FEB 71

THE TRAINMASTER

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NATIONAL RAILWAY HISTORICAL SOCIETY

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PACIFIC NORTHWEST CHAPTER
NATIONAL RAILWAY HISTORICAL SOCIETY

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CHAPTER NEWS LETTER
("The Trainmaster")

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Articles which appear in "The Trainmaster" do not express the official National Railway Historical Society attitude on any subject unless specifically designated as such.

COMING EVENTS:

FEBRUARY 19, 1971: The regular February meeting of the Pacific Northwest Chapter, National Railway Historical Society will be held at 8:00pm, at the Columbia Gorge Model Railroad Club, 3405 N. Montana Ave (281-8591) The meeting program will be:

Slides by Edward F. Wagner of the Portland Planning Commission who recently completed a trip to various large cities (Montreal, London Hamburg, Paris, Stockholm) to study transit systems. His presentation will be followed by a question and answer period.

MARCH 19, 1971: The regular March meeting of the National Railway Historical Society, Pacific Northwest Chapter will be held at the Columbia Gorge Model Railroad Club. This will be 16mm movie night with a selection of 16mm movies from various sources.

APRIL 16, 1971: The regular April meeting of the Pacific Northwest Chapter, NRHS

APRIL 24-25 1971: RAILCON '71 in Spokane, Washington.

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OP&E STEAM PLANS:

Plans for weekly steam excursions on the Oregon, Pacific and Eastern Railway during the summer of 1971 were announced in late January at Cottage Grove's annual civic awards banquet. Making the announcement were Loran L. Stewart, president of Bohemia Lumber Company, and Willis B. Kyle, president of the Yreka Western Railroad. The two firms are joint owners of the Row River Investment Company, which purchased the OP&E from Georgia-Pacific Corp. last year.

Yreka Western steam locomotives 18 and 19 will provide power for the trains that are planned on Saturdays, Sundays and holidays from Memorial Day through Labor Day. Two 50-mile roundtrips are planned each day, with trains consisting of up to six coaches and an open observation car of 1920 vintage (ed note The open car will be the PNW-NRHS's Rocky Mountain Car #598). Each train will hold 400 persons and fares will be determined by the Public Utilities Commision within 30 days.

Mr. Kyle said the total operation will represent an investment of over $100,000 and that over 12,000 passengers are expected the first summer, with a 30 percent increase per year for each of the next three years. The train will be called "The Goose" and will operate from a new station to be built just east of Interstate 5, next to the Village Green Motel.

Gil Mulin

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RAILPAX:

Portland will be served by passenger trains under the new Railpax scheme for operation of the nations railroad passenger trains. Originally left out of the first route selection Portland was put into the system when pressure from people on the Pacific Coast to include a north-south passenger train in the operations. The train will be operated between Seattle and San Diego. No announcement was made as to schedules, equipment etc. Portland was also included in the final plan with an eastern connection to Chicago through Washington. Again no announcement was made as to whether the service would be via Hinkle and the UP or Pasco and the BN presuming the meeting point is Spokane.

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MINUTES OF THE JANUARY 15, 1971 MEETING OF PNW-NRHS:

The meeting was called to order at the meeting room of the Columbia Gorge Model Railroad Club at 8:10pm by President Roger Phillips.

The minutes of the November meeting were read and approved.

The treasurers report was given and approved.

A discussion was held concerning continuation of complimentary memberships to individuals who have given outstanding help to the chapter. Motions to give memberships to the following individuals were seconded and approved.

Jack Jones N.S. Westergaard John Malonis Cora Jackson

Jack Holst reported on the recent meeting of the editorial committee of the NRHS Bulletin.

Reports of local interest from Jack Holst included news that the Mt. Emily Shay has arrived in good order at Cass, West Virginia. Also, the Stimson Shay #1 at the Oaks Park has been disassembled and is in the process of repairs in preparation for re-assembly.

Ed Berntsen reported on upcoming rail excursions and events. Roger Phillips reported that the New Years Eve trip to Wishram broke even financially.

A discussion was held concerning a possible "farewell" trip on the Southern Pacific's "Cascade". This might include activities at Castro Point in the Bay Area. A straw vote was taken and indicated a group of about 12 would participate. Jack Holst will investigate.

Ken Dethman reported that Representative Edith Green has introducted legislation to delay the initation of Railpax.

Roger Phillips read a letter from Willis Kyle, president of the Oregon, Pacific and Eastern Railroad proposing rental of Car #598 for excursions at Cottage Grove. He reported that after consulting with all officers and board members, he phoned Cottage Grove and indicated that the Chapter would be agreeable to the rental proposal. A motion by Jack Holst to formally accept OP&E's offer was seconded and approved.

Jack Holst reported that the McCloud River Railroad is going to rebuild their locomotive and continue special excursion operations.

A motion by Roger Sackett to offer to the Columbia Gorge Model Railroad Club to pay toward heat and light expenses for the privilege of holding regular meetings in the Gorge's meeting room was seconded and approved.

A motion by Jack Holst to appoint Ed Immel and Roger Sackett to investigate the availability of a storage site for a car to be used by the Chapter as a library and meeting room was seconded and approved.

