

**Walker's handbook on domestic hot water fitting, explosive and non-explosive.**

**Contributors**

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WALKER'S HANDBOOK  
ON  
DOMESTIC  
HOT WATER FITTING,  
*Explosive and Non-Explosive.*

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# →‡ CONTENTS. ‡←

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	Page.
Our Explosive Hot Water Principles analyzed and the causes of their explosions explained.    ..    ..	4
The Non-Explosive Principle, how it is constructed and how to fix it.    ..    ..    ..    ..    ..    ..	1
How to alter from the High Pressure Principle to the Non-Explosive.    ..    ..    ..    ..    ..	16
How to alter from the Worm Principle to the Non- Explosive.    ..    ..    ..    ..    ..    ..	16
How to alter from the Circulating Principle to the Non-Explosive.    ..    ..    ..    ..    ..    ..	17
How to alter from the Cylinder Principle to the Non- Explosive.    ..    ..    ..    ..    ..    ..	17
The Non-Explosive Boilerless Principle.    ..    ..	19
The Double Boiler Principle and the vent pipe <i>j</i> .    ..	20
The setting of Back Boilers.    ..    ..    ..    ..	24
The Boiler Bed and Back Boiler-    ..    ..    ..    ..	25
The prevention of Explosions connected with defective Principles. General and concluding remarks.    ..	26

## OUR EXPLOSIVE KITCHEN BOILERS, &c.

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**W**HEN shocked by the casualties of the last few Winters, it must have seemed strange to others as it did to the Writer, that in the year 1891, no Principle of Hot Water Supply existed, that would give an adequate supply, and still be free from the danger of exploding.

Yet it is a fact, and hundreds of practical men know that all our approved methods of Domestic Hot Water Fitting have hitherto been dangerously defective; even the uninitiated need no proof of this, our Newspapers have too often of late recorded many dreadful disasters which are terrible to persons immediately concerned, yet frequently treated with apathy by many who have not yet been blown up.

It is an error to think that there is a difference in those mechanical arrangements that have exploded and those that have not, there are hundreds of apparatuses working apparently all right to-day, and have been working throughout the Winters, that are exactly like those that have been blown to pieces, as far as their mechanical arrangement is concerned, and they are being put in just the same way by the dozens every day.

Two houses may be fitted up exactly alike, at the one time, and at equal cost, and be done by the one first-class Plumber; one arrangement explodes the other does not, Why? the causes are numerous, I will give you one or two of them.

A keen frost is on, a breeze is blowing, and in its natural direction to-night, the wind strikes on the upper part of your neighbour's house, sweeps through the Attic and plays around the Store Cistern and Feed Pipe; the Exhaust or Steam Pipe with its nose above the roof is well blowed; you are comparatively sheltered to-night, that wall over there always did protect your back (or the back of your house) when the wind howled from that direction. And little does your neighbour think on the following chilly morning, as she piles on the coals and draws out the Boiler damper, that before dinner time

arrives there will be no oven or grate to cook dinner in, and little did you expect to find your neighbour's Back Boiler in the middle of your kitchen floor when you came home that evening. We will leave out the melancholy side of these cases.

The fact is, that owing to the relative situations of the two houses and the direction of the wind, the cistern and pipes of your less sheltered neighbour were frozen and yours were not, and the Boiler reported accordingly.

Some houses are very cold in their upper parts, and are soon affected by frost, in other houses you can smell the heat, &c., of the kitchen when on the top Landing. Two houses may be built alike, and fitted up on the same principle, generally speaking, and still differ in point of safety, because they still differ in many things more or less important in Winter, such as the number of fires kept; the amount of gas burnt; the positions of the cisterns and the pipes with regard to receiving the warmed atmosphere of the interior, for in some houses the cisterns never derive any benefit from interior communicants of heat, whilst in other houses owing to their favourable position, they are out of all draught; and the comparatively warm atmosphere of the interior prevents freezing under most circumstances.

It would be economising to pay more attention to the housing of Cisterns and circulating Pipes generally. There are some Boilers never *Burst* because they never *Boil*; fire up as you may; this saves the lives of a great number in Winter, but prevents them from washing themselves so comfortably in Summer. These Boilers only suit one Season. Other Boilers are always on the sing and bubble; this indicates, of course, that the heat of the fire acts quickly on the water and the contents can be easily raised to boiling or *danger point*, this is the kind of Boiler that generally spouts at the Steam Pipe, when this steam pipe is not trapped, for often steam pipes are trapped in the fixing, thoughtlessly, and sometimes vibrate themselves loose and become trapped by dropping out of position, consequently the ascending of the heated water and steam is rendered almost an impossibility, and the circulation or rising of hot water in the Steam or

Outlet Pipe can only take place when a great heat and a great pressure of steam are brought to bear upon the obstructing cold water in the trapped pipes; this unnatural action puts a strain on Cylinders, Boilers and Pipes, which they were never intended to bear, hence we have steam spouting out of taps instead of water, Cylinders and Pipes rattling and shaking with this dangerous internal force which is simply *Steam fighting for an outlet under difficulties*. It will be plainly understood that those Boilers that are easily boiled are to be leared the most when the steam outlets are obstructed in any way. Fortunately it takes a most tremendous pressure to burst a Kitchen Boiler or explosions would be more frequent, and the extraordinary resisting power which the ordinary Boiler possesses, is self evident from the fact of its being able to keep the steam within bounds until it generates the power to drive out a Kitchen Range complete and blow out a Gable.

If there were any possible means of discovering how many Boilers are *very near* exploding every Winter, I have a notion that it would create a general scare among Householders.

What is known as the High Pressure Principle has, for many years, been condemned by all competent authority; what is known as the Circulating Principle, is an improvement on the High Pressure, but inferior to the ordinary Cylinder Principle; therefore if an alteration and improvement were desired, and the last named Principle substituted; you were then supposed to be up to date and out of danger.

Now the fact is—although a great improvement has been made by this alteration, the danger is only lessened, and although you are not so likely to be blown up by the Kitchen Boiler; you might be cannoned off to Eternity quite as promptly by its deputy and companion the Cylinder; for, now the Cylinder itself takes the matter in hand, and it has two peculiarities full of potency.

There is the *Cylinder Collapse*, and there is the *Cylinder Explosion*, each produced by exactly opposite forces; viz., a blowing in by air, and a blowing out by steam, the first being a flattening of the Cylinder sides

under the pressure of the atmosphere, after the inner water and air have been partly or wholly driven out by the action of heat ; the flattening being in proportion to the amount of air rarefied and driven out of the Cylinder, or, in other words, the proportion of vacuum created.

Of course a Cylinder might be made in various ways sufficiently strong to resist the outside pressure, but the defective action of the Principle or *cause* of the Collapse would exist still ; we will try and remove the *cause*.

With regard to the Cylinder explosions, almost everyone knows the common cause ; viz., steam pipe blocked, water boiling, a tremendous force is brought to bear on Cylinder and back Boiler, no outlet for steam, an internal struggle goes on between the two for a short time, another case of survival of the fittest, and away goes the Cylinder or its contents through the gable or elsewhere.

