WONDERFUL WORLD OF STEAM LOCOMOTIVES pdf

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The glorious steam world that was, the twilight period when enthusiasts scurried to distant countries in search of live steam, and the dwindling number of active locomotives which remain in service is the subject of this sympathetic and knowledgeable book.

The Internet Craftsmanship Museum Presents: Chuck Balmer Click on photo to view a larger image. Chuck Balmerâ€"Master Live Steam Model Engineer Introduction Over the years the Joe Martin Foundation has honored miniature craftsmanship of all kinds, both the work of professionals like clockmakers, jewelers, engravers and gunsmiths and dedicated amateurs in model making and other areas. Amateurs here meaning not that they are unskilled, but simply that they are unpaid. At the heart of model engineering is building a miniature running engine of some kind, with steam engines being among the earliest and still the most popular. Getting an engine built faithfully to scale to run is a challenge and getting it to run well is an art. The smaller the scale, the tougher it is. Click on photo to view a larger image. Club president Donald Frozina had this to say in his cover letter: He is most recognized for his 1: He is a prolific and meticulous builder who is a resource and mentor to other builders. Enclosed is a nomination with further details. Frozina also noted the following: This is coupled with an enthusiastic willingness to share his expertise with fellow modelers. He is a retired electrical engineer, who, at the start of the space age, designed aerospace testing equipment, data systems, and even robots, while preserving the technology of the railroad age through painstakingly accurate working locomotive models. The jewel of his collection is a 1: Balmer was inspired to model steam engines by memories from his youth of watching The Wonderful World of Disney on TV as Walt drove a scale steam locomotive around his property. Those models and robots include: It is 8 feet long and weighs pounds. Avatar was written up in several publications including the Wall Street Journal. Huey is programmed to remind Balmer of birthdays, anniversaries, and holidays. The diesel engines mimic full size engines with an internal combustion engine driving a generator with appropriate electronic controls. Few diesel models are so internally accurate. Balmer had first seen the massive, full-sized Allegheny in the Henry Ford Museum in , and it sparked a passion to build it in miniature. In he purchased a set of blueprints of the Allegheny, which showed basic schematics but few part details. Parts ranged from a 4-foot long copper boiler that took a week of 8-hour days to machine and generated 28 pounds of copper shavings, down to tiny fittings no bigger than your fingernail. He also made 59 wooden patterns. Then, over two summers, he and his son, Jim, made more than castings. Building fully functional miniature steam locomotives poses daunting engineering and design challenges. The Allegheny, like most of his other engines, runs on steam. This creates additional issues dealing with heat and expansion, as steam and water do not scale. All of his engines run and are regularly seen steaming around the Cinder Sniffers Rail Park in Indiana as well as at his backyard track in Urbana. Chuck Balmer is a master designer as well as a master builder in miniature. He also is a champion of the work of other model builders. Several aging model builders and widows of model builders have turned to Balmer to complete locomotives that otherwise would be scrapped. Finishing a partially completed project can be more challenging than building your own. Article reproduced with permission of Live Steam Magazine. Other videos are also avialble on YouTube. Here he is at the controls of one of his earlier projects, a NYC Hudson. It was completed in His family lived just two blocks from the train tracks here in Urbana, Ohio, and he would go down and watch the steam locomotives switch cars around in the yards. He moved on to HO trains for a while but then got interested in electronics when he was about twelve years old and temporarily put the trains aside. A young Chuck Balmer works on one of his electronics projects. Developing skills in electronics leads to a career As a young boy Chuck built a lot of models, some plastic and some scratch built. When he became grade school aged, he got interested in electronics and built numerous radio transmitters and radios, audio amplifiers, and eventually computers using vacuum tubes. He built radios and even worked for a local TV repair shop and continued doing TV repair into high school where he began building computers that won superior ratings in state science fairs. He also built his first robot in high school. While an undergraduate at UD, he built another small robot and several other computer related projects. He was also offered a part-time