Jack Holst reported that the SP&S book is in the hands of the publisher. This book will be available for the Chapter to sell for income.

A motion was made and seconded to adjourn the meeting at 9:25pm. A program followed including movies of an SP&S steam excursion and tape recordings of SP operations.

Robert Williams, Sec.

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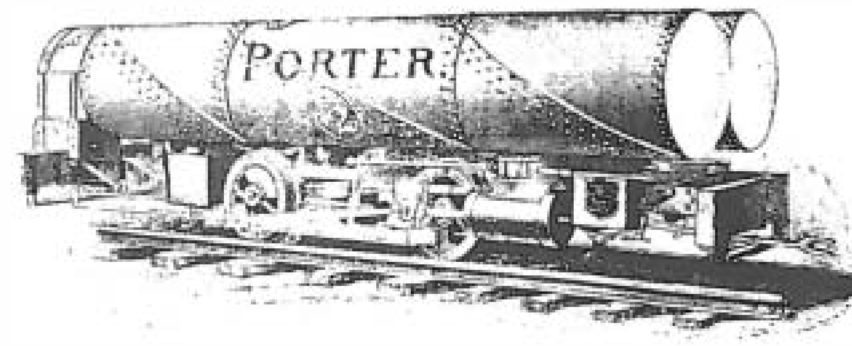
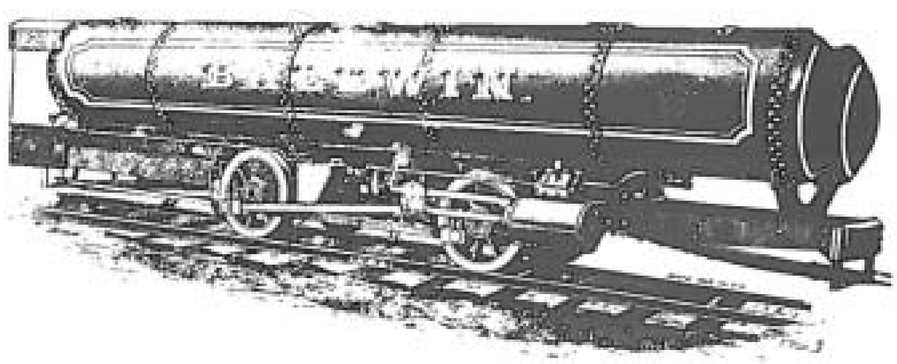
The following article is courtesy of Compressed Air magazine





Early locomotives powered by compressed air closely resembled steam-driven models, from which they evolved. A riveted air-storage tank that replaced the steam boiler and larger bearings were principal differences. Cab, headlight, and bell were much the same. When greater air-storage capacity became necessary, larger tanks, and then double tanks, appeared; such locomotives retained little semblance of their predecessors. Porter and Baldwin double-tank models shown were being offered in 1895. Cylinders on Baldwin unit were called the Vauclain, after their designer, Samuel Vauclain, who later became president of Baldwin.

THE AIR-POWERED CHOOCHOO

A short, illustrated article in the December 1967 issue of *Compressed Air* dealt with the subject of compressed air locomotives. The topic also was occasionally treated briefly during preceding years, but never as fully as its interest merits.

—The Editors

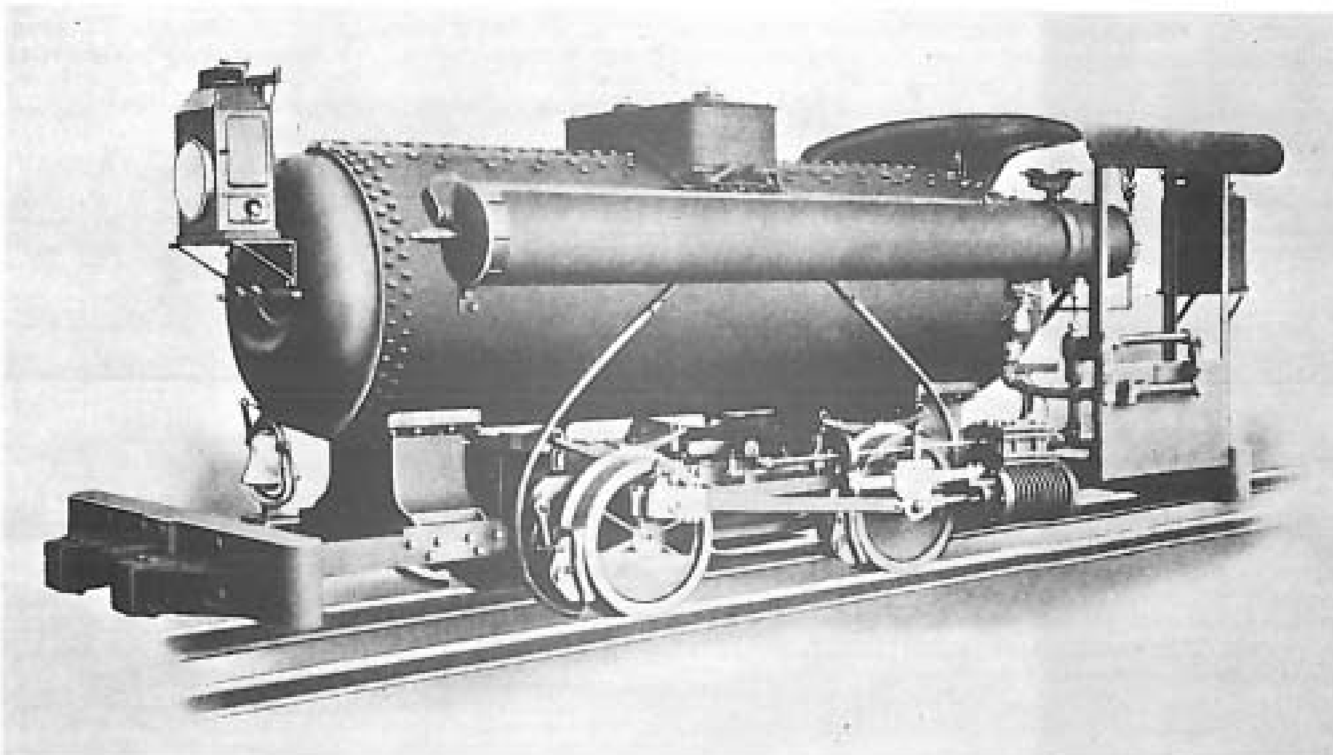
Air-powered haulage attained considerable acceptance around the turn of the century, especially underground where transportation by horse or mule power was slow and uneconomical and steam and electricity were undesirable and even hazardous. There were also various surface applications, particularly where the danger of fire or explosion was great. Some pneumatic locomotives are still in service, but as they wear out they are usually replaced by more modern traction units. The development of storage-battery electric locomotives, which did not produce sparks or require the inconvenient and dangerous overhead trolley of earlier types, was principally responsible for the decline of air-powered haulage.