In Liverpool a Cylinder was driven out of an Hotel, high over the house tops, and after travelling ahead a long distance at great speed, dropped down into the Central Railway Station, a flattened mass of copper. See Liverpool papers May 14th 1891, and "Liverpool Echo" May 13th, 1891. The writer mentions this case, as it shows the tremendous power of steam that can be generated with a Cylinder and a closed Boiler ; but he purposely refrains from giving full particulars here, of any special case or disaster as he would have to deal with personalities associated with melancholy circumstances ; which would be very unpleasant and hurtful to the feelings of those concerned in the cases referred to. You may put what is called a Safety Valve, on your Boiler or your Cylinder, and sit by the fire to see how it acts, and you will be perfectly safe—if it work all right.

I have a notion that the feelings of the sitter would be even more strained than the feelings of Carlyle were, whilst sitting in his study, painfully anticipating the next crow of his neighbour's rooster ; the Inventor prefers to give you uncontrolled clear outlets, the principle of a Steam Valve in a house is abhorrent. As steam *force* is not required for domestic purposes ; and as all the required

heat can be got with absolute safety; the Inventor has not attempted to control or regulate, that dangerous force, but has entirely abolished it, by substituting a Principle far superior in action, unattended by any straining, clicking and vibrating of pipes, and entirely free from any possibility of Explosion. Before introducing to your notice the Non-Explosive Principle I will call your attention to a serious danger which exists in all other known arrangements both new and old. The most common cause of explosions being already mentioned, there still remains the other cause hitherto unmentioned, viz. when the water supplies to Boilers are stopped by frost or other causes, the Boilers often become empty, and have been known to get red hot at the front and owing to the water coming on at such a time and passing into hot Boiler, great damage has been done thereby. A Boiler would soon become dry and red hot, especially where it is a small one at the back of a Closed Kitchen Range, if Supply Cistern or Cylinder run dry.

There is nothing to prevent accidents occurring this way in the Worm Principle, the Circulating Principle, the Cylinder, or any other known Principle Old or New.

The Non-Explosive is the first and only principle that abolishes this great danger. Experienced Plumbers always have advised the fixing of the Cylinder Principle, as it possesses the advantage of giving a reserved supply to Boiler when the water is off, and they fix the Cylinder in such a manner that the contents cannot be drawn out when the supply pipe is stopped, therefore it takes a longer time for a Boiler to become dry if the Cylinder be properly connected, as the contents of the Cylinder should be lowered *only by the evaporation of water in the Boiler*. It is scarcely credible, but still quite true, that there is a Plumbing Patent and the arrangement is such that the whole contents of both Cylinder and Store Cistern can be run off direct without any syphoning but simply by ordinary use of any of the taps; and there are eight taps shown in the Official Drawing of the Patent, and through any one of these the Cylinder may be run dry any time the main supply may be off.

In the drawing referred to with its accompanying

Specification, Plumbers will find the Cold Feed to Cylinder put in at the top, and the Hot-Draw-Off-Pipe taken out of the bottom, and the Cold Feed is connected to Cylinder in such a way that the top part and crown of the latter must always be empty and air bound.

How the water in Store Cistern will remain cold; why the water at the bottom of Cylinder is considered to be the hottest; why the Cylinder should be emptied when the hottest water could be taken from the top and the Cylinder still kept full; these and many other things in this arrangement, similarly profound, will never be understood by those who understand Plumbing.

The Boiler attached to this fixing and claimed as original was a double boiler patented before by somebody else, here claimed by mistake most likely; also the Old Worm with its Regulating cistern which is sketched out and claimed as a *Modification of the invention*; another mistake most likely. But how much better would it have been had this Inventor given some intelligent Plumber's Boy a private view and received some practical information, before making the comicality more public by a most stubborn yet futile attempt to stop the progress of others with an arrangement like this.

There was a society or so called Academy hailing from France that offered to confer a Gold Medal upon the Writer, along with a First Class Diploma of Merit, their terms were generous to themselves; they scattered their honours broadcast, at so much per head, the Diploma *a piece of paper*, you could have for nothing, the Great Gold Medal (Gilt) they would send *along with the Diploma* when you made a simpleton of yourself by sending them the required purchase money; no Money no Medal! The writer felt that the honour was more than he was built to carry so declined it with awe.

Of course, a great Inventor must claim a Medal of some sort also, the gilt side may pass for gold to others even though the leather side rests on the ribs of the conscience.

When one sees this guilty honour advertised by the *purchaser* as an honour conferred, its comical side reminds him somewhat of the historic deeds of good old

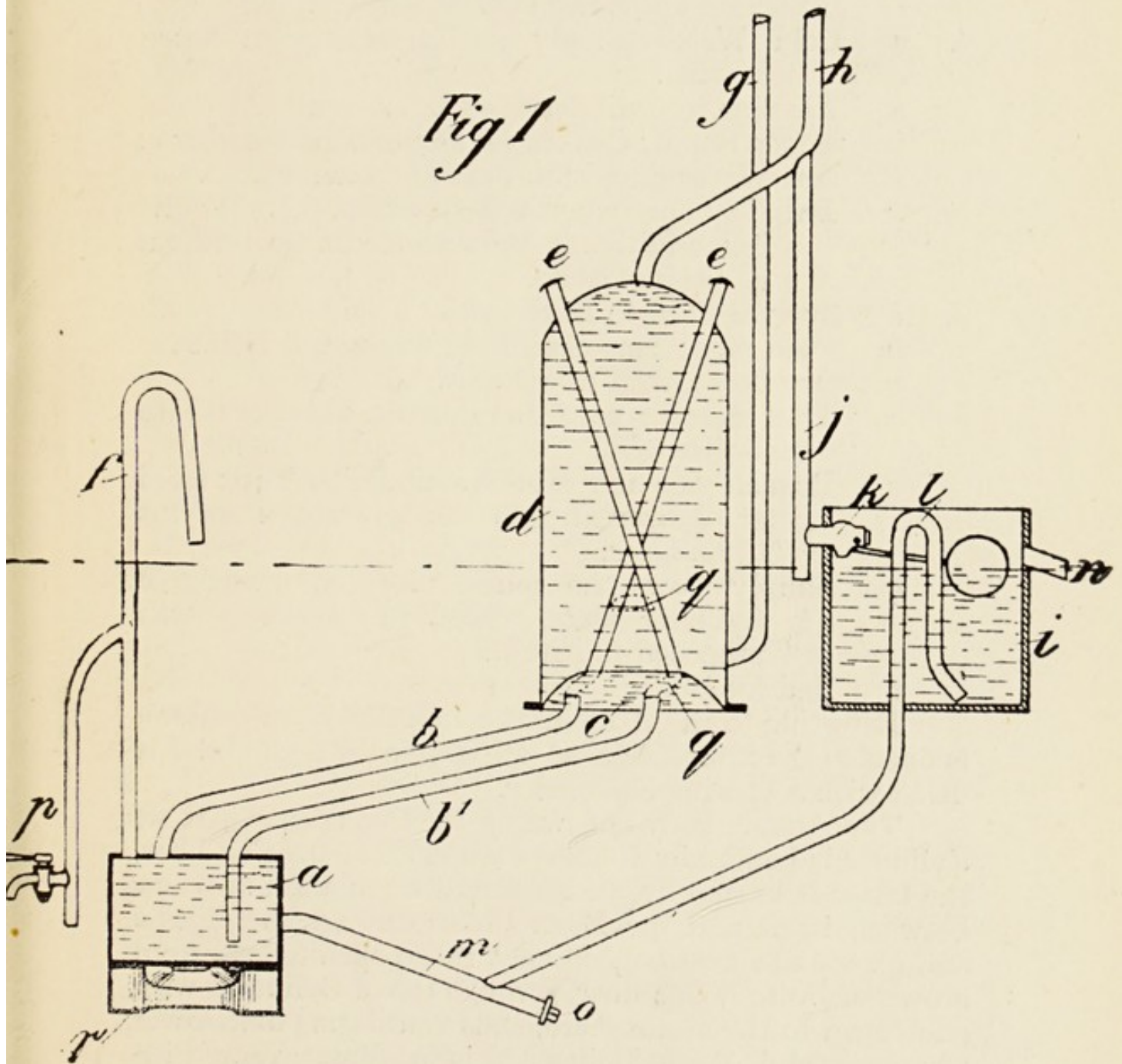
Ally Sloper, and most fittingly finishes the *reductio ad absurdum*.

