ATTAINING MAXIMUM EFFICIENCY & ECONOMY FROM LOW PRESSURE STEAM HEATING SYSTEMS

A TREATISE

by

WALTER S. FINKEN

Kenite Laboratory, Inc., 83 Murray Street, New York, N. Y.

Printed in the United States of America

ATTAINING MAXIMUM EFFICIENCY & ECONOMY FROM LOW PRESSURE STEAM HEATING SYSTEMS

by

WALTER S. FINKEN
Consulting Engineer

It is not sufficient in measuring the economy of a steam-heating system to use as a yard stick the efficiency of the boiler alone. High efficiency naturally can only be attained from the proper construction and the proper operation of the system as a whole.

Low efficiency, however, is too often adjudged to be the result of faulty construction, when in reality it is almost always the result of errors in functioning. Even in systems possessing slight errors in construction, a high degree of efficiency may be attained if there are no errors in operation.

Let us pause for a moment to ask the question, "Just what does a steam-heating system consist of"?

The average answer would be that there are many TYPES of systems; for example, a One- or a Two-Pipe system or a Vapor or Vacuum system, and that each of these systems consists of a boiler, piping and radiators, so arranged as to conform with the TYPE of system being considered. This answer would be less than 50% complete, because it takes into consideration only the mechanics of the system, whereas the mechanical phase of a heating system plays only a minor part in its efficiency, acting merely as a conveying medium between the heat absorbed from the fuel and the space or room to be heated.

The vital factor in the efficiency of a low-pressure steam-heating system is hidden in the WATER contained within the boiler. The degree of purity of this boiler water governs to a greater extent, than any other single factor, the efficient operation of a heating system, irrespective of the TYPE of system installed.

Too much emphasis cannot be placed upon the detrimental results arising from the sludge which accumulates within a boiler or from impurities found in solution or in suspension of the boiler water itself. Instances have been recorded where, by the proper conditioning of boiler water, a saving of 38% in the consumption of fuel has been attained.

It is the contention of the writer that 90% of the difficulties experienced in the operation of Low-Pressure Steam-Heating Systems are directly due to the contaminated condition of Boiler Water and only 10% due to mechanical defects. This statement is logical since it is based on a wide experience in correcting the contaminated condition of boiler water in a large number of steam-heating systems where high efficiency has been attained and defects which at first appeared to be structural were completely rectified.

Contaminated water, for steaming purposes, may contain various mineral salts in solution, such as Lime or Magnesium, or it may contain animal matter such as fish oil or greases. It may also contain vegetable matter in the form of loam or certain gases that have been absorbed by the water. The presence of these substances in boiler water taken singly or collectively will cause a steam-heating system to function badly.

In considering the action of these substances, it will be seen that the Mineral salts may be dissolved by the water, that the Loam as vegetation may remain in suspension and that the oils or greases may combine chemically with various salts in solution or remain suspended to form an excessive surface tension, detrimental to the free liberation of steam bubbles from boiler water. It is this excessive surface tension which is the basic cause of most steam-heating troubles. Under these conditions aerated boiler feed water containing chlorine, marsh or other gases react violently when subjected to heat and will produce an artificial water line. This condition creates a swelling action that is quite frequently mistaken for a loss of boiler water where in reality the water has merely subsided to its normal level after having liberated the absorbed gases.

"KEK"

To correct the conditions arising from these causes we have developed a product called "KEK". In its preparation we have considered the necessity of correcting the steaming qualities of boiler water, by both a chemical and a physical action.

Chemically, "KEK" acts against the harmful salts that are in solution in boiler water and, physically, "KEK" removes the

animal oils or vegetable matter held in suspension. The combined chemical and physical action precipitates the impurities harmful to the proper steaming of boiler water, and causes these substances to fall to the base of the boiler or mud-drum where they may be drawn out in the form of sludge.

It is the presence of these impurities in boiler water which causes the water to become contaminated.

SYMPTOMS OF INEFFICIENT HEATING

The following complaints occurring in steam-heating systems are the most common symptoms which indicate contaminated boiler water. They are often mistaken to be the result of defective installations, but in the vast majority of cases when boiler-water impurities have been removed, a maximum of heating efficiency is restored. These symptoms are:

1—Radiators not heating properly.
2—Inability to raise steam pressure.
3—Inability to hold the water line in the boiler as the pressure increases.
4—Hammering in pipes and radiators.
5—Radiators filling with water.
6—Air valves ejecting water.
7—Excessive fuel consumption.
8—Cracked boiler sections.
9—Unsteady water line.