Unquestionably, the compressed air locomotive's foremost advantage was its safety. It was the only type available that eliminated hazards arising from sparks, flames, smoke, short circuits, electric shock, and poisonous gases. It was safe for use in gaseous coal mines and heavily timbered workings. Carrying its own motive power, it would go anywhere tracks could be laid. A minor advantage was the contribution its exhaust made to ventilation.

Chief disadvantage was the necessity of replenishing its air supply rather frequently. Air compressors were then too heavy and bulky to be carried on the locomotive. Compressors were almost always steam-driven, which was unsatisfactory underground. The air supply was normally compressed on the surface and piped to charging stations at track-side locations. Sometimes the pipeline itself provided sufficient storage capacity. If not, a receiver of the required size was set up at each charging station. Special flexible metallic couplings were developed so that the locomotive would not have to be stopped at exactly the same point each time to make the connection. This and other features saved time, and in a well-engineered installation, it was possible to recharge a locomotive in as little as 1½ minutes. The number and size of charging stations varied according to how many locomotives were in service and the lengths of their haulage runs.

Use of air for motive power was visualized more than a century and a half ago. In 1799, George Medhurst, a Danish engineer, reportedly compressed air to 210 psig with power from a windmill and used it trying to build a pneumatic road carriage. In 1816, Sterling Brothers, of Edinburgh, Scotland, invented an air-powered engine that was a failure commercially but did stimulate further investigations in the same field. A man named Wright was granted an English patent in April 1828 on a method of pneumatic tramcar propulsion that involved use of iron cylinders under the car for storing compressed air and also an air reheater. William Mann patented in England in 1829 compound or stage compression of air and forecast pneumatic propulsion of carriages, locomotives, and ships. During the same year, a man named Bompass, also in England, is said to have patented a locomotive for operation with compressed air. Baron Anthony Bernard von Rathen was issued a patent in England on 2 November 1847, for an air-powered road vehicle. In the workshop of England's Putney College Of Civil Engineering, he built a prototype machine that was tried out in August 1849. It reportedly attained speeds of 8 and 12 mph on two different days. For reasons not now known, nothing more was heard of the invention.

It is believed that an air-powered locomotive was first used in 1850 at the Govan colliery in Glasgow, Scotland. It was an 18-inch-stroke steam unit, con-



C. H. Vivian

verted to air operation. To provide motive air, David Elder, a partner in the shipbuilding firm of Randolph Elder & Company, Ltd., developed a rather remarkable vertical, beam-type compressor that was operated at 25 rpm with steam at 18-psig pressure. It had a steam cylinder of 15-inch diameter and 36-inch stroke at one end and a heavy flywheel at the other, the two being connected by a walking beam that pivoted on a fulcrum at the center. Two single-acting compression cylinders—one at either side of the fulcrum—were of 21-inch diameter and 18-inch stroke. On the upstroke, air was drawn into the bottom of a cylinder through three rows of valves consisting of balls, 2 inches in diameter, each in a separate cage and working with a ½-inch lift. On the downstroke, the air passed through similar valves in the piston and was then compressed in the upper part of the cylinder on the next upstroke. The air cylinders had brass liners and pistons. They had no rings and depended upon an accurate fit for tightness. After compression to 25 to 30 psig, air was discharged through other ball valves in the cylinder head and was cooled by passing the discharge pipe through a reservoir of water. The cooled air was conveyed through a 10-inch water-jacketed pipe to the locomotive charging station. The locomotive was a converted steam engine having a single drive cylinder of 10-inch diameter and 18-inch stroke. Initially, the haulage distance was 2650 feet.