There is a standard by which mechanical things can be accurately measured and tested; you may blind a man in the case of a box of pills, if you soft soap the pill aperiiently, and the wrapper editorially; they will both go down, but it is different in things mechanical; the analytical mind of our modern clever Artizan, soon weeds out the useless, when he turns his attention to the set object of doing so. The Writer does not mean that every Mechanic can do so individually; but a small Committee of Mechanics would soon relegate some novelties to their proper places, and the communion of minds bent on a subject connected with their own trade would soon bring about a correct solution of even a very knotty problem. No man who wishes for such approval as he might be justly proud of, or wishes to be informed of his mistakes that he may remedy them, would ever object to submit to this proper ordeal; and he would be foolish in thinking that that which is justly condemned by Specialists can or ought to be crammed down the throat of the General Public, by bogus medals or misrepresentations.

To go back from digression to the subject proper, it will be understood that a Boiler is in a dangerous condition when its supply cylinder has run dry, and there remain only the contents of the small Boiler to evaporate before it gets red hot itself; and should it boil dry; get hot; and the cold water rush in owing to a thaw;—water turned on—water thrown in cistern—or by any other cause, the damage is done in an instant; there is here the danger of collapse also. In the Non-Explosive this cause of explosion is removed, the old method of feeding Back Boilers is abolished, and a feed pipe so constructed, that no water will run into Boilers when they are not in proper condition to receive it; thus a perfect safeguard is provided against water suddenly coming on by any means whatever—it may run into the cistern but cannot pass out of cistern into Boiler if the latter be empty, and there is no tap or pipe by which either Cylinder or Boiler can possibly be emptied.

# Walker's Steamless and Non-Explosive Principle.

*Fig 1*



- a* Low Pressure Back Boiler—"Non-Explosive."
- b* and *b1* Flow and return pipes 'tween Boiler and Chamber.
- c* Heating Chamber of Cylinder.
- d* Hot Water Cylinder—Steam condensing and "Non-Explosive."
- e* Two vent pipes for Back Boiler and Heating Chamber—Steamless.
- f* Direct vent pipe from Boiler—Steamless.
- g* Cold Water Supply to Cylinder from Store Cistern.
- h* Air pipe to Cylinder open at extremity.
- i* Safety Supply Cistern for Boiler and Chamber *c*.
- j* Hot Water Supply to Small Cistern.
- k* Ball Tap open when water lowers in Boiler giving additional vent to Cylinder without emptying same.
- l* Syphon Feed to Back Boiler.
- m* Feed pipe; continued from Syphon to Boiler.
- n* Overflow; fixed below crown of Syphon.
- o* Trap Screw; used in starting safety feed to Boiler.
- p* Branch pipe and Hot-Water Boiler Tap; fixed at proper height to prevent emptying Chamber *c*.
- q* Simply shows the course pipes would take if Cylinder were heated in another way proposed in patent.
- r* Bed for Boiler.

Referring to the Sketch, the Low Pressure Boiler *a* is open to the atmosphere at all times, the Cylinder *d* is fitted with a heating chamber *c*.

The main body of water in the upper part of Cylinder is heated by contact with the Heating Chamber, the latter is heated by the continual circulation of water between itself and the Back Boiler through the pipes *b* and *b1*. *e* are two copper vent pipes opening up from crown of Bottom Chamber, through top of Cylinder, with ends open to the atmosphere, thus ventilating both lower Chamber and Back Boiler. *f* is a direct vent Pipe from Boiler with the open end turned down to be in view at all times.

The Back Boiler and the Heating Chamber are supplied with heated water from the pipe *j*, which first supplies the Safety Cistern *i*, and is then syphoned into Boiler. This feed is started in the first instance simply by placing one hand on the mouth of the overflow *n* and pressing the Ball down until the water rises in the Cistern, charges the Syphon and sets feed in operation, which when started requires no further attention. The Feed Pipe *m* is purposely fixed with a fall from the Back Boiler, and a Trap screw fixed at its lowest part, so that this pipe will contain a little water even when the Boiler is empty.

This is intended to make the arrangement more secure against any thoughtless or inadvertent attempt to refill the Boiler when empty, for the Syphon cannot be started in the manner just described unless this water is run out of pipe first by means of the Trap Screw *o*, thereby leaving the required clear course for the air to escape when charging the Syphon. The short overflow *n* is also purposely fixed below the level of Syphon top, as shown, so that if Ball Tap be leaky the water cannot be raised above the intended level.

The branch pipe *p* is fixed at the level, as shown, to give a supply of water from Boiler Tap without emptying Boiler *a*, Chamber *c*, or Cistern *i*, thus leaving a good quantity of water which can only be lowered by evaporating through ebullition.

*h* is the usual Expansion pipe to Cylinder, which is carried above Store Cistern with end left open, and is, as usual, the pipe from which the hot water branches are taken to supply the various parts of Building.

*g* is the usual Cold-Water-Supply to Cylinder, coming down from the Store Cistern just referred to.

It would be superfluous to show or comment upon the ordinary fittings in the upper parts of Buildings now, as all that is necessary to be said about them is noticed incidentally further on.

The Boiler Tap is an index to the whole arrangement at all times, when it is running it proves the apparatus to be in good working order.

Referring to the safety of this arrangement, we will briefly run over the points which embrace it.

It will be evident that no Explosion can take place in the Back Boiler, as it is in free communication with the atmosphere through the pipe *f*, it also possesses two more outlets through the pipes *e*; the feed pipe *m* may be considered another outlet which would act under slight pressure, but would never be likely to be brought into operation, as there are already three free outlets which cannot be frozen, within a short distance of the fire place. Compare this with a single steam outlet thirty or forty feet away from the Boiler, and in Winter often seen protruding through the snow on the roof.

