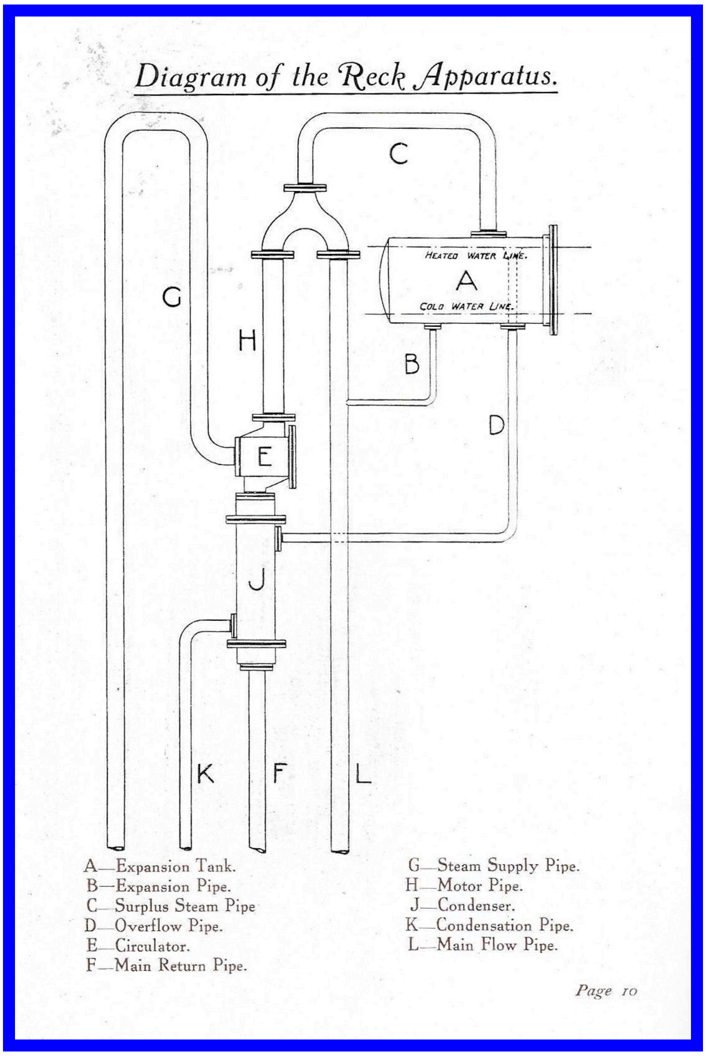
PUMPS & PUMPING MACHINERY
1500 BC-1960

Reck and Barker Circulators



1911

AB Reck

From Wikipedia, the free encyclopedia

AB Reck	
Born	September 1, 1850
Death	October 19, 1927 (77 years)

Information with the symbol retrieved from Wikidata .

Source references are available together.

[edit on Wikidata]

Anders Borch Reck (September 1, 1850 in Sakskøbing - October 19, 1927) was a Danish officer, engineer and businessman, founder of Reck's Heating Comp.

He was born in Sakskøbing, where his father, Christian Frederik David Reck, was a district doctor. The mother was Jacobine F. Kornerup. He graduated from Roskilde Cathedral School in 1868 and took the year after philosophy , but then entered the military road. In 1871 he became a second lord in the foothills and 1874 premier lieutenant in the engineering corps . However, his interest was now caught by heat and ventilation studies , for which he made various trips to France , Germany and Sweden . In 1878 he entered a number in the Engineering Corps and became a practical heating and ventilation engineer.

In *the Journal of the Technical Association* (I, 1877-78) he published a longer article: *How should we best ventilate and heat our schools, prisons and the like. Buildings?* The business thus started became a matter of importance, why he resigned from the military office in 1882 , to which he was only attached at 1885 to be appointed captain of the engineering corps's reinforcement. The furnaces designed by him were rewarded at several exhibitions at home and abroad, thus with a gold medal at an international hygienic exhibition in London in 1884 , and one of his last special fuel-saving furnaces is a Danish woodworking oven-designed magazine furnace with a fire department for firewood, peat and similar flammable fuel.

In particular, it has been mentioned that he has performed a number of heating and ventilation systems in public buildings, eg the Reichstag building , the exhibition building at Charlottenborg , Frederiksborg Castle , Marmorkirken , etc., to which there are still a number of improved disinfection plants to which the Ministry of Justice gave the impetus in 1884 that send him to Germany to study disinfection. The company founded by him was converted into a limited company , Reck's Heating Company, for which he was the director in 1898 .

He died in 1927 . He is reproduced on the group portrait of the *men* of *Industry* by PS Krøyer .

these are cheaper and lighter than 4½-inch brick walls, and cost less. Wood studding would not prove so satisfactory, as it is not fire-resisting. These blocks are built in cement and plastered ready to take distempering or painting, whichever is preferred.

The wardrobe parts and other woodwork might be in deal or whitewood painted and enamelled or stained and varnished; these would be panelled to match the doors, and the internal fittings to wardrobe might consist only of hanging hooks and hangers, or more elaborate shelving and divisions, as described on page 80 of our issue of October 21, 1911.

The bedstead would be of the usual "Nurse" type in iron, but enamelled white instead of the usual black or dark green, as everything in the room should be light and cheerful. One easy chair should be provided and one square bedroom chair of the usual cane type.

