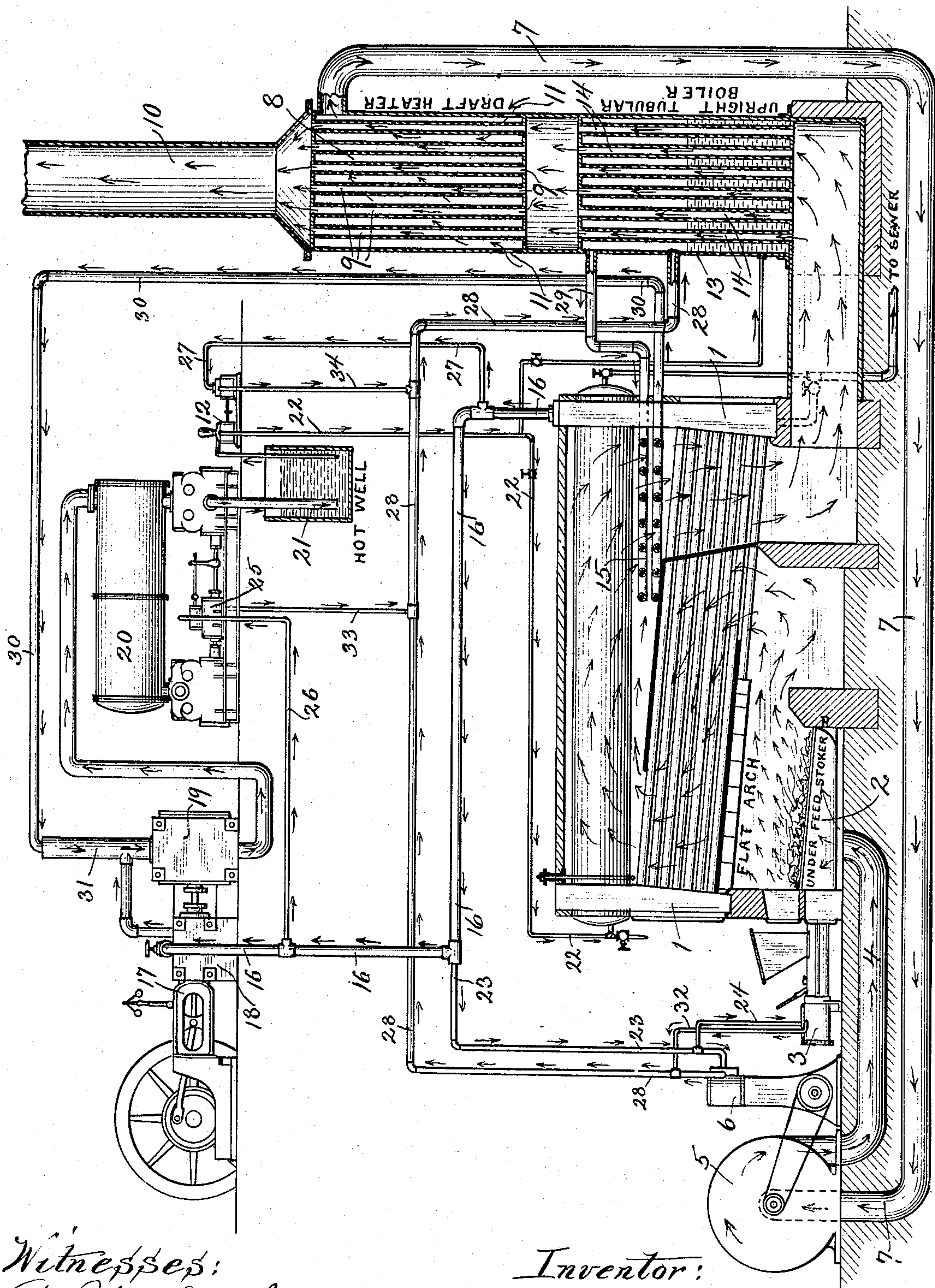


No. 854,980.

PATENTED MAY 28, 1907.

G. Y. BONUS.
POWER SYSTEM.

APPLICATION FILED FEB. 13, 1905.



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UNITED STATES PATENT OFFICE.