With regard to Cylinder Heating Chamber *c*, that also has two direct outlets through the short pipes *e*, and with the co-operative vent pipe *f*, it practically possesses the same number of outlets as the Boiler.

With regard to the Upper Chamber of Cylinder, the contents cannot be raised to boiling point *under any circumstances imaginable*, as it is heated by water which is open to the atmosphere, therefore it always remains a few degrees below steam point, and the water circulating through the upper or colder parts of house may freeze solid with perfect safety to the occupants.

Should the supply to Cistern *i* be stopped, this cistern may be kept partly full by hand, the ball tap will then be open giving additional vent to Cylinder, but as in this arrangement the upper chamber of Cylinder cannot be emptied or boiled dry and is never subject to steam pressure, there is no possibility of collapse even if this tap were closed by filling the cistern to the overflow. Should the Back Boiler be neglected and get *red hot* it cannot communicate a boiling heat to water in the Cylinder. Should the water supply *come on suddenly* or water be thrown into small cistern inadvertently at a time when Boiler was red hot; there would be *no danger whatever attending same* as the Syphon will not take water automatically when the Boiler is not in a safe condition to receive it; for when the water in the cistern *i* has by prolonged evaporation been brought below the mouth of Syphon, the latter instantaneously ceases to be self acting and the feed must be started again *in the particular manner already described*, before any water can be

got to enter Boiler. In all other arrangements water coming into Cisterns rushes direct in Boilers whether they are red hot or otherwise.

Owing to the easy and regular circulation between Boiler and Heating Chamber, and partly owing to the arrangement for contact of this Heating Chamber with the cooler water in Upper Chamber of Cylinder, the Vent Pipes *e* never steam at the outlets and the Cylinder is noiseless in action though rapidly heated.

Though the Vent Pipes are ever open in free communication with the heated water in Cylinder and Boiler, they operate as Vent Pipes only, not Steam Pipes; and though it may seem strange, it is a fact, that there would be no danger if even these pipes were blocked.

To demonstrate the condensing power of the Cylinder with every Vent pipe closed; the Inventor has frequently corked up the air pipe on roof, the Vent pipe *f* from Boiler, and the two Vent pipes *e* of cylinder; and has kept the water on Back Boiler boiling furiously for hours, without producing the slightest pressure or sign of steam at any of the outlets, or at Feed Cistern, the Cylinder has silently condensed it all, absorbed the heat and abolished the Steam force, even with every outlet blocked air-tight.

Thus we can have good Heating Arrangements without any drawbacks, and free from all danger attending the two hitherto disastrous causes of Explosions, viz.—pipes freezing in the cooler and upper parts of Buildings, or pipes suddenly thawing and delivering water in hot and empty Cylinders and Boilers.

In fixing this apparatus there is no special arrangement of pipes required in the upper parts of Buildings; the Sketch shows all the original parts which secure the safety and effectiveness of the arrangement, and these will work in harmony with the remaining portion of the Plumbing work if that be done in the ordinary way, which is familiar to all Plumbers, and need not be here described. It follows that in many cases where an alteration from some other Principle to the Non-Explosive is required, that a great portion of the existing work may frequently be left in, and advantageously incorporated with the new arrangement; therefore a word or two with reference to

the method of altering old Explosive systems of Hot Water Supply, to the new system, may not be out of place ; and although Practical Plumbers, after glancing at the Sketch, are not likely to require any written instructions, yet there still remain many persons who take an interest in anything mechanical which prevents disaster or loss of life, and to them and others the *modus operandi* will be interesting and probably useful.

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## To alter from the High Pressure to the Non-Explosive Principle.

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IT is not necessary to say anything with regard to the fixing of Cylinder Back Boiler, or Regulating Cistern, as the Sketch shows them in their relative positions with their pipes and connections as required, therefore all that remains to be said about altering the High Pressure Principle is that the descending or flow pipe which was connected to the Back Boiler is now to be connected to the pipe *g*, it will then be the Cold Feed to the Cylinder ; next, the Hot or ascending pipe which was connected to Back Boiler is now to be connected to the Expansion pipe *h*, and it then becomes the Hot water supply from Cylinder. This completes the alteration.

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## To alter the Worm Principle.

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THE descending or cold pipe cut off from Worm is to be attached to pipe *g*, the ascending or Hot pipe cut off from Worm will now be connected to pipe *h*, these pipes will then answer as the Cold Feed and Expansion pipes to Cylinder. The ascending pipe in the Worm Principle usually terminates at the highest draw-off tap with closed end ; in such cases carry it up above level of Store Cistern, and leave end of pipe open.

## To alter from the Circulating Principle.

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**F**IX as sketch : connect the descending pipe cut off from old Boiler to the pipe *g*, and connect the ascending pipe cut off from Boiler to pipe *h*. These pipes are then the cold supply to Cylinder and the hot supply to house ; the end of the ascending pipe in the Circulating Principle always enters the Hot Water Cistern, disconnect it now and carry it up a little above the level of the Cistern, and leave the end of the pipe open. The Hot and Cold Cisterns may still remain connected, for by this alteration the Hot Cistern is simply turned into an additional Cold Water Cistern. It will be seen that by this alteration the Cylinder has the advantage of possessing a separate Cold Water supply.

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## To alter from the Ordinary Cylinder Principle to the Non-Explosive.

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**F**IX as sketch : connect the existing Feed and Expansion pipes to the pipes *g* and *h*, this completes the alteration of this Principle. A Star Top Screw Down Boss Cock will give more satisfaction than a Lever Handle Cock, for front of Kitchen Range, the screw down is so easily repaired ; we can get used to a clock ticking but not to a tap dripping, especially when the little pool is on the hearthstone. The pipe known by the Trade as the Hot-Water-Return, may be fixed to this apparatus in the usual way.

To those not familiar with this term I may state that where this Hot-Water-Return-Pipe is added, it produces a continual circulation of hot water through the pipes, and you get a supply of hot water immediately a tap is turned on ; otherwise, you have to run off more or less cold water, before the hot arrives at tap.

A separate Cold Feed Pipe may also be fixed to Cylinder if desired, but as this pipe and the Hot Water Return Pipe are generally dispensed with, to save expense in Hot Water Fitting, I may state, that, it is quite optional whether they be used or not in connection with this apparatus ; sufficient to say they have been considered in this Invention and can be applied with the usual results, or can be dispensed with as neither condition affects the safety of the apparatus as can be plainly seen. It will be obvious to the Plumber that the end of the aforementioned Hot Return Pipe, should have no connection with the Flow or Return Pipes connected with Boiler and Lower Chamber of Cylinder. Plumbers will note the following little matter, the branch pipe  $p$ , should be only half the diameter of the steam pipe  $f$ , that is to say 1 in. Steam Pipe and  $\frac{1}{2}$  in. Branch to Boiler Tap, on a  $\frac{3}{8}$  in. Branch will be better where the feed to Boiler is only  $\frac{3}{4}$  in. What is the reason for this? the thinking Plumber will say :— the reason is simply this :—the pipe  $f$  from which this branch is taken is in free communication with the atmosphere at a point very close to where this branch is taken from, and as the water comes up this pipe from a source very little higher than the branch, its pressure is very light ; and if you empty this pipe very rapidly the supply will not equal the demand of an equal size Branch, therefore air would be drawn in from the outlet end of  $f$  close to, and the flow from the Tap would be intermittent and gurgling.