The floor-covering must be sanitary and easy to clean. Probably a good stout linoleum cemented to the concrete floor will best fulfil these requirements.

The Reck System of Heating.

The advantages claimed for this system, which is named after the Danish engineer who invented it, are that it can be combined with almost any system of ventilation, that the cost of installation and of upkeep is less than that of an ordinary hot-water system, and that by means of regulators, the heat in the various rooms or portions of the same building can be altered at will. In addition, both heating and cooling can be effected very quickly.

In the Reck system a constant and rapid flow of water is ensured by means of a circulator, between which and the radiators flow and return pipes are fixed in much the same way as in an ordinary gravity system. The water is partially heated by low-pressure steam in a "re-heater," to which the flow and return pipes are also connected. Above the highest radiator an expansion tank is fixed, and to this the water in the flow pipe is taken before beginning its work of heat distribution through the building. A few feet below the expansion tank is fitted (on the flow pipe) the patent circulator. Through this low-pressure steam is forced, and this causes the water in the pipe, between the circulator and the expansion tank, to boil. A condenser is fitted on the ascending flow pipe just below the circulator, and the steam discharged above the water line in the expansion tank is condensed by the partially heated water coming from the re-heater. The over-balancing effect obtained by the difference in weight between the water mixed with steam in the ascending flow pipe, and the water without steam in the same length of descending flow pipe, is sufficient to cause a circulation about four times as fast as that obtained in an ordinary gravity system.

This rapid circulation ensures the quick heating and cooling to which reference has already been made, and it also renders it possible to use supply piping of much smaller bore than has hitherto been required. However unfavourably the radiators are placed, whether by distance from the heater, lack of height over it, or even should they be placed below the return pipe, their fullest efficiency is secured. In addition, radiators 10 or 15 per cent. smaller than is usual may be relied on to give a perfectly satisfactory result. By this means a reduction of about 40 per cent. in the amount of water in the system, from that required in an ordinary gravity system, is obtained. There is no waste in fuel consumption, and the steam which accelerates the circulation at the same time heats the water in the circulator and the condenser.

A pressure of from 3 to 6 lb. is required, and may be obtained from high-pressure boilers and reduced, or if the hospital has separate pavilions a low-pressure boiler may be installed in each. Any temperature between 100° F. and 185° F. may be obtained, but the piping is usually designed to give a mean pressure in the radiators of 185° F. when maximum work is required from the apparatus. Sectional regulators may also be fixed, and each radiator may be controlled by valves on the inlet and outlet connections.

The cost of installation and upkeep will also be found to compare favourably with that of other systems. We are indebted for the above particulars to Dr. Mackintosh's book on the "Construction, Equipment, and Management of a General Hospital."

Buildings Contemplated and in Progress.

Brighton.—It is proposed to complete the Throat and Ear Hospital as originally intended by the erection of an east wing at a cost of £2,000.

Bridlington.—On the advice of the medical officer the Town Council are considering the advisability of erecting a sanatorium.

Cardiff.—The Cardiff Guardians have acquired land upon which to erect a new infirmary and possibly also a phthisical block.

Croydon.—The Local Government Board have sanctioned the borrowing of £2,500 for the provision of a boiler house and heating apparatus at the Borough Hospital.

Carnarvon.—Three close tenders have been received for the erection of a new infirmary for the Guardians. The lowest is £6,848, the highest £6,896. The architect's estimate was £6,932.

Exeter.—The City Council are endeavouring to raise a loan of £15,500 for the extension of the Infectious Diseases Hospital.

Elham.—Forms of tender may be obtained from the architect, Mr. A. R. Bowles, of Folkestone, for the erection of a new female block and nurses' home at the Guardians' Workhouse, near Lyminge.

Edinburgh.—The Dean of Guild Court have approved plans for conversion of premises in Chalmers Street into a nursing home; £9,000 is the estimated cost of the works, which are being carried out under the supervision of Mr. T. D. Rhind, of Edinburgh.

Sligo.—The Guardians are about to have gas installed at the workhouse for lighting purposes.

HOT-WATER HEATING

ON

The Reck Patent Circulator System.

▽ ▽
▽

JAMES BOYD & SONS,

Heating Engineers,

PAISLEY.

And at 196, Great Portland Street, London, W.

Introduction.

THE system of heating described in the following pages was invented by Captain A. B. Reck, of Copenhagen. It was introduced into the United Kingdom early in 1903, being the first induced-circulation system to be applied in this country. The earliest contract of importance carried out on the Reck principle was for heating the Out-Patients' Department of the Western Infirmary at Glasgow. From the time when this installation was completed, and the value of the system shown, its growth has been steady, in spite of the fact that numerous systems have since been invented and placed on the market in competition with it. In 1911 there were upwards of 200 installations at work in the United Kingdom, representing a total radiating surface of more than 680,000 square feet.