To understand why these common symptoms of inefficiency in modern steam-heating systems are the result of contaminated boiler water, let us assume that in a given heating system it is difficult to heat all connected radiators properly, when ample fuel is being burned in the furnace. This condition, no matter what its cause, represents a low efficient heating plant, because the heat liberated from the fuel which is burned is not transmitted to the radiators for a useful purpose. A highly efficient SYSTEM would transmit to the radiators a maximum of heat from the fuel consumed. The important thing to bear in mind therefore is that irrespective of the amount of fuel consumed, the radiation of the heat at the radiators still depends upon the efficiency of the SYSTEM as a whole. Heat losses in the piping lowers the efficiency of the system.

In comparison with the modern steam-heating system, take for example the Old-Fashioned Parlor Stove. Its efficiency was high because all the heat generated from the fuel, with the exception of that which escaped through the chimney, was absorbed in heating the surrounding air in the room in which it was located; while in the modern steam-heating systems, where fuel is burned in a furnace in the cellar, heat must be CON-

VEYED through piping to radiators in the rooms which are to be heated. In the transfer of this heat from fuel burned in the furnace and conveyed to rooms which may be remotely located, there is a loss of heat. As this loss increases, the efficiency of the heating system decreases. Such losses in efficiency may represent not only a loss in comfort, but also a loss in dollars and cents.

While this may seem to be purely elementary, it is of the utmost importance that these simple facts be kept vividly before us if we are to acquire a broader knowledge involving the attainment of comfort and economy through heating efficiency.

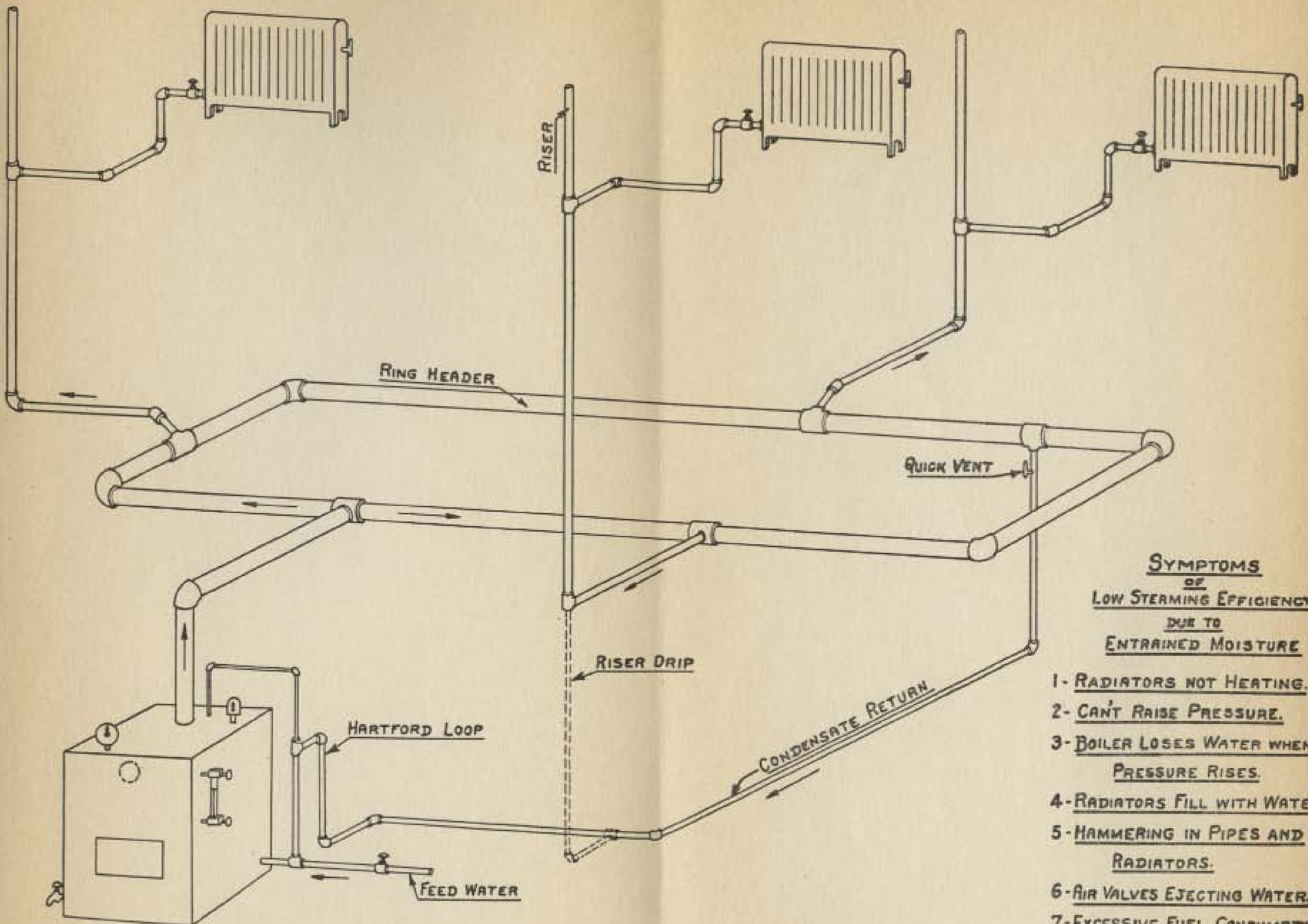
WHY DO WELL CONSTRUCTED HEATING SYSTEMS OFTEN FAIL TO FUNCTION PROPERLY?