I mention this, as Plumbers would naturally put a  $\frac{3}{4}$  in. Branch in, but they will find that smaller sizes are ample for general use, and will be equal in flow to any other boiler taps, as there is a much better pressure owing to the height of the supply above the level of the Tap.

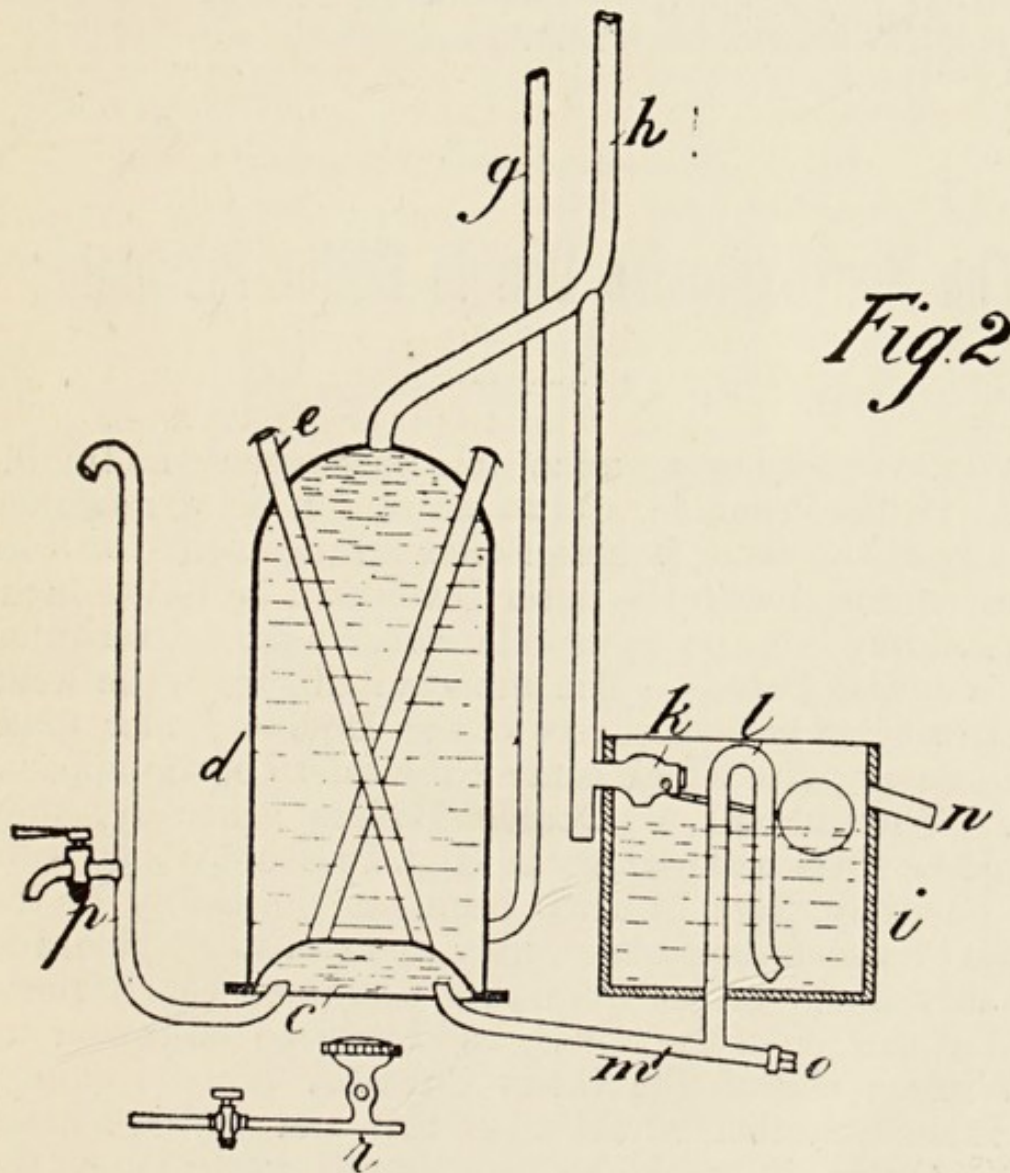
Whatever the size of the Steam and Supply pipes be, that are connected to the Boiler, the rule with regard to this Branch pipe is that it should be half the size of them.

It will be found much more convenient to fix both the Steam and the Branch pipes if the brass Branch Piece and Couplings are used in place of branching lead to lead. A small tap may be used in place of Cap Screw  $o$ , the tap can be closed or opened conveniently and quickly.

## The Non-Explosive Boilerless Principle.

**A**S there are circumstances when a Non-Explosive arrangement is required, preferably to work by gas, or in some way independant of the usual domestic Back Boiler, the writer has invented a simple arrangement that will answer all such requirements, and may be termed a modification of the Non-Explosive Principle.

Figure 2 is a sectional elevation of this modification, the arrangement is under all circumstances as safe as that already described.



SKETCH OF MODIFICATION.

The Boiler *a* is dispensed with, and the apparatus worked by the action of heat applied direct on bottom of Chamber *c*, the water therein heating the main body of water in Cylinder as before described. In this arrangement the pipe *p* is turned upwards from Chamber *c*, and the tap fixed at the desired height so as to give hot water without emptying Chamber *c* or Cistern *i*.

The Syphon *l* and Feed Pipe *m* are fixed on the same principle as before described, but in this modification the feed is connected direct to bottom Chamber *c* as shown. The Cylinder may be heated by gas, or by being fixed on top of a Close Fire Kitchen Range, or any preferred way: simply to illustrate the action; *r* shows a plain atmospheric gas burner in position.

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## The Non-Explosive Double Boiler Principle.

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THE Writer having some time back invented a Double Boiler Principle, and to prevent it being mistaken or any of the other Double Boiler arrangements, or from being confused with the latter Invention, he has thought it necessary to insert in this Handbook a brief description of his earlier Patent. The important differences between his Invention and all others of the Double Boiler kind, lie in those parts which control the safety of the apparatus. With regard to Double Boilers generally, they would be little better than the High Pressure if they were fixed as they have hitherto been, as the safety of the Inner Chamber depends entirely upon its steam pipe, and the only steam outlet from this chamber, has hitherto been at the top of the house, and likely to be frozen up in Winter; should the Outer Chamber become empty, the Inner Chamber would then boil and with a Frozen Steam Outlet it would be as liable to explosion as the High Pressure Boiler. This possibility of the Inner

Chamber Exploding or boiling under circumstances common in Winter, has either been entirely overlooked, or other Inventors have seen no way to overcome the difficulty, they simply tell you it is possible to keep the Outer Chamber full by hand if the supply be stopped; but they forget to tell you what will become of the apparatus if you neglect it and the contents of Outer Chamber should boil away. A sound and valuable Patent has been granted to the Writer for his Double Boiler Principle, based principally on the Invention of Safety Pipe *j* which ensures the safety of a Principle which has hitherto, under the circumstances described, been Explosive.

