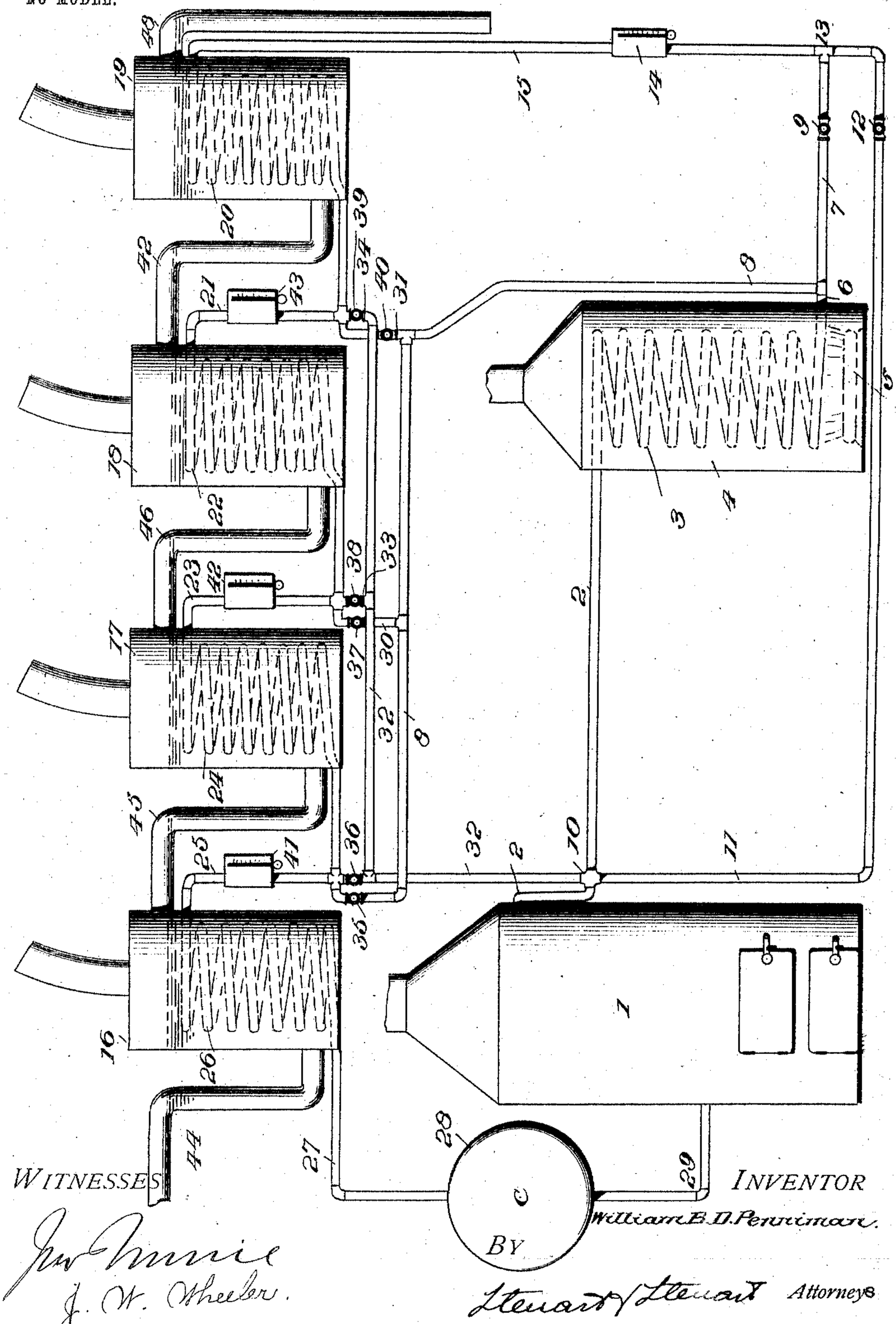
No. 766,841. PATENTED AUG. 9, 1904.

W. B. D. PENNIMAN.

PROCESS OF PRODUCING HIGH TEMPERATURE BY THE USE OF STEAM WITHOUT THE PRODUCTION OF HIGH PRESSURE.

APPLICATION FILED JAN. 13, 1903.

NO MODEL.



WITNESSES

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No. 766,841. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM B. D. PENNIMAN, OF BALTIMORE, MARYLAND.

PROCESS OF PRODUCING HIGH TEMPERATURE BY THE USE OF STEAM WITHOUT THE PRODUCTION OF HIGH PRESSURE.

SPECIFICATION forming part of Letters Patent No. 766,841, dated August 9, 1904.

