

KINMEL ESTATE FIRE HYDRANT SYSTEM

GREEN & CARTER LIMITED



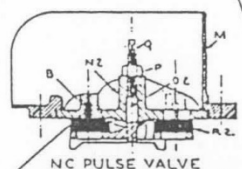
21/09/1842 1 X NO 7
28/10/1842 1 X NO 6
05/11/1842 1 X NO 6
12/11/1842 1 X NO7



N-C PULSE VALVE PARTS

B. RUBBER BUFFERS.
NZ N-C CROWN.
OL N-C ADJUSTING SPINDLE.
RZ N-C RUBBER

NUMBER PLATE

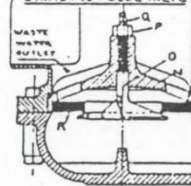


NOTE:-
BUFFERS 'B' PROTRUDE
1/4" FROM FACE
CHARGING COCKS.

PULSE VALVE PARTS

M POT
N CROWN
O ADJUSTING SPINDLE.
P LOCK NUT
Q SQUARE FOR SPANNER.
R P.V. RUBBER.

STANDARD PULSE VALVE



AIR VESSEL.

AIR VESSEL DOOR

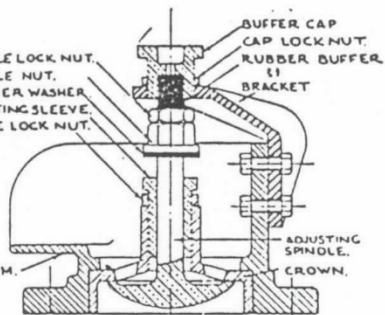
RAM BED

AIR VALVE

SPINDLE LOCK NUT.
SPINDLE NUT.
LEATHER WASHER.
ADJUSTING SLEEVE.
SLEEVE LOCK NUT.

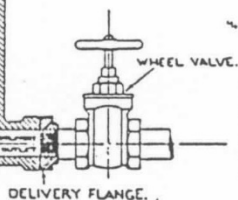
POT M.M.

METAL PULSE VALVE



GRID VALVE PARTS

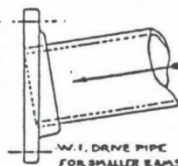
S. GRID.
T. GUARD.
U. GUARD LOCK NUT.
V. STUD.
W. GRID RUBBER.



DELIVERY FLANGE.

GRID VALVE

CAST IRON DRIVE PIPE.

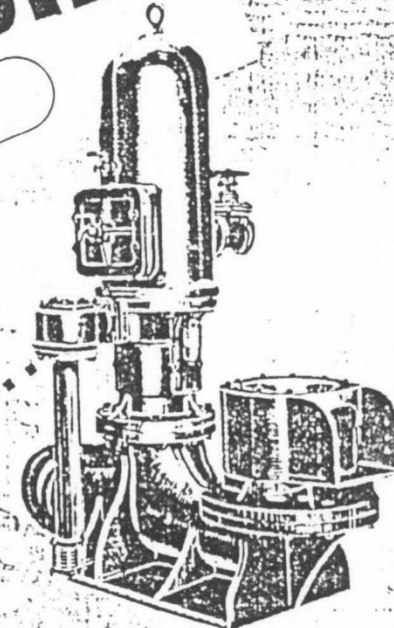


W.I. DRIVE PIPE
FOR SMALLER RAMS.

the VULCAN

high-duty

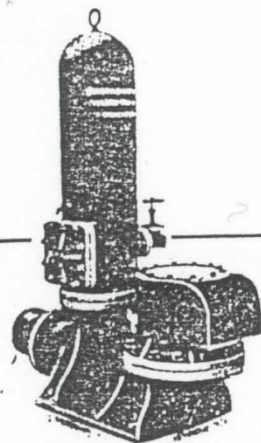
Hydraulic Rams



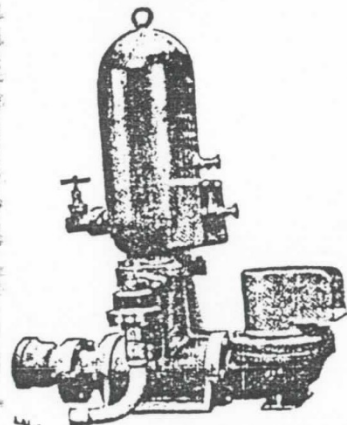
SURREY ARCHAEOLOGICAL SOCIETY

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EAST REACH, TAUNTON (01823) 331111

GREEN & CARTER LIMITED. VULCAN IRON WORKS



SIMPLE TYPE RAM



TUBULAR RAM

the VULCAN

HIGH DUTY HYDRAULIC RAMS

These Hydraulic Rams are complete in themselves and designed to work with the minimum of attention, and to suit all the ordinary conditions obtaining, and if carefully installed according to our instructions they are guaranteed to give unqualified satisfaction.

Every "VULCAN" Hydraulic Ram manufactured and sent out from our Works is thoroughly tested and adjusted to suit the conditions under which it is to be installed, and in consequence we assure ourselves and all parties concerned of their ability to efficiently perform the duty specified.