This pipe *j* is taken from the outflow or Hot water pipe of Cylinder, and is both hot feed to small cistern and additional steam pipe to Cylinder, for if the water become low in Outer Chamber and steam pipe be frozen, the Ball Tap will be open, giving vent to Inner Chamber and Cylinder.

The pipe is taken from above the Cylinder simply to give the required vent without reducing the contents of the latter, but it is patented as a Hot Water Feed to Cistern also, *therefore any unauthorised person will be called to account should he by altering the position of this pipe think to evade the Patent, and still make use of it or the Ball Tap as a steam outlet for any existing explosive Principle.* The following is the abridgement of the Patent as it appears in the Official Journal of Patents.

The sketch is also the same as it appears in that Journal with the addition of the Syphon Feed to the Back Boiler, the latter being a later Patented invention and shown in the Non-Explosive Principle, but may be used in connection with all kinds of Back Boilers, the addition of the Syphon feed makes Walker's the only safe Double Boiler Principle existing or Patented.





“ The kitchen boiler *a* has an inner chamber *b*, from which lead two pipes *f*, *d* to cylinder *e*, after which *d*<sup>1</sup> leads to the ordinary supply cistern and *f*<sup>1</sup> to a greater height, where it is open to the atmosphere.

Sometimes *e* may be dispensed with, and the pipes continued as shown in dotted lines. The cold water supply is by the pipes *d*<sup>1</sup> *d*, to the former of which draw-off taps may be fitted as convenient. The hot water passes up *f*, *f*<sup>1</sup>, the latter being also fitted with taps and a pipe *j* leads from *f*<sup>1</sup> to the small cistern *h* (fitted with ball-cock *i*, for the usual purpose), so that the water supplied to the outer chamber *a* is hot. The chamber *a* has two steam-escape pipes *k*, *k* and a draw-off pipe *l*.

By this arrangement, an explosion owing to the blocking of the pipes *f*<sup>1</sup>, *d*<sup>1</sup> by frost, etc., is prevented; for water in *b* cannot rise above boiling point until the contents of *a* have all boiled away, and in this case there will be communication with the atmosphere through *f*, *f*<sup>1</sup>, *j*, and the Ball-cock *i*. (GRANT OF PATENT OPPOSED).” From the latter note it will be seen that this Patent was opposed, first in Comptroller’s Court, London, then an appeal made against the Comptroller’s decision, the latter heard in the High Courts of Justice, London.

The Inventor’s simple statement of the facts as they existed, without any Legal assistance, carried the full claims successfully through both Courts, in spite of tenacious efforts of the opponent’s very able representative. The fair field given to both sides and the thorough patient scrutiny of evidence exercised in these Courts, were conspicuous to and impressive on one who scarcely expected to find the highest legal talent in the nation, lend themselves so earnestly to such a comparatively small case and applying the great principle of justice to small matters with as much care and consideration as though the fate of nations would evolve from the issue. Any criticism on this opposition coming from the writer might savour of partiality, and perhaps be waste of time, the Official Specifications and their accompanying Drawings show the true and correct construction of Patents and always afford opportunities for interested persons to examine the intrinsic merits of any Patented Invention.

It will be seen by comparison with others that neither Single or Double Boilers in themselves have hitherto secured the safety of any apparatus, and how under similar circumstances a Double Boiler would be Explosive in one case and quite free from danger in the other, *owing to the difference in the arrangement, the addition of Safety pipe J, and the later addition of Syphon Feed to Boiler.* In the latter invented Non-Explosive-Principle to remove the possibility of under any circumstances boiling the water which circulates through the Upper parts of Buildings; the Inner Chamber is not used and a Single Boiler with original connections is fixed which give free outlets which are dependent on no mechanical action; all parts ever likely to boil under any imaginable circumstances, are provided with these Outlets which are always open in free communication with the atmosphere; ever within sight; can be tested in a moment, and can never be frozen up.

The writer's newly invented Cylinder which is equally as safe as the Boiler, and both Cylinder and Boiler being supplied by his Safety Feed Cistern, form a combination and a Principle never existing before, and which has been received as favourably by Practical men as the Inventor could wish; his efforts and object have been hitherto to invite the friendly criticism of all competent persons, and in so doing the Principle has met with the unanimous approval of all examiners, and now rolls onward on its merits without a single valuable opinion dissentient as to its safety or practicability.

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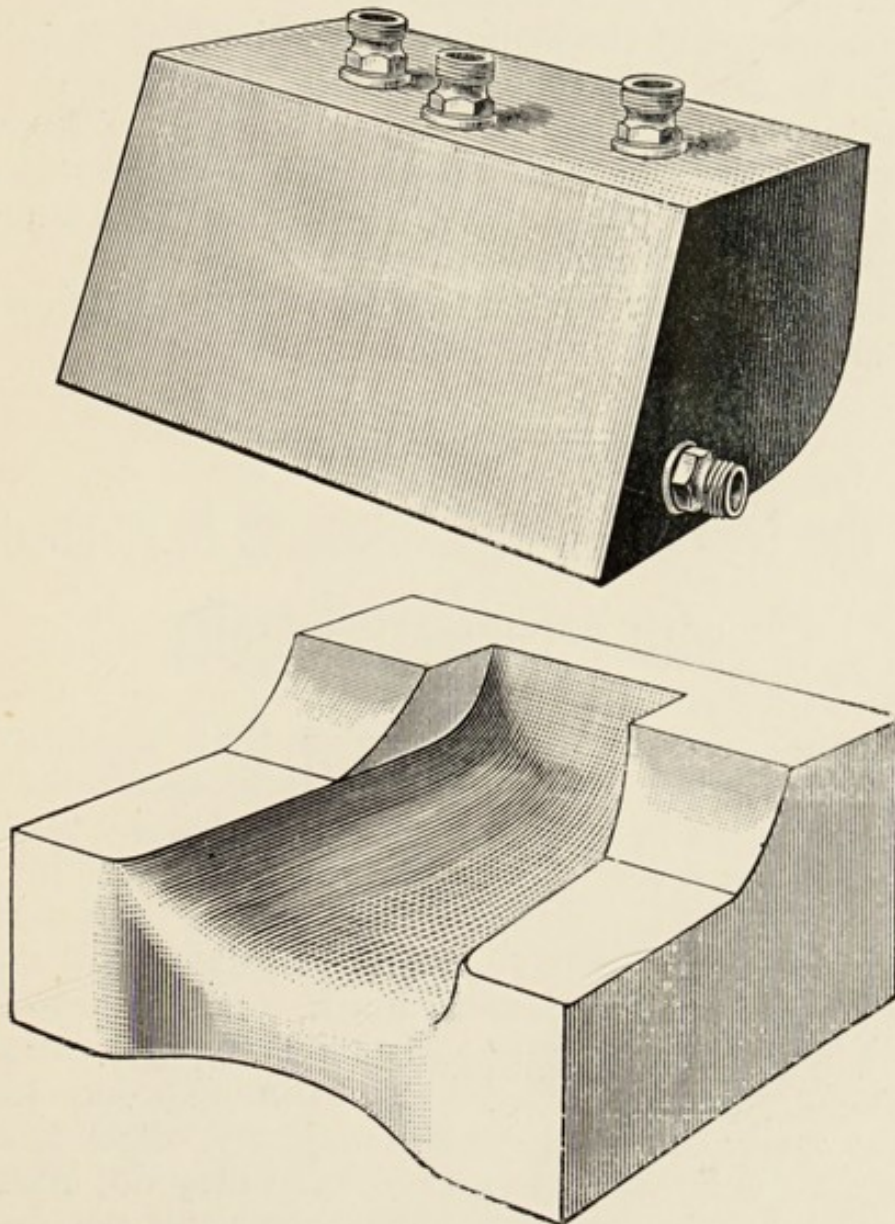
## The Setting of Boilers.

