

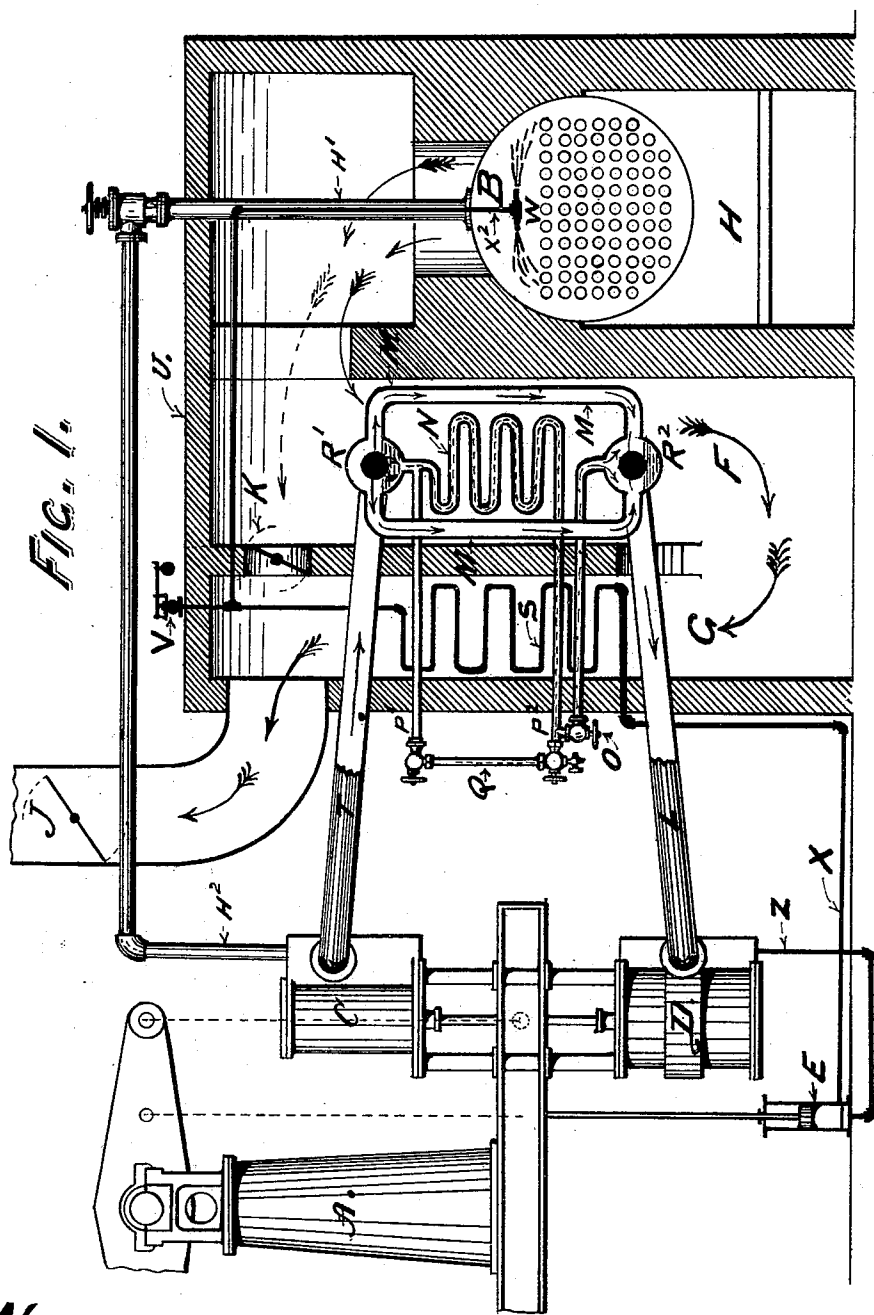
(No Model.)

2 Sheets—Sheet 1.

A. J. L. LORETZ.  
COMPOUND ENGINE.

No. 512,306.

Patented Jan. 9, 1894.