The American trade publication *Engineering & Mining Journal* in January 1878 mentioned that air-powered locomotives were being used in the Earl of Durham's colliery at Philadelphia, England, and that such units had been used in collieries on the Tyne and Wear rivers.

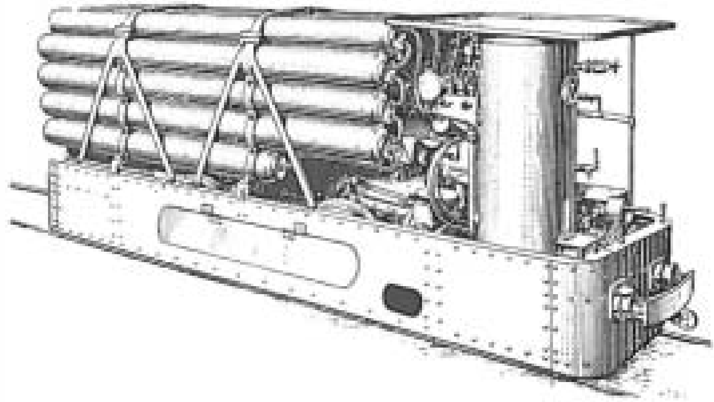
According to a history of the former Baldwin Locomotive Works, a predecessor firm built the first air-operated locomotive in the United States in 1874. The purchaser intended to use it for drawing street cars in Louisville, Ky., but there is now no information regarding such service. It had four wheels, each of 30-inch diameter, and its twin drive cylinders were 7 inches in diameter and of 12-inch stroke. A second, smaller unit was constructed in 1877 for the Plymouth Cordage Company, which used it for haulage in and around its frame-building plant in Plymouth, Mass. It weighed 7000 pounds, had four 24-inch wheels and two 5 × 10-inch drive cylinders.

Most American-built compressed air locomotives bore either the Baldwin or the Porter name. The Baldwin, just mentioned, was manufactured by Burnham, Williams & Company, of Philadelphia. The Porter was produced by H. K. Porter & Company, of Pittsburgh. Both firms were primarily manufacturers of steam locomotives, and in that field, the Baldwin was a world leader for many years. In 1899, Burnham, Williams & Company had shop capacity for building 1000 units a year—more than three for every working day. Baldwins were built in all sizes, for all types of service, whereas Porter specialized in small units, primarily for switching service. Its first air-powered unit was produced in 1890. Another prominent American steam locomotive builder, American Locomotive Company, apparently never made air-power units.

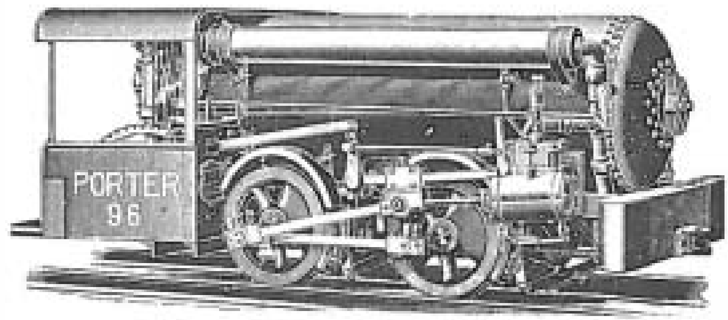
A 1901 Porter catalog about "light locomotives" contained 233 pages, listed 600 steam models and 60 air-powered units. Porter had by then forged to the front in the air-haulage field and was advertising that it had installed "about 90 percent of the air locomotives in America," and could refer inquirers to "some 25 plants in operation, each with one to six locomotives for track gauges of 18 to 56½ inches." The total number of air locomotives in the United States in 1902 was estimated at around 100.

There was little demand for air-powered locomotives prior to 1895 and production to then is estimated at not more than 20 units. They soon became popular for various services and remained so for the next 25 to 30 years. By far the greatest application was in coal mines,

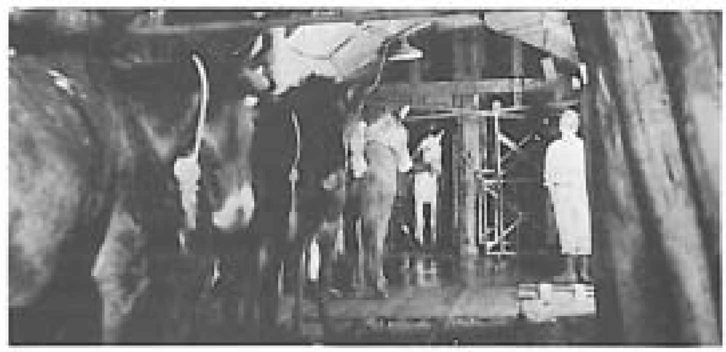
CHOOCHOO



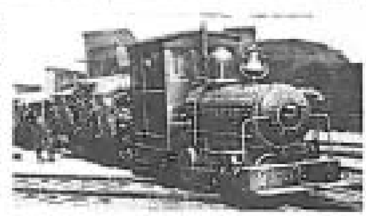
After German invention of seamless steel cylinders known as Mannesmann tubes, nests of these high-pressure air storage vessels became common on pneumatic locomotives built in Europe. Virtually all similarity with earlier steam-driven units then disappeared. The machine shown was used in coal mine haulage service around 1910