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**T**HE majority of Boilers of all kinds are very difficult to get hot at times, the under flues as a rule are not easily cleaned; very often in the setting of Boilers their flues are improperly or carelessly formed, and it is difficult to get a proper supply of hot water rapidly when you require it although the Plumbing portion of the

work may be done in a first-class manner; and the Bricklayer's little responsibility is very often saddled on the back of the Plumber. Some flues are unnecessarily capacious, generally at the back, and when these have a good draught and a good fire, the Boilers do not receive their proportionate amount of heat as it is drawn rapidly under the Boiler into a large air space, and flies up the chimney leaving a comparatively small share to the Boiler *en passant*.

To remove these defects the Writer has made all his Boilers a particular shape at the back and sets them on a formed bed.



WALKER'S BOILER AND BOILER BED.

The Sketch shows this bed for the Boiler, which, is in one piece of fire clay, the under flue and part of the back flue is already formed by the concavity in the Bed, and in the setting of Boilers there is nothing to be done but simply lay the bed and sit the Boiler on it, and a proper flue is formed at once.

This ensures a clean flue to the Boiler formed in such a manner that the ordinary cleaning out of the grate invariably keeps the flue clear, as the under flue has a quick slope to the front and turns up to the back of the flue with a circular curve, the Boiler has a corresponding curve so that the hand may be put in with ease and passed up the back of Boiler.

The shape of the Boiler Bed admits of the remainder of the Flue being carried up with brickwork in the usual manner to form either a perpendicular or side outlet. The cost of the Boiler Bed runs less than the brickwork bed, as the most particular part of the flue is formed in a proper manner in a few minutes.

The Writer recommends the fixing of dampers to control Boiler flues in all cases.

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## On the prevention of Explosions in connection with defective Principles.

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IT is believed by many persons that by keeping a good fire day and night through frosty weather, that the Steam Pipe is kept clear, and accidents prevented; in some cases it might act as a preventive, but in others it would just be the way to bring about a disaster, and the writer having seen that method advised in a public paper, feels impelled to condemn it, for in cases of horizontal and sometimes slightly trapped pipes, the heat is not conveyed from the Boiler to the exposed extremities so easily or rapidly as the majority of persons imagine, and whatever a Practical man may do after testing and subsequent observance of pipes, no person with

a limited knowledge however confident, should attempt to keep pipes clear by generating steam; unless he has some certain means of proving that the outlet is clear and that it will remain so. The Writer has known instances, where the only pipes affected by the frost were the main pipe near Ball tap and the steam pipe near Store Cistern; in such cases you would have, apparently, the ordinary proper supply in all the taps, Hot and Cold, until the Store Cistern became empty; yet your Steam Pipe may be frozen up all the time; this fact is mentioned to disabuse the minds of many from the notion that if they have water in some particular tap, they are all right.

A good supply of water is no indication of safety in the existing defective systems, a free outlet to Steam Pipe is the all important thing; and fortunate warning indeed it would be, were the supplies in all cases to cease previous to imminent danger. What is to be done then in the matter? A large fire may mean danger, and no fire means perfect safety; and if there *must* be one under the Boiler in hard frost, let it be *very* small to prevent boiling.

It will now be seen that Boilers assist only, in making a safe apparatus and are simply relatively safe; that is safe when all other parts of the arrangement are so constructed that the parts will not bring about an explosion of the Boilers or Cylinders to which they belong.

Hence the mistakes and failures through keeping in view some fragmentary part of an Apparatus with a notion of improving the whole, in place of grasping the arrangement in its totality and clearly understanding the relative bearing of each part on the whole when in practical operation, before and after any rearrangement or alteration.

The object of the Inventor, all through, has been to construct an Apparatus which would prevent explosions arising not from *one* particular cause, but from *all* causes that ever produced an explosion; his Inventions have been kept back for years that he might be able to satisfy himself on all points and prove to Practical men that this has been accomplished in its totality.

An immediate profit on an imperfect arrangement was not his object, the lasting character and reputation of the work and the worker were considered to be of more consequence, trusting that in their sequence they would be more beneficial in every respect, *as nothing existed in practice* that deserved the name of a Non-Explosive arrangement.

The Steam-Valve may be safe under one circumstance only, *if it work when required but it does not always do so.*

The Boilers that may be safe, if you keep filling them by hand at times, when their proper supplies are stopped, become explosive when they boil dry, or if you happen to neglect them or be ignorant of the fact that they have become empty. The Fusible-Plugs which are supposed to melt and give vent to Boiler if Boiler become empty, are no use whatever to those Boilers that *burst when they are full*; for, as before stated, the prevailing cause of explosions is, that there is no outlet for steam when the Boiler is *full and water boiling*, consequently if a plug melt as quickly as butter, when a Boiler was *dry and hot*; it is worthless as a preventive when a Boiler is *full and bursting* for a steam outlet, the Inventor's arrangement has more vent at all times in operation, than would be obtained *by three Valves opening, or three Plugs melting* even if these things acted when required. It is not necessary to be a Plumber to see the applicability or common sense of these remarks, or to recognise the necessity for an entire improving alteration in the basis and principle of Hot Water Fitting, and the necessity for a principle that removes entirely, that dangerous and unnecessary steam power instead of ineffectually cobbling with it.

The numerous fatal accidents that have taken place this last few years, through explosions connected with Hot Water Arrangements, would never have occurred had the Non-Explosive *been in operation*, and where it is fixed all accidents of the kind will be unknown in the future.