It is only necessary to have a stream of water with a small fall, say 2 1/4 ft. upwards, when deliveries can be made in proportion with these Rams to upwards of 400 ft. elevation and any reasonable distance without the use of fuel or lubricants. We can supply special Rams to deliver to elevations up to 100 ft. under suitable conditions of fall and supply.

LIST OF SIMPLE TYPE VULCAN RAMS

Size Hydraulic Ram and diameter of Drive Pipe	Quantity supplied by Spring or Stream per minute	Diameter of Delivery Pipe (minimum)	Quantity of Water per 24 hours Ram may be expected to raise suitable conditions	Code Word
1 1/4	1 to 4	1/2	100 to 800	Debberan
1 1/2	2 to 6	1/2	400 to 1000	Debbering
2	5 to 10	1	800 to 2000	Decent
2 1/2	8 to 25	1	750 to 3000	Dechler
3	12 to 30	1 1/2	1000 to 5000	Deckerig
4	20 to 45	1 1/2	2000 to 10000	Deedelsak
5	30 to 60	2	4000 to 18000	Deeken
6	50 to 100	2 1/2	8000 to 30000	Deedles
8	100 to 200	3	15000 to 80000	Deedlands
9	200 to 300	4	30000 to 90000	Deebelter
10	300 to 400	4	45000 to 120000	

LIST OF COMPOUND TYPE VULCAN RAMS

Size of Hydraulic Ram and Bore of Drive Pipe	Quantity of dirty water for working Ram in gallons per minute	Code Word
1 1/2	5 to 10	Cedar
2	12 to 30	Cedel
3	20 to 40	Cedric
4	30 to 60	Cedre
5	50 to 100	Cedrum
6	100 to 200	Cedant
8	200 to 300	Cedel
10	300 to 400	Cedus

Where the supply of pure water is too small to work a Simple Ram, but where a stream of impure water is also available, a Compound Ram may be recommended and raise the pure water only.

The Ram is fixed to a drive pipe in the same way as a Simple Ram, but instead of the power water impinging against the grid valve and being forced into the air vessel, the energy of its blow is taken up by a plunger contained in the pumping cylinder. On the upstroke the plunger forces clear water into the air vessel, this water having been drawn through the suction valve on the previous down stroke, which is operated by a strong spring. In the centre of the pumping vessel, which is a space open to the air, so that should any water leak up past the bottom of the plunger it flows away and cannot come into contact with the clean supply.

Where the water contains suspended matter injurious to the metal pistons a Tubular Ram is used containing a circular rubber sleeve. This type, however, is only suitable where the reason of fall to lift does not exceed 1-20 and lift does not exceed 200 ft.

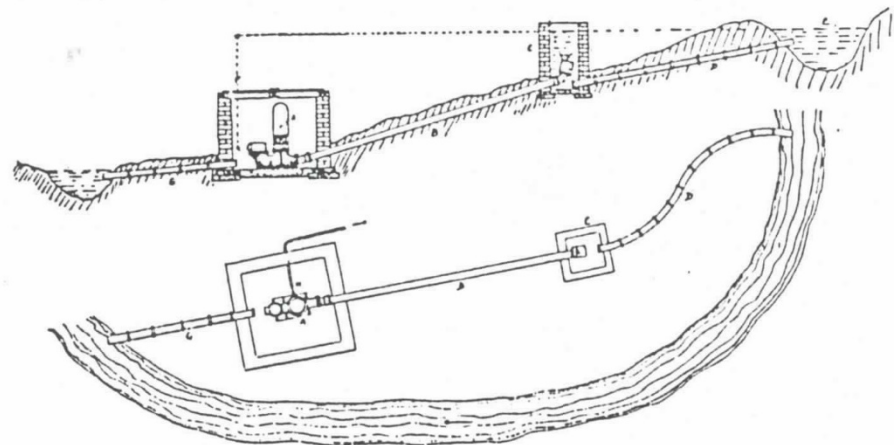
SURREY ARCHAEOLOGICAL SOCIETY

GREEN & CARTER LIMITED. VULCAN IRON WORKS

INCORPORATING EASTON & COURTNEY OF LONDON

the VULCAN

HIGH DUTY HYDRAULIC RAMS



USUAL METHOD OF FIXING VULCAN RAMS

- | | | |
|----------------------|-----------------------------|---|
| A. Ram | F. Working Fall | The Pipes D and G may be of reasonable length, but the Drive Pipe B must be of dimensions given by us. The delivery may be taken in any direction required. |
| B. Drive Pipe | G. Waste Drain | When sending enquiries give the following particulars:- |
| C. Catchpit | H. Delivery Main | Total fall and distance in which obtained |
| D. Supply Pipe | K. Inlet Valve and Strainer | Quantity of water available (maximum and minimum) |
| E. Head Water Level. | | Quantity of water to be raised. |
| | | Height to be raised. |
| | | Length of delivery main. |

AD 1772

In the year 1772 the first suggestions for raising water by means of a Hydraulic Ram were made by John Whitehurst, but it did not become a practical machine until Joseph Montgolfier, the French inventor of the first balloon, succeeded in 1796 in making an automatic ram. The general principles involved have become the basis for all hydraulic rams since that time, although subsequent improvements have made them more highly efficient.

