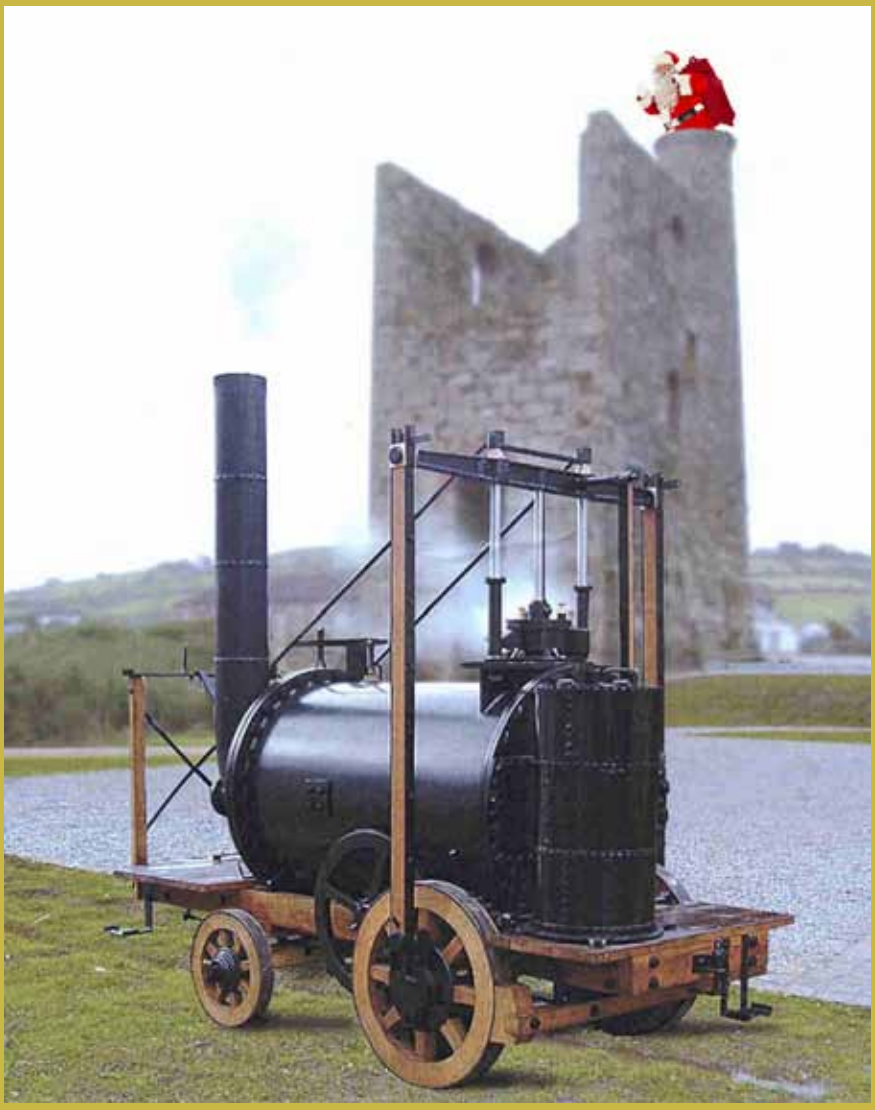
THE TREVITHICK SOCIETY

KOWETHAS TREVITHICK

NEWSLETTER 162 WINTER 2013



Reg. Charity
No. 246586

Seasonal greetings from Wheal Harriet, Dolcoath

CHAIRMAN'S ADDRESS

What a Year!

There comes a time of year when we put on warmer clothes, look back with some satisfaction and forward with anticipation. While always wishing we had achieved more, it's been a good year for the Society in many ways.

On the publication side we sold out of *The Oblivion of Trevithick* and *From Holman Bros. to CompAir*, reprinting the latter. We also published and reprinted *The Genius of Trevithick*, and closed the year by publishing two weighty, important books, *Devon Great Consols* and *The History of Camborne School of Mines*.

There was excitement in the form of a trip to a little French village with the 1801 Trevithick replica where we made international friends and subsequently received an invitation to take it to Suffolk next year.

We successfully sought funding from the Heritage Lottery Fund to record and digitise of our ever increasing stock of papers, films, images and artefacts for worldwide use. We congratulated Cornwall Council on its successful bid to the HLF for over £1 million to create a centre for Cornish mining history at King Edward Mine.

The East Cornwall branch has continued to prosper in the hands of the Manley Team and has been a rich source of new members.

Kingsley has given a number of lectures connected to Cornwall's industrial past and I have been fortunate enough to give Trevithick lectures to the Cornish Diaspora in California, combining the trip with a visit to the Smithsonian in Washington, D.C.

We have negotiated with Coastline Housing Ltd to lease a former Holman building in Camborne as a home for the Society and we are currently awaiting the outcome of a Change of Use Planning Application.

As we go to press we are making arrangements for one of the most exciting local events of the coming year, a firework and illumination display at Heartlands on the evening of Camborne Trevithick Day; watch the next newsletter for further information.

All in all it's been a good year and there are good things to come. All the above has taken a lot of organising and plenty of hard work. You can see that our interests are wide ranging, appeal to many tastes and usually don't require any special skills; we have fun. Come and join us if you have a little time to spare, we promise it will be interesting.

In the meantime we wish you and yours the Compliments of the Season.

Philip M Hosken

EDITORIAL

I wish to thank the contributors for their timely submissions which have enabled this issue to be completed in 2013.

Colin French

Copy date for next newsletter: February 15th 2014

Established 1935

LETTERS TO THE EDITOR

Dear Editor,

As a septuagenarian member of the Society, I was particularly delighted to read in the latest Newsletter of the Society's enterprise in attending the celebrations in Chitenay earlier this year. It was heartening to reflect how substantial have been the Society's practical achievements since I ceased to serve on the Council some 20 years ago.

I have no doubt that international recognition of Richard Trevithick's engineering achievements will have been permanently enhanced by the successful construction and demonstration of the Puffing Devil. The welcome you evidently received in Chitenay will have helped to create many new friendships.

I enjoyed a similar welcome in September this year when I went to nearby Orleans for the River Loire festival. For no less than six days I and a Dutch colleague on the executive committee of European Maritime Heritage were accommodated in a local hotel and fed generously at a succession of open-air meals cooked on the bank of the Loire, between frequent excursions on the river; memorable and generous hospitality.