## The Non-Explosive Principle Patented.

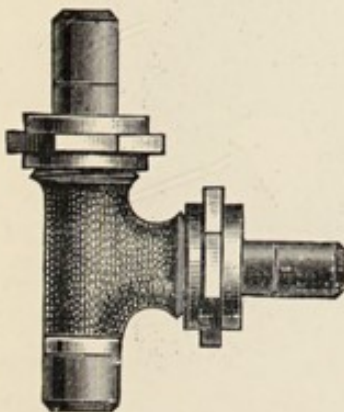
### A FEW OF ITS ADVANTAGES AT A GLANCE.

- 1.—No necessity to keep a small fire in Winter when you require a large one.
- 2.—No rusty coloured water in your Baths or Wash Basins.
- 3.—No Steam Pressure; hence no clicking, vibrating, or straining of pipes.
- 4.—Circulating Pipes last much longer with this easy natural hot flow.
- 5.—No Puffing or Spouting of steam pipes on roofs or elsewhere.
- 6.—Inherently safe; outlets ever open to the atmosphere in many places, which cannot be frozen up in Winter; always two or three reserve outlets more than is necessary for actual working; and no danger if all these were blocked.
- 7.—No Exploding or Collapsing; either through pipes freezing, neglect, or water suddenly coming on and rushing into hot Boilers.

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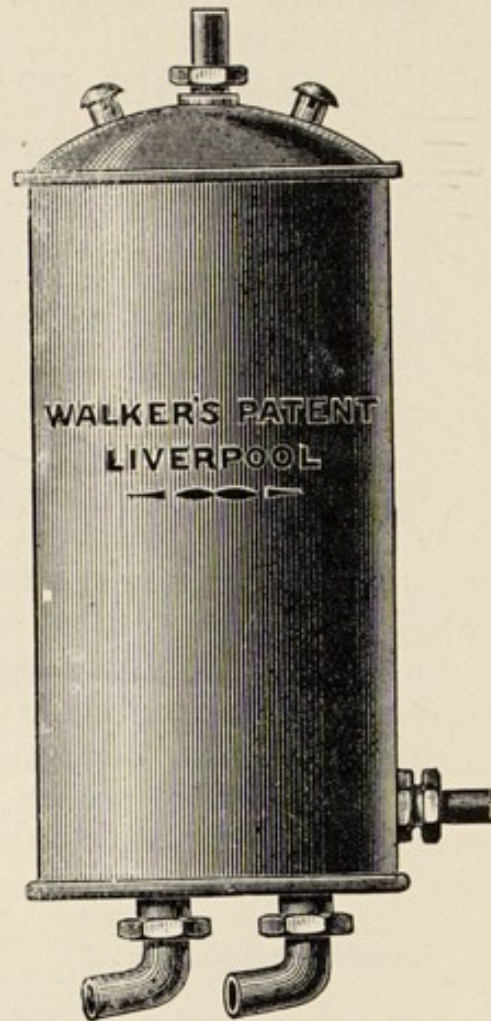
## Walker's Patent Specialities.

Walker's Specialities are supplied by the Local Agents, or Plumber's Warehousemen, and are fixed by all Practical Plumbers authorized to fit up his Patents (See List) and are also supplied and fixed by the Inventor

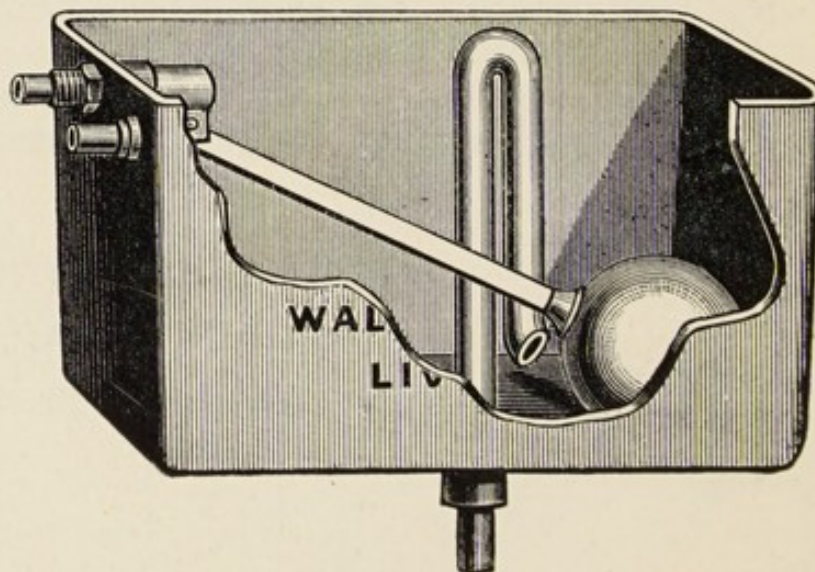


**BRANCH CONNECTION  
FOR BOILER TAP,  
SUITABLE for 1in. or  $\frac{3}{4}$ in. STEAM  
PIPE.**

WALKER'S PATENT SPECIALITIES.



STEAMLESS HOT WATER CYLINDER, WITH CORRUGATED HEATING & CONDENSING CHAMBERS.



SAFETY FEED CISTERN FOR ALL BACK BOILERS.

**COMBINED BOILER BED & FLUE, see page 25.**

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**IMPROVED RAPID HEATING CIRCULATING LOW  
PRESSURE BOILER, see page 25.**

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Inquiry invited pertaining to anything in this Handbook.

Plumbers desiring to be Authorised Fitters of these specialities, will on approved application receive license, and be placed on the forthcoming list of Fitters for a nominal sum per annum

The cost of fitting a House up with the Non-Explosive Hot Water Principle is about equal to the cost of fitting up with the Worm or Circulating Principles, and a little more than the ordinary Cylinder Principle

Taking a speculative view of the Non-Explosive Principle, a safe Hot Water Arrangement must increase the intrinsic value and facilitate the sale of any house, and with regard to Empties where houses are otherwise equal, it is reasonable to suppose that the safe ones will also command the Tenants Letters of enquiry may be addressed to the nearest Local Agents, the Local Authorised Fitters of the Invention (see list), or direct to the Inventor.

One may reasonably ask the question,—are the dangerous Principles of Hot Water Supply fit to be in any house whatever? for to leave a Family to the mercies of a Closed Boiler and a hard frost, is sure to trouble any ordinarily apprehensive man when he goes from home in the Winter mornings, and the only persons that can remain unconcerned, are those who are not aware of the facts, or those that doubt the truth of plain unrefutable statements.

The Plumbing and Sanitary Directorates, of our Liverpool Corporation, have of late years made most considerable progress in the way of weeding out and improving numerous things which come under their special control, and the appointing of Practical Tradesmen as Official Inspectors of work, has in itself done an

immeasurable amount of good for the public, and it augers well for the future quality of Plumbing work in Liverpool. This is a good system ; for the sense and the object of most trade-points are immediately understood, when both the Inspector and Mechanic are masters of the one Craft ; and you may reasonably suspect the qualifications of those who kick against intelligent interrogation and practical supervision ; probably we may find this City taking the initiative, and dealing with Conditions Explosive as it already does by rule prohibitory, with Conditions Insanitary.

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↔ JAMES WALKER, ↔

Plumber, etc.,

WEST DERBY STREET,  
LIVERPOOL.