The answer to this question, though not always, is almost invariably that the steam which is generated is condensed in the steam main often as fast as it is being formed in the steam boiler and therefore never reaches the radiators it is intended to heat. Let us refer for a moment to diagram "1" showing a typical layout of a One-Pipe steam-heating system, comprising a Boiler, Steam Header, Risers, Radiators and Return Piping.

Steam generated in the boiler is piped to a ring steam header to which are connected branch risers that supply each radiator. As the steam condenses in the radiators, the water of condensation returns to the riser where it flows down the pipe to the ring-header. The condensate then flows through this header to the return main, by which it is returned to the boiler where it compensates for an equal amount of steam generated. It is advisable to note that the water of condensation returning from the radiators flows through the risers in the opposite direction to the steam feeding the radiators. The presence of this water in steam pipes is detrimental from the standpoint of economy in fuel consumption, as will be explained further on.

On diagram "2" is shown a cross-sectional view of a small round steam boiler connected to a steam main, a riser and a return pipe. This is a conventional hook-up and is intended to depict the source of 90% of all steam-heating difficulties. In this boiler a condition of high surface tension of the boiler water is illustrated.

Let us now consider in just what ways this high surface tension is the cause of the nine symptoms of defective heating which were enumerated in a preceding paragraph. First, however, let us consider for a moment the situation of a new installation.



Symptoms of Low Steaming Efficiency due to Entrained Moisture

1- Radiators not Heating.
2- Can't Raise Pressure.
3- Boiler Loses Water when Pressure Rises.
4- Radiators Fill with Water.
5- Hammering in Pipes and Radiators.
6- Air Valves Ejecting Water.
7- Excessive Fuel Consumption.

DIAGRAM 1

If a steam boiler, together with the piping and radiators, were made of glass and the boiler was filled to its proper water line with pure water and a fire started in the fire-box, the steam that was generated would be DRY, and would fill the piping system with a true water vapor. Under these conditions, with air eliminated from the system, all the connected radiators would heat through thoroughly, and no trouble would ever be experienced. Since steam-heating systems, however, must be made from commercially practical metals and since these metals often have foreign matter in the form of mineral salts and core-sand binder adhering to their inner surfaces, which dissolve in the boiler water, and since the make-up water invariably carries with it some measure of impurities, corrective methods should be applied even in new installations if high heating efficiency is to be attained.

Before designating what corrective method should be used, it would be well to determine the cause of the trouble, and to observe what takes place within a steam boiler that is functioning badly. Water in a steam-heating boiler either contains impurities or it does not. If it does not contain impurities, there will be little or no trouble experienced with most heating systems. If the boiler water does contain impurities, heating troubles may be expected. These impurities cause surging and priming of boiler water. The degree to which such priming is experienced is dependent upon the amount of impurities that are present.

Surging of boiler water within a boiler is shown graphically in diagram "2". Note that the small gas or steam bubbles form on the metal directly adjacent to the fire-box. These bubbles cling to the metal until they become sufficiently large to become buoyant. They then break away from the metal and rise to the surface of the water. This is a critical moment in the generation of steam. It is at this moment that water changes from a liquid to a gas.

These bubbles are subjected to hydrostatic pressure equivalent to the depth of water above the bubble, and this pressure tends to keep the bubbles compressed. As they ascend through the water the hydrostatic pressure surrounding them diminishes and permits the bubbles to expand. Should the boiler water, through which these bubbles pass, contain impurities either in solid form or in solution, their ascent will be impeded and many of them may join together causing their size to be increased. When each steam bubble reaches the surface its ascent is momentarily retarded by the surface tension of the water. In fact, before any of these bubbles can break through this barrier they may have to further increase in size by merging with other ascending bubbles in order to enlarge sufficiently to displace whatever oils and greases may be present on the surface. Surface tension of boiler water is at its maximum when oils and greases are in flotation.

