THE COUPLING

The Official News Letter of the Johannesburg Live Steam Club

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INSIDE THIS ISSUE

WHERE IN THE WORLD IS ING. D.L. PORTA

Continued from Issue 2

Porta achieved his successes through careful attention to small details and by the application of strict engineering principles to steam locomotive design. No single change could produce dramatic improvements; Porta applied many small improvements to areas that had been ignored before. These included items such as water treatment, lubrication, materials, servicing techniques, mechanical fasteners, and others. Not only was power and effiency greatly increased, but maintenance was greatly reduced and the operator's jobs were made easier. After a few years at the Rio Turbio, Porta moved back to Buenos Aires to join the Instituto Nacional de Tecnologica Industrial (INTI) where he became the head of the thermodynamics department. At INTI,

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THE GAS PRODUCER COMBUSTION SYSTEM

Continued from issue 2

An integral component of the GPCS is an improved stack/nozzle arrangement in the smokebox of the locomotive. To ensure complete combustion of the firebox gases, the secondary air is introduced through small openings at high velocity into the firebox. This produces turbulence so that the air thoroughly mixes with the burning gases. Because of the small primary air openings in the grates and the small secondary openings in the firebox walls, more energy is required to "pump" this air through the boiler than with a conventional firebox. If a conventional nozzle and stack arrangement were used (as on most U.S. locomotives), a very restrictive nozzle would be required which would produce excessive backpressure on the pistons. This would negate much of the advantage of the increased steam generating capacity of the GPCS. To overcome this problem, the locomotive is fitted with a high efficiency front end such as a Lempor or Kylpor ejector, both of which were developed by Porta. These systems produce the maximum draft for the minimum backpressure, maximizing the power developed in the locomotive's cylinders, even with the increased pumping that is required with the GPCS.

In the GPCS, the coal burns at a lower temperature than in a normal locomotive. The admission of only 30% of the required air combined with the steam flow causes the solid constituents of the coal to burn, while the remaining components are converted to mostly carbon monoxide gas and water vapour. In the space above the firebed, the secondary air ducts provide the remaining air necessary to completely burn this gas. The low velocity of the air through the firebed combined with the thick fire reduces the carry over of coal particles, which greatly reduces the sandblasting effect and the risk of line-side fires. The firebox is

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From the Editor

Keith Bradley
Editor and Secretary

This month instead of boring you with my inane chatter, I thought that I would bore you with someone else's chatter. The following is the text of a letter I received the other day from a friend in the USA.

From: Jon Hollahan

Hi Keith,

You might have noticed that sometime ago I hinted at trouble in South Florida as we counted down to our winter meet, now that the problem has been taken care of, I'll fill you in on the details.
The Florida State amusement park inspectors decided that us Live Steamers hauling the public made us an amusement park ride.
They red-tagged the independent track in Fort Myers and the Florida Live Steamers Southern track in Coconut Creek just weeks before the meet was to start.
To comply with the regulations regarding amusement park rides was out of the question, but to not remove the restraining order was going to make a lot of club members and public mad, not to mention putting those clubs who have tracks in public parks in danger of losing their land.
The amusement park regulations required us to fence the entire perimeter of the track, having engineering drawings made of each and every locomotive, car and track (passed by a professional engineer), have a Prof. Eng. Perform stress calculations and certify that each piece of equipment is safe. It also included non-destructive testing, periodic re-inspection by the state at the cost of hundreds of dollars per inspection AND the installation of speed regulators on each locomotive (yeah right…).
To say the least, these regulations and all the others I have not mentioned, were way beyond the scope of what we could accomplish in years, let alone in weeks.
Fortunately, instead of having to change the law like they did in Michigan (which took months) we were able to find an exemption in the amusement park law covering educational institutions displaying products of industry. Easy, right? Wrong! The exemption had never been used and there was no policy for applying for one.
So, after much sweat and a lot of visits and phone calls to county lawyers and state representatives and yet more sweat, we learned today that we (the FLS Southern track, Fort Lauderdale) has been approved for the exemption and we have put this ugly issue behind us. The independent track in Fort Myers have their exemption approved a couple of weeks ago.