WITNESSES:  
*Chas. G. Loretz*  
*Wm. Suydam*

INVENTOR:  
*Arthur J. L. Loretz*

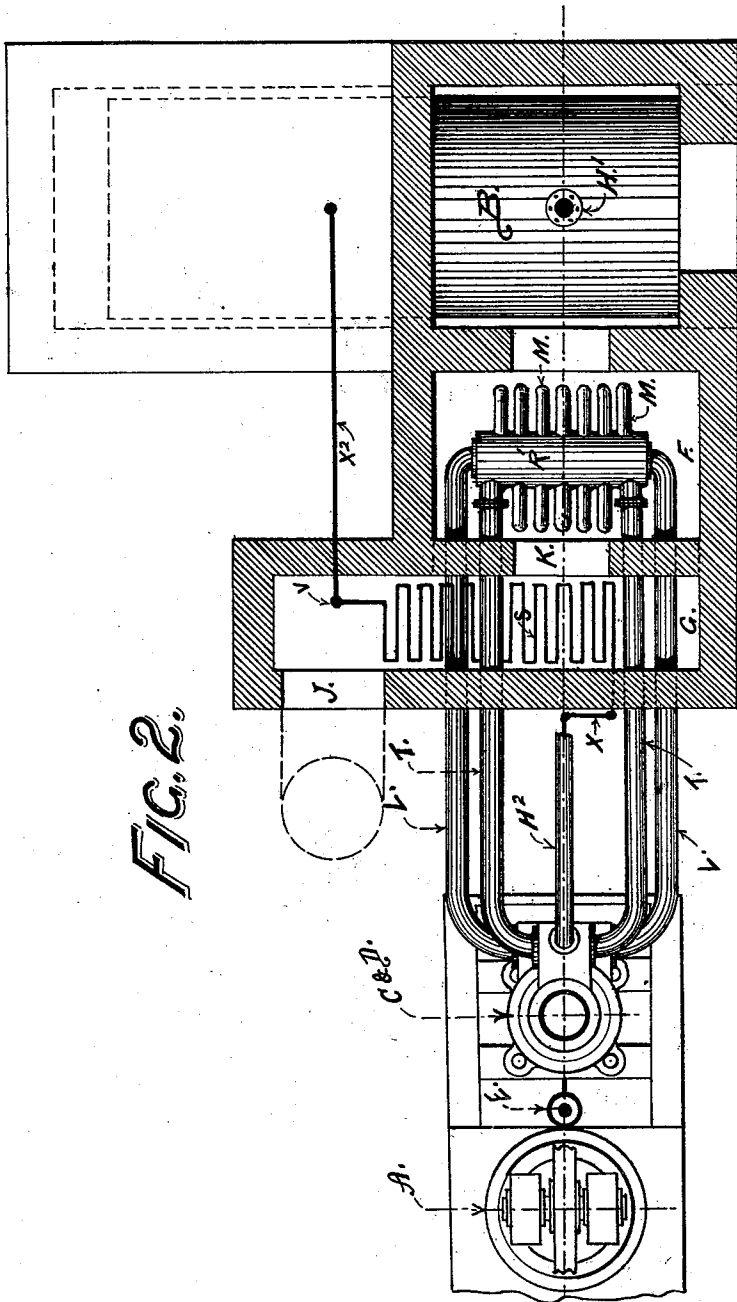
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# UNITED STATES PATENT OFFICE.

ARTHUR J. L. LORETZ, OF BROOKLYN, NEW YORK.

## COMPOUND ENGINE.

SPECIFICATION forming part of Letters Patent No. 512,306, dated January 9, 1894.

Application filed December 6, 1892. Serial No. 454,308. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR J. L. LORETZ, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful improvement in compound engines for superheating low-pressure steam and re-evaporating condensed water combined therewith, of which the following is a specification, reference being had to the accompanying drawings and letters of reference marked thereon, which form part of the specification.

My invention has in view the production of an apparatus in connection with a steam boiler and compound engine, to raise the falling temperature of the steam after leaving the high pressure cylinder during its passage to the low pressure cylinder, also to separate and re-evaporate the entrained water, thereby furnishing the low pressure cylinder with dry steam.

In compound engines where the steam is used very expansively, for instance, expanded in the high pressure cylinder from say one hundred pounds boiler pressure down to nearly that of the atmosphere, considerable difficulty has been experienced in separating the entrained water and preventing it from entering the low pressure cylinder, which not only produces great loss in economy of fuel, but is also liable to cause damage to the mechanism by its presence in the working cylinder. I am aware that many devices have been and are in use to overcome this difficulty, by steam jacketing and intercepting the passage of this low steam by series of pipes filled with high pressure steam direct from the boiler; but this heat is insufficient, besides very costly, as it is virtually taken from the furnace and thus reduces the boiler capacity for effective work. I am also aware that superheating and feed water pipes have been placed in flues and furnaces of boilers, but in practice great difficulties have arisen in preventing such devices from the destructive effects of heat while the furnace fires are in action and the engine not in operation, and no saturated steam or feed water passing through these pipes to absorb the heat. The principal period above referred to occurs at the time that fires are started. In my apparatus the steam that leaves the high pressure cylinder at a temperature of about 216° passes

through a series of pipes before entering the low pressure cylinder, which are exposed in a flue chamber of the boiler to a temperature of some 450° (which is over 100° higher than the steam generated in the boiler or any steam jacketing apparatus). These super-heating pipes are all placed in the back connection of the boiler, where all the products of combustion pass off to the chimney, after having performed their office in generating steam in the boiler. The heat in the flue chambers is controlled by a damper, which when open at the starting of fires in furnace or whenever the engine is stopped, will allow the heat to pass off directly to chimney without acting upon the heating devices, but when closed will cause the heat to pass through them for absorption.