When such steam bubbles break through the surface of the water and pass into the steam-dome they carry with them water in liquid form as will be explained later on. It is the condensing power of this water as a liquid upon the steam which has been created that lowers the efficiency of steam-heating systems. The greater the amount of water or free moisture present in steam the greater will be the amount of condensation with a corresponding lowering of heating efficiency. Eliminate high percentages of entrained moisture in the steam and you will eliminate the vast majority of all steam-heating troubles.

Water as a liquid is visible.
Water as a gas is invisible.

The moment steam becomes visible it is in a process of condensation. Water as a liquid and water as a gas may be visualized by observing the water column of a steam boiler. The space above the visible water line contains water as a gas which is invisible. The space below the water line contains water as a liquid which is visible. The temperatures of these two forms of water are identical. When minute particles of free moisture are carried over from the steam-dome into the water column, moisture will be seen to collect on the glass and a foggy or opaque condition will be observed above the water line. Such steam is then in a process of condensation and the condensing action which is taking place indicates a heat loss or in other words the transmission of heat from the water as a gas to the water as a liquid.

The phenomenon of the changing of the gas to a liquid as described in the instance of the water column occurs in the steam main when steam and entrained moisture are both present. The water condenses the steam.

As the condensation of steam in the steam main defeats the purpose for which the steam is generated, let us next consider the principles governing the formation and condensation of steam.

THE FORMATION OF STEAM

Assume that a steam boiler is filled to its proper steaming level with water having a temperature of 32 degrees F. and that through the application of heat the temperature of the water is raised to 212 degrees. Deducting 32 degrees from the final 212 degrees, it is obvious that the water must absorb 180 degrees of heat to attain the higher temperature.

Now, in measuring heat two different factors must be borne in mind—Degrees of heat and Heat units. Degrees of

heat are used in determining temperatures but there is a definite relation between degrees of heat and heat units. A heat unit termed B.T.U. (British Thermal Unit) being the average amount of heat required to raise the temperature of one pound of water one degree F. It therefore follows that water in raising from 32 degrees to 212 degrees must absorb 180 B.T.U. of heat.

Having started with water in the boiler at 32 degrees F., these 32 degrees may be converted into 32 B.T.U. and considered useful heat in the generation of steam (without regard to the latent heat of ice). Add to this the 180 B.T.U. (which previously it was shown were absorbed in raising water from 32 degrees F. to 212 degrees) and we find the result to be 32 B.T.U. plus 180 B.T.U. equalling 212 B.T.U. This is the useful number of heat units in water which has attained a boiling point of 212 degrees F.

To then change water at 212 degrees F. into steam at 212 degrees F. additional heat units must be applied. This additional heat is called the latent heat of evaporation. In the conversion of water into steam the water must undergo three distinct heat changes. First, heat is absorbed from the fuel to raise the temperature of the water to its boiling point, then an additional amount of heat must be absorbed by the water for the internal creation of steam at the tubes or crown sheets. Finally, before steam can then be liberated into the steam-dome of the boiler an additional amount of heat must be absorbed by the water to perform the work of removing the air within the steam dome which the steam displaces.

A summary of the total amount of heat in steam generated from water at 32 degrees F. then is as follows:

Initial heat of the water	32 B.T.U.
Heat necessary to raise the water to boiling point	180 "
Internal heat necessary to convert water at 212 degrees into steam at 212 degrees	898.8 "
Heat required to do the work of expanding against atmospheric pressure	72.9 "
Total amount of heat in steam at atmospheric pressure	1183.7 B.T.U.

We may state therefore that the heat contained in the water before evaporation is the sum of 32 B.T.U. and 180 B.T.U. or 212 B.T.U., and that the latent heat of evaporation is the sum 898.8 plus 72.9, or 971.7 B.T.U., or in round figures, 970 B.T.U.

For all practical purposes and for the purpose of this treatise, we will consider water at 212 degrees as possessing 212 B.T.U. and the latent heat of steam taken as 970 B.T.U., or a total of 1182 B.T.U. as representing the useful heat of steam, at atmospheric pressure.

HEAT LOSSES DUE TO CONDENSATION.

Having determined the number of heat units in steam and the number of heat units in water at the boiling point and realizing that their temperatures are identical, it is important to note that the 970 B.T.U. indicating the latent heat of steam is the factor which makes possible the conversion of water as a liquid into water as a gas (steam). It is also important to note that if the latent heat is removed from steam, the steam will immediately revert to water.