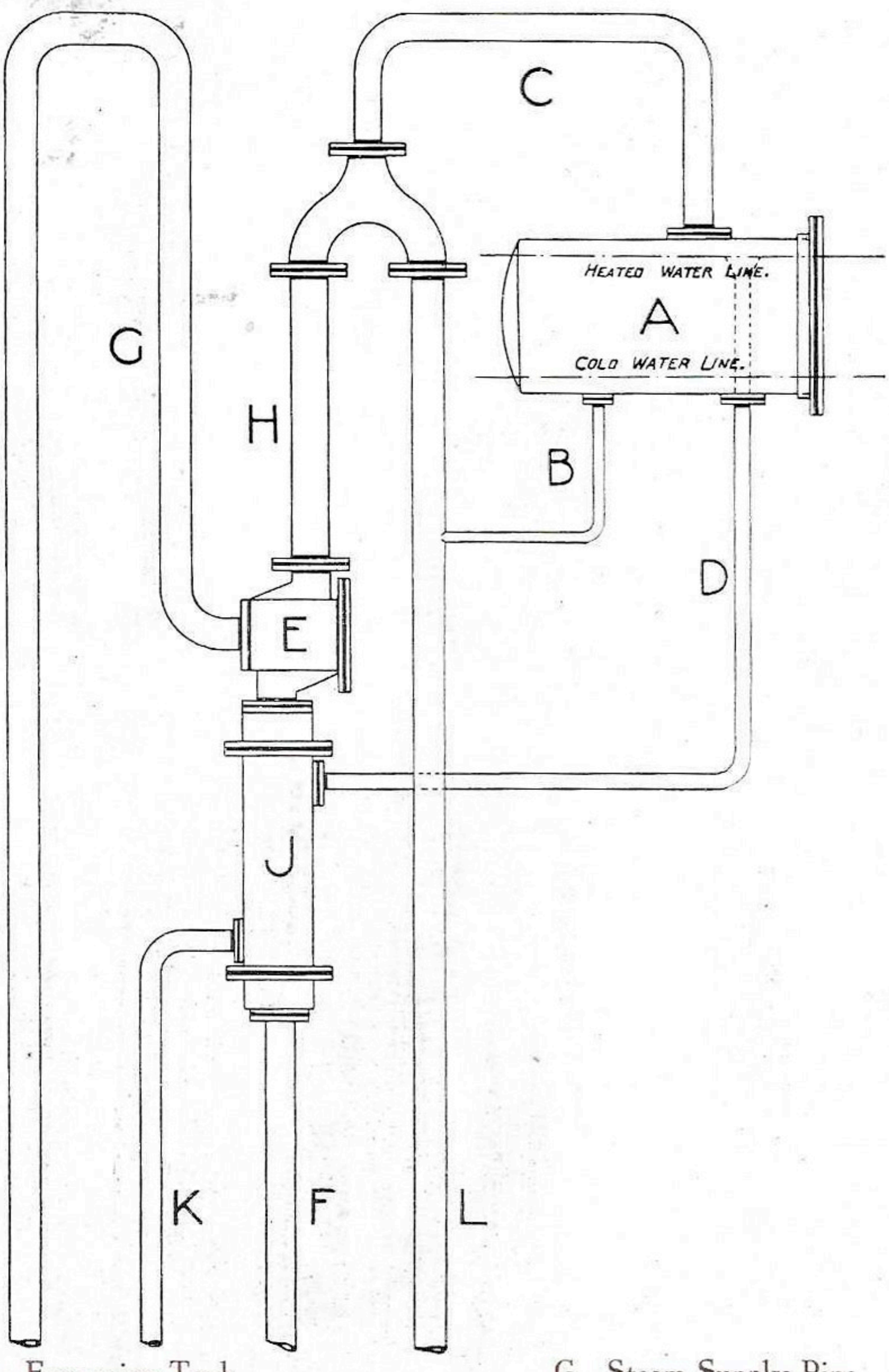
The fact that the system has grown to this extent should render unnecessary any excuse for making the statement that the Reck System is reliable and satisfactory in every way.

Although the principle of the Reck System has never been changed, the design and construction of the special apparatus have been modified and improved repeatedly. The knowledge and experience of leading engineers in every country where heating is used have been brought to bear on the subject of perfecting the system, until now every possibility of defect has been eliminated.

It is, therefore. with entire confidence that we bring the Reck System to your notice, feeling sure that its long and successful existence is its best advertisement.

JAMES BOYD & SONS.

Diagram of the Reck Apparatus.



A—Expansion Tank.
B—Expansion Pipe.
C—Surplus Steam Pipe
D—Overflow Pipe.
E—Circulator.
F—Main Return Pipe.
G—Steam Supply Pipe.
H—Motor Pipe.
J—Condenser.
K—Condensation Pipe.
L—Main Flow Pipe.

Description of the Reck System.

THE Reck System consists of a low-pressure hot-water heating apparatus, in which the water is heated, and the circulation is produced, by low-pressure steam. The source from which the steam is obtained is immaterial, so long only as it is supplied to the system at a low pressure.