HAVE YOU PAID YOUR SUBSCRIPTIONS YET!
YES?
GOOD FOR YOU!
NO?
PLEASE PAY NOW!

Tool post Chatter

From the Chairman's bench

As this is a new feature in our monthly newsletter, It is up tome to make an effort, so here goes.

STEAM FACTS

- Steam is the term usually applied to the vapour phase of water, this phase is reached when water boils.
- Steam or water vapour is invisible, only through partial condensation does it appear as a mist.
- Superheated steam behaves like a gas, when compressed its temperature rises, when heated at a constant pressure it's volume increases, when heated at a constant volume its pressure rises, etc, etc.
- For every one (1) cubic foot of water evaporated at 212F/14,7PSI (sea level Abs.) it generates 1601 cubic feet of dry steam.
- At 90PSI the temperature required to boil water for superheated steam is 328F.

Metric to Imperial pressure tables.

FROM		TO	Multiplication factor
kPa		PSI	by 0,145
MPa		PSI	by 145
PSI		Kpa	by 6.8948
PSI		Mpa	by 0.0068948
PSI		Bar	by 0.068948
Bar		PSI	by 14.5
PSI		Atmosphere	by 0.068457
Kg/cm2		PSI	by14.223
Atmosphere		PSI	by 14.696

Yours in Steam
Ian Headland

CALENDAR OF EVENTS

EVENT: CLUB BUSINESS MEETING

PLACE: W. H. COETZER SCHOOL
TIME: LAST TUESDAY OF THE MONTH @ 20H00
Monthly Gathering of Members.

EVENT: CLUB FAMILY DAYS

PLACE: THE TRACK, WEMMER PAN
TIME: FOURTH SUNDAY OF THE MONTH. 12H00 TO 17H00
Fun and Family day at the track grounds.

EVENT: CLUB WORKS DAY

PLACE: THE TRACK, WEMMER PAN
TIME: SATURDAY AFTER THE GENERAL MEETING 10H00 TO 15H00
Track maintenance and construction for the 1999 and 2000 steam meetings.

EVENT: SUNDAY PUBLIC RUNNING DAYS

PLACE: THE TRACK, WEMMER PAN
TIME: EVERY SUNDAY FROM 15H00 TO 17H00, WEATHER PERMITTING.
Public passenger haulage. Members and friends.

EVENT: GAUTENG STEAM-UP, CARS IT THE PARK

PLACE: THE STATION, WEMMER PAN
TIME: WEEKEND 5 AND 6 JUNE 1999.

LONG-RANGE PLANNING

EVENT: HOBBIES AND CRAFTS FAIR

PLACE: TRANSPORT MUESEM, WEMMER PAN
TIME: WEEKEND, 2 AND 3 OCTOBER 1999

EVENT: MEMBER WORKSHOP VISITS

PLACE: CONSENTING MEMBER'S WORKSHOPS
TIME: TO BE ADVISED
Monthly visits to some consenting member's workshops will be arranged

EVENT: NATIONAL STEAM MEET (RSME)

PLACE: RSME, LEN RUTTER PARK, FLORIDA
TIME: 24TH TO THE 26TH SEPTEMBER 1999
1999 International Steam Meet, Boiler Certificates and Drivers Licenses required from all entrants wishing to participate with their locomotives.

EVENT: IBLS 2000, BRITISH COLUMBIA, CANADA

PLACE: BRITISH COLUMBIA SOCIETY OF MODEL ENGINEERS
TIME: 12.13.14TH AUGUST 2000
Only if you have the money and the will to spend it. Details in the newsletter.

Editorial continued from page 2

This exemption has always been in the regulations, but people warned us to "let sleeping dogs lie" well this dog woke up and bit us hard with only three weeks to go before the meet started.
The moral of the story?
Wake up and smell the coal smoke. Beat the lawyers at their own game, before it comes back and haunts you. Clubs in similar situations should go to work now, before they lose years of hard work and hundreds of dollars in equipment.

