said channels *a'* are so arranged in the valve surface that in the ordinary operation of the engines, during which the point of cut off does not exceed fifty or sixty per cent. of the stroke they remain closed under the action of the piece or bridge *f'* of the slide valve *f* for the low pressure cylinder. When, however, the link arrangement is, for the purpose of starting the engine, adjusted for a larger point of cut off (corresponding, say, to ninety per cent. or more of the stroke of the engine) one of the said ports will be opened (Fig. 5) whereby steam will be admitted from the cross pipe *d* to that end of the low pressure cylinder which corresponds to the direction of motion of the piston at the time. When the ports are closed by the slide valve *f*, the steam can no longer pass from the main steam pipe *d'* and cross pipe *d* into the low pressure cylinder, and therefore no counter pressure is produced upon the high pressure piston. As moreover, owing to the large point of cut off the position of the cranks is now the most favorable one, and inasmuch as the port *a* which has remained closed up to this time only opens when the piston stroke in the low pressure cylinder changes, the link motion may be absolutely relied upon for effective operation in starting the engine.

The ports *a a* may be located at any other proper point in the face of the valve seat, and in such relation to the valve as to be controlled thereby, and opened whenever the normal point of cut-off is exceeded, as above explained.

The diagram of Zeuner, Fig. 7, corresponds to a link arrangement fitted for a maximum cut off (say ninety-four per cent.) in accordance with this invention.

In the diagram, I is the crank circle; II is the circle the radius of which equals the maximum overlapping; III is the slide valve circle calculated for the minimum cut off (fourteen per cent.); IV is the slide valve circle for the medium cut off (fifty per cent.) V is the slide valve circle for the maximum cut

off; and VI is the line connecting all the slide valve circles (the central curve).

The distance between the two arcs of circles VII and VIII drawn in dotted lines, equals the width of the ports *a* in the direction of motion of the slide valve *f*.

It will be seen from the diagram that the ports *a* in the ordinary operation of the engine remain closed until a cut off corresponding to about fifty per cent. of the stroke of the engine (which is the maximum under ordinary circumstances) is attained. When however the mechanism is adjusted for a cut off corresponding to ninety-four per cent. of the stroke one of the ports *a* will begin to open when the piston has completed about one half per cent. of its stroke, and will be fully open when two per cent. of the piston stroke has been made. It then remains fully open until the piston makes about eighty-five per cent. of its stroke after which the closing of the said port will begin. When the piston has made about ninety per cent. of its stroke the port will be completely closed again.

It is to be understood that the arrangements hereinbefore described may also be applied to engines operating with more than two cylinders, it being only necessary in that case to fulfill the conditions hereinbefore mentioned.

I claim—

1. In compound locomotive engines, the combination with the low pressure slide valve, of a valve seat therefor provided with the usual steam ports and with two auxiliary steam ports in perpetual communication with the source of live steam, adapted to be covered and uncovered by the said valve under certain conditions of cut-off, for the purpose set forth.

2. In compound locomotives, the combination with the low pressure slide valve, of a seat therefor provided with the usual steam ports and with two auxiliary steam ports in perpetual communication with the live steam supply and arranged relatively to the slide valve so as to be normally covered thereby and uncovered to admit live steam to one or the other side of the low pressure piston according to the direction in which the engine is to move whenever the normal cut-off point is exceeded for the purpose set forth.

3. The herein described means for starting compound locomotives, which consist in the combination with the low pressure slide valve, of a valve seat therefor provided with the usual steam ports and with two auxiliary steam ports *a, a*, in perpetual communication with the live steam supply, said ports arranged relatively to the valve so as to be closed steam tight thereby during the normal operation of the engine, and to be uncovered by said valve when the cut off point exceeds the normal whereby live steam may be admitted to the side of the low pressure piston corresponding with the direction in which the locomotive is

to move to start the same through the medium of said piston only, and whereby after closure of said ports and the consequent cessation of counter pressure on the high pressure piston, the locomotive can be set in motion through the medium of the latter piston, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

KARL GÖLSDORF.

Witnesses:

A. SCHLESSING,  
F. BELMONT.