Early in the nineteenth century, Mr. James Easton purchased Montgolfier's patent and introduced the machine into this country, and as the founder of Messrs. Easton & Amos (known at various times as Easton, Amos & Anderson and as Easton, Courtney & Darbishire), was responsible for the installation of large numbers of these machines all over the British Isles, in fact more than 1000 prior to 1860.

We have now acquired this old-established business, and having ourselves been actively engaged in the manufacture and installation of the well-known VULCAN Ram for over 58 years, we are thus in possession of all records dealing with the earliest Ram practice in this country, and can supply all Easton Ram Spares.

A FEW OF OUR CLIENTS

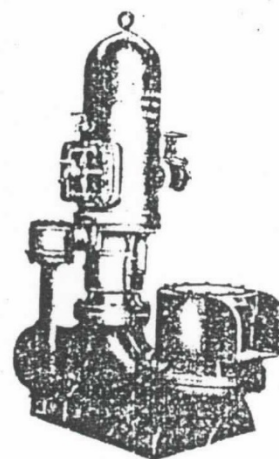
The Crown Estates

The Duchy of Lancaster
The Duchy of Cornwall
The Duke of Beaufort
The Duke of Bedford
The Duke of Marlborough
The Duke of Wellington

The Marquess of Bath
The Earl of Harewood
Viscount Cowdray
Lord Leconfield
Lord Clifford of Chudleigh
Crown Agents for the Colonies

H.M. Forestry Commissioners
Devonshire County Council
Herefordshire County Council
Monmouth County Council
Pembroke County Council
Cornwall County Council

COMPOUND RAM (PISTON TYPE)

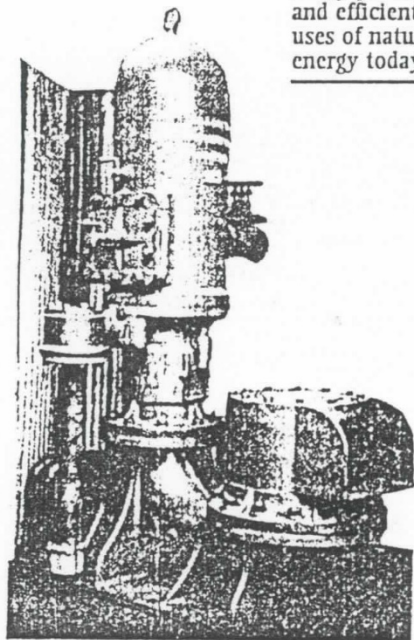


GREEN & CARTER LIMITED. VULCAN IRON WORKS

INCORPORATING EASTON & COURTNEY OF LONDON

TWO CENTURIES OF THE HYDRAULIC RAM

"The hydraulic ram has stood the test of time ... and it remains one of the few really practical and efficient uses of natural energy today"



A very large compound ram for a village water supply in the Midlands.

Both its name, which invited confusion, and its workings apparently everlasting, but shrouded in mystery, have led the hydraulic ram to gain a certain mystique, and allowed its owners to acquire an air of superiority over those lesser mortals whose water supply is by other means.

The gradual spread of the mains water and electricity grid led to the decline of the ram in the post-war period, but with the escalating costs of mains supplies, there is a demand for in-depth information from landowners anxious to acquire their own 'free' water supply, or resurrect that ram that has lain unused for years. This article, therefore, attempts to give an explanation of working principles, brief history and applications of the hydraulic ram.

The water, being admitted into the drive pipe, flows through it by gravitation until it reaches the ram, passes through the ram and through the pulse valve into the waste drain. As the water flows, its velocity increases until the pulse valve is no longer able to pass the volume of water flowing; and on this point being reached the pulse valve is suddenly closed. The outlet thus being closed, the flow of water suddenly stops. This produces a concussion of more or less severity in the body of the ram, according to the height and distance from which the water is flowing; and a result of this concussion is that a portion of the water in the body of the ram is forced upwards through the delivery valve into the air cylinder. At the same time the recoil allows the pulse valve to return to its original position. The outlet being thus reopened, the water which was brought to rest by the closing of the pulse valve recommences to flow through the ram till it acquires the necessary velocity to raise the pulse valve a second time, closing the outlet, producing a concussion, and forcing more water into the air chamber through the delivery valve. This series of events, which takes time to describe clearly, occurs from 40 to 90 times per minute, according to the size of the hydraulic ram, fall of water driving the ram, etc. The ram will continue working automatically for months, the pulse valve rubber and the delivery valve rubber being the only moving parts.

The water, which is forced into the air chamber, finds its way from it through a pipe, known as the rising main, to the place where it is required for use, a continuous flow being maintained so long as the ram remains working.