Leading American builder of compressed air locomotives was H. K. Porter Company, which owed its existence to a benefaction. Its founder, H. Kirk Porter, had intended to become a minister and was graduated from Newton Theological Seminary in 1862. He chose an industrial career instead of the pulpit after his father bequeathed him $20,000. Following service in the Union Army, he organized the firm of Smith & Porter in 1866 to manufacture light steam locomotives. Air-driven units were added in 1890. The concern became Porter, Bell & Company in 1871, later H. K. Porter & Company, and finally H. K. Porter Company in 1899. It discontinued building locomotives in the 1940's.



Mules, shown here in a Mexican mine awaiting trip to daylight on the shaft cage in the background, were used for haulage. Richard Hirsch gave figures to the Engineering Society Of Western Pennsylvania on compressed air versus mule haulage in colliery No. 6 of the Susquehanna Coal Company at Lyons, Pa., during 197 days in 1897. Cost with mules, including labor, feed, supplies, interest, and depreciation was $11,328, with air locomotives it was $3979. On a net ton-mile basis, the respective costs were $0.0514 against $0.019.



International Harvester Company of Chicago, one of the largest industrial users of air haulage, had four Porter locomotives in service at its McCormick Lumber Yards, where they hauled more than 13 million board feet of lumber during each of several years. A train consisted of ten cars. Air-powered transportation also was used at federal powder magazines at Iona Island, N.Y., and Lake Denmark, N.J., to haul explosives, artillery shells, etc. Other units were used at a Hercules powder factory and in a southern plant handling large quantities of cotton.

This 1915 Porter locomotive was intended for service in the cane fields of a Cuban sugar plantation, but never reached there. It was ordered through the New Orleans firm of Dibert, Bancroft & Ross., Ltd., and shipped to it from the Pittsburgh factory, but the deal fell through about that time and it was held in New Orleans. When it was offered for sale at a reduced price, the Sewerage & Water Board of New Orleans bought it as a standby for two trolley-type electric locomotives then in use for switching cars about the grounds of the water plant. Later it saw considerable use for trackage not equipped with overhead power. Its three interconnected air-storage tanks constituted the main 800-psig reservoirs and fed air through a reducing valve to an auxiliary reservoir at 250 psig. The air was then used in compound cylinders at that pressure. It is now in storage and is still serviceable.

where transportation had long been a problem. Sledges drawn by humans—often women and girls—were once used. The cars that came later were pulled by dogs, ponies, horses, and mules. Next came endless ropes, encircling wheels at the two terminals and powered by steam if on the surface, and occasionally by compressed air engines if underground. Then, electric trolley-type and compressed air locomotives were introduced and, at the turn of the century, gasoline-engine-driven units were being tried out. The air-powered type was preferred to the electric for its safety and to rope haulage because it could operate in two directions and enter rooms that a rope could not. A rope had greater power for negotiating heavy grades, but if the unmanned cars were derailed, there was inevitably a bad pile-up. With air-powered haulage, such a complication could be avoided or reduced in severity by stopping the train quickly.

In nongaseous mines with thick coal seams that provide ample headroom, steam locomotives could be used and were economical. Often, to reduce the smoke nuisance, no firing was done during a trip. Instead, it was customary to fill the firebox with fuel, let it burn until the darker colored gas and smoke had passed off, then enter the mine with empty cars and return with loaded ones, all on the one charge of fuel. A large firebox was obviously of advantage. One of the largest locomotives used in this manner (in 1901) was a 60,000-pound unit at Pocahontas, Va. It could make a 7-mile roundtrip without refueling. In gaseous mines or those with low roofs, steam locomotive haulage was out of the question and air-powered units were often selected as superior to other available methods.

Physical conditions of mine adits, shafts, and workings governed the size of the locomotives used. Headroom and width of haulageways, sharpness of curves and grades, and maximum distance of haulage were the chief factors affecting the dimensions of the units. They were built to order: long or short; wide or narrow; high or low. Eventually, so many different sizes had been developed that catalog models would meet the needs of most customers.

Early locomotives were essentially converted steam-driven models and used air at the same pressure in each of the two power cylinders. The pressure was commonly somewhere between 100 and 200 psig and this, plus the volume of air storage available, was the controlling factor as regards the distance of travel that was possible without recharging.

As mine workings were extended, haulageways grew longer. Locomotives of greater capacity were needed. The logical course was to store the air at higher pressure, thus cramming more of it into the storage vessels. This necessitated the development of compressors that worked at higher pressures than the conventional 2-stage models then in service. Pneumatic engineers responded by designing 3- and 4-stage compressors. It is consequently an historic fact that compressed air haulage was a principal factor in the development of high-pressure compressors. These machines appeared in increasing numbers during the 1890's and most of them were applied to charging locomotives.