These facts also are purely elementary but it is sometimes the elementary things which are lost sight of and recognition of these simple facts is paramount before attempting to effect an economical and efficient operation of a steam-heating system. To secure high efficiency in steam-heating systems, knowledge of defects in the system must be obtained. After the defects are known, further knowledge pertaining to the cause of these defects must be procured. To show the major cause of inefficient steam heating, together with its manifold operating difficulties, your attention is again directed to diagram "2", where you will note a graphic illustration on the structure of steam bubbles as they leave the surface of boiler water. You will note that as steam emerges from the water surface it is encased within a thin veneering of water holding it in bubble form. The size of these bubbles depend upon the surface tension of the water. The greater the surface tension the larger the bubble will become.

When these steam bubbles are under the surface of the water they are compressed by the weight of the water surrounding them. When they break through the surface and are liberated into the steam-dome, they immediately explode. The veneering of water which encases them is then broken into hundreds of minute water particles which are sprayed into the steam-dome. These fragments of water are then carried by the velocity of steam leaving the boiler on into the steam main. Once they have entered the steam main, they remain in suspension in the form of entrained moisture.

This is another critical point in the operation of a heating system because the efficiency of the system as a whole depends upon the presence or absence of these water particles IN THE STEAM MAIN. If these water particles are present the steam will condense, the amount of condensation depending upon the amount of entrained moisture present. This condition simulates the action of a barometric condenser, and decreases the efficiency of a heating system. If these water particles are absent in a steam main and the main is properly insulated, there will be no condensation of the steam and a thermos bottle effect will be produced thereby increasing the efficiency of the heating system. Should 50% of entrained moisture be