GEORGE Y. BONUS, OF CHICAGO, ILLINOIS.

POWER SYSTEM.

No. 854,980.

Specification of Letters Patent.

Patented May 28, 1907.

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To all whom it may concern:

Be it known that I, GEORGE Y. BONUS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Power-Economizing System, of which the following is a specification.

My invention relates to power systems in which water is converted into steam and the steam pressure used to drive any kind of a steam motor; and the objects of my improvements are, first, to provide a compound engine having the area of one of its pistons at least seven or more times the area of the other piston; second, to pass the exhaust steam from a plurality of engines into the cylinder having the large piston; third, to superheat the steam from one or more exhausts before passing it to the engine; fourth, to utilize the hot gases coming from the furnace to heat water and steam; fifth, to utilize the hot gases coming from the furnace to heat the draft air from the furnace, about as shown and other objects which will become apparent from the description to follow.

Heretofore compound engines have been made, but with the larger piston of such size with relation to the smaller piston that only the exhaust steam from the one cylinder containing the small piston could be used in said large cylinder. The exhaust steam was delivered to the large cylinder direct from the small cylinder without being superheated. The hot gases from the furnace after passing through the boiler were permitted to be wasted by passing directly into the chimney.

By my improved construction and arrangement of parts I utilize what may be considered all the available heat created by the furnace or fire under the boiler, and the low pressure steam is superheated before entering the low pressure cylinder. This permits of a much larger area of difference between the high pressure cylinder and the low pressure; and the larger the low pressure cylinder is the greater will the vacuum area be and therefore also the economy increased.

My system also provides for heating water or other matters by the exhausts of the several small engines.

While I have shown and will describe a number of devices in combination to attain the objects of my invention, I desire to have it understood that not all of the devices

shown are necessarily required to come within the scope of my invention as will be particularly pointed out in the appended claims.

In the drawing forming a part of this specification I illustrate a high pressure boiler, a low pressure boiler, a plurality of high pressure cylinders, a low pressure cylinder a draft heater, and a steam superheater connected and arranged to give the most economical results.

Similar reference characters refer to similar parts throughout.

The boiler 1, is shown as being a water tube boiler, and is shown as being provided with an under feed stoker 2, operated by the steam cylinder 3, although any style of fire place and grate may be provided. I preferably employ a forced draft for the furnace fire through the duct 4 by means of the fan 5 which is driven by the steam engine 6. To the suction side of the fan 5 is connected an air duct 7 which leads to the air heater 8. The heater 8 is a sheet metal boiler provided with a plurality of tubes 9 through which the hot gases from the fire under the boiler 1 pass before passing out through the chimney 10; and is also provided with a plurality of inlet openings 11 for the admission of outside air into said heater 8.

The water inside of the boiler 1 and 13 is kept at the proper level by the ordinary boiler pump 12, being regulated to each by proper valves. Preferably between the draft heater 8 and the boiler 1 is placed a low pressure boiler 13 provided with a plurality of tubes 14 through which the hot gases coming from the fire under the boiler 1 pass before passing through the tubes 9 in the heater 8. Within the hot gases flues about the boiler 1 is provided a steam superheater 15.

The live steam under high pressure from boiler 1 is led through pipe 16 to the compound engine 17 which is provided with the high pressure cylinder 18 and the low pressure cylinder 19. The low pressure cylinder 19 is preferably seven or more times as large as the high pressure cylinder 18. The exhaust steam from the low pressure cylinder 19 is preferably passed into a condenser 20, from whence the water is pumped back into the boiler 1 through the pipe 22 by the pump 12. Steam pressure from the boiler 1 is supplied to the engine 6 through the branch 23; to the cylinder 3 through the branch 24; to

the condenser pump cylinder 25 through the branch 26; and to the boiler pump 12 through the branch 27. The exhaust steam from the compound engine cylinder 18 is led directly into cylinder 19, but the exhausts from all the remaining cylinders are led through pipe 28 into the low pressure boiler 13, from this it passes through the pipe 29, through the steam superheater 15 and then finally through the pipe 30 into the cylinder 19 of the compound engine, joining the exhaust from the cylinder 18 in the enlargement 31 of the pipe 30 adjacent to the cylinder 19. Instead of taking this course, the exhaust steam from the compound engine cylinder 18 may pass through the superheater 15 with all the exhausts and thence into the cylinder 19; or all the exhausts may pass directly into the superheater 15 instead of first passing into the boiler 13.

