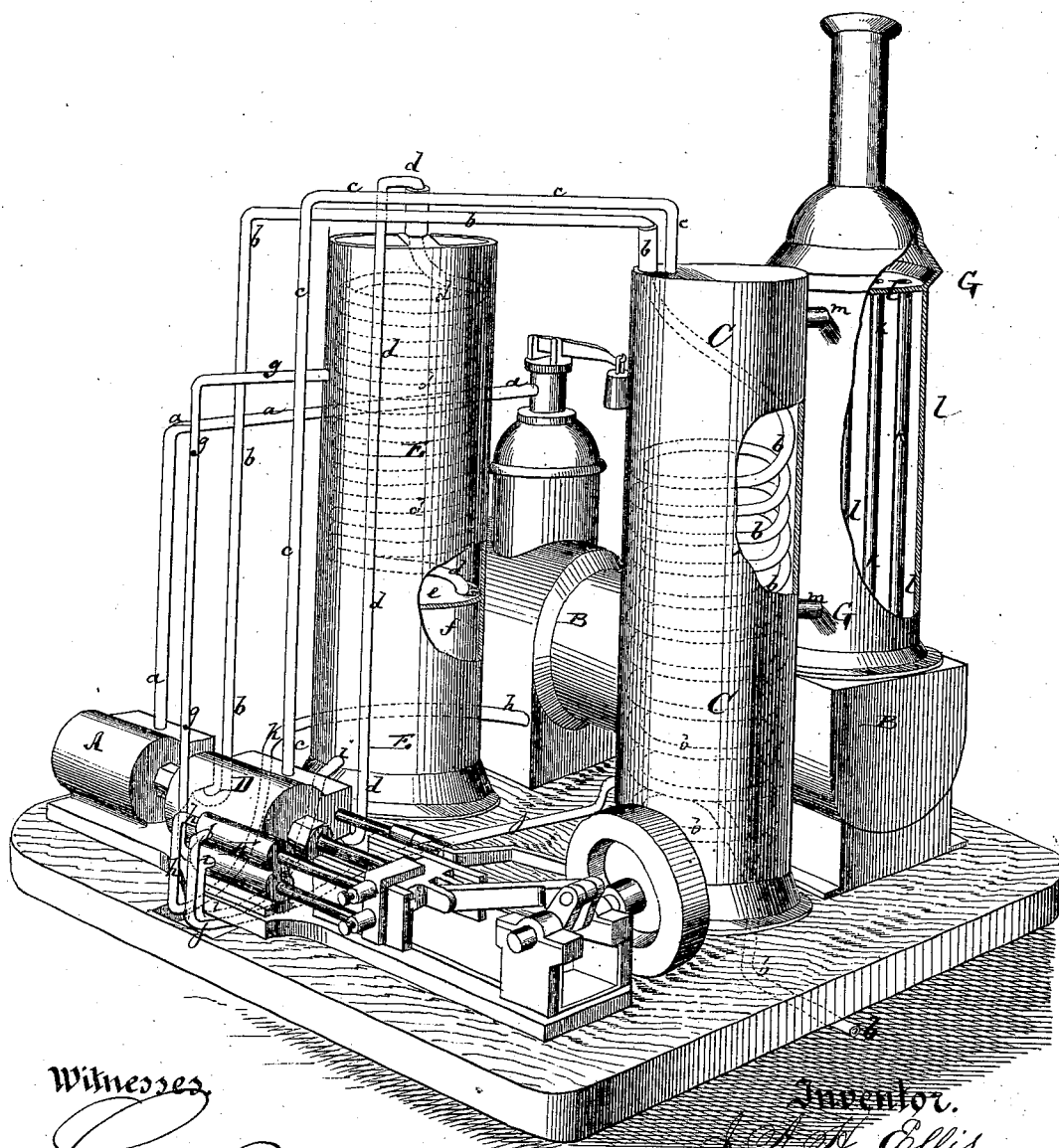


J. A. H. Ellis.  
Combined Steam and Gas Engine.

108574

PATENTED OCT 25 1870



Witnesses.

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# United States Patent Office.

JOEL A. H. ELLIS, OF SPRINGFIELD, VERMONT.

Letters Patent No. 108,574, dated October 25, 1870.

## IMPROVEMENT IN COMBINED STEAM AND GAS-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

*To all whom it may concern:*

Be it known that I, JOEL A. H. ELLIS, of Springfield, in the county of Windsor and State of Vermont, have invented a new and improved Combined Steam and Gas-Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which the drawing represents a perspective view of my improved compound engine.

My invention relates to steam and vapor-engines, and my object is to introduce certain improvements upon the means heretofore employed to economize the heat.

I will first describe my improvements in connection with all that is necessary to a full understanding thereof, and then clearly point them out in my claim.

A in the drawing represents a steam-engine, of suitable construction, connected by the steam-pipe *a*, with a boiler, B, of suitable kind.

The exhaust-pipe *b* of the engine is carried into the upper part of a tank, C, containing volatile liquid, such as gasoline, or other hydrocarbon, and is carried in spiral windings to the lower part of said tank, and finally opened to the atmosphere or suitable receptacle.

The heat of the exhaust steam passing through the tank will convert the liquid contained in the same into vapor.

This vapor is, through a pipe, *c*, carried to an engine, D, of suitable construction, operating the same by its expansive force. The engine D exhausts through a pipe, *d*, into a condenser, E.

This condenser is filled with water above its false bottom *e*, and receives the coiled pipe *d*, as shown.

The vapors in the pipe *d* will give off their heat to the water and become condensed, the condensed

liquid passing into the lower compartment *f* of the condenser, whence it is returned to the tank C.

The water in the condenser may be used for the feed-water of the boiler, and is, therefore, advantageously heated by the exhaust vapors from the engine D.

The water-chamber of the condenser is, therefore, by a pipe, *g*, connected with the feed-pump F, which forces the water into the boiler, through a pipe, *h*.

The same, or another pump, is, by a pipe, *i*, connected with the lower compartment *f* of the condenser, and by a pipe, *j*, with the tank C, for forcing the condensed liquid from the condenser into the tank.

The smoke-stack G of the boiler B, may also be converted into a tank for vaporizing the volatile liquid. For this purpose the smoke-flues *k k* pass through a vessel, *l*, which is, by pipes *m m*, connected with the tank C, so that the heat of the products of combustion, passing through the flues *k*, may be utilized for vaporizing the liquid in the vessel *l* and tank.

The connection or combination of the tank and smoke-stack is not necessary but desirable. Either may be used independent of or without the other.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. A condenser, E, for steam and vapor-engines, divided by a false bottom, *e*, into a water-chamber above, and a hydrocarbon-chamber below, combined with vapor-pipe coils *d*, as and for the purpose described.

2. The boiler B, having a smoke-stack, G, provided with hydrocarbon-chamber *l* and flues *k*, as and for the purpose described.

JOEL A. H. ELLIS.

Witnesses:

A. V. BRIESEN,  
T. B. MOSHER.