

(No Model.)

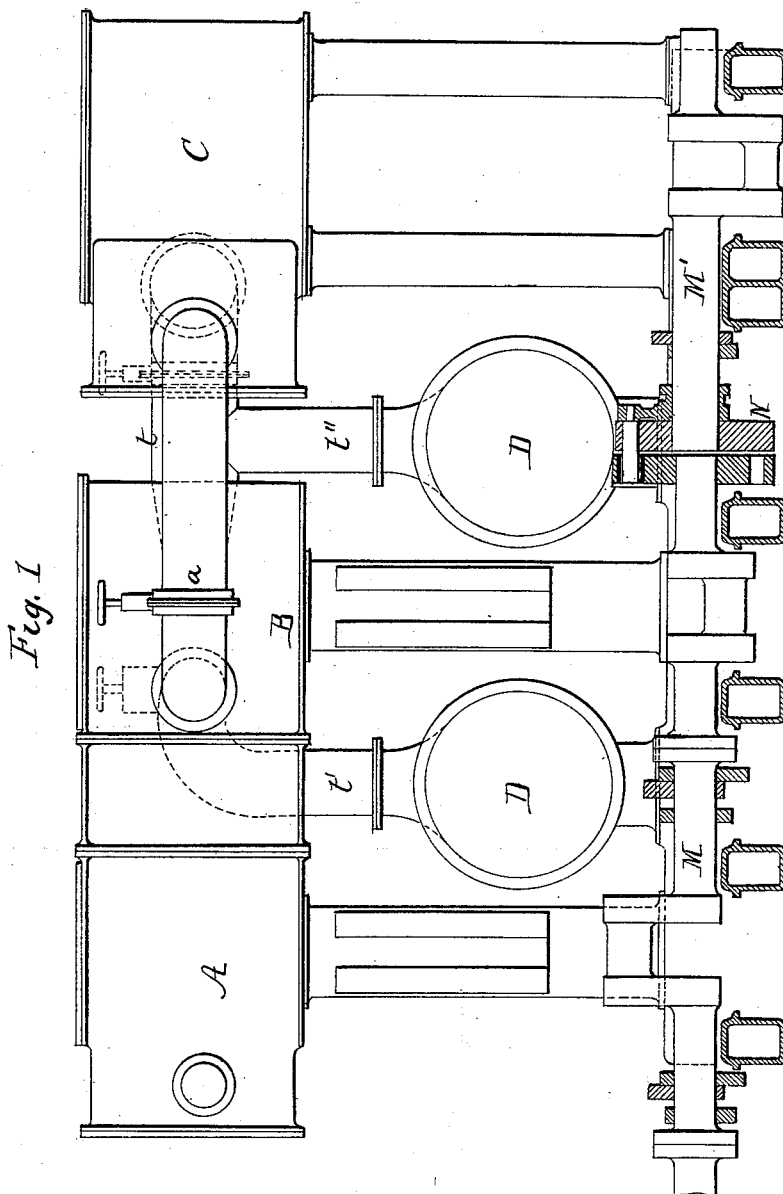
3 Sheets—Sheet 1.

C. KOCH.

COMPOUND MOTIVE POWER ENGINE.

No. 347,619.

Patented Aug. 17, 1886.



Witnesses,

*Joseph H. Klein*  
*George O. Sibson*

Inventor

*Charles Koch*  
by his attorneys  
*Horton and Co*

(No Model.)