Application filed January 13, 1903. Serial No. 138,878. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. D. PENNIMAN, a citizen of the United States of America, and a resident of 13 North street, Baltimore, Maryland, have invented certain new and useful Improvements in Processes of Producing High Temperatures by the Use of Steam without the Production of High Pressure, of which the following is a specification.

My invention consists of a process for the production of a high temperature by the use of steam without the production of the usually accompanying high pressure.

The object of my invention is to employ steam for the purpose of heating any material which it is desired to heat without the necessity for the employment of expensive apparatus, such as would be necessary if the usual pressure were produced which corresponds to the temperature of steam produced by direct evaporation.

My process consists in drawing two streams of steam from a source of steam-supply, passing one of them through a superheating device in which it may be superheated to a high temperature, but without any particular regard to the temperature or to the regularity of that temperature, then reuniting the two streams of steam through suitable regulating-valves and passing the mixture, the temperature of which has been definitely regulated by the proportions of the mixture passed through the heating-coil or other apparatus designed for heating the material operated upon, then through a condenser, and returning it to the source of steam-supply by gravity. It will be perceived that in this train all of the parts are in direct connection with each other and the pressure will be practically constant throughout the whole series. I have found by experience that by carrying a low pressure of steam upon my boiler—say ten or twenty pounds—I can produce at the point where it is desired to employ the steam for heating purposes a temperature ranging from 220° to 900° Fahrenheit without materially increasing the pressure in the boiler. I have embodied this process in an apparatus which is used for the distillation of such material as coal-oil and which illustrates the purpose for which it may be used; but it may be employed in many other forms of apparatus and for many other purposes without departing from my invention.

Referring to the drawing, 1 represents a steam-boiler; 2, a main steam-pipe leading therefrom to the coil 3 of a superheater 4.

3 is a coil located within a suitable device for subjecting the coil to the action of a suitable source of heat, such as a series of burners 5. The lower end of the coil 3 emerges from the superheater as a pipe 6 and at a point beyond the superheater branches. One of the branches is numbered 7 and the other 8.

9 is a valve in the branch 7.

10 is a cross in the branch 2, from which several branches project connected to the pipe 2. One branch, 11, descends and at a point opposite the valve 9 is provided with a valve 12, the pipe 7 and the pipe 11 reuniting at the point 13. 14 is a thermometer located in the pipe 15, which is the union of the pipes 7 and 11.

16, 17, 18, and 19 are a battery of oil-stills, each still containing a coil, the still 19 containing the coil 20, which is connected at its upper end with the pipe 15 and at its lower end to a pipe 21, which connects it with the top of the coil 22 in the still 18. The lower end of the coil 22 is connected by the pipe 23 to the top of the coil 24 in the still 17. The lower end of the coil 24 is connected by the pipe 25 to the top of the coil 26 in the still 16. The lower end of the coil 26 is connected to the pipe 27, which passes through a condenser 28, from which the pipe 29 returns to the boiler. The pipe 8, which is a branch of the pipe 6, extends past the series of stills and terminates in a connection with the pipe 25, which pipe 8 also has a branch 30, by which it is connected to the pipe 23, and branch 31, by which it is connected to the pipe 21. The pipe 2 has a branch 32, which also passes past the battery of stills and is connected to the pipe 25. The branch 32 also has a branch 33, by which it is connected to the pipe 23, and a branch 34, by which it is connected to the pipe 21.

35 is a valve in the pipe 8, by which the admission of superheated steam to the pipe 25 may be regulated and controlled.

36 is a valve by which the admission of boiler-steam to the pipe 25 may be regulated and controlled.

37 is a valve by which the admission of superheated steam to the pipe 23 may be regulated and controlled.

38 is a valve by which the admission of boiler-steam to the pipe 23 may be regulated and controlled.

39 is a valve by which the admission of boiler-steam to the pipe 21 may be regulated and controlled.

40 is a valve by which the admission of superheated steam to the pipe 21 may be regulated and controlled.

41 is a thermometer in the pipe 25. 42 is a thermometer in the pipe 23. 43 is a thermometer in the pipe 21 by which the temperature of the steam in these various pipes may be determined.

44 is an inlet-pipe by which oil or other material to be distilled or heated is admitted to the still 16. It is connected to a source of supply at a level high enough to cause the oil or other material to flow down into the still 16 at the bottom and then rise in the still to the level of its overflow-pipe.

45 is an overflow-pipe of the still 16, connected to the still 16 near its top and to the still 17 near its bottom.

46 is an overflow-pipe for the still 17, connected to the still 17 near its top and to the still 18 near its bottom.

47 is an overflow-pipe for the still 18, connected to the still 18 near its top and to the still 19 near its bottom.