The article in the Newsletter postulates that one day the Society will maybe do something like this again. I hope that aspiration is fulfilled, and applaud the hard work and dedication of you and your team in getting the replica to Chitenay and using it so effectively to promote Cornwall and the Society there.

John Robinson.

LISKEARD TOWN MUSEUM

Members, who like me regularly pass through East Cornwall, may like to consider a comfort stop in Liskeard and then take in the town's excellent museum. The museum, which shares premises in the former East Cornwall Savings Bank with the local TIC, is a model of what a town museum should be and has strong community involvement. Of particular interest is the Mining Room, which has been set up with the help of the Society's East Cornwall Branch. A star exhibit there is a large working model of a man-engine, constructed in Meccano by Michael Denny of Herodsfoot, and captured in this photograph by Jackie Jenkins.

Graham Thorne

FENLAND ROTATIVE BEAM ENGINES, A CASTLE AND LANCASTER BOMBERS

The Fenlands, locally known as the Fens, is an area of approximately 1500 square miles (3900 square km) situated around the western areas of The Wash in Eastern England. Main areas of the Fens are to be found in the counties of Lincolnshire, Cambridgeshire, Norfolk and a small area of North West Suffolk.

The Fens were originally a natural marshy region which over the centuries has had many attempts to drain it for agricultural purposes, with the earliest attempts being made by the Romans. Drainage of the Fens has always been a major problem due to the low lying nature of the terrain with many acres being just above sea level or just below. To effectively drain the Fens water has to be raised from the lower levels into the upper drainage channels in order to get the water flowing away to the sea. The main outlets to the sea being the rivers; Great Ouse, Nene and Welland flowing out into The Wash.

Major strides were made in drainage when wind pumps were introduced throughout the Fens, but these only worked when the wind blew – a bit like the present day electric wind turbines! The wind pump is a simple device consisting of a small windmill driving a scoop wheel to raise the water from lower level to the upper level. An example of one of these pumps can be found at the National Trust's property of Wicken Fen in Cambridgeshire.

With the Industrial Revolution in the late 17th century and early 18th century and the introduction of steam power, wind pumps were gradually replaced by the more "powerful" and reliable steam pumps. A great number of steam pumps were installed across the Fens, many of them of the rotative beam engine design. Many of these engines were in operation right up to the middle of the 20th century, to be gradually replaced by diesel pumps or fully automatic electric pumps from the middle and latter half of the 20th century.

Three of these rotative beam engines have survived in their original engine houses and are well worth a visit. They are: Dogdyke Pumping Station, Pinchbeck Engine and Stretham Old Engine. Of the three only the Dogdyke engine is able to be operated by steam, the remaining two are operated by electric motor for demonstration purposes.

Stretham Old Engine

This is located just south of Stretham village in Cambridgeshire (Grid Ref. TL815729) – height above sea level 8 feet – sign posted off the A1123 trunk road. Originally supplied by The Butterley Company Ltd in 1831, the engine is a 60 nominal BHP double acting condensing rotative beam engine with a bore of 39 inches (99cm) and a stroke of 96 inches (2.4 metre) operating at between 12 and 16 strokes per minute.

The engine is gear coupled, via beam and connecting rod, to a 37 feet-2 inch (11.3 metre) scoop wheel which is just over 2 feet (0.72 metre) wide having 48 paddles, or ladles, around its circumference. The scoop wheel operates at between 3 to 4 rpm delivering about 100 tons of water per minute.

Also at Stretham Pump House are various items connected with Fenland drainage including Lancashire boilers, diesel pumps and many more interesting items.

Just 4.5 miles south east from Stretham is the National Trust property Wicken Fen (Grid ref. TL562705) – just off the A1123 trunk road – which has a small smock wind pump, probably built

around 1912 among its exhibits and is demonstrated occasionally.

Pinchbeck Engine

This is located on the northern outskirts of Spalding in the South Holland area of Lincolnshire (Grid ref. TF261261) – height above sea level 10 feet. The Pinchbeck Engine is a 20 HP condensing rotative beam engine built and supplied by The Butterley Company Ltd in 1833. The engine has a single 35 inch (89 cm) cylinder with a 56 inch (1.42 metre) stroke driving a scoop wheel through a beam and connecting rod to the crankshaft, which is equipped with a 8.5 feet (5.64 metre) flywheel with a maximum operating speed of 30 rpm.

The 22 feet (6.71 metre) diameter scoop wheel has 40 paddles around its circumference and is gear coupled to the engine crankshaft to reduce scoop rpm. Pumping capacity was 7500 imperial gallons (34000 litres) through a 8 feet (2.44 metre) lift into the drainage channel. The Pinchbeck Engine was replaced by modern fully automated electric pumps in 1952.

The Pinchbeck Engine museum complex is also home to the Museum of Land Drainage which is located in the old coal store. Exhibits on display include the blacksmiths shop, still in its original condition, and various items connected with Fenland drainage. The museum buildings are Grade II listed and are also a Scheduled Ancient Monument in the care of the Welland and Deepings Internal Drainage Board.

The engine is powered by an electric motor for demonstration purposes.

Dogdyke Engine

This can be found on the banks of the River Witham, about half a mile southwest of Tattershall village in the North Lindsey area of North East Lincolnshire (Grid Ref. TF210553) – height above sea level 7 feet.

The engine, still in its original engine house, is low pressure double-acting with a separate condenser of approximately 16 HP, made by Bradley and Craven of Wakefield, Yorkshire in 1855/6 replacing several wind pumps. Pumping

capacity is approximately 25 tons of water per minute, via the scoop wheel.

Engine dimensions are 24 inch diameter cylinder with a 48 inch stroke driving a 16 feet diameter scoop wheel, via beam, connecting rod and a 16 feet diameter flywheel, the scoop having 36 wooden paddles around its circumference. The scoop wheel is geared down to 7 rpm.

The engine is steamed on the first Sunday of the month from May till October from 1.30 pm to 4.30 pm. It is also open and in steam on Steam Heritage Days, mainly in March and September. The engine was replaced by a diesel pump in 1940, which in turn has been replaced by fully automatic electric pumps.

Also on site at Dogdyke are a Ruston and Hornsby 23.6 litre diesel engine coupled to a 22 inch Gwynnes centrifugal pump, a Ruston and Hornsby auxiliary engine and various other items connected with Fenland drainage.