The fall of water necessary to work a ram may be as low as 2 feet and with such a fall, water may be raised to 40 or 50 feet. With higher falls, such as from 5 to 20 feet and over, water can be raised to upwards of 300 ft. in height and 2 miles in distance. Green & Carter are also the only company who still supply the so-called 'compound or tubular' ram, which enables a plentiful supply of impure water to drive a piston or expand a rubber tube, which plunger action, with the aid of a suction valve, will allow a small spring of pure water to be pumped to the delivery tank.

The fall of water necessary to work a ram may be as low as 500mm and with such a fall, water may be raised to 18m. With higher falls, such as from 2 to 7m and over, water can be raised to upwards of 100m or more in height and 5km in distance. Green & Carter are also the company who still supply the so-called 'compound'; or 'tubular' ram, which enables a plentiful supply of impure water to drive a piston or expand a rubber tube, which plunger action, with the aid of a suction valve will allow a small spring of pure water to be pumped to the delivery tank.

Installation is extremely simple. All that is required is some method of containing the power - water at the point of use by constructing a pool or catchpit. This may be formed by a dam across a stream or the construction of a containment area using local materials and being waterproofed by usual methods, or the provision of a pre-fabricated container of polyethylene or similar material.

From this, running downwards on an even gradient to the point of location of the ram itself, runs the drainpipe which has to be heavy gauge galvanised steel or cast iron pipe and of an appropriate length which is

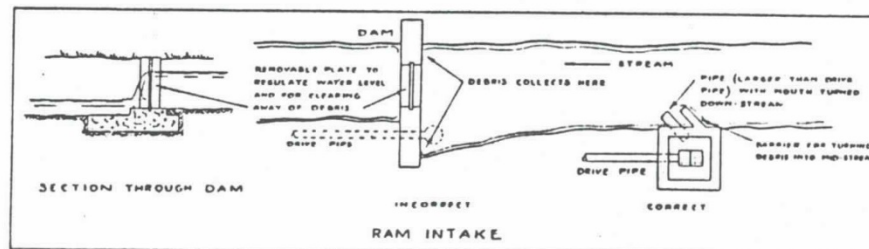
dependent upon the height to which the water is to be pumped. Although it is not essential that this pipe should be buried, it is preferable in order to avoid interference from wild life and unauthorised persons.

The ram chamber itself can vary considerably but all that is required is a concrete base which will securely hold the ram in place but this could equally be constructed from heavy bulks of timber to which the ram could be bolted. Naturally, some kind of covering (while not essential) is preferable to give the necessary security to the installation.

As far as the delivery pipe is concerned this should be treated conventionally as with any other type of water-pumping system. The whole installation is extremely simple and straight-forward and can be carried out by inexperienced or local labour from details provided by the manufacturer.

Due to the action of the ram, unless the conditions are unusually severe, and provided the ram is kept working, it will be unaffected by changes in temperature especially low temperatures which might cause a conventional system to 'freeze up' unless some form of heat is provided.

DAMS.



A SIMPLE PUMP WHICH USES NATURAL ENERGY

Across the world, from the neat farms and country estates of Europe and North America to remote hillsides in rural villages of the Third World and the lonely uplands of the South Atlantic Falkland Islands, a steady rhythmic beat can be heard, never faltering or ceasing day and night; year in, year out; the source of the sound, shrouded in mystery and working independently of any visible power source, is often a venerable cast iron apparatus deep in the undergrowth disgorging water in regular pulses.

Further enquiries will reveal this to be a hydraulic ram, usually of great age which pumps water to a storage reservoir at a considerably higher level to gravity feed the various points of consumption.

The ram has, however, come back into its own. With high energy costs worldwide, increasing 'mains' water costs and the need for simple equipment for the Third World it has no equal and the firm of Green and Carter which commercially invented the ram in 1774 is still serving the world more than two centuries later.

The manufacturers are very aware that despite its considerable potential worldwide and proven track record many technical operators and advisory bodies are unaware of its existence and principles; this brief article seeks to give a broad outline of the working principles, history and applications of the hydraulic ram.

A more detailed look at the method of operation will be helpful in understanding the basic working principles:

Water, entering the steel drivepipe flows

through it by gravitation until it reaches the ram, passes through the ram and through the pulse valve into the waste drain. As the water flows, its velocity increases until the pulse valve is no longer able to pass the volume of water flowing: at this point the pulse valve is suddenly closed. The outlet thus being closed, the flow of water suddenly stops. This produces a concussion of more or less severity in the body of the ram according to the height and distance from which the water is flowing. The result of this concussion is that a portion of the water in the body of the ram is forced upwards through the delivery valve into the air cylinder.

At the same time the recoil allows the pulse valve to return to its original position. The outlet being thus reopened, the water which was brought to rest by the closing of the pulse valve recommences to flow through the ram till it acquires the necessary velocity to raise the pulse valve a second time, closing the outlet, producing a concussion and forcing more water into the air chamber through the delivery valve.