technician position in the instrumentation department at the UD Research Institute. In addition, he built a fuel injection system for his Triumph motorcycle and wrote an article about it for the UD Engineer magazine that won a prize for the best article published that year. After graduation he built his first locomotive and proceeded to build three more by In , Chuck designed the first channel digital multi-train control system for electric trains. He started a company called Electro-Plex Inc. He moved on to Grimes Aerospace as a project engineer where he worked on an aircraft proximity warning system as well as many other projects. He earned his MSEE degree while working and eventually went to work for an instrumentation company where he designed data acquisition equipment. Having started their microcomputer program, Chuck became software engineering manager and was responsible for developing large data acquisition systems. In , he left the company to strike out on his own. While slowly developing a consulting customer base, he taught a computer course at Ohio State University and took on contract engineering jobs. He continued running his own business for 25 years, specializing in the design and manufacture of electronic production test equipment for the aerospace industry. Chuck officially retired in but still does some consulting for one of his long-time customers. Star Wars movie inspires work on robots Chuck designed and built these robots, named "Avatar" and "Huey. He built a robot named Avatar and won a contest for an article on the best home built robot in Robotics Age magazine in This robot was put on display for 3 years at the Boston Computer Museum. While it was gone, he built another more complex robot named Huey that was operational in and still roams his shop today. Getting a start in metalworking He first learned how to use machining equipment in the Mechanical Engineering department at the University of Dayton making fixtures for the test equipment he was building. After graduation he decided to put together an electronics and mechanical laboratory at home where he could pursue building his own projects. He learned most of his mechanical and metalworking skills on his own with a little help from his brother-in-law who was a tool and die maker. In , after retirement Chuck again focused on the live steam hobby and began building the Allegheny locomotive that took seven years full time 14, hrs to complete. In addition to the four scratch built locomotives built before , since , he has scratch-built three more locomotives, restored or completed eight more, and built seven train cars to go with them. Learning the casting process Chuck needed to make castings for another locomotive and purchased a small furnace, some books on casting, and began learning how to make patterns and molds. Eventually he needed a larger furnace, so he designed and built the one that he still uses today. The techniques he uses for making castings were learned from experience. He even created a video explaining the casting process from making patterns to pouring metal to share his experience with others. Advancing his welding skills for the Allegheny Chuck had learned to gas and stick weld when he was building his first locomotive. When building the Allegheny, he realized that he needed to learn how to TIG and MIG weld, so he and his son enrolled in an eight-week course at the local vocational school. Here they learned the basics and were even able to bring in the chassis for the Allegheny for final welding. Building a workshop for the lifetime collection of tools he had acquired Here is where the work gets done. In the last photo, his son Jim is helping with the casting process. The interior was organized into an office area, a machine shop, an electronics lab, and a foundry area. Over the years, two additions have been added to accommodate the welding area, stock storage, and room for locomotive storage. In addition to many specialized hand tools acquired while building test equipment, he has three metal lathes ranging in size from a small Unimat for very small parts to a WWII vintage 5" South Bend thread cutting lathe for larger parts. He has a small vertical milling machine as well as two drill presses. All of the lathes and the mill have been outfitted with digital readouts on all axes. He has a 24" sheet metal sheer, brake, and roller as well as a 1. The foundry consists of a propane-fired furnace capable of melting eight pounds of cast iron and additional equipment for preparing casting sand and making molds. The electronics area of the shop has several computers, three oscilloscopes, a function generator, several power supplies, several types of meters, and soldering equipment, and a selection of thousands of electronic components. Description of Project Over castings were required for the Allegheny alone. Chuck makes the wood patterns himself and does the casting in bronze, iron and aluminum in his own home-built foundry. The complete tender with 6-wheel and 8-wheel trucks. Mobile stand for freight cars Chuck Balmer and son Jim stand behind the Allegheny on the hydraulic lift stand. There is also a wall display of the casting patterns that goes to shows along with the trains. Here is a

coal car and cattle car on the club track. Note that the engine is named "Julie B. Lima Locomotive Works provided pages of plans for the original engine, but many more drawings had to be made to cover some details not found in the plans. Several trips to the Ford Museum in Michigan to measure and photograph a full-size Allegheny displayed there provided the needed details. New Submissions Welcomed If you have additional information on a project or builder shown on this site that you would like to contribute, please e-mail terry craftsmanshipmuseum. We also welcome new contributions. Please see our page at www. This section is not currently sponsored To learn how your company or organization can sponsor a section in the Craftsmanship Museum, please contact mecm craftsmanshipmuseum.