The Castle

Whilst visiting Dogdyke there are two further attractions within a very short distance which are well worth visiting. The first of these attractions cannot be missed as it is the National Trust's Tattershall Castle, which can be located on the western edge of Tattershall village alongside the A153 trunk road, about half a mile from the Dogdyke Engine (Grid ref. TF211575). Tattershall Castle is a 130 feet (40 metre) high six-floored stunning red brick medieval castle built by Ralph Cromwell in 1434. The 150 steps climb from the basement to the roof are arduous, but the views from the roof over the flat Fenland countryside are well worth the effort.

The Lancaster Bomber

Whilst in the Dogdyke area it is also well worth taking time to visit the Battle of Britain Memorial Flight based at RAF Coningsby Airfield, just to the east of Tattershall village, which operates squadrons of the Typhoon Eurofighter. In fact Dogdyke Pumping Station is directly under the flight path of the main runway and has many warning notices advising visitors of the high noise levels from Typhoon aircraft taking off.

The Battle of Britain Memorial Flight hangar is home to the Avro Lancaster, Supermarine Spitfires and Hawker Hurricanes, DC3 Douglas Dakota, De Haviland Chipmunk trained and a Rolls Royce Merlin engine repair bay.

To see the mighty Lancaster, Spitfire and Hurricane close up is a never to be forgotten experience. There are only two airworthy Lancasters in the world, the BBMF one and one in Canada.

Throughout the summer months the Battle of Britain Memorial Flight give flying displays around the country. For up-to-date information regarding locations go to www.raf.mod.uk/bbmf/displayinfo/. If one visits Coningsby on a BBMF Day you may also be lucky to see the RAF Typhoons in operation from the public viewing area adjacent to the Memorial Flight hangar. The noise from the Typhoon on take off is "awesome".

Lincolnshire Aviation Centre

Still on a World War II theme there is a second Lancaster bomber just 9 miles east of Tattershall village at the Lincolnshire Aviation Centre at East Kirkby village, just off the A155 trunk road (Grid ref. TF337622).

The Aviation Centre is located on the Old World War II RAF East Kirkby bomber airfield and retains many of the old hangars, buildings, control tower and airfield infrastructure. Besides the Lancaster bombers there are many displays of aircraft, airfield transport, recovered crash wreckage, W.W.II RAF memorabilia and many of the surface operational buildings. The operational buildings have been restored to W.W.II conditions and give the visitor an insight into what conditions were like during bomber operations during W.W.II. The Lancaster and many more aircraft, wartime transport, etc. are on display in hangars around the control tower.

This Lancaster has been fully restored to W.W.II condition, and although it has not got an airworthiness certificate it is unique in that it offers visitors a chance to have a taxi run around the museum site. See www.lincsaviation.co.uk.

Norman Tarry

TOURISM AWARDS FOR GEEVOR

On November 7th 2013, Geevor Tin Mine was nominated in two categories at the Cornwall Tourism Awards in Newquay and came away with three prizes.

It secured silver in the *Historic Property and Country House* category, gold for being the best *Art, Museum and Maritime Attraction*, and then was named the *Winner of Winners* – the most prestigious award at the event.

Malcolm Bell, head of VisitCornwall, who announced the prize said "They symbolise the essence of being a tourism operation ... fighting for customers, struggling to raise investment funding, striving each year to improve, innovate and be better than the year before".

Geevor was singled out for its "evocative and interactive Cornish mining exhibitions and tours", and applauded for its value for money. And, as the management team were quick to point out "the award is testament to all the hard work of staff, volunteers and everyone who supports it in the community".

THE ASSOCIATION FOR INDUSTRIAL ARCHAEOLOGY TOUR

The AIA Spring Tour of Moravia and Silesia, organised by Heritage of Industry in its 25th Anniversary Year, is now open for booking. Non-members are very welcome and full details are at: http://www.heritageofindustry.co.uk/Longer%20Tours/2014_Moravia/Moravia.html or Hunters Moon, Gorelands Lane, Chalfont St Giles, HP8 4HQ.

BEAM ENGINES IN AMERICA X: LEHIGH ZINC COMPANY'S 110-INCH ENGINE "THE PRESIDENT"

On the southeastern outskirts of Allentown, Pennsylvania, just a little over half a kilometre south of Interstate 78 (Fig. 1), stands the house of the largest beam engine ever built in North America. Now ruinous and hidden amid woods (Fig. 2), the house stands beside the flooded open pit that marks the site of the Ueberroth Mine, the largest and most productive of the Lehigh Zinc Company's Friedensville mines.

Lehigh Zinc Company and the Ueberroth Mine

In 1853, following the discovery of rich, near-surface zinc ore in the dolomitic limestones of Friedenville's Saucon Valley, a zinc works was established in nearby Bethlehem for the production of zinc oxide and, six years later, for metallic zinc. In 1860, this business became the Lehigh Zinc Company, which remained in operation until 1911 when it was taken over by the New Jersey Zinc Company and the plant removed. By 1876, the plant's capacity was 3000 tons of zinc oxide and 3600 tons of metallic zinc per year, or about half the country's annual consumption, and the mines had, in aggregate, raised some 300,000 tons of ore. When mining operations is the Saucon Valley ceased in 1893, this figure had risen to 800,000 tons of ore averaging 30% zinc.

From the start, the Friedensville mines were notoriously wet and a series of increasingly larger pumps were erected to cope with this problem. In 1854, the Ueberroth Mine was a shallow open-pit operation being drained by centrifugal pumps that were soon replaced by a double-acting pump capable of raising 200 gals/min. In 1861, a Woodward pump was installed, to which a 100 hp Corliss engine was added in 1863 that drove four centrifugal pumps capable of raising about 2500 gals/min from a depth of 65 feet. But all proved inadequate for the task as the mine deepened.