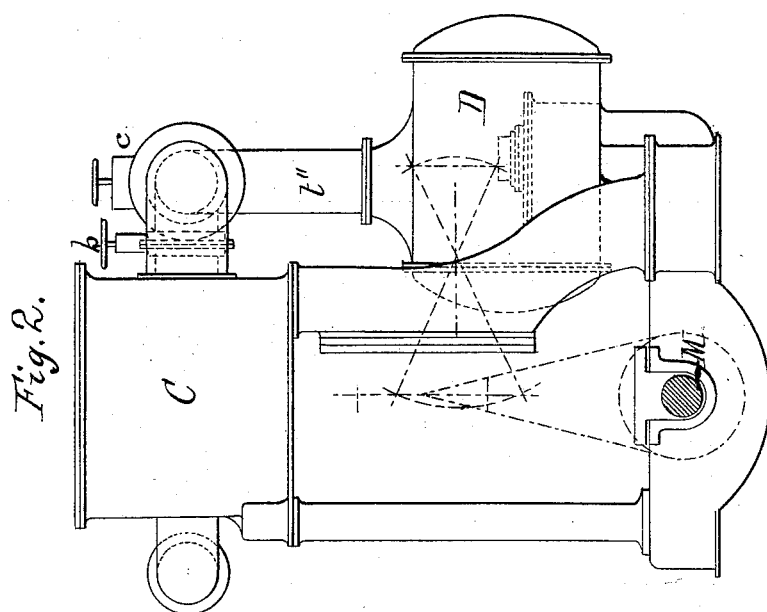
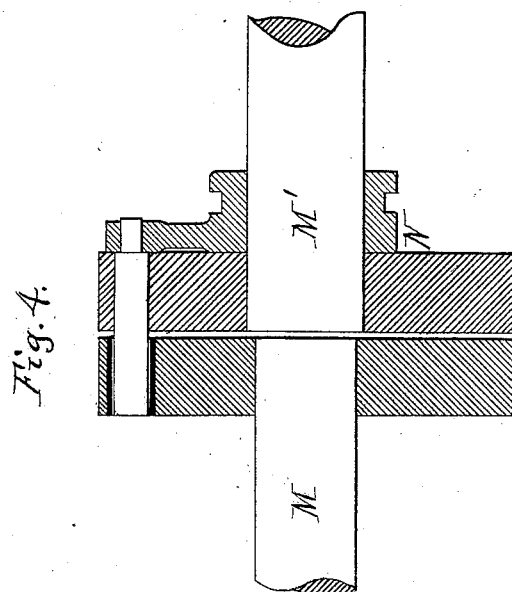
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*George C. Libson*

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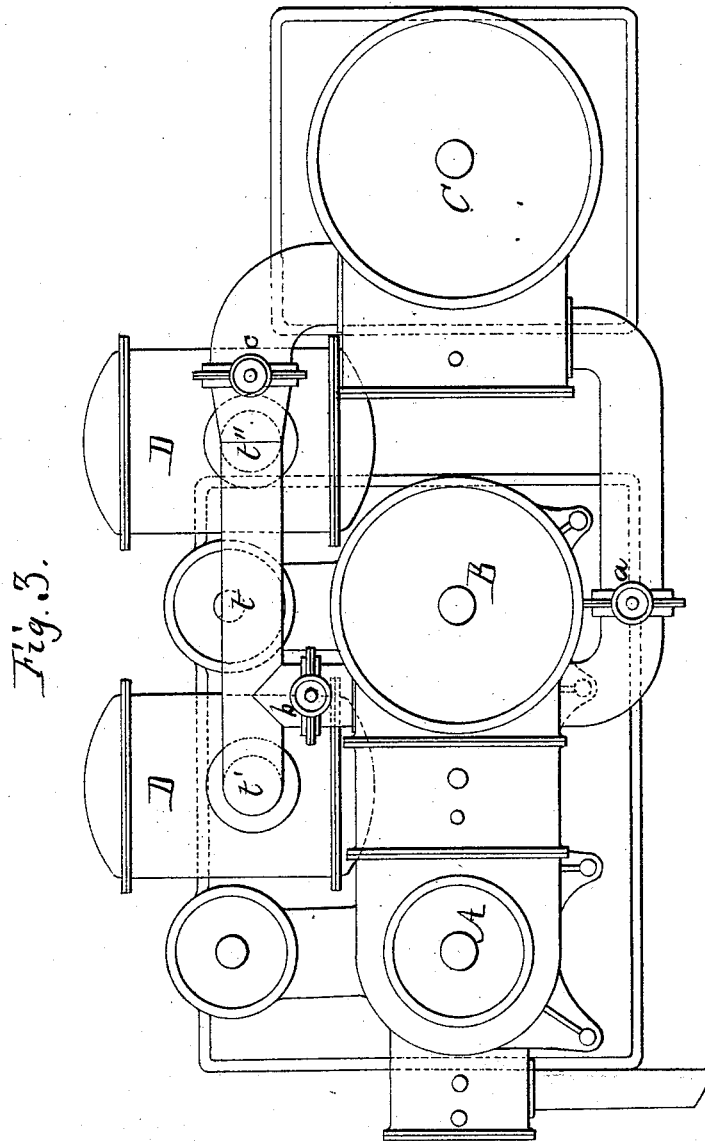
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*George C. Libron.*

Inventor  
*Charles Koch*  
by his Attorneys,  
*Horsman and Sons*

# UNITED STATES PATENT OFFICE.

CHARLES KOCH, OF PARIS, FRANCE, ASSIGNOR TO LE SOCIÉTÉ ANONYME  
DES USINES FRANCO-RUSSES, OF SAME PLACE.