Jon Hollahan
Southern Florida Live Steamers USA

"Ed's note: this is an abridged version of the letter"

Cuban 2-8-0 no 1816

Porta was able to devote time to thinking about the next generation of steam locomotives. In 1969, Porta presented a detailed technical paper titled "Steam Locomotive Development in Argentina - Its Contribution to the Future of Railway Technology in the Under-Developed Countries" to the Institution of Locomotive Engineers in Great Britain. This paper discussed Porta's work on the Rio Turbio 2-10-2's, and provided detailed results of performance tests of the engines and their maintenance history. Porta also outlined his concepts for new, technologically advanced steam locomotives, which would be suitable for use in non-industrialised countries. Already by this time, diesel-electric locomotives in less advanced countries had begun to show faults. Whereas steam locomotives could be routinely abused and maintained to a large degree (where necessary) with sledgehammers and bailing wire, diesel locomotives required precision maintenance and repair. Expensive repair parts had to be

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imported to cash-strapped third-world countries to keep diesels running, where before most steam repair parts could be fabricated locally. In some cases relatively new diesels were sitting idle while ancient steamers had to be pulled out and put back into service. Porta saw that there were many cases where steam power was economically justifiable and presented his case for new engines to accomplish this. Porta's paper provides a wealth of information on steam developments in Argentina, both by Porta and other engineers, and provides insight, which is still valid today.

Proposed 2-12-12-0 for the Rio Turbio Railway

Porta proposed several new designs for steam locomotives for various railway inquiries in the 1960's and 1970's, incorporating his principals for greatly increased efficiency, reliability, and power. One proposal was a roller bearing, 3-cylinder compound meter gauge 2-10-0 for Argentina. Before anyone had heard of ACE, Porta had laid out a ultra-high pressure (850 PSIG), 3 cylinder, triple expansion compound 2-10-0 for U.S. fast freight service. Bigger engines were considered for the Rio Turbio to provide power to move much longer coal trains. Initially, 2-10-10-2 mallets were proposed, but as the design was fine-tuned it evolved into the monster shown above. This massive 2-12-12-0's were proposed as replacements for the 2-10-2's in the 1970's to allow far heavier trains to be operated, and a contract to construct them in Argentinean shipyards was almost let. Unfortunately, changed circumstances killed the project. The most recent reports indicate railway management has chosen to import side-rod diesels, although the 2-10-2's were still working at last report. As recently as 1994, however, Porta's 2-10-2's were doing the majority of the work on this remote rail line.

By 1980, Porta had developed a clear philosophy of steam design based on his over 30 years of work in the field. Porta's concept was that steam development could be broken down into three classes:

FGS SGS and TGS

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inherently maintained at a more-even temperature, which reduces thermal stresses. The thick firebed, cooled by the flow of underfire steam, makes the fireman's job easier as it is much less likely to form clinkers or develop thin spots. On the Rio Turbio engines, the stoker steam jets are not normally used; the coal just spills out of the stoker and is allowed to spread across the firebed.

As a comparison, the efficiency of a typical modern locomotive boiler with a huge combustion chamber was less than 50% at maximum output. Porta's 2-10-2's, built in the late 1950's and early 1960's, attained 78 to 80% efficiency at high output under documented tests.

The GPCS can be adapted to virtually any solid fuel, and has been successfully tested with wood, charcoal fines mixed with oil, and sawmill waste. Porta has recently been working in Cuba to adapt the GPCS in a 2-8-0 to burn baggasse , the discarded waste left when sugar cane is crushed to produce sugar

Porta has equipped one engine with a refinement of this design, known as the cyclonic gas producer firebox. This locomotive has the air ducts arranged to produce a swirling effect in the firebox gases, augmented through the use of steam jets. This will cause the air to more completely mix with the firebox gases for even more complete combustion, and centrifugally separates the few airborne coal particles to allow them to completely burn before exiting the firebox. New firebox designs shown in Porta's technical papers would have a different shape to

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DID YOU KNOW?