The essential parts of the Reck System are the **Circulator,** the **Expansion Tank,** and the **Condenser.**

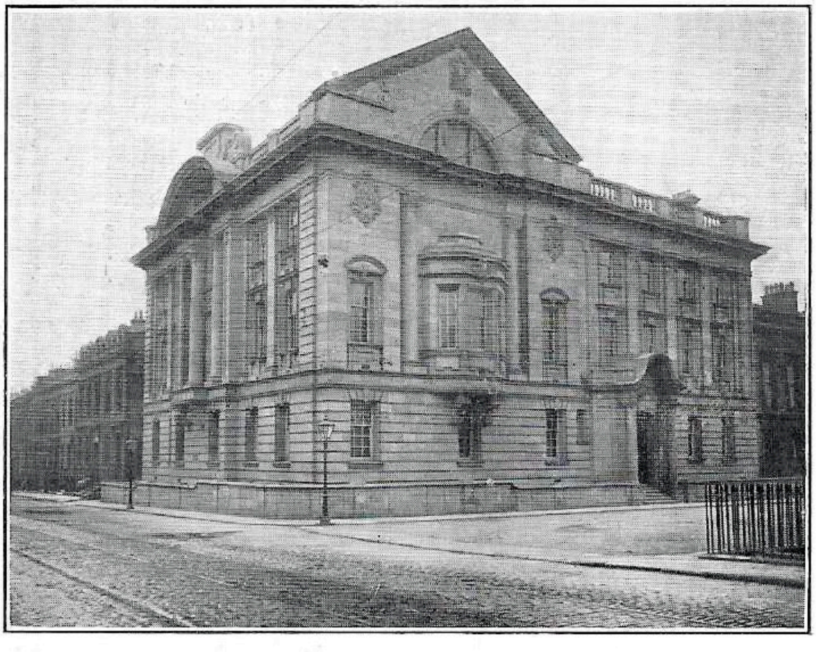
The Expansion Tank (A) is fitted above the highest radiators, as in an ordinary hot-water heating system. It acts simply as a receiver for the surplus water produced by expansion when the apparatus is heated, and for any surplus steam that may rise from the Circulator (E). It is connected to the heating apparatus by an Expansion Pipe (B), and by a Surplus Steam Pipe (C), and to the Condenser (J) by an Overflow Pipe (D).

The Circulator (E) is fitted on the main return pipe from the radiator system, at a point a few feet lower than the Expansion Tank (A). Its duty is to mix low-pressure steam with the circulating water. The Main Return Pipe (F) terminates at the underside of the Circulator (E), and the Steam Supply Pipe (G) is connected to the side of the Circulator. The steam inlet is fitted with a screen, or nozzle, inside the Circulator, so perfect in construction that steam is injected into the water without the slightest noise.

The normal water level in the system, when cold, stands an inch or two above the bottom of the Expansion Tank, so that the Circulator and the pipes in connection with it are full of water. When steam is injected into the Circulator, boiling takes place at this point, and there is naturally a very rapid movement of mixed steam and water upwards through the Pipe (H)—the "Motor Pipe." As this mixture reaches the top of Pipe (H), the steam and water separate by gravity, the steam passing over by Pipe (C) into the upper part of the Expansion Tank, whence it finds its way through the Overflow Pipe (D) into the Condenser (J). As the Condenser is inserted in the Return Pipe (F) at the coldest point, all surplus steam passing through Pipes (C) and (D) here becomes reduced to water, and is conveyed in this form through Pipe (K) to any desired point. In most installations this Pipe (K) is used as a feed pipe to the steam boiler, as, when it is so used, **all** steam condensed in the Circulator and Condenser returns automatically, providing a constant feed without waste, and so maintaining a uniform water level in the boiler.

When the steam is separated from the water at the top of the Motor Pipe (H), the water falls back by gravity into Pipe (L), which distributes it to the radiator system. Pipe (L) is, therefore, the main flow pipe to the whole heating apparatus, while Pipe (F) is the corresponding main return pipe, the two being linked up through the radiator system, forming a complete circulation, of which the motive power is the difference of weight between the Column (L) and the Column composed of (F) and (H).

As the column of mixed steam and water in the Motor Pipe (H) weighs only half as much as the corresponding column of pure water in the Flow Pipe (L), the immense power for producing circulation is apparent. It will further be readily seen that this power is only limited by the length of the Motor Pipe (H), while the steam pressure required is only sufficient to overcome the pressure of a column of water of the height of Pipe (H), or about $\frac{1}{2}$ lb. per square inch for each foot of height. The pressures employed vary from $2\frac{1}{2}$ lb. to $7\frac{1}{2}$ lb. per square inch, according to the extent of the apparatus, and it is therefore apparent that no specially-designed or expensive boiler is required.



THE INSTITUTE OF ENGINEERS AND SHIPBUILDERS, GLASGOW.

List of Installations in all Countries.

	Public Buildings.	Churches.	Hospitals	Asylums and Poorhouses.	Schools.	Hotels and Restaurants.	Business Premises.	Residences.	Ships.	Total.	
										Number.	Effect in Square Feet of Hot-Water Radiator Surface.
The United Kingdom	11	12	35	5	52	2	50	30	5	202	681,300
France	9		3	6	1	11	59	145		234	268,900
Germany	10	5	2		4		21	1		43	240,700
Denmark	12	6	28	11	9	6	33	16		121	240,600
Austria	9		9	2	5	6	12	7		50	163,000
Belgium	2						6	13		21	85,300
Holland	3		2		2		2	1		10	45,900
Spain	1						1	1		3	43,300
Sweden	1		1	3		3	9	2		19	39,300
Italy	2		1			3	2	5		13	32,500
Switzerland ...				3	2	1	3			9	32,500
Norway			1	2			1	7		11	27,300
Hungary	1						1			2	11,600
Finland	1									1	2,000
Russia							1			1	1,500
Greece							1			1	800
Portugal								1		1	800
United States ...	1			4			3	3		11	69,000
China			2			1	5			8	50,000
Argentina			3				5	26		34	43,900
Japan						2		4		6	18,400
Chili			1			1	1	1		4	5,000
Australia							1			1	2,000
Total	63	23	88	36	75	36	217	263	5	806	2,105,600

THE GEORGE A. CLARK TOWN HALL, PAISLEY.