During the next decade, locomotive designers improved the efficiency of their product by reversing the stage compression idea and utilizing the air twice at decreasing pressures in compound cylinders. It seems probable that Porter introduced this feature first. An old Porter catalog gives the date as 1908 and adds that the innovation had been under development for 4 years. Between 1890 and 1908, Porter had built about 300 single-expansion locomotives. The initial 2-stage unit was delivered to the Susquehanna Coal Company in Pennsylvania. Comparative tests showed that the new design was 50 percent more efficient than the old one and required only 70 percent as much compressed air. The result was almost immediate acceptance of compound models by the trade and few single-stage units were built afterward. A 1911 trade journal article stated that there were then 275 locomotives in the coal mines of Pennsylvania alone, and as many more in other states and Canada.

In the Porter 2-stage locomotive, compressed air drawn from the high-pressure storage tank at 900 psig or higher was reduced to 250 psig and fed to the high-pressure cylinder. The latter's exhaust passed to the low-pressure cylinder at about 50 psig. Its expansion in the first cylinder reduced its temperature to approximately 140° F below that of the atmosphere. Practically all of the lost heat was restored by passing the air through a reheater of the tube-nest type. Atmospheric air furnished the heat and was drawn through the tubes by an ejector operated by exhaust air from the low-pressure cylinder. The work done in the two cylinders was approximately equal.

In the United States, most of the high-pressure compressors for locomotive service were supplied by Ingersoll-Sergeant Drill Company, Rand Drill Company, and Norwalk Compressor Company. The first two firms mentioned were apparently sales agents for both Porter and Baldwin locomotives and listed them in their catalogs. The 1905 Ingersoll-Sergeant catalog stated that steam haulage units were then little used. Electric trolley types were used extensively, but were admittedly dangerous and could not reach mine areas beyond trolley installations. Compressed air locomotives were therefore favored.

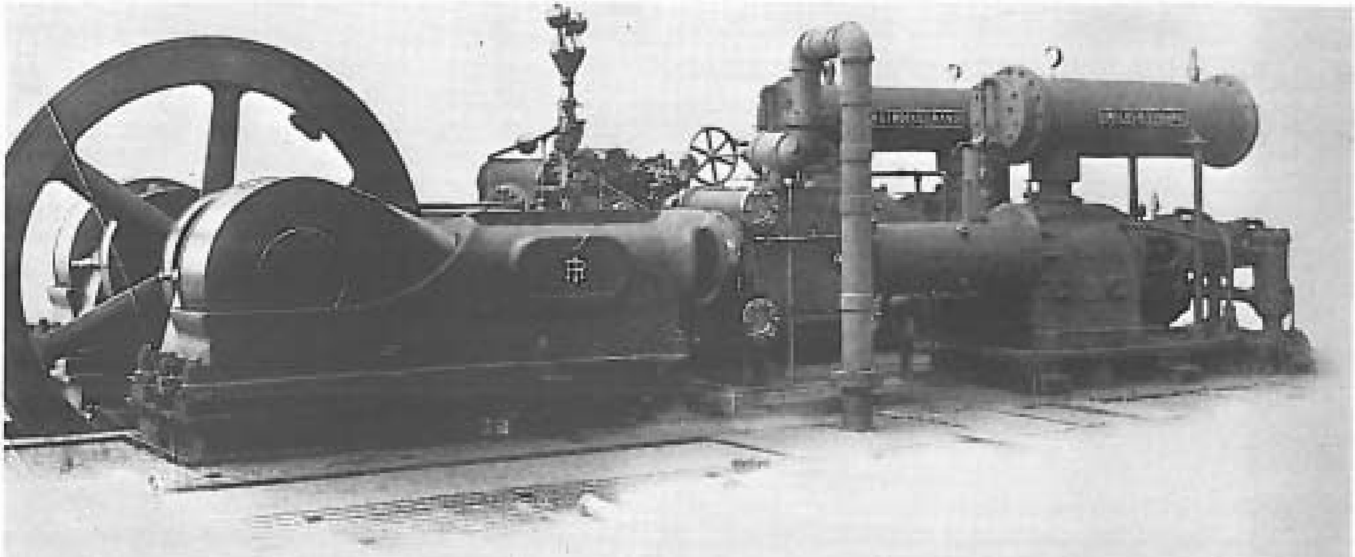
Ingersoll-Sergeant was then building a 3-stage, straight-line, high-pressure machine, designated as the AC-3, in piston strokes from 14 to 30 inches and for discharge pressures of 700 to 1500 psig. The first-stage cylinder was water-jacketed for cooling, and the two others were submerged in a metal box kept full of water. A 4-stage duplex model was also being built for discharge pressures of 850 to 1000 psig and had been sold for servicing haulage locomotives at the Johnstown coal mines of Cambria Steel Company, the Pittsburgh Coal Company, Jamison Coal & Coke Company, Washington Coal & Coke Company, all in Pennsylvania; also to the Anaconda Copper Mining Company for service in Montana.

Rand Drill Company was producing high-pressure compressors of vertical design, but only in comparatively small sizes. Norwalk built horizontal machines in the same general size range as Ingersoll-Sergeant. The Ingersoll-Sergeant and Rand firms were merged in 1905 to form Ingersoll-Rand Company, and in the following year George R. Murray, sales manager of the new concern, informed his salesmen that Porter had bought about 150 compressors from the two predecessor companies during the preceding year. Purchases continued to be substantial afterward, but the 1905 figure was never exceeded.