Why are railroad tracks 4 feet, 8 1/2 inches apart?

The reasoned approach

The following submitted by Douglas Puffert of the University of Munich, Wed, 23 Oct 1996

Well, I've had an opportunity to look into the issue for my dissertation (and forthcoming book), so perhaps I can clarify the record. As much as I like the idea of path-dependence, and although I believe that I have shown its applicability to the modern history of railway gauge, it seems unlikely that we can carry the process back as far as the story suggests.

American railways were not built by ex-patriot Brits, but (almost exclusively) by Native American engineers who copied British practice. This practice they copied was that of the Liverpool & Manchester Railway (opened in 1830), built by mine-works engineer George Stephenson. Stephenson indeed copied the gauge with which he had previous experience in the mines, but this was originally the not quite so "exceedingly odd" measure of 4'8". The extra half-inch was added during construction of the L&M in order to allow a little more leeway between rails and wheel flanges. There is some evidence that the original rails were often 2" wide, indicating a width of track including the rails of exactly 5'0"--still less an "exceedingly odd" measure.

Mining tramways differed substantially in width, ranging mostly between 3'0" and 4'6" in southern England and Wales. The 4'8" of northern England was an outlayer, and it is could be regarded as accidental that Stephenson happened to have had a history with that gauge. It appears true that mining ore carts were about the same width as road wagons, but the width varied by region. It is plausible that the width of wagons was fitted to road ruts, although ruts at narrow city gates might have mattered more than ruts on open roads. The main "evidence" for carrying the story back to Roman chariots, by the way, comes not from any study of the history of road ruts but from consideration of ancient "groove-ways"-- essentially permanent stone "ruts", a practical form of improved road surface at the time. It is true that one or two of these (NOT in Britain) happen to have roughly the same "gauge" as modern railways--within a broad band of

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maximise this cyclonic effect.

The GPCS has been applied to locomotives in Argentina, Paraguay, Brazil, and Cuba by Mr. Porta, to locomotives in South Africa and China by David Wardale, and to locomotives in England and South Africa by Phil Girdlestone. The GPCS has even been applied to miniature steam locomotives (7 1/4inch and 15 inch gauge) in England, South Africa, and the USA.

While the GPCS is a simple concept, it requires careful attention to it design and tuning to ensure its proper operation. The GPCS is another example of advanced steam locomotive engineering, which requires Porta's philosophy of detailed engineering analysis and calculation- rather than the good old "trial-and-error" method- for optimum operation

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1- First Generation Steam (FGS)-

Steam locomotives that had been previously built. He viewed the French designs as being the climax thermodynamically, while he considered American engines the best mechanically. No engines in existence had ever incorporated all of the proven concepts of FGS.

2- Second Generation Steam (SGS)-

Steam locomotives which could be built immediately with little or no research and development, which would incorporate and maximise all proven thermodynamic principals for improved performance, plus state-of-the-art materials, design methods, and construction techniques.

3- Third Generation Steam (TGS)-

Steam locomotives, which would incorporate, advanced concepts that would require significant research and development, best acquired through trials on SGS locomotives.

Porta felt that many existing steam locomotives could be significantly improved with the limits of FGS. He also believed that SGS locomotives could successfully compete on modern

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wheel widths that would fit the grooves. However, others are of different widths. So part of the story as told may be consistent with the evidence, but it is hardly proved by it. (But if anyone knows of better evidence, particularly any actual research on ruts let me know.)

By the way - 4'8. 5" (1435 mm.) is the standard gauge in North America, most of Europe (not in Siberia or former Russian and Soviet empires), and parts of South America, Asia, and Australia. All told, nearly 60 percent of world route length. The L&M railway had a strong demonstration effect in Continental Europe as well as the U.S., and Stephenson-trained engineers also aided the gauge's diffusion in Britain and the Continent--but not in North America.

Again by the way--some American engineers copied Stephenson's practice only approximately, doubtless in order not to deal with "exceedingly odd" dimensions. Thus they introduced gauges of 4'9", 4'10", and 5'0". The latter two choices led to some difficulties in later integrating the continental railway network.