In 1866, the company's engineer, Cornishman John West (nephew of the great Cornish engineer, William West), erected a 300 h.p. double-acting condensing horizontal engine of his own design with a 32-inch cylinder and 9-foot

Fig. 1

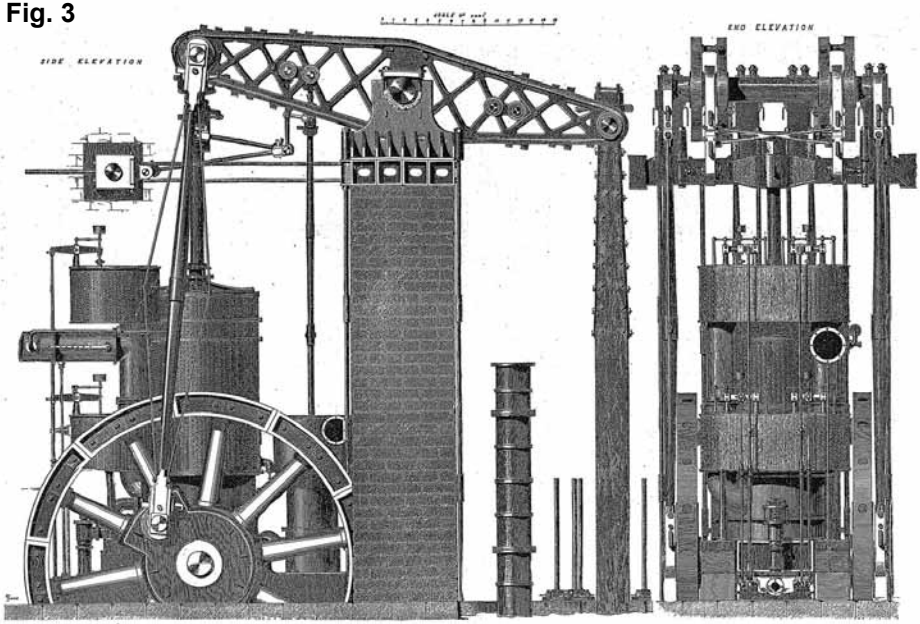
Fig. 2

stroke. The mine's new pumping shaft had been sunk to a depth of 132 ft that year, and the West engine, which operated three 22-inch lift pumps, was capable of raising 5700 gals/min at 16 strokes/min. Also at work at the neighbouring Hartman Mine was a 50-inch Bull engine (10 ft stroke) designed by West some 15 years earlier. This worked a 22-inch pump at 7½ stokes/min, raising 1800 gals/min. The engine, which had been moved to the mine from elsewhere in 1865, was claimed to be the first Cornish engine built in the United States. If so, it may have been the 50-inch Cornish engine (10 ft stroke) upon which the same claim was laid by the *Royal Cornwall Gazette* in 1851, where it was described it as being built by Messrs J.T. Sutton & Co. of Pennsylvania for the Perkiomen copper mine in Audubon, some 50 km to the south.

"The President"

As with the earlier engines, however, the combined pumping power of the West and Bull engines proved inadequate as the main pumping shaft was deepened, and, in 1869, West was called upon to design an engine capable of pumping 12,000 gals/min from a depth of 300 ft. The engine he designed, a condensing, double-acting rotative engine weighing 675 tons, was unique, but proved to be as successful as it was gargantuan. With a 110-inch cylinder and two latticework bobs, the engine worked both pump rods in the shaft and a pair of massive flywheels inside the engine house (Fig. 3). It was built over a three-year period by Merrick & Sons at their Southwark Foundry in Philadelphia (see Newsletter 89, p. 13-15), although much of the casting was subcontracted to Lazell, Perkins & Co. of Bridgewater, Massachusetts, while the pumps, boilers and mountings were manufactured by the Philadelphia firm of I.P. Morris & Co. Having been erected on the main pumping shaft by Cornishman Simeon Noell, it was set to work on January 19, 1872, and was run continuously by two emigrant Cornishmen until October 28, 1876, following which the mine was allowed to flood. West is thought to have called his engine "The President"

Fig. 3



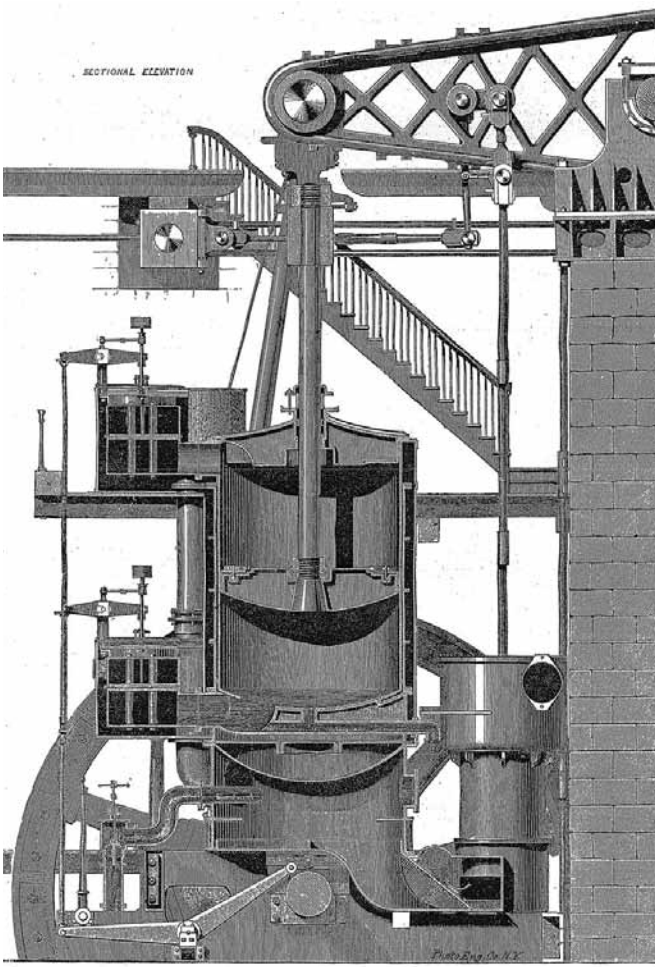
in honour of President Ulysses S. Grant who had been invited to officiate at its dedication, but who, in the event, failed to arrive.