## COMPOUND MOTIVE-POWER ENGINE.

SPECIFICATION forming part of Letters Patent No. 347,619, dated August 17, 1886.

Application filed December 26, 1884. Serial No. 151,198. (No model.) Patented in France October 22, 1884, No. 164,951; in Belgium October 23, 1884, No. 66,672; in England October 24, 1884, No. 14,093, and in Italy November 25, 1884, No. 17,610.

*To all whom it may concern:*

Be it known that I, CHARLES KOCH, a citizen of the Republic of France, and a resident of Paris, France, have invented certain improvements in Compound Motive-Power Engines, (for which I have obtained French Patent No. 164,951, October 22, 1884; Belgian Patent No. 66,672, October 23, 1884; British Patent No. 14,093, October 24, 1884; Italian Patent No. 17,610, November 25, 1884,) of which the following is a specification.

Engines actuated by the double, triple, or multiple expansion of the motive-power fluid, and having two, three, or more working cylinders or groups of cylinders, cannot as at present constructed and arranged work under the most suitable conditions as to regularity and economy when the power required to be developed is less than a certain fraction of the maximum power of which they are capable.

The object of the present invention is to provide means whereby one or more of the cylinders in the series may be readily cut off from such series when and so soon as the engine-power requires to be considerably reduced, and the engine through the remaining cylinder or cylinders continues to work with all the economy and regularity desirable.

In applying the invention, by way of example, to a compound engine actuated by successive expansion of the steam in three cylinders the following arrangement is adopted, which will be understood on reference to the accompanying drawings, in which—

Figure 1 is a front elevation of a three-cylinder engine. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view of the same, and Fig. 4 is a detail view of a clutch connection or coupling.

The first cylinder, A, which receives the steam direct from the boiler, and the second cylinder, B, which takes its steam from the first cylinder, are arranged so that their piston-rods act upon the driving-shaft M, one end of which serves to transmit the power and the other end of which is fitted with a clutch, N, (see the detail view, Fig. 4,) adapted to engage with or be disconnected from a second shaft, M', arranged in line with the main shaft.

The third cylinder, C, acts through its piston-rod upon this second shaft M' and receives its steam from the second cylinder, with which it is brought into connection by the valve or slide *a* when required for use. When, on the contrary, the third cylinder is not required for use, this connection between the second and third cylinders is cut off, and the exhaust-steam from the second cylinder passes by the valve or cock *b* and the pipes *t t'* to the condensers D. When the engine is working at full power or under conditions such that its working is regular and economical, the two driving-shafts are coupled and the three cylinders operate in the usual manner—that is to say, the steam passes successively through the three cylinders A, B, and C before escaping to the condenser. The cocks or valves *a* and *c* are open, the cock or valve *b* is closed, and the clutch N is in gear. When, on the other hand, that fraction of the maximum power which it is desired to obtain from the engine becomes so small that, by reason of the large size of the third cylinder, the action ceases to be regular and economical, the two shafts are disconnected by throwing the clutch N out of gear, and communication between the second and third cylinders is cut off by closing the cock or valve *a*, and opened between the second cylinder and the condenser by opening the cock or valve *b* and closing the cock or valve *c*. Thereupon the third cylinder, situated on the side remote from the transmission of the power, ceases to act, and the engine continues to run as a two-cylinder engine with a regularity and economy which would not have been attainable with the three cylinders under the same conditions as to steam-pressure and work to be done. The economy effected by the adoption of this arrangement is for the engine above described—as an example, about thirty per centum when working at about one-fifth ( $\frac{1}{5}$ ) of its maximum power, under which conditions the distribution of the work over the several pistons still remains normal.

It is evident that the above arrangement is applicable to all engines of triple, quadruple, or multiple expansion of whatever type. It

is especially valuable for those—such as marine engines and certain workshop engines—which are frequently required to develop powers far below their maximum capacity.

5 What is desired to be claimed is—

1. The combination of the cylinders and condenser of a compound engine and a divided crank-shaft with a clutch for said divided shaft, and valves for opening and closing the  
10 communication between two or more said cylinders and the condenser, substantially as set forth.

2. The combination of two or more cylinders

of a compound engine and a divided crank-shaft therefor with a clutch for connecting or  
15 disconnecting the parts of the shaft, and a valve or valves to open and close the communication between two or more of said cylinders, as and for the purpose described.

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

CHARLES KOCH.

Witnesses:

ALFRED COINX,

ROBT. M. HOOPER.