Referring to the accompanying drawings: Figure 1, is a side elevation of my improvement, and Fig. 2, a plan of same.

Similar letters of reference indicate similar parts.

A. is a compound engine with high pressure steam cylinder C. and low pressure cylinder D. and feed pump E.

B. is a horizontal tubular boiler, set in the ordinary manner, with an addition of two flue-chambers F. and G. through which the products of combustion generated in the furnace H. pass off to chimney J., as indicated by arrows.

K. is a by-pass damper which is opened to allow the products of combustion to pass off direct to chimney J. without going through flues F. and G. This damper is invariably open, when the fires are started, to prevent the heat from acting on the heater pipes M., N. and S., hereinbefore referred to, and hereinafter to be more fully described. When the engine is started this damper is closed for contrary effect.

The action of the apparatus is as follows: The steam in the boiler B. having reached a pressure of one hundred pounds per square inch, the damper K. is closed and the engine A. is started. The steam which had been admitted into the high pressure cylinder C. direct from the boiler B. by pipe H<sup>1</sup>, H<sup>2</sup>, having been cut off and expanded about seven times its volume, then leaves the cylinder C. at about 216° through double set of pipes T., to supply

the low pressure cylinder D.; in so doing, it will have to pass through pipe T. to R', which latter connects to R<sup>2</sup>, by a series of vertical pipes M. which are all exposed in flue chamber F. to a temperature of at least 450°, and from pipe R<sup>2</sup>. to double set of pipes L. and low pressure chest of cylinder D. where the steam is again used expansively as though received from a low pressure boiler. The pipes T. and L. are made double, in order to facilitate the education and induction of steam from one cylinder to the other. Now, since the vertical pipes M. are smaller in diameter, yet in their numbers are made to aggregate a greater area than connecting pipe R'. and T., and are connected above the bottom of the pipe R', it naturally follows that their capacity for absorbing heat by vapor is great, while the condensed water will separate and collect and lie in lower half of pipe R', as shown. To the bottom of this pipe R'. is attached a heating coil N., into which the water above referred to will naturally flow by gravitation, but is prevented from passing, either entirely or too rapidly into the lower pipe R<sup>2</sup>. by the valve O. This valve is regulated by the engineer so as to keep the coil filled with condensed water and hold it therein a sufficient length of time to allow it to be re-evaporated by the heat in flue chamber F, connections P'. and P<sup>2</sup>. and glass gage Q. showing the continual condition as to height of water in coil, and admitting the regulation thereof by valve O. What water might pass off through valve O. into R<sup>2</sup>. and collect in chest of cylinder D. is withdrawn through pipe Z. by feed pump E.;

is re-heated or re-evaporated, and returned to the boiler B. by first passing by way of pipes X. through coil S. in chamber G., which coil is provided with safety valve V. and distributor W. in boiler B. A separator is placed between chest of cylinder D. and pump E. on pipe Z., to prevent lubricating oil from steam cylinders being pumped into boilers.

Having explained my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with two cylinders C. and D. of a compound engine A. provided with a pump E., and a boiler B. arranged with two flues F. and G. containing coil S. having connections with pump and boiler, and series of pipes M. and their connections to steam chests of engine cylinders; a by-pass damper K. for the purpose herein described.

2. In combination with two cylinders C. and D. of a compound engine A. and a boiler B.; a super-heating apparatus R'. R<sup>2</sup>. M. and its connections to steam chests of engine cylinders arranged in flue F., by-pass damper K. and flue G., when all constructed, as and for the purpose set forth.

3. In combination with two steam cylinders C. and D. of a compound engine A., of a super-heater R'. M. R<sup>2</sup>. in communication with the steam chests of the engine; a coil N. with regulating valve O., for the purpose hereinbefore set forth.

ARTHUR J. L. LORETZ.

Witnesses:

EDW. E. BOWNS,  
CHARLES F. LORETZ.