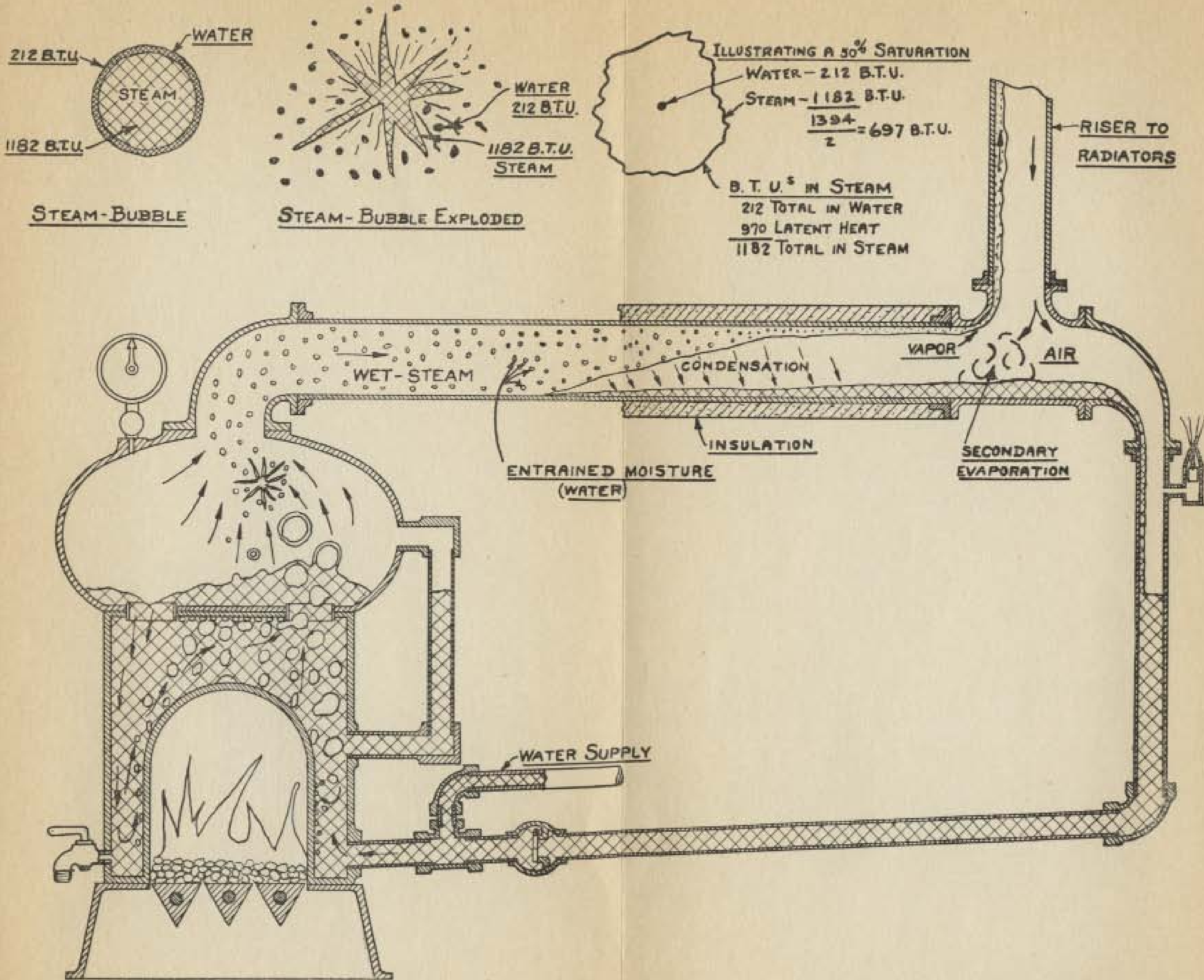

WATER
212 B.T.U.
STEAM
1182 B.T.U.
STEAM-BUBBLE
WATER
212 B.T.U.
1182 B.T.U.
STEAM
STEAM-BUBBLE EXPLODED
ILLUSTRATING A 50% SATURATION
WATER - 212 B.T.U.
STEAM - 1182 B.T.U.
1394 / 2 = 697 B.T.U.
B.T.U.S IN STEAM
212 TOTAL IN WATER
970 LATENT HEAT
1182 TOTAL IN STEAM
RISER TO RADIATORS
VAPOR
AIR
WET-STEAM
CONDENSATION
INSULATION
SECONDARY EVAPORATION
ENTRAINED MOISTURE (WATER)
WATER SUPPLY

DIAGRAM 2

present, all the steam will condense and none will be available for heating connected radiation.

An explanation illustrating why the presence of these minute water particles IN THE STEAM MAIN prevent the proper functioning of a steam heating system is important.

When water particles, which are carried by the velocity of steam leaving a boiler, are blown into the steam main they contain the same number of heat units as are present in the water that is in the boiler, namely 212 B.T.U. The steam that carried these water particles into the steam main contain 1182 B.T.U. The temperatures of both the water and the steam are identical. The difference between the two is simply the difference of the latent heat of steam, or 970 B.T.U. which are required to change water as a liquid at 212 degrees F. into water as a gas (steam) at 212 degrees F.

A layman's logic is sufficient to reason that if a cup were filled half with hot water and the other half with cold water, the hot water would give off its heat (B.T.U.) to the cold water, until both waters attained an equal temperature.

This principal applies in like manner to the unbalanced heat condition which exists between water and steam within a steam main, where the heat energies are 212 and 1182 B.T.U. respectively. The average heat in this water and steam combination, where the water and steam are of equal weight would be 50% of the sum of 212 plus 1182 or 697 B.T.U.

As has been indicated before, it requires 970 B.T.U. to convert water into steam but when a 50% saturation exists within the steam main, the mean number of heat units becomes only 697 B.T.U. because the steam gives off some of its latent heat to the water which is present in the form of entrained moisture. The steam then no longer contains a sufficient number of heat units to maintain itself as a gas and therefore condenses or reverts to water.

Should this condition prevail in a closed vessel where the supply of steam is suddenly cut off, the condensation of the steam would create a sub-atmospheric pressure that would cause the water, containing 697 B.T.U., to start a secondary evaporation which would continue until the water had lost sufficient heat through radiation.

DETRIMENTAL EFFECTS—
THE RESULT OF ENTRAINED MOISTURE

From our analysis of the preceding photographs it may now readily be seen that the presence of foreign matter in boiler water causes a condition of entrained moisture to exist within the steam main and that the presence of these free water particles in suspension in the steam, causes the steam to CONDENSE. As a result of this condensing action much of the steam which is generated for heating purposes may never reach the point of radiation. In addition, the condensing action itself sets up an excessive line drop or unbalanced pressure condition between that which exists in the boiler and that which exists at the end of the steam main, thus preventing the return of condensate to the boiler and by so doing creating a water hammer in the pipe lines. If the boiler is forced under these conditions, the condensate is driven on into the radiators where it causes an additional hammering sound in the affected unit. With radiators filled with condensate, water is ejected from air valves.

When the boiler pressure exceeds the pressure of the condensate in the return main, water may also be forced out of the boiler through the return piping, where it is elevated into the steam header and aggravates the condition set up by the original entrained moisture. Should a check valve be installed in the return main to prevent this water from leaving the boiler, the pressure on the boiler side of the check valve flap will be greater than that on the condensate or return side, thereby sealing the check valve and preventing the return of any condensate until the hydrostatic head in the return piping overbalances the boiler pressure. If there is a sufficient head between the water line of the boiler and the junction of the return pipe to the steam header, no flooding of the steam main will take place, but should there be an insufficient distance for this hydrostatic head the condensate will flood the steam main.

In the event of a Hartford Loop installation on the return line the action is somewhat similar to that of a check valve, where the unbalanced steam pressure between the steam boiler and the end of the main prevents the return of the condensate.

If there is an excessive steam condensation taking place within a steam main, a boiler may be prevented from raising pressure, because the steam condenses as fast as it is generated.