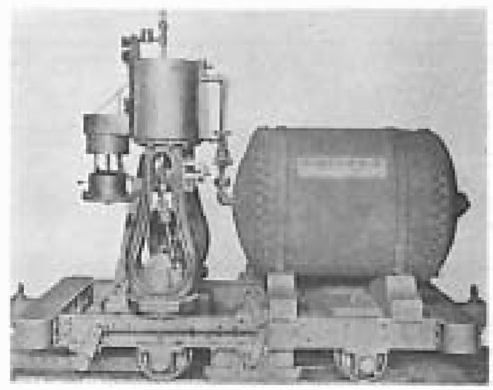
An American trade journal's review of coal mine haulage practices in Europe in 1914 stated that most compressors used from 1907 to 1910 were designed for 1500-psig discharge, that a typical locomotive carried air at 750 psig and used it in single-stage cylinders at 150 psig. By 1910, 4-stage compressors discharging to 2250 psig were available; compound locomotives carried the air at nearly the pressure and reduced it to 270 psig for working in the high-pressure cylinder. The discharge was reheated before passing to the low-pressure cylinder. One of these units could haul a train of loaded cars 7000 yards on one charge of air, as compared to only 4000 yards for the average single-stage locomotive previously used.

In 1912, compressors of five stages appeared, with discharge pressures to 3000 psig for use in triple-expansion locomotives that used the air initially at 400 psig. Haulage distance between charges had increased to 10,000 yards, while the air consumption was only 45 percent of that registered in 1907–10. A train usually consisted of 40 cars, each with a capacity of 1500 pounds of coal or a ton of rock.

During this period, it was reported, hundreds of air-powered locomotives and close to 100 compressor stations were in use in German collieries. Other plants were operating in Austria-Hungary, Belgium, France, and Spain. In January 1914, one factory on the continent was building 39 locomotives and twelve compressors. A 1920 account reported that 624 pneumatic locomotives hauled approximately 15 million tons of coal annually in the Dortmund, Germany, mines.



Ingersoll-Rand Class OC, 4-stage, steam-driven air compressor was built around 1908 and used by Federal Coal & Coke Company for charging mine haulage locomotives. It had a 27-inch stroke and was designed for 1000-psig discharge pressure.



Small air locomotive of unusual design built in 1903 by the Rix Compressed Air & Drill Company of San Francisco was intended for service on steep grades in mountainous country. Air was stored at 600 psig and reduced to 120 psig before being used in the vertical engine.

CHOOCHOO

On some units, motive air was charged at 3000 psig into three or four weldless steel cylinders 12 to 18 inches in diameter; a single charge sufficed for a run of about 6 miles. The locomotives had compound cylinders, ranged from 10 to 30 hp, and weighed 3½ to 7 tons.

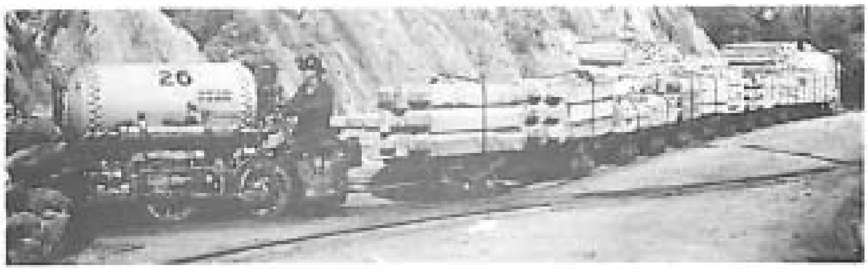
Although coal mines were the overall greatest users of air haulage, the largest individual American installations were at Anaconda Copper Mining Company in Montana and Homestake gold mine in South Dakota. At its Washoe ore-reduction works, Anaconda used the locomotives exclusively for hauling ore, limestone, coal, and coke. Starting in 1902, eleven and sometimes twelve units were in service on 46 miles of trackage, largely on sidehill terrain. The plant operated around the clock, 7 days a week. Nine of the locomotives were on duty 24 hours and the others, 16 hours. One unit weighed 42,000 pounds, the others 26,000. Air supply was compressed by two 4-stage, Corliss steam valve compressors of 48-inch piston stroke that normally ran continuously. They discharged at 900 psig into several thousand feet of pipe that served as a storage reservoir. From this line, the locomotive tanks were charged at intervals of 20 minutes to 1 hour. The air was reduced in pressure to 150 psig before entering the power cylinders. Train speed was limited to 5 mph.

Homestake initiated air haulage with one Porter locomotive and an Ingersoll-Sergeant 3-stage compressor discharging at 900 psig. The locomotive hauled 2000 tons of ore daily from the shafthead to various stamp mills, a distance of 1200 to 2000 feet. The compressed air was delivered to several charging stations in 6-inch pipe, which provided adequate storage capacity. Steam locomotives had been used previously, but the risk of their setting fire to the numerous frame buildings was so great that air power was substituted. In addition to eliminating this hazard, the air locomotive, which weighed 27,600 pounds, proved capable of doing in one shift of 8 to 9 hours the same work that had previously required 3-shift operation.