Contemporary descriptions of the engine come to us from several sources. An illustrated description, that contains a quote from West himself, was published in a supplement to *Scientific American* on August 5, 1876. That portion which describes the engine reads as follows:

We start with two plunger pumps of 30 in. diameter, set in cisterns 87 ft. down the shaft, one discharging into the adit 25 ft. below the surface, the other discharging into tanks on the surface for condenser and boilers. Below these, two lifting pumps, hung in wire ropes, work to the bottom, 127 ft. below the collar of the shaft, or 122 ft. below the old zero point, or 75 ft. below the level of Saucon Creek, which crosses the road half a mile south. These pumps will throw 735 gallons per stroke – the engine can work comfortably at 12 strokes per minute, and the power is more than adequate, and the dimensions of the shaft (30½ ft. by 21½ ft. in the clear) ample for doubling this number of pumps, and carrying all to a depth of 300 ft, or 178 ft below the present bottom of the mines, with power still in reserve for what may be required below.

Our engraving (Figs. 3 and 4) shows that, in many respects, the engine is of the Cornish type. Mr. West has, indeed, carried with him from Cornwall the traditions of a successful practice.

It is well known that the Cornish engine cannot be worked to any great extent expansively, unless the pits are so deep that a great mass has to be put in motion, in the shape of pump spears, etc. Now the lift in the Lehigh mines is comparatively small, and Mr. West therefore introduced the means of expansive working – that is to say, great mass in motion – in the shape of two fly-wheels. It will be seen that these wheels appear comparatively small in diameter, and nothing will give a better idea of the colossal dimensions of the whole of the machinery than the statement that they weigh seventy-five tons each. The beams appear light, but then there are four of them; the holding down bolts also look slight, but then their number is great. For the following particulars we are



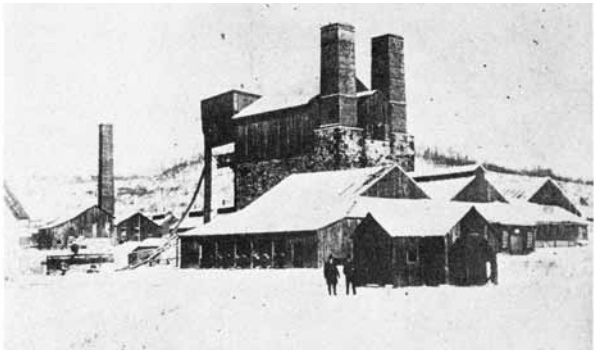


Fig. 4 (top) and Fig. 5

indebted to the courtesy of Mr. West: "The engine has a pumping capacity of 15,000 gallons per minute, and has been run to 19,000 in case of emergency, raising water from a depth of 350 ft. The engine alone weighs 650 tons, and including the pumps and boilers, the total weight of the machinery is 1000 tons. The cylinder is 110¼ in. in diameter; length of stroke, 10 ft. The heaviest pieces of iron in the engine are the sections of beams, which weigh 24 tons each. The fly-wheels weigh 75 tons each; crank pins, 1 ton each. The piston rod is 14 in. in diameter. The crosshead weighs 8 tons. The connecting rods have 9 in. necks, and are 15 in. in the middle, 41 ft. 2½ in. long, and weigh 11 tons each. There are two air pumps, 50 in. in diameter each. The 'President' drives four plunger pumps, each 30 in. in diameter by 10 ft stroke, and four lifting pumps each 31½ in. in diameter by 10 ft. stroke – the plunger pumps being uppermost and stationary. The lifting pumps are in the bottom of the shaft, and are movable, so as to go down as the shaft is sunk. To handle these lifting pumps, hoisting or lowering them at pleasure, a steam capstan capable of lifting 50 tons vertically is used. By a series of strong gearing, a drum and a steel wire rope, with this capstan, if any thing goes wrong with the pumps, they can be taken hold of