The Reck System.

THE fact that hot water is the most suitable medium for warming buildings is so generally admitted that it would be superfluous to repeat the reasons for its preference. There are, however, many cases in which its installation becomes difficult on account of these three features :—

1. Its limited motive power.
2. Its absolute dependence on levels.
3. Its large and unsightly pipes.

The Reck System is put forward as the only safe and simple hot-water heating system which is free from these features.

Its motive power—the force producing circulation—is not limited, being created artificially.

Its circulation does not depend on levels; the boiler may be in the roof and the radiators in the basement.

Its pipes are of minimum size throughout.

In an ordinary gravity hot-water system, circulation is obtained by a difference of pressure resulting from a difference in temperature between the flow and return water. If, in a heating apparatus, the radiators on the ground floor are placed 11 feet above the boiler, the difference, assuming a flow temperature of 185° Fahr. and a return temperature of 135° Fahr., would be equal to the pressure exerted by a column of water about 2 inches high, or about $\frac{1}{14}$ lb. per square inch. This would represent the whole power available to overcome all the obstacles of friction and resistance in the entire apparatus up to the most distant of these radiators. In consequence, the movement of water must be slow, even though the pipes are large.

If the Reck principle is applied to the same apparatus, it is an easy matter to obtain a pressure equal to that of a column of water 32 inches high, or **sixteen times as great** as is possible with gravity only as the source of power.

This increased pressure might be entirely used by reducing the pipes throughout the apparatus—in other words, by increasing the resistance. Or it might be used to produce an extremely rapid circulation through pipes of large diameter. Both would have their advantages: the first in reducing the pipes to an absolute minimum, the second in furnishing an apparatus that could be heated in an exceedingly short time. Experience has shown, however, that it is unsafe to use extremely small pipes, on account of risks of breakage and stoppage. It has also been proved that the advantages of a very high circulation velocity do not repay the cost of large pipes.

In using the Reck System, therefore, the available pressure is consumed partly in reduction of the pipe sizes within safe limits and partly in increased velocity of circulation. The result obtained is that, while the piping is reduced to about half the usual diameters, the circulation is increased to about four times the usual velocity. The point arrived at in this way is that where the highest efficiency combines with the greatest economy.

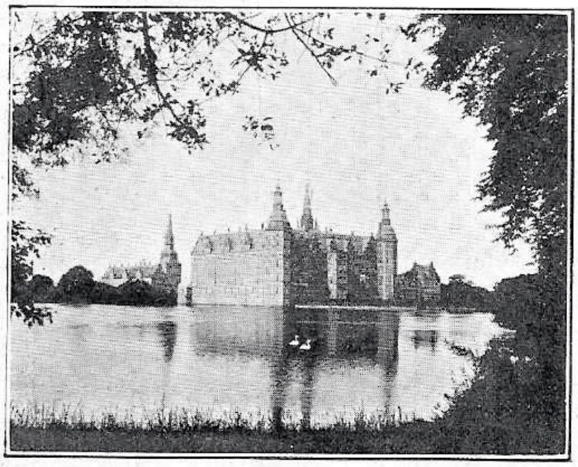
The advantages of the reduction in the sizes of the piping are:—

1. ***The pipes are more easily concealed, and the apparatus is less unsightly.***
2. ***Less cutting of floors and walls is required.***
3. ***The volume of water is materially reduced, and the quantity of fuel used in heating it is proportionately smaller.***
4. ***The initial cost of the apparatus is reduced.***

The advantages of the more powerful circulation are:—

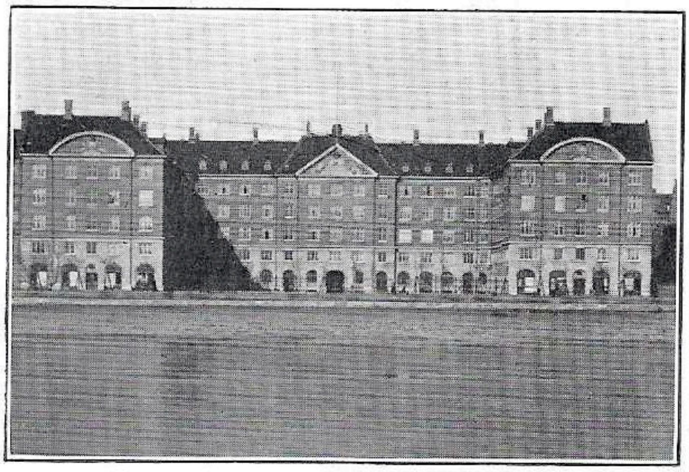
1. ***The boiler need not be at the lowest point in the apparatus.***
2. ***The pipes may be placed without regard to levels or gradients.***
3. ***Efficient circulation becomes assured at great distances.***
4. ***The heating effect is produced rapidly.***

There are many installations in actual use where these advantages are shown, and where the possibilities of the Reck System in overcoming difficulties are apparent. The following examples might be quoted :—