This series of events, which takes time to describe clearly, occurs from 40 to 90 times per minute, according to the size of the hydraulic ram, the fall of water driving the ram, etc. The ram will continue working automatically, the pulse valve rubber and the delivery valve rubber being the only moving parts.

The water, which is forced into the air chamber, finds its way through a pipe, known as the rising main, to the place where it is required for use with a continuous flow being maintained so long as the ram remains working.



The original patent granted by George III to Pierre Montgolfier in 1816

OLDEST MANUFACTURERS

Green and Carter are proud of their pedigree as the world's oldest manufacturers of the hydraulic ram and to this day are exclusively engaged solely in its manufacture and production. In 1772 John Whitehurst discovered the principles of the ram and produced a machine to work in a brewery at Oulton, Cheshire, to raise water to upper floors of the building. It was not, however, entirely satisfactory as a small boy had to be employed to open and close a tap. It was in use for over 15 years, though, one hopes, not with the same operator! Pierre Montgolfier, in 1798, invented the first automatic pulse valve, thus making the ram a commercial reality. Both he and his brother were prolific inventors but are today remembered best for the 'hot air' balloon.

At this time in Great Britain the Easton family, from Somerset, were in the forefront of many great engineering projects such as canal building, fen drainage and foundry work, and in 1814 at Sunninghill, Berkshire, they acquired the rights of manufacture and marketing for the British Isles and Empire. Over the years, Josiah Easton and his son, James installed water schemes for many of the landed estates of the day, and many of those rams are in use to this day.

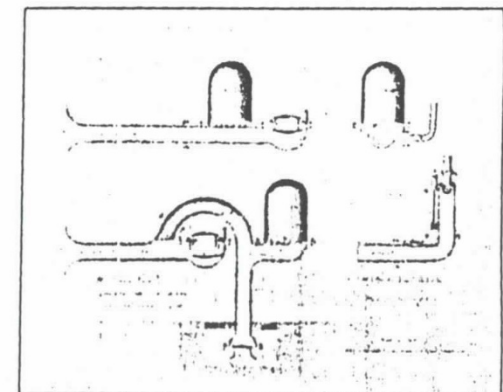
The firm of Green & Carter occupied an iron foundry at Kingsworthy, Winchester, and had for many years manufactured and supplied rams throughout the world. In 1928 they acquired

James Eason's business and have remained to this day exclusively producing the 'Vulcan' ram, incorporating all the most modern features, and yet they can supply parts for all their rams produced over the years no matter how old.

One of the most fascinating aspects of the business is the lucky chance that has resulted in the preservation of nearly every record and piece of correspondence from the early 1800's. This also provides a valuable reference library for, together with the maps and plans, many estate owners, farmers and stately homes have been able to make use of the records for the repair and incorporation of the original systems into modern supply systems.

The hydraulic ram has more than stood the test of time. Many over 100 years old are still in use, and it remains one of the few really practical and efficient uses of natural energy today: It is cheap to purchase, will last indefinitely and with no moving metal parts is simplicity itself requiring the minimum of maintenance.

If the two essentials are provided by the landowner - a supply of water (ie: a spring or stream, as little as 1 gallon per minute will suffice) and the ability to provide a 'fall' for that water - the ram itself can reduce or even eliminate those costly water bills. Ram installations qualify for MAFF grants.



The ram as detailed by Montgolfier in his patent

SUMMARY

Energy Source	Water	No fossil fuel, electricity or solar power of any kind is required.
Input requirement	4 litres/min. -2000 litres/min and 500mm 'fall' minimum	Larger inputs can be achieved by using a series of rams mounted side by side.
Output potential	Up to 250,000 litres/24hr.	Dependent upon fall/lift ratio. Higher outputs may be obtained by series of Rams.
Lift potential	Up to 30 times 'fall'	i.e. 10m fall gives maximum lift of 300m
Installation	Extremely simple	Easily undertaken by local labour
Construction	Heavy cast-iron & gun metal two moulded rubber valves.	Special grades of gun metal can be supplied to suit corrosive water conditions
Operating life	Indefinite	Many rams of over 100 years old still in operation
Maintenance	Negligible	Only two rubber valves occasionally need replacing. There is no metal in motion.
Uses	Village water supplies Irrigation Water circulation for heat pumps Water circulation for solar panels Water pumping and circulation in industry Charging hydraulic accumulators for remote operation of sluices, lock gates, etc.	

FARMER FIGHTS THE DROUGHT WITH RAM

FARMER Peter Lee is fighting the drought down on his farm at Bochym, Cury, with the aid of a ram.

In the short time in which the ram has been in use, Mr. Lee admits he has almost made up its installation and repair costs with the saving in metered mains water. He hopes to cut his half-yearly water rates bill of £460 by more than half.

"I could kick myself for not having it sooner", he said. "When we went on the mains in the 1960's we just let the ram go. Now it is going to save us a lot of money."

Ironically, Bochym Farm has never been without water, even in a drought. Its location is such that supplies have always been maintained.