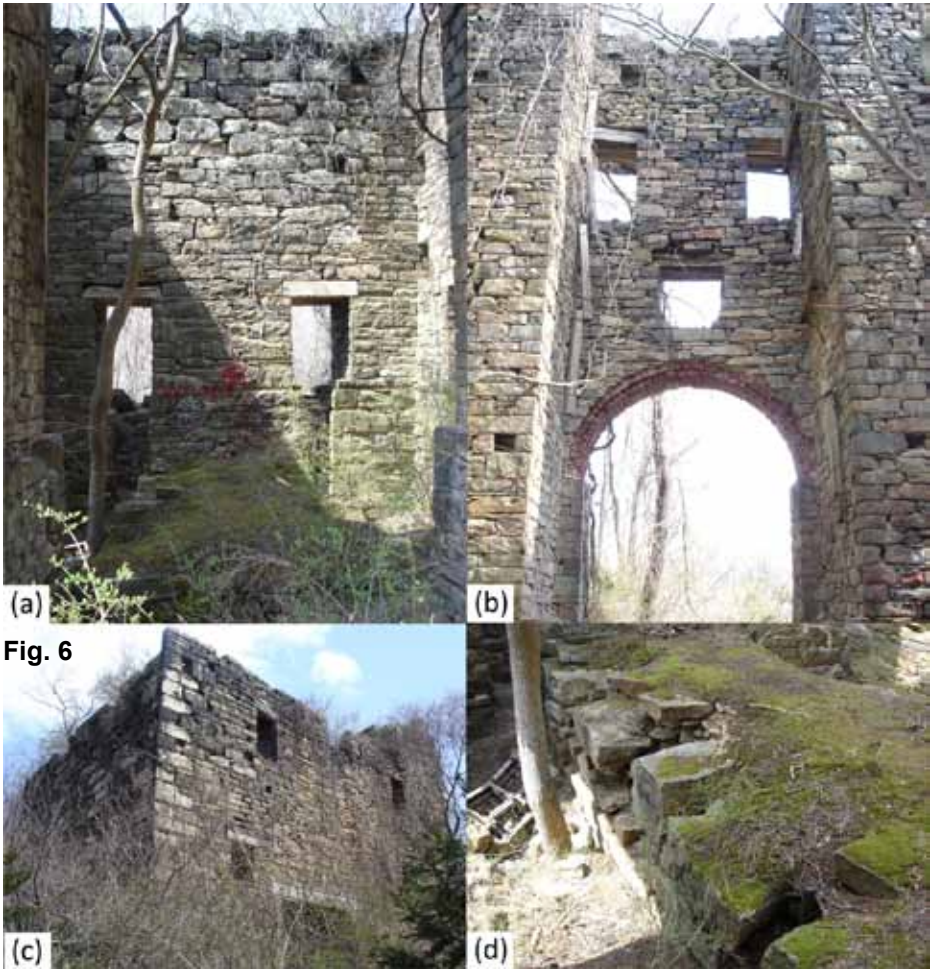


Fig. 6

by the top and pulled out of water, repaired, and put back in a very short time." The arrangement of the valve gear is rather peculiar. It will be seen that the engine is double-acting. The valves are of the Cornish type, driven by cams bolted on the fly-wheel shaft rigidly. These operate on rolls attached to the ends of levers. There were three sets of steam cams made with the engine to cut off respectively at 9 in., 20 in. and 36 in., to be changed to suit the work, but not adjustable. The speed is regulated by a throttle valve in the steam-pipe with a long arm and wire attached leading down to the bottom of the mine, and there connected to a block of wood which floats on the water. This regulates the engine according to the incoming water. This arrangement is quite new to us, and answers admirably. Mr. West attempted to make a commercial success in preference to an engineering refinement, or he would have tried an adjustable cut-off regulated by a wire and float in the same way. The 9 in. cut-off was first tried, and gave good diagrams. Subsequently, however, the 20 in. cam was put on and worked better, the pressure being reduced; very little more coal was consumed, and the engines ran much more steadily and with less shock.

Plan of "The President"

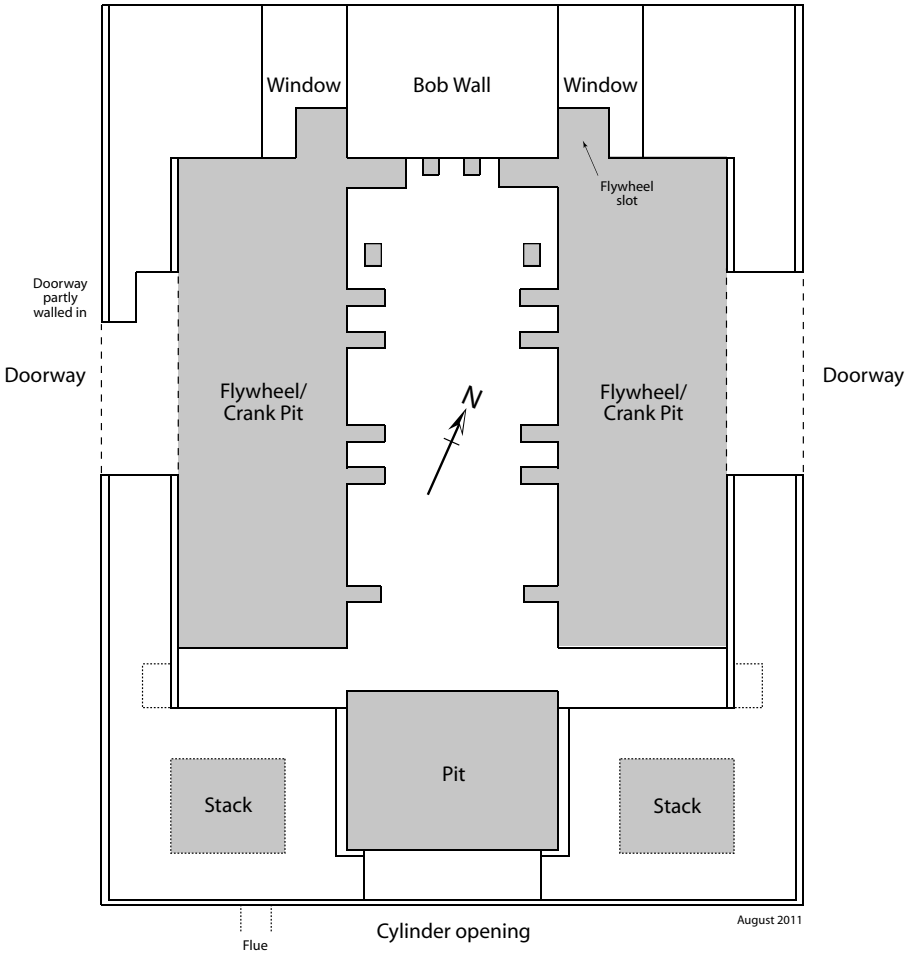


Fig. 7

The quantity of water is so great that when the engine is stopped while the shaft or pit is being sunk it will rise up over the suction pipes – wind bores – and valve chambers – clack pieces – in four minutes. This renders it necessary that the provisions for emergency should be very complete.

A more technical description, made as the engine was being erected, was published by H.S. Drinker in the *Transactions of the American Institute of Mining Engineers* for 1873. This describes the new engine as follows:

The steam is to be supplied by sixteen boilers, each 50 feet long, 36 inches in diameter, and built of 5-16ths iron.

Balanced valves, 20 inches in diameter, and with 1¾-inch lift, are used to admit steam to the cylinder, which is of

cast iron, 110 inches in diameter, and 10 feet stroke, and weighs 30,398 lbs. The cylinder bottom weighs 26,798 lbs, and the head 24,540 lbs, making the total weight of the cylinder and heads 81,736 lbs, or 40 net tons. The cylinder jacket is of cast-iron, 1 5/8 inches thick, and weighs 26,928 lbs. A space of half an inch is left between the cylinder and jacket, the latter being lagged with well-seasoned wood. The exhaust valves are 30 inches in diameter, and lift 3 inches.

The condenser is situated directly beneath the cylinder (see Fig. 4), and a channel-way leads from it to the air pump. The condenser and bonnet weigh 33,075 lbs, and the bottom 24,213 lbs, making a total of 57,288 lbs. The piston-rod is of wrought-iron, 14 inches in diameter and 22 feet long. The cross-head weighs 15,740 lbs, and is fastened to the piston-rod by a nut weighing 1100 lbs. A parallel motion is employed to keep the piston-rod vertical.

The working-beam is in four parts, lattice-patterned, and weighs in all 95 net tons.

The connecting-rods run from the working-beam to the fly-wheels, and are 41 feet 2½ inches from centre to centre, and 15 inches in diameter in the middle. They weigh over 16,250 lbs each. There are two fly-wheels, one on each side of the cylinder, each of which is 30 feet in diameter, and weighs, with weights bolted in, about 92 tons. The pump-rods are attached to the other end of the working-beams by back and centres, running through its four parts. One of these centres weighs 2374 lbs.

There are two wooden main pump-rods, 2 feet by 3, made of six pieces of one foot square Georgia pine lumber. The bucket-rods and the plunger-stockings are attached to them by means of set-offs, and a plunger-head.