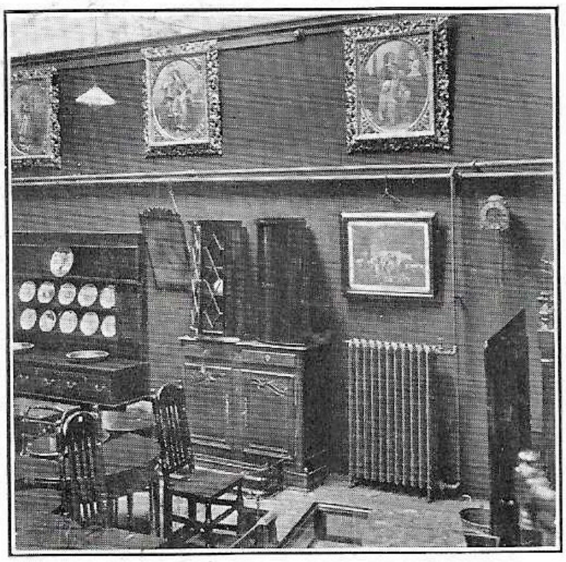
FREDERIKSBORG CASTLE, HILLEROD, DENMARK.

1. An old castle, which has been converted into a Museum, and which contains ninety highly-decorated rooms, has been heated throughout without cutting a single hole through the ceilings. The vertical main pipes are carried up in the walls of the staircases, and the distributing pipes, which convey heated water to the radiators in the rooms, are laid mainly under the floors, rising and falling as required by the different levels. Many of the radiators, containing 100 square feet of heating surface each, and placed at a distance of 100 feet from the vertical pipes, are working with flow and return pipes only ½ inch in diameter. This installation has been in constant use for more than thirteen years, without repair or adjustment.



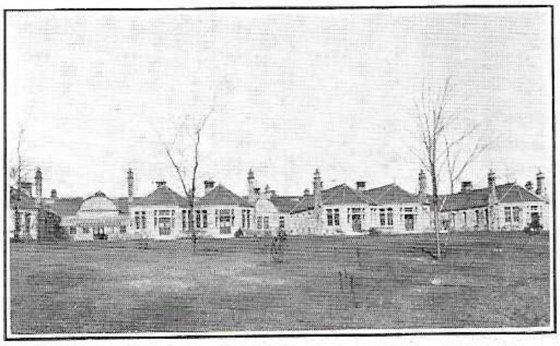
THE INSTITUTION OF CROWN PRINCE FREDERIC, COPENHAGEN

2. An Institution, which contains 250 rooms, is heated throughout from one central boiler room. The main pipes to each wing are over 200 feet long, each carry 5,500 square feet of heating surface, and are each only 4 inches in diameter. The most distant radiators are equal in efficiency to those nearest the boiler.



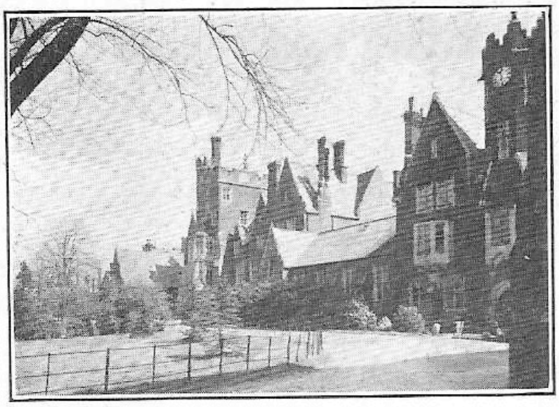
MR. WILLIAM POLLOCK'S SHOWROOM, SAUCHIEHALL STREET, GLASGOW.

3. In a large Art Showroom, the boiler is placed in an outbuilding about 10 feet above the showroom floor. The flow and return pipes are fitted horizontally along the walls at a height of about 8 feet from the floor, and are also used as hanging rails for pictures. The radiators, placed on the floor level, are all fed **downwards** from these pipes. In this case the entire heating apparatus is below the level of the boiler.



HOSPITAL AT GLENGALL ASYLUM, AYR.

4. Two different Hospitals, each one story high, have all the flow and return pipes above the ceilings, the radiators at the floor level being connected to vertical descending pipes. In these buildings the floors are not perforated at any point.



EPSOM COLLEGE, EPSOM, SURREY.

5. In a large College, six isolated buildings are heated from one boiler room. The main flow and return pipes, which carry 8,500 square feet of heating surface, are 5 inches in diameter, and run downhill to the various buildings, the boiler room being situated in the highest building.