Fully restored after being submerged in water for 20 years, the ram now pumps 4000 gallons a day with a lift of 207 foot from a river which runs through his land.

Much of the old pipework was found intact and was

serviceable. For the 1500 yard rise from the pump to the farm, however, Mr. Lee laid new alkathene pipework.

"I have never known that river to dry up", he added, pointing to the silt covered pool. "It slows down in the summer that is ail. I only wish I had done this sooner. It's so simple and costs nothing to run."

The ram is not a farm animal but a self-driven pump first installed at the turn of the century when they were popular with farmers who had natural water courses on their land.

With the coming of mains supplies, many rams went dry. They were left to rot and rust in their brick and stone-lined pits.

The recent drought encouraged Mr. Lee, aged 39, and his wife Jennifer to bring the ram back into use after 20 years idleness.

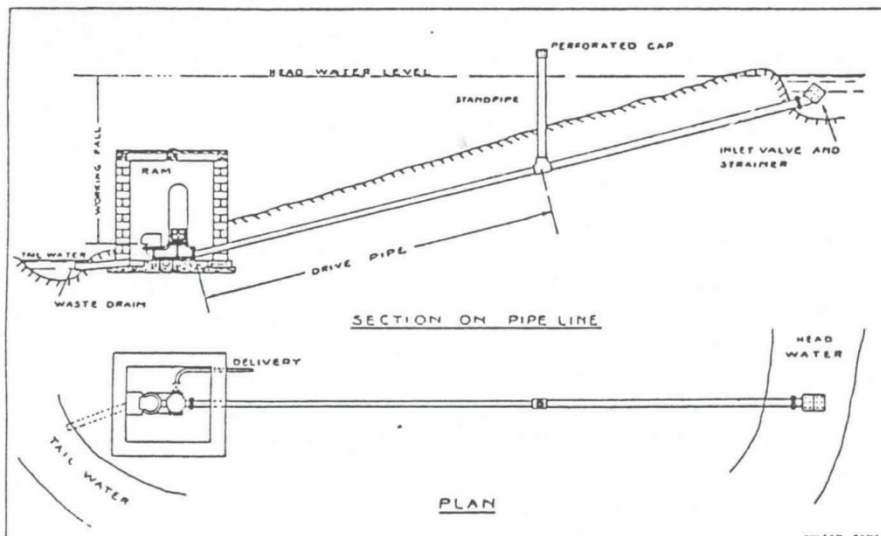
Now it is pumping water from an endless supply up a steep incline to the farm where he is feeding all his stock, washing down his milking parlour and taking water to the fields for water troughs.

He has even supplied a separate 'plumbing' system to the farm buildings to make use of this never ending supply of water.

Meanwhile Mrs. Lee and her two children Emma (10) and Ann (7) can use the supply for the horses and fowl.



Mr. Lee is pictured with the ram pump.



RAM DATAFORM

..... 19

Please quote for a Vulcan RAM to work under the conditions mentioned below.

NAME

ADDRESS

..... POST CODE

TELEPHONE (Daytime) (Evening)

FALL: The gross fall obtainable on the stream or below the spring.

DRIVE: The length in feet or yards in which such fall is obtained

SUPPLY: Amount of water at command in stream or spring which to work RAM in gallons per minute

LIFT: Total height to which you require the water raised.

DELIVERY: How much water is required per 24 hours.

DISTANCE: The distance in feet or yards to which the water would have to be forced from RAM to cistern

SPRING WATER: If a Compound RAM is required the amount of spring water available in gallons per minute and whether or not this can gravitate to site of the RAM.

If to replace an old RAM, in addition to the above particulars, give length and bore of the existing drive pipe and state if this is straight, clean and in good condition.

GREEN & CARTER (RAMS)
VULCAN WORKS
ASHBRITTLE
Nr. WELLINGTON
SOMERSET TA21 0LQ

PRICE LIST OF VULCAN RAMs SIMPLE TYPE

RAM size	RAM only Price	RAM with Essential Spares and Fitting Kit	Gross weight
1 1/4"	£465.00	£545.00	84lbs
1 1/2"	£535.57	£615.30	112lbs
2"	£719.09	£822.15	210lbs
2 1/2"	£1006.13	£1102.16	399lbs
3"	£1167.48	£1296.83	408lbs
4"	£1853.07	£2112.43	530lbs
5"	£2711.50	£3246.20	1008lbs
6"	£4620.00	£4926.86	1480lbs
8"	£10034.78	£11220.31	3700lbs

We recommend the RAM be purchased with essential spares and fittings kit as listed above to ensure easy installation.

COMPOUND RAMs

Tubular compound plus 50% to standard prices
Piston type compound plus 65% to standard prices

RECONDITIONED RAMs

These are usually available and prices subject to availability are List Price less up to 20% depending on amount of work necessary to provide full reconditioning specification. We provide a full written specification of the works to carry out the reconditioning service. ALL our reconditioned RAMs are guaranteed as exactly as our new RAMs. Specification sent on receipt of SAE.