With reference to economy in fuel consumption, it is obvious that when fuel is burned for the generation of steam for heating purposes, and THAT steam is condensed in the steam main, due to excessive entrained moisture, greater quantities of fuel will have to be consumed to acquire the desired amount of heat. Often, even greatly increased quantities of fuel will not provide the desired heating result.

The cracking of boiler sections are prevented by the elimination of entrained moisture, for the reason that when a steady normal water line is maintained in the boiler all surfaces of the boiler metal exposed to the direct products of combustion are covered with water and unequal expansional and contractional strains are eliminated.

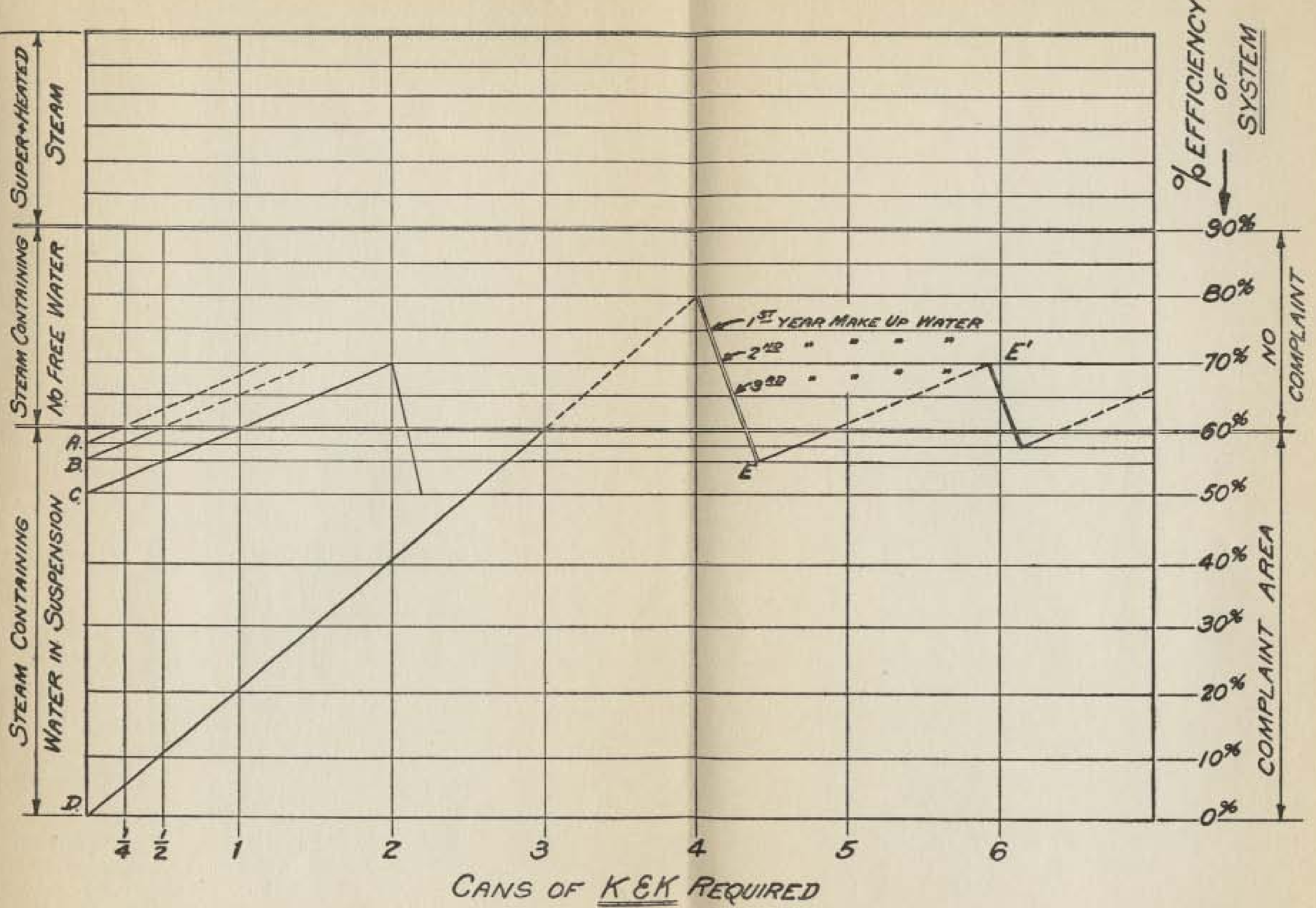

SUPER-HEATED STEAM
STEAM CONTAINING NO FREE WATER
STEAM CONTAINING WATER IN SUSPENSION
A.
B.
C.
D.
% EFFICIENCY OF SYSTEM
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NO COMPLAINT
COMPLAINT AREA
1ST YEAR MAKE UP WATER
2ND " " "
3RD " " "
E
E'
1/4
1/2
1
2
3
4
5
6
CANS OF KEK REQUIRED

DIAGRAM 3

THE REMEDY.