Similar instances, where apparently insuperable difficulties have been overcome by the Reck System, might be quoted in large numbers, but probably the best recommendation of the system is to be found in the fact that it is now in use in

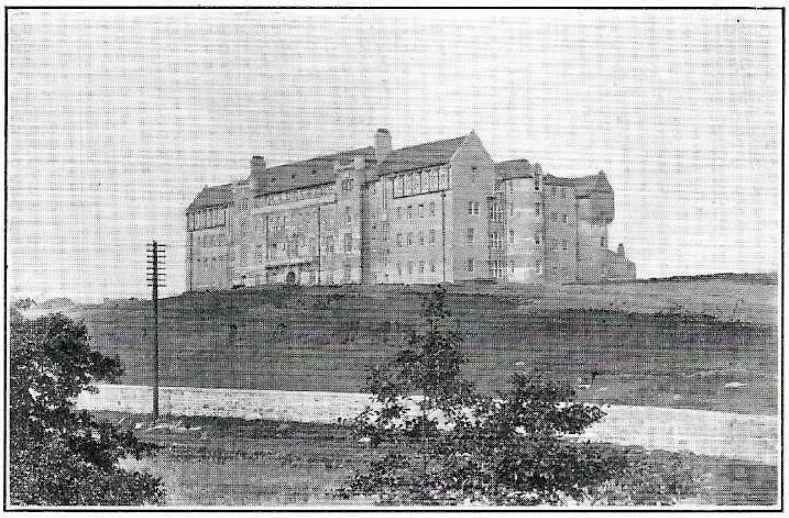
more than 800 buildings,

and that the demand for it is steadily increasing year by year, as its advantages become more generally realized.

It may be suggested that an equally "elastic" system of heating can be provided by applying circulating pumps to an ordinary hot-water heating apparatus. This suggestion would be correct up to a certain point, but it should not be overlooked that:—

1. ***Pumps consume power, while the Reck Circulator does not.***
2. ***Pumps are liable to break down, while the Reck Circulator is not.***
3. ***The attendant of a pumping system must have some mechanical knowledge, while the attendant of a Reck System needs none.***

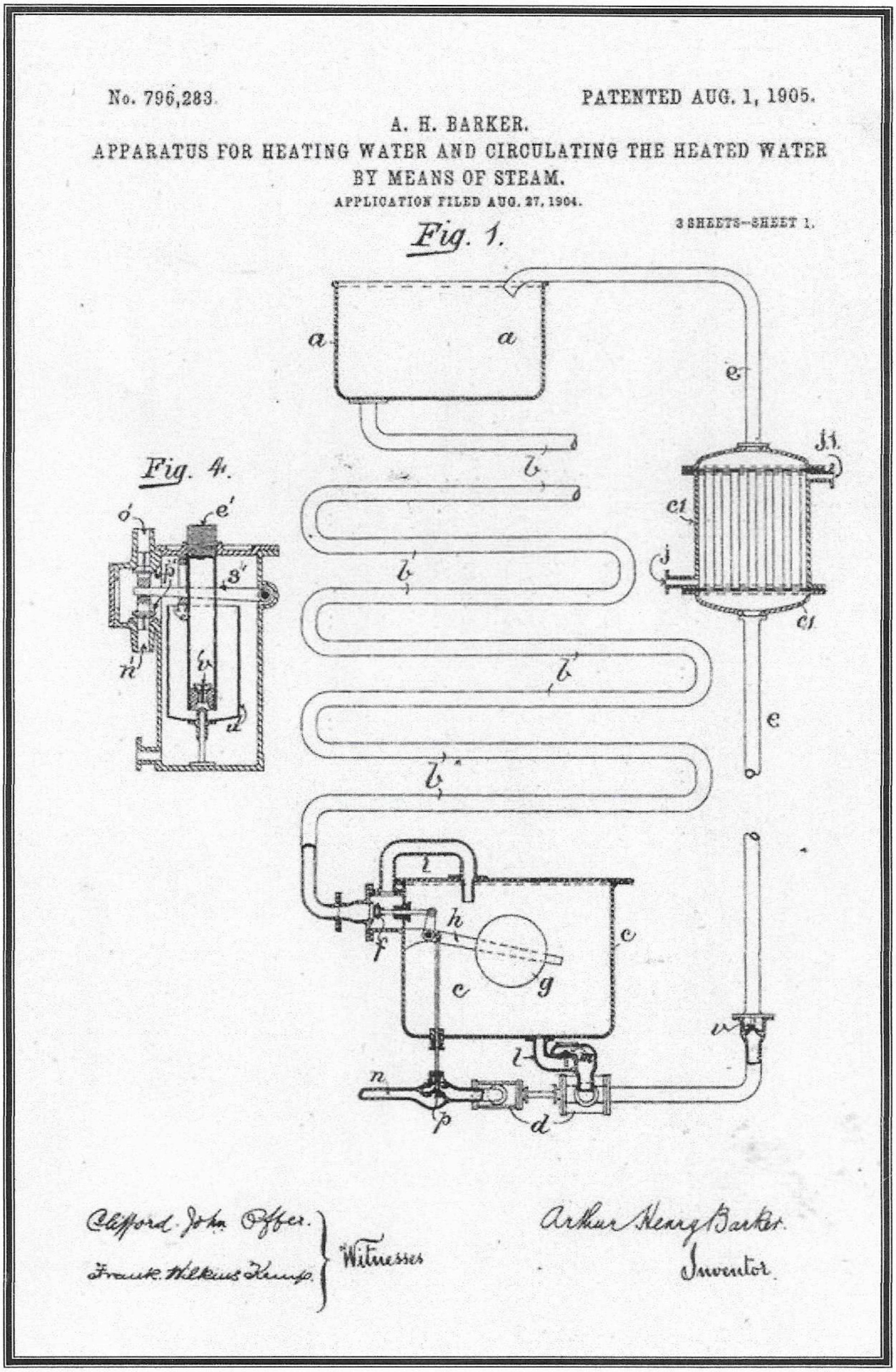
It must be borne in mind that, while the Reck Circulator does the work of a pump, it contains no mechanism, no moving parts; that it does not wear or deteriorate with extended use; and that it requires no skilled attention. The method by which such a result can be obtained is explained in the following pages:—



QUEEN VICTORIA MEMORIAL SCHOOL, DUNBLANE.