BLAKE HYDRAMS

We manufacture here at our Works a comprehensive range of parts for these RAMs to include, valve rubbers, gunmetal waste valves and delivery valves, cast iron parts, ie/ RAM beds and air vessels.

NOTE: These prices are strictly nett Ex Works, VAT, carriage and packing is extra.

EXPORT: We have our own export packing department who can crate and pack our RAMs in individual component parts if required to withstand the most arduous transport in remote areas worldwide.

OPTIONS

Brass nuts, complete set plus 12% on nett price
Acid resisting gunmetal pulse & grid valve assemblies plus 15% on nett price
Metal pulse valve (not available in 3" size RAM and above) plus 8% on nett price
Hi-Duty type N-C specification (recommended for export installations and arduous service conditions) plus 14% nett price.

SERVICE CONTRACT

In depth service carried out on RAM on annual basis by our engineers to ensure continued efficient service - price on application.

ORDERING INSTRUCTIONS

1. Complete the DATA FORM to enable us to advise as to size of RAM to suit your requirements. (We will visit site if required)
2. Write to us giving details of RAM size required; also options, delivery instructions. We then quote to include options and packing and carriage. (We are delighted that you collect from our works, subject to prior arrangement).
3. TERMS: 25% with order, balance on collection or delivery.

SUBJECT TO CONFIRMATION AND CHANGE WITHOUT NOTICE.

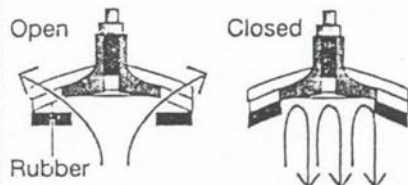
Telephone: (24 Hrs.) 01823 672365
Mobile: 0374 108884
Fax: 01823 672950

Hydraulic ram

The hydraulic ram can pump water without using any external power. All it needs is the natural flow of water from a small stream. The basic idea was developed over 200 years ago, but rams are in the spotlight again because of environmental concerns. A single ram can supply an entire village with water.

Pulse valve

As the volume of water passing through the central hole increases, the pressure on the underside of the rubber suddenly becomes sufficient to snap the rubber against the valve set.



Air

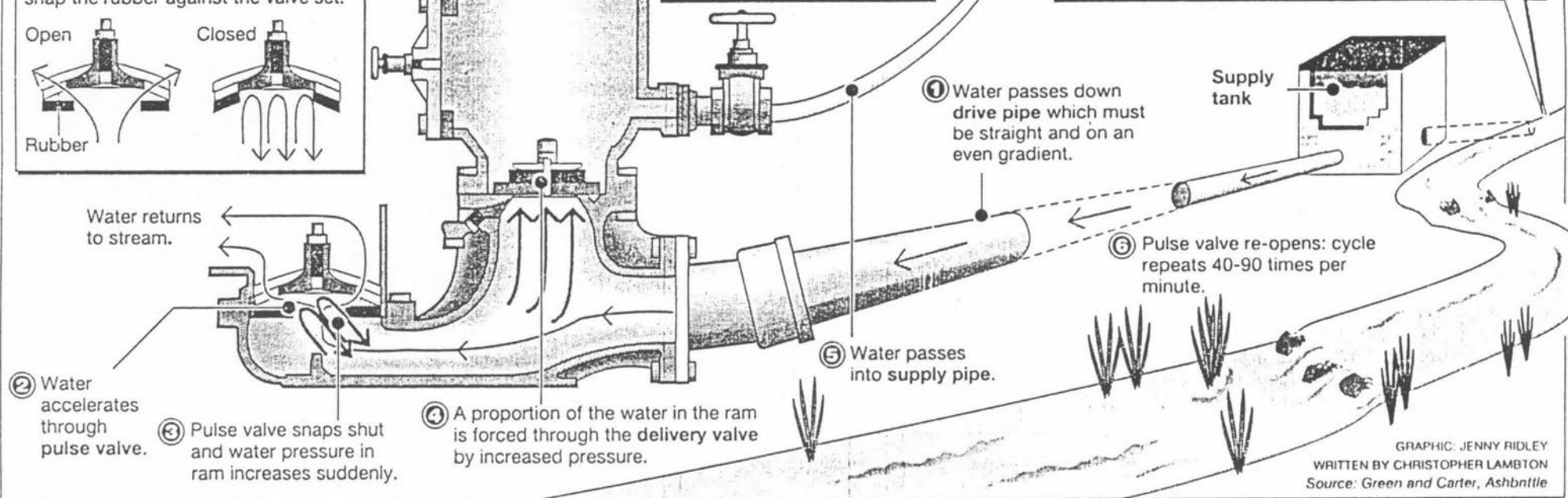
The air is under pressure and provides a "cushion" that turns the pulsing water supply into a steady flow. Without the air, the ram would still work but would eventually be damaged by the hammering and shaking this produces.

Header tank

A ram can raise water upwards of 100m in height and 5km in distance. The steady flow from the ram fills a header tank that can then supply houses.