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Once your start tinkering with that relationship, things get. There is an illustration of Joule spending his honeymoon measuring the temperature difference in a waterfall, with his patient newlywed bride Mrs. Joule taking a reading from the top and Mr. Joule taking a reading at the bottom. They could find no difference. The lesson is that when scientists such as Joule and his patient wife and others started studying the underpinnings of thermodynamics, notably the relationship between mechanical action work and heat, it takes an enormous amount of work to generate measurable amounts of heat. Conversely, if you generate a large amount of heat by burning coal in the steam engine, and even if you convert only a tiny fraction of that heat to work, you get usable and economically beneficial amounts of work in the form that can propel the train. That was an essential feature of the Industrial Revolution. Even if you used heat inefficiently to generate work, you could do many useful things and work on improving efficiency step-by-step over time. That was also another feature of Industrial Progress. You started out with very inefficient conversion of heat into work and made various improvements, step-by-step and over time to get the much more efficient engines we have today. If the keep-it-simple- and -stupid KISS principle was an iron law with the iron horse, steam locomotives would have never gotten superheaters. The diesel-electric locomotive that superceded steam entirely, on the other hand, is a pretty complicated thing that was also rather expensive in relative terms back-in-the day. There is a tendency to view the steam locomotive as the dirt-simple design that engineers kept adding complications to superheater, feedwater heater, high boiler pressure, condenser in "failed" attempts to increase thermal efficiency in exchange for greatly increased maintenance expenses. By that reasoning, the diesel should have failed. According to the H. So what about the feedwater heater? Forward progress in engine efficiency or just another gadget not worth the maintenance expense? Judging maintenance cost can be challenging as it can be influenced by what Porta called "detail design. How much trouble is a feedwater heater probably depends on "detail design. What kind of fuel savings do you get from a feedwater heater anyway? In rough-round numbers and at around PSI boiler temperature and about F exit temperature of the superheater, it takes about btu to raise a pound of superheated steam starting with cold water. Of that, it takes about btu to raise the cold water to the roughly F boiler temperature, another btu to evaporate it at that boiler pressure, and another f to superheat it. As it takes 1 btu per deg F per pound of water, I would say an exhaust steam injector or an "open shell" feedwater heater would save about BTU or an efficiency gain under optimal conditions of about 10 percent. This is consistent with what Wardale claims for efficiency gain, but from his tables, his efficiency gain was lower than that in practice. One version of this was the Franco-Crosti system tried in England and elsewhere, where you piped the mix of steam and combustion gas from stack into a kind of "mini boiler", actually the feedwater preheater or economizer. That system, unfortunately, cooled the hot gases to where they started condensing, and the condensed locomotive exhaust is very corrosive and those heat exchangers did not last very long. Another version of this was tried by Chapelon on the A1 low-speed freight locomotive. It is also proposed by Wardale on the 5AT project. When the combustion gas in the tubes has cooled below F, it cannot boil any more water but it certainly can preheat the water up to F. This flue-gas economizer seems simple enough, but the detail engineering is always where "the tough need to get going. Such a system could offer a 25 percent savings on heat rate. What does this mean? Increase the boiler efficiency to 80 percent with a Gas Producer scheme, we are talking about 11 percent on the T1, 12 percent on the A1. Finally, use exhaust cylinder steam to power a combustion-air preheater to boost the boiler to 90 percent efficiency, and we are at 16 percent efficiency simple expansion, If steam engine is a dirt-simple machine burning dirt-cheap fuel, however, forget about even a superheater -- go saturated steam.

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