The condensation of steam within a steam main may be prevented or corrected by the use of "KEK".

"KEK" is a highly efficient and uninjurious product which has been developed to condition steam through preventing the development of entrained moisture.

"KEK" also will remove scale deposits from boiler tubes and sheets. It also permits a more rapid generation of steam through the elimination of the surface tension in boiler water.

GUIDANCE IN THE USE OF "KEK".

Directions for the use of "KEK" are supplied with the can in which it is packed. The amount required to rectify the steaming condition of a boiler, by preventing the passage of free moisture into a steam main, is dependent upon the amount of contamination present in the boiler water. No two steam boilers are alike in their steaming qualities. The water in one boiler may be the cause of only 5% of entrained moisture to be present while the water in another boiler, identical in size and construction, may cause 50% of entrained moisture to pass into the steam main.

For guidance in the amount of "KEK" to use, your attention is directed to diagram "3". This diagram indicates the amount of "KEK" required to prevent the passage of free moisture into the steam main. It is based upon the percentage of moisture present in steam.

If a steam-heating system as a whole is over 60% efficient, complaints of improper heating probably will not occur, providing proper provision has been made for the elimination of air. If the efficiency is less than 60% any or all of the heating difficulties previously enumerated may be experienced.

If a heating system for example is 57% efficient the most likely complaint would be that SOME radiators are slow in heating. By following line "A" on diagram "3" you will observe that one-fourth of a can of "KEK" will remove sufficient moisture in the steam to permit the efficiency of this boiler to rise above the 60% line. In the case of a condition as indicated on lines "B" and "C", one-half to one can of "KEK" will be required to raise the steaming efficiency from 55 and 50% respectively, above the 60% line. Line "B" indicated a condition where too much time is required to raise adequate steam to heat the connected radiation. Line "C" indicates a condition where there is enough steam available to heat slowly the connected radiation but where it is found impossible to raise steam pressure at the boiler. The drops in efficiency which occur between lines "C" and "D" create the complaints which are experienced by manufacturers of steam boilers, oil burners, automatic stokers, air valves, etc. Often such complaints take the form of a complete condemnation of the products of these respective manufacturers. On this basis such complaints are entirely unfounded because a conditioning of the boiler water would prove the water alone to be at fault and that the products of these manufacturers were in no way responsible for the inefficiency.

The amounts of money which heating and plumbing contractors could save themselves and these manufacturers as well as the losses of reputations which are sustained by all concerned, would a thousand times more than pay for the amount of "KEK" required to clear up the simple difficulties which cause most steam-heating troubles.

Line "D" indicates a very bad boiler condition where large quantities of make-up water are required,—where hammering and knocking occurs in mains and risers,—where water leaves the boiler and does not return, and where radiators fill with water and air valves fail to function. The three cans of "KEK" specified for this condition are based on a steam boiler containing 60 gallons of water, where no other boiler cleaner or water treating compound has previously been used. In the event that foreign cleaning compounds had previously been used in the boiler an additional quantity of "KEK" will be required to kill off their actions. In conditioning such a boiler the water will become very thick and dirty and it will become necessary to draw off this dirty water and refill until the water remaining in the boiler is reasonably clear. This drawing and refilling operation should be done while the boiler is in steaming condition. After it has been completed a small amount of "KEK" as indicated at E—E' (diagram 3) should be added to correct the contaminated condition of the new make-up water.

Once the boiler has been properly treated with "KEK" only dry moisture free steam will be liberated and the efficiency of the system as a whole will continue to improve until the inner surfaces of the piping are rendered dry or free of excess moisture, which should require approximately one-half hour. At this point maximum steaming efficiency will be attained. Each new supply of make-up water which is required will again decrease the steaming efficiency in proportion to the amount of contamination that it contains. When the efficiency of a system again drops below 60% only a small amount of "KEK" will be required to restore the steam to a dry and efficient state as before.

"KEK", when used as directed, is guaranteed not to in any way injure the metal of a boiler or any auxiliary attachments which are part of the heating system.

KEK

OTHER PRODUCTS

Kenite Joint Compound, (In paste form)

Kenite Joint Compound, (In powdered form)

Kenite Oil Pipe Plastic

Kenite Boiler Repair, Odorless

Kenite Storage Tank Cleaner

Kenite Soldering Paste

Kenite Plumber's Soil

KENITE LABORATORY INC.

83 Murray Street

New York, N. Y.