Stream

A ram can work from a "fall" (the vertical distance between the supply tank and the ram) as small as 0.5m with a flow rate of only 4 litres per minute. With higher falls and flows, a ram can pump 250,000 litres in 24 hours. If the stream is impure, but there is a separate source of pure water, a "compound" ram can be used to pump pure water using the power of the impure flow.



GRAPHIC: JENNY RIDLEY
WRITTEN BY CHRISTOPHER LAMBERTON
Source: Green and Carter, Ashbottle

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BEEFING UP THE WATER PRESSURE

A REVIVAL OF THE OLD MECHANICAL RAM STARTS AN OVERFLOW

What's the connection between Montgolfier, the Somerset Levels and farmers' water bills?

It's the hydraulic ram, a masterpiece of 18th century technology that is enjoying a revival, much to the delight of the only company in Britain that makes them.

Green and Carter, a family firm in Ashbrittle, which is as close to the Somerset border as you can get without falling into Devon, is currently installing more hydraulic rams than it did when it was laying on water supplies to the great estates and country houses in Victorian times.

Farmers all over Britain are turning back to a low-technology answer to their water needs as an alternative to paying ever higher bills for piped mains water.

And in the environmentally-conscious 1990s you could hardly hope for a better set of green credentials than the hydraulic ram can display.

Essentially it is a water-driven pump which uses the force supplied by a head of water from a river or stream to force a smaller quantity of water through a narrower pipe - up to 1,000 feet vertically or over a distance of several miles.

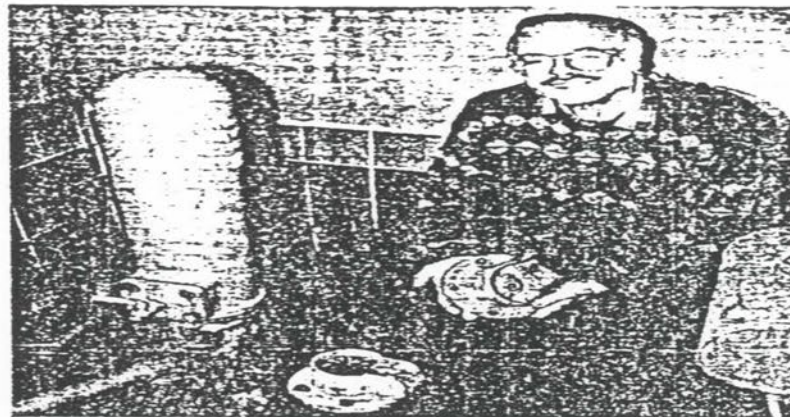
Marketing

The mechanism is governed by a pulse valve, whose regular opening and closing creates the rhythmic thumping sound which is all that betrays the ram's presence in a wood or field.

It was Montgolfier, the French hot-air balloonist who invented the device but, says the current head of the family firm, Charles Doble; 'While he was good at inventing things he wasn't terribly good at marketing them.'

The result was that the British patent - signed by George III and still in the company's ownership - was bought by Josiah Easton, a surveyor who laid out many of the roads in the West and also designed steam pumps to drain the Somerset Levels.

His company was eventually bought out by Green and Carter.



Still pumping: A Georgian hydraulic ram is still operating and Charles Doble even has spare parts if they are needed.

'But it was he who really promoted the concept of the ram,' says Charles Doble. 'A lot of the large country houses didn't have piped water supplies in the 1800s - they relied on wells. But as soon as the big estates began putting them in, the smaller country houses followed and there was a trickle-down effect to farms and smaller properties.'

Details of every single, individually-numbered ram Green and Carter has ever supplied are recorded in green leather-bound ledgers dating back to 1774. Royalty, dukes and earls, prime ministers and other notable figures, including Lawrence of Arabia are named.

Green and Carter exports hydraulic rams to undeveloped countries where they provide the answer to water supply problems. But now American farmers, faced since the 1970's with soaring water bills, are after them as well. And demand in Britain has never been higher.

'We are now installing 1,000 units a year in this country - and that's probably more than the company was doing in Victorian times,' says Charles Doble.

STAND BY FOR MORE SUPPLY CUTS

Britain has still not recovered from the effects of last year's drought - and farmers should be on stand-by for more water restrictions this summer, the National Rivers Authority has warned.

Many reservoirs in the west have still not been replenished after the unprecedented demands placed on them last year.

And although January river levels were above the long-term average, more worrying statistics have just emerged for rainfall.

Latest figures show that between March and January rainfall across the West was almost one-fifth less than average - a worrying large discrepancy. And although Devon and Cornwall received 104% of a normal January's rain, the NRA's Wessex region, covering Somerset, Avon, Dorset and Wiltshire, got less than 70% of its usual rainfall.



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V.C.S.

Ilam Hall, Dovedale, Derbyshire, the seat of the late Rt. Hon. R. W. Hanbury, M.P.

Showing a Hydram worked by water taken from the river Manifold, with a fall of 4-ft. and raising 4,000 gallons per day to tanks in the Hall, 100-ft. above the Ram.