48 is an overflow-pipe for the still 19, connected to the still 19 near its top and to any suitable receptacle at its lower end. Each of the stills 16, 17, 18, and 19 is provided in its top with a suitable escape for vapor, which is connected with a proper condenser.

It will be observed from an examination of the device just described that the train of steam-pipes through which the steam is passed are all connected together in one continuous circuit. Therefore the pressure throughout the series is maintained practically uniform. If steam at a pressure of ten or twenty pounds may be maintained upon the boiler 1, a temperature of about 220° to 250° will be obtained in the pipes 2, 11, and 32. Steam at the same temperature will enter the superheating-coil 3, which is connected to the pipe 2, and then as it passes through the coil 3 will be subjected to the heating action of the fire 5, by which it will be heated to a high temperature. The regulation of the fire 5 is quite immaterial, and the amount of heat imparted to the steam by that fire is equally immaterial, although of course it must be maintained high enough to accomplish the desired result. The pipe 6 connected to the lower end of the coil 3 carries a superheated stream from the superheater through the valve 9 to the point 13, which is the point at which the steam-pipe 11 and the steam-pipe 7, which is a branch of the pipe 6, unite. The valves 9 and 12 in the pipes 7 and 11 can be regulated so as to control the amount of steam admitted to the pipe 15 at the point 13, and as they pass the thermometer 14, which is in the pipe 13, the temperature of the mixture can be definitely determined and regulated. The temperature of the steam in the pipe 15 can be regulated by the adjustment of the valves 9 and 12 with great exactness, so that a uniform temperature at the thermometer 14 can be maintained with a minimum of effort. The steam passing through the pipe 15 is admitted to the top of the coil 20, passes down through that coil and thence to the coil 22, and thence to the coil 24, and thence to the coil 26, from which it proceeds to the condenser 28. If the steam has not already been condensed while passing through the stills 19, 18, 17, and 16, it will be condensed in the condenser 28 and will then flow as water by gravity into the boiler 1 to be again started through the same circuit. The branch 32, connected to the steam-pipe 2, carries boiler-steam of boiler temperature to the pipes 21, 23, and 25, which connect the coils of the various stills. The pipe 8 and its branches are also connected to the pipes 21, 23, and 25, so as to admit superheated steam to those pipes.

It will thus be seen that by the regulation of the valves 9 and 12, 35 and 36, 37 and 38, and 39 and 40 the temperature of the coils 20, 22, 24, and 26 can be regulated with almost absolute accuracy, and the temperature may be told by the thermometers 14, 43, 42, and 41. It will also be observed that as the oil flows in through the pipe 44, containing the largest number of distillates mixed together, it will meet the coldest steam, and hence the most volatile of the distillates will be driven off in the still 16. The remaining fluid will flow by the pipe 45 to the still 17, where it will meet a higher temperature in the coil 24 and the next series of distillates will be driven off. The remaining fluid will then flow through the pipe 46 to the still 18, where it will meet a still higher temperature and another set of distillates will be driven off. The remaining fluid will then flow through the pipe 47 to the still 19, where it will meet a still higher temperature and the last distillates will be driven off. The remaining fluid will then flow through the pipe 48 to some suitable receptacle. It will thus be perceived that I have a stream of material containing a number of distillates which are vaporized at varying temperatures flowing in one direction through my apparatus, and the heating agent flowing in an opposite direction through my apparatus, the heating agent entering the last still at the highest temperature and leaving the first still at the lowest temperature.

The material to be distilled is first subjected to the lowest temperature, then to a higher, then a higher, and finally to the highest temperature successively, and the distillates are driven off by a temperature only such as is necessary to accomplish the desired result. The apparatus may be regulated so as to produce in each still the temperature desired—that is to say, if the steam on entering the still 19 should be at a temperature of 800° Fahrenheit and in the still should lose 120° of heat, but it should be desired to employ in the still 18 a temperature of 700°, this can be accomplished by introducing fresh superheated steam by the valve 39, so as to raise the temperature from 680° to 700°. The same result can be accomplished with each of the stills by adding superheated steam or adding boiler-steam, as the case requires.

I claim—

1. The process of producing high temperatures at low steam-pressures, which consists of withdrawing steam from a source of steam-supply in two streams, superheating one of the streams and remixing the two streams in regulated quantities to produce the desired working temperature and then causing the mixture to flow through a system of heating-conduits.

2. The process of producing high temperatures at low steam-pressures, which consists of withdrawing steam from a source of steam-supply in two streams, superheating one of the streams, and remixing the two streams in regulated quantities to produce a desired working temperature, and then condensing the same.

Signed by me at Baltimore, Maryland, this 5th day of January, 1903.

WILLIAM B. D. PENNIMAN.

Witnesses:
FELIX R. SULLIVAN,
GEO. WM. SNYDER, Jr.