The pipe 28 is connected between boiler 13 and engine 6, and is connected to cylinder 3 by the branch 32; to the condenser cylinder 25 by the branch 33; and to the cylinder of pump 12 by the branch 34.

It will be seen that by the use of this system practically all the heat created by the fire under the boiler is used to advantage and the steam is so manipulated through the different apparatus as to give the most efficient result.

In operation the fire under the boiler 1 is supplied with heated fresh air through the duct 4 by the fan 5; the hot gases from the fire pass through the flues of the boiler 1, thence they pass through the flues of the low pressure boiler 13, and thence through the flues of the draft air heater 8 and finally out through the chimney 10. The steam generated in the boiler 1 is led to the different engines through the pipe 16 and its tributaries. The exhaust from the different engines is led into the low pressure boiler 13 and from thence through the superheater 15, after which it may be led into the low pressure cylinder 19 of the engine 17 or out to a heater to heat water for boiler feeds.

The exhaust from the low pressure cylinder 19 is condensed by any desired form of condenser 20, and the water stored in a hot well 21 from which it is pumped into the boiler again.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a power economizing system, a source of steam supply, a plurality of engines one of which is a compound engine, a steam superheater and connections whereby the exhaust steam from all engines except the compound engine is led through said superheater and thence with the exhaust from the high pressure cylinder of said compound engine to the low pressure cylinder of said compound engine.

2. In a power economizing system, a high pressure boiler, a low pressure boiler, a steam superheater, a furnace for heating said two boilers and said superheater, a plurality of engines one of which is a compound engine, and connections whereby the exhaust steam from all engines except the compound engine is led to the low pressure boiler, thence through said steam superheater and with the exhaust from the high pressure cylinder of the compound engine to the low pressure cylinder of the compound engine.

3. In a power economizing system, a high pressure boiler, a steam superheater, a furnace for heating said boiler and said superheater, a plurality of engines one of which is a compound engine and connections whereby the exhaust steam from all engines except the compound engine is led through said superheater and thence together with the exhaust from the high pressure cylinder of the compound engine to the low pressure cylinder of said compound engine.

4. In a power economizing system, a high pressure boiler, a plurality of engines one of which is a compound engine, a steam superheater and connections whereby the exhaust steam from all engines except the compound engine is led through said superheater and thence together with the exhaust from the high pressure cylinder of the compound engine to the low pressure cylinder of said compound engine.

5. In a power economizing system, a high pressure boiler, a low pressure boiler, a plurality of engines one of which is a compound engine, a steam superheater and connections whereby the exhaust steam from all engines except the compound engine is led to the low pressure boiler, thence through the said steam superheater and together with the exhaust steam from the high pressure cylinder of the compound engine to the low pressure cylinder of said compound engine.

6. In a power economizing system, a high pressure boiler, a compound engine for furnishing power, an engine for operating the furnace stoker, an engine for operating the feed water pump, a steam superheater and connections whereby the exhaust steam from the two last named engines is led through said superheater and thence together with the exhaust steam from the high pressure cylinder of said compound engine to the low pressure cylinder of said compound engine.

7. In a power economizing system, a high pressure boiler, a low pressure boiler, a steam superheater, a furnace for heating said two boilers and said steam superheater, a compound engine for furnishing power, an engine for operating the furnace stoker, an engine for operating the feed water pump, and connections whereby the exhaust steam from the two last named engines is led through said low pressure boiler, thence through said

superheater and together with the exhaust steam from the high pressure cylinder of the compound engine to the low pressure cylinder of the compound engine, to the low pressure cylinder of said compound engine.

5 In testimony whereof I have signed my name to this specification in the presence of

two subscribing witnesses this 11th day of November 1903 at Chicago, Illinois.

GEORGE Y. BONUS.

Witnesses:

R. J. JACKER,
C. L. CROSS.