Success of this surface transportation system led to extending air haulage to the underground workings where horses and mules had been used before. Gradually the fleet of locomotives grew until, in 1925, there were twenty of 5-ton size and nine of 3½-ton size, running on more than 100 miles of tracks within the mine and handling men and materials as well as ore. To supply the 1000-psig locomotive charging air, an Ingersoll-Sergeant 4-stage, steam-driven compressor of 48-inch piston stroke, reportedly then the world's largest, was installed in 1906. When additional air was required, a second steam-driven unit of 42-inch stroke was acquired and later an Ingersoll-Rand 4-stage, synchronous-motor-driven machine of 24-inch stroke was added. Meanwhile, the original 48-inch unit had been converted for driving with power transmitted through ropes from an electric motor.

Some of these air-powered locomotives are still in service, although there is a saying around Homestake that the only original parts of most of them are their air storage tanks. Other parts for replacement have been turned out in the mine's efficient mechanical shops. As the locomotives reach a point beyond the hope of repair, they are replaced by electric storage battery units ranging to 8-ton size.

Air-powered locomotives were used during the construction of several large railroad tunnels, mainly in the Swiss Alps, the first instance being in the 49,212-foot St. Gotthard bore, completed in 1882. Eight small drifts of headings made up the full cross section and the upper ones were excavated considerably in advance of the others. Horses hauled the cars of muck out of these on narrow-gauge tracks. When they reached the point where full-section excavation had been completed, the cars were dumped into larger ones, which were drawn to the portal by air-powered locomotives. When tools and materials were taken into the tunnel, this procedure was repeated in



The Homestake gold mine at Lead, S. Oak., was a notable example of the few metal mines that had haulageways wide enough and straight enough to accommodate air-powered locomotives. A few units of its once large fleet are still in service. View shows timber for underground supports being moved from the Kirk timber yard to a mine shaft for lowering into the workings.

An American inventor developed this air-powered machine in 1933, hopeful that it could be used in standard railway service, but nothing came of the efforts. It contained main and auxiliary engine-driven compressors to maintain the operating air at 400 psig. Storage tanks are shown in the rear. Another attempt in the same field was made in Germany around 1940. The Esslingen diesel, built for the German State Railways, used a diesel-driven compressor to compress air to about 100 psig. The air was cooled during compression by injected water, then heated to 650° F by waste gases from the diesel engine, and next expanded in two ordinary locomotive cylinders.

Ed Fry of Cripple Creek, Colo., built several small air-powered locomotives in the 1950's that were popular in the gold mines there until economic conditions closed the operations. Called the Air Tram, Fry's conception was driven by an Ingersoll-Rand 5½-hp air motor that transmitted its power to the axles through roller chains and sprockets. The air-storage tank was charged at an initial pressure of 100 psig The locomotive (left), with Fry at the controls, was sold for mine service in Canada.

reverse order, the transfer of loads to the higher level being accomplished with hoists. Two 5½-ton locomotives were used at first—one at each tunnel end—and were charged with air at 90- to 105-psig pressure. Later, more compact units, charged with 220-psig air, were constructed by M. M. Schneider & Company, of Creuset. At the peak of operation, three locomotives operated at each end and transported loads of approximately 4600 tons daily.

In the 65,734-foot Simplon tunnel that was opened in 1906, steam locomotives were first used. After the boiler pressure had reached 220 psig, firing was stopped to reduce the smoke and was not resumed until the pressure had dropped below 100 psig. After a time, compressed air locomotives were substituted. They eliminated the smoke nuisance and also aided somewhat in ventilating the working spaces. The locomotives had air storage capacity of 70 cubic feet, consisting of Mannesmann weldless tubes that had been developed in Germany. These were charged with air at 1030 psig, which was reduced to 150 psig for use in the power cylinders.

Air-powered locomotives were partly responsible for setting construction records for that era in the 47,675-foot Loetchbert Alpine tunnel, where 1 million cubic yards of rock were drilled, blasted, loaded, and hauled out in less than 5 years, the best day's advance being 36 feet. At one end, two Ingersoll-Rand 4-stage compressors delivered 460 cfm of air at 1760 psig for operating the locomotives.

For the construction of the Mont d'Or tunnel (circa 1912), the A. Borsig works in Germany built two compound pneumatic locomotives with special features. One was a 3-axle, 11-ton unit; the other, a 4-axle, 31-ton model. The air, carried in two long horizontal tanks, was heated before entering the high-pressure cylinder and again before passing from the exhaust of that cylinder to the low-pressure cylinder. Final temperature in both cases was about 355° F. Heat came from a furnace that burned charcoal to reduce smoke. The smaller locomotive hauled loads to 60 tons and the larger one, to 200 tons.

In North America, air-power haulage was used in the 5-mile, double-track Connaught tunnel at Rogers Pass on the main line of the Canadian Pacific Railway by the contractors, Foley Brothers, Walsh, and Stewart. It was claimed that this method of handling spoil was largely responsible for the builders earning a bonus by completing the tunnel 364 days ahead of schedule.

Although no compressed air locomotives were built in the United States by the compressor manufacturers that sold them, a subsidiary of one of them, Canadian Rand Drill Company, produced locomotives for a