Douglas Puffert

University of Munich

railroads, if they were given modern servicing facilities (as developed in the U.S. by the Norfolk & Western Railway) and if proper maintenance and operating techniques were used, which were equally important to good design.

In 1980, Porta was called in by American Coal Enterprises (ACE) as the foremost authority on steam locomotive development.

Porta performed other steam projects in the 1980's. The railways of Paraguay, which operate a fleet of wood-burning locomotives, called him in to assist in modernising their railways. At least one engine was modified with a GPCS adapted for wood and other improvements. Later, Porta moved on to Brazil to the infamous Donna Teresa Christina coal-hauling railway. This railway was famous for its fleet of U.S. built meter gauge 2-10-4's. By the early 1980's, the 2-10-4's had worn out beyond the ability of the railways to rebuild them, and European built 2-10-2's were imported from other parts of South America. Porta was called in to see if the smoke emissions of the line's locomotives could be reduced. Naturally, the GPCS was just the answer to this and one 2-8-2 and several of the 2-10-2's were so modified.

Even though the 1980's appear to have been the most promising decade for his work, Porta continues even now to improve steam locomotives.

Club News

By ye roving reporter

Okay, first attempt at reporting a club event. (I now have writers' block after the first sentence) try again.

The Roof Party

On the eve of the 24th of April 1999, a small band of Livesteamers gathered at the hallowed grounds of the Johannesburg Live Steam Club to celebrate the "Topping out" of the ground track station.

The event was the culmination of the efforts of Eddie Steyn, Len Ryneke, Clive Chadwick and many, other members who put in many Saturdays to complete. Some 30 people (members, wives and friends) attended, and a baberque was held to honour the occasion. At the same time Chris Greef's 5" 16DA was running merrily around the ground level track and Johnny Heath's Speedy doing the honours on the elevated line.

Unfortunately the editor of this magazine was unable to attend the beginning of the event and can not give a fully detailed report, perhaps some other member could oblige with their impressions?

For those of us who have a few thousand Rand tucked away, here's what the BCSME group in Canada is doing for the Millennium (In conjunction with the Train Mountain IBLS meet)

International Meet of the Millennium

August 12, 13, 14 2000

International Brotherhood of Live Steamers
Hosted by the British Columbia Society of Model Engineers

Burnaby Central Railway, Confederation Park
120 North Willingdon Avenue
Burnaby, BC, CANADA V5C 6K1

Schedule of Functions and Events

Day, Date	Registration	Unloading/Loading	Track Operations	Vendors & Suppliers	Special & Static Displays	Food Services	Special Events
Wednesday, August 9, 2000		Site open all day	IBLS members & guests			Light Snacks and Beverages	
Thursday, Aug 10		Site open all day	IBLS members & guests			Light Snacks and Beverages	
Friday, Aug 11	9am to 8pm at International Junction on Site	Site open all day	IBLS members & guests	Site open for setup	Site open for setup	Light Snacks and Beverages	Reception for Guests *(time to be announced)*
Saturday, Aug 12	9am to 5pm at International Junction on Site	Early Morning Late Afternoon	IBLS members & guests all day *(11am-5pm Trains for General Public)*	Displays open all day	Displays open all day	Bkfst, burgers, and snacks available on site, plus IBLS Dinner	IBLS Secretaries Meeting *(time to be announced)*
Sunday, Aug 13	9am to 5pm at International Junction on Site	Early Morning Late Afternoon	IBLS members & guests all day *(11am-5pm Trains for General Public)*	Displays open all day	Displays open all day	Bkfst, burgers, and snacks available	Club Representatives Meeting *(time to be announced)*
Monday, Aug 14	9am to 3pm	Site open all day	IBLS members & guests	Displays open until 3pm	Displays open until 3pm	Bkfst, burgers, and snacks available	Wind-up Party *(time to be announced)*
Tuesday, Aug 15		Site open all day	IBLS members & guests			Light Snacks and Beverages	