There are to be four lift-pumps of 31½ inches in diameter, discharging into four tanks, resting on bearers, 96 ½ feet from the surface. Four plunger-pumps force the water from the tanks to the surface. As the shaft is carried down, the lifting-pumps will not be required to raise the water more than one hundred feet. A fifth plunger and a fifth lifting cylinder will be provided, so that the work of lowering the pumps, as the deepening of the shaft will render necessary from time to time, will be much shortened in time, and seven of the eight pumps can be kept almost continually in operation. The engine can be run under a pressure of 60 lbs to the inch, and would then exert nearly 3000 horse-power. It is, however, not intended to run at so high a pressure, but it is intended that the engine shall pump 17,000 gallons of water per minute from a depth of three hundred feet. All the larger parts of the engine are made to resist a strain eight times greater than it is calculated they will ever be called upon to sustain.

Confirmation of Drinker's description and further details of the engine can be gained from the graduating thesis of Charles Bull, completed at Lehigh University in 1878, soon after the engine had ceased work. Among these details is reference to an episode of repair work to one of the pumps, during which the engine was run at 15 strokes/min for 37 hours without ill effect.

The Engine House

Bull's description also extends to aspects the engine house and its foundations. To support its immense weight, the engine's foundations were laid to a depth of 32 feet below the bed-plate and from this point a solid wall of masonry was built up. To this wall the bed-plate, which was hollow and cast in two pieces, was bolted. Typical of pumping engine houses in Cornwall, the engine house was three stories high, with the air pumps and condenser on the ground floor, the second floor near the top of the cylinder, and the beam on the third (see Fig. 4). The engine's 16 boilers were housed in a building adjoining the engine house to the rear, where their footprint can still be seen, and were connected to the main steam pipe, which ran the entire length of the boiler house. A contemporary photograph (Fig. 5) shows this building to have had a three-gabled roof.

The existing house (see Fig. 2) is complete to the base of third floor, which the contemporary photograph shows was continued to the roof line in timber, and is built entirely of Potsdam Sandstone, an Upper Cambrian sandstone from upstate New York that was highly regarded as a building material in the 19th century. The bob wall (north) is 9-foot thick and contains two "plug doors", immediately below the interior of which are slots for the two flywheels (Fig. 6a). Outside, the bob wall stonework extends downward to the top of the shaft, a distance at least as great as the house is high. When operations ceased, the shaft had been sunk to a depth of 240 feet.

The rear (south) wall contains a large, brick-arched cylinder opening above which is a centrally placed steam inlet, a pair of middle chamber windows and recesses for the two spring beams (Fig. 6b). As in Cornwall, these extended the length of the house and were cantilevered out over the bob wall to support bob plats on either side of the beams, one of which is visible in the contemporary photograph. The two square stacks that served the boilers occupy the two rear corners.

The side walls are mirror images of each other, each containing at their base, a large wooden-linteled doorway that was presumably used to bring the two flywheels into the house (Fig. 6c). There are window openings flush with each stack in the bottom and middle chambers, a second window opening in the middle chamber, and a smaller opening of uncertain function in the bottom chamber. An additional opening located centrally at the top of each wall was presumably used to support the cast-iron main girder to which the parallel motion was attached.

The plan of the engine house as it exists today highlights its gargantuan size and reveals the layout of the bottom chamber (Fig. 7). This is dominated by a central masonry platform to which the engine was anchored by numerous holding down bolts (Fig. 6d), either side of which are large pits for the flywheels and cranks, and doorways in the side walls. The bob wall contains two windows and slots that mark the location of the two flywheels. The rear corners of the house are occupied by the two stacks, between which are the cylinder opening and an additional pit of uncertain function.

The engine house is now all that remains of West's extraordinary engine and is a rare record of beam engines in North America. But, as yet, there has been no attempt at stabilization, although the house is in good condition. Hopefully this will change as the site's importance gains wider recognition as indicated by Peterson and Zagorski's excellent article on the history of zinc mining in the Saucon Valley published in 2001 (*Canal History and Technology Proceedings*, vol. 20, p. 139-162).

Damian Nance

TREASURE SAVED

The National Railway Museum in York has purchased one of the world's oldest steam locomotive models, known as Sans Pareil (Without Equal), thanks to a £50,000 grant from The National Lottery through the Heritage Lottery Fund. It can perhaps be seen as a second generation Trevithick puffer.

KING EDWARD MINE

King Edward is now buzzing with excitement and expectation as we have had confirmed that the site has been awarded grant funding through the Heritage Lottery Fund of £1.1 million. This will be used to refurbish the building block at the top or north end of the site and includes the count house, the early blacksmith's shop, dry and carpenter's shop. The race is now on the clear the artefacts, rubbish and equipment stored therein. The current joke at King Edward that we should attach wheels to everything as we seem to move everything so often! A storage building is to be erected in the Home Field but the timings have not worked out conveniently and so we will have to obtain two lorry containers to use as temporary stores.

The nature trails and educational models are gradually taking shape using funding previously granted under the "Your Heritage" banner including some excellent work on the model beam pumping engine built by the late Bill Cheshire but sadly kept in a dismantled state in a very damp shed for some years. The obvious effect of this atmosphere has been the necessity to make of a number of replacement parts.

The archaeological investigation at the boilerhouse area of the stamps engine house has proved a great success. The was led by James Gossip of Cornwall Council's Historic Environment Service and President of Meneage Archaeology Group (MAG) with KEM's Keith Rundle putting in a monumental effort overseeing the day to day running of the dig. Eight trenches were opened up at strategic points. The first two were sited where it was thought they would intercept the footings of the boilerhouse walls, which they did, and so were a great success. The third was placed where it was felt it would find the exhaust flue from the boilers to the chimney some thirty feet or so west of the boilerhouse. This trench soon uncovered, at shallow depth, part of a laid stone working surface and so digging ceased and trench number four was opened adjacent to trench three in a further attempt to locate the flue. At a depth of two metres the flue was still not found so for safety reasons the trench was back filled but will hopefully be re-opened sometime in the near future and taken to a greater depth. Trenches four, five, six and seven were all situated on the coal yard and found a cobbled working surface. One trench was situated where we anticipated finding the boilerhouse east wall and, at the time of writing, may have uncovered one of the two large doorways the boilerhouse would have been furnished with. Further excavation will prove the point. The trench furthest east, or closest to the assay building has uncovered a beautiful piece of coal yard floor but also a sloping area, its use currently under discussion and where

more investigation is needed. Most of the finds unearthed were of domestic origin comprising pottery pieces, bits of glass bottles and a hob nailed boot in surprisingly good condition. These last four trenches are of shallow depth and have been left open for the public to appreciate.