Arthur H Barker 1870-1954, President IHVE 1922-23

Arthur Barker was born in Pontefract, Yorkshire, in May 1870, the son of W Hurst Barker JP of Castle House. At the age of 15, he won the Salt Scholarship to the University of Leeds. Next, he was awarded two Whitworth Scholarships, taking the first place in two successive years and obtained both Science and Art Degrees at London University. He went on to have a long and distinguished career in both industry and in education.


No. 796,283. PATENTED AUG. 1, 1905.

A. H. BARKER.

APPARATUS FOR HEATING WATER AND CIRCULATING THE HEATED WATER BY MEANS OF STEAM.

APPLICATION FILED AUG. 27, 1904.

3 SHEETS—SHEET 1.

Clifford John Offer.
Frank Wilkins Kemp.
Witnesses

Arthur Henry Barker.
Inventor

Barker's US Patent of 1905 for his Accelerator

BARKER

ON

HEATING.

THE THEORY AND PRACTICE

OF

HEATING AND VENTILATION

BY

A. H. BARKER, B.Sc., B.A. (Lond.),

Senior Whitworth Scholar, 1895.

Consulting Engineer; Managing Director of J. F. Phillips & Son, Ltd., Heating Engineers, Queen Anne's Chambers, S.W.; Lecturer on Heating and Ventilating Engineering at University College London, and at London County Council Technical Institute.

Member of Council British Institution of Heating and Ventilating Engineers; Member of American Society of Heating and Ventilating Engineers.

AUTHOR OF "GRAPHICAL CALCULUS," "GRAPHIC METHODS OF ENGINE DESIGN," "MANAGEMENT OF SMALL ENGINEERING WORKSHOPS," &c., &c.

LONDON:
THE CARTON PRESS, 199, STRAND, W.C.
1912.

beginning and end of those two pipes, *the pressure being measured when the water is flowing*. This aspect of circulation will be further considered in a later chapter.

If there is no circulation to some particular radiator, the practical cause of it may be obscure, but of the physical cause there is no possible doubt, namely, that owing to some such reason as above described, the pressures at the beginning and end of the pipe are the same. Any cause, therefore, which will disturb that balance will be sufficient to start circulation in the pipe.

Other Methods of Producing Circulation.

There are other more artificial methods of causing hot water to flow through pipes which are all incomparably easier to understand than the natural system explained above.

All these methods consist of producing and maintaining a head of water greater on the flow pipe than on the return pipe. Any simple method which will bring about this end may be employed for maintaining the excess of pressure which is a fundamental necessity for the continued circulation.

Common methods for causing water to flow in pipes can be and are extensively used, such as reciprocating pumps, centrifugal pumps, injectors. There are also several other well-known means or systems which have been specially devised for provoking a circulation, such as the "Cable" or "Barker" system, the Æro system, the Reck system, the Bruckner system, the Beck system, and others. All these systems produce a difference in pressure between the flow and the return pipe fixed at the same level, much greater than the difference produced by the ordinary difference of specific gravity of the water, which is the fundamental principle on which the ordinary or natural system of circulation works.

Analysing these different methods, it will be found that the result of each one is merely to increase the pressure in the flow pipe, or to decrease that in the return pipe, or both.

1. *Reciprocating Pump*.—Functionally this is in reality a means of alternately expanding and contracting chambers in connection with the flow and return pipe respectively, combined with non-return valves, such that the water can only flow one way round. The expansion decreases the pressure in the return pipe by taking water from it, and the contraction increases the pressure in the flow pipe by forcing more water into it.

2. *Centrifugal Pump*.—This also produces a suction on the return pipe, and an increased pressure on the flow pipe, by means of the rotation of a disc or fan within the water itself, in such a way as to force water from the return pipe to the flow pipe by centrifugal action.

3. *An Injector* produces a similar result by an induced current formed by blowing a jet of steam into the water at a high velocity.

4. *On the "Cable" or Barker system* the pressure in the return pipe is reduced by connecting the return pipe with a chamber containing steam at a very low pressure, which condenses the steam and heats the water at the same time. By producing and maintaining a partial vacuum in this chamber the pressure in the return pipe is reduced. The apparatus then lifts the heated water by steam pressure to a tank at a higher level, which tank is in connection with the flow pipe, thereby increasing the pressure in the flow pipe, and simultaneously decreasing that in the return pipe.

The Reck system decreases the pressure in the return pipe only, by blowing steam into the rising portion of the flow pipe, thereby substituting for a solid column of water an emulsion or mixture of steam and water, thereby raising point *D*.

The Bruckner system effects the same end in a somewhat different way, by boiling the water in the rising portion of the main flow pipe, thereby generating steam bubbles in it and making it lighter.

The effect of any of these methods in producing rapid circulation or accelerating the circulation, depends on the degree to which the pressure in the flow pipe is increased over that in the return pipe, and the dimensions of the pipes are determined to correspond with the excess of pressure.