Many thanks go to members of MAG and to KEM volunteers Keith Rundle, Barbara Tripp, Sarah Jolly, Tony Bunt, Dave Allen, and Phil Porter for their hard work in making the exercise a success. The writer even did a turn on the shovel some days. I stress here that the project is still continuing and so watch this space to keep the adrenaline pulsing!

Work continues on urgent maintenance by the mill team. The stamps dippa wheel is being replaced having reached the end of its life and shortly the mill team's attention will turn to replacing the deck of the sand table which is used regularly to demonstrate tin concentration to visitors.

A short while ago a message from the County Conservation Officer enquired if we could give a home to three cast iron "I" section fish bellied beams from an old railway bridge near St. Newlyn East and dating circa 1876. Having said "Yes" Cormac duly arranged delivery and the beams arrived on a large lorry – yes, a large lorry – they are twenty eight feet long and three tonnes in weight! Cast beams are not used these days and hence are a rarity and had we not taken them they would have been scrapped. Members and anoraks wishing to view them will find them in the car park field.

K.J.T.R.

SARA'S FOUNDRY, CAMBORNE

Allen Buckley M.B.E. kindly sent in this photograph of Sara's Foundry, Redbrooke Road, Camborne as it was in February 1981. The photograph was taken by Jim Harvey.

"Our esteemed and highly respected early member, Gordon Richards, worked there".

J.A.B.

PUBLICATIONS

As mentioned in Newsletter 161, *Devon Great Consols: A Mine of Mines* by R J Stewart appeared at the end of October. In addition a reprint of *From Holman Brothers to CompAir*, which has been out of print for some months, is now once more available, still at the original price of £18.50. The new impression is limited to only 250 copies, so, if you missed out last time, don't delay.

Graham Thorne

LEVANT REPORT

The Levant Whim remained in steam until early November and proved to be very popular during half term week at the end of October.

The repair to the condenser dump valve under the floor has proved to be very successful and extra load-spreading washers were installed to the flange. A liberal coat of paint was also applied to all of the items that are normally covered by the water in the cistern surrounding the condenser.

Many years ago, a very kind German visitor donated two automatic dosing pumps for the boiler water treatment and they have proved to be very reliable. Prior to this the engine driver of the day had to manually dose the boiler feed tank with chemicals that were dangerous to handle so this is a far safer method. A new regime of water treatment has been started for the boiler, and it is proving difficult to get the tannin level to the correct amount. We have our own test kit now and no longer need to rely on an outside contractor to give us confusing results!

Until mid February the mine will only be open to visitors on 'Greasy-Gang' days (usually Fridays) but as an extensive winter maintenance programme has been drawn up it is hoped that volunteers may be able to give up more than one day a week. Our custodian Anthony Power will be only too pleased to hear from anyone that can help on 01736 786156, or just come along! We have a whole range of jobs to complete, from simple painting of the guards and engine to more technical aspects involving the dismantling of the steam engine. Full training will be given for anyone not sure of any engineering aspects!

The sale of National Trust raffle tickets to help fund the refurbishment and preservation of the old Geevor upcast fan which is situated at the head of Engine shaft has met with a very positive response from visitors. Many thanks are due to our guides and drivers in bringing this to their attention.

We are still attempting to get a positive response from the London Science Museum with regard to the Carpalla 40" Harvey pumping engine that they have in storage at Wroughton Airfield, near Swindon. We have the ideal engine house to place it in (adjacent to the Whim), and the steam to power it. We feel that the 55 years that they have stored it with nobody seeing it is long enough. Not so many years from now it is unlikely that there will be anyone left with the expertise to place an engine of this type into an appropriate engine house. If anyone has influence with aforesaid museum - we would love to hear from them!

Ron Flaxman.

SOCIETY MEETINGS

Society Programme

2014

Friday January 10th. KEM.
John Couch Adams – Astronomer.
by Robert Beeman.
This is the talk rescheduled from October 2013.

Friday February 14th. KEM.
The St.Austell Bread Riots of 1847.
by Hilary Ballard.

Tuesday February 18th. ECB.
*Wacker Quay and its Railway-Its history and modern day community management***.**
by Dave Readman.

Tuesday March 11th. ECB.
17th Century Copper production**.**
by Author Rick Stewart.

Friday March 14th. KEM.
The Pentewan Railway.
by Robert Evans.

Saturday March 29th. Field Trip.
Walk about Pentewan.
led by Robert Evans at Pentewan village (meeting point to be confirmed) at 2.00pm.

The West Cornwall Branch meets at King Edward Mine (KEM) at 7.30pm on the 2nd Friday of the month.

The East Cornwall Branch (ECB) meets at the Public Rooms at Liskeard and start at 7.30pm, unless stated otherwise.

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For up-to-date news follow us at:
http://teammanley-ts.blogspot.com

Non members are welcome to all talks.

Annual General Meeting

2014

Plans are in hand for the next Annual General Meeting and Dinner which will be held at Bude on Saturday 10th. May 2014. The main topics to be covered are the slate industry and the Bude Canal. The Friday afternoon visit will be to the Delabole Slate Company when we will meet at the works at 2-00pm. On the Saturday field trip we will be examining the coastal slate industry remains between Tintagel and Trebarwith. Given good weather the scenery in this area is stunning. At the time of writing timings and some details still have to be settled so complete details will appear in the next newsletter.

K.J.T.R.

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The Trevithick Society, a registered charity, is a recognised body of the study of industrial archaeology in Cornwall. Membership is open to all who are interested in the region's great industrial past, whether or not they live in Cornwall. The Society takes its name from one of Britain's foremost inventors and pioneers of the Industrial Revolution, Richard Trevithick, a Cornishman whose name is inseparable from the development of steam power. This newsletter is published quarterly and, together with the annual journal, is distributed free to members. Letters and contributions are always welcome and should be sent direct to the editor.

The views expressed in this newsletter are those of the authors and not necessarily those of the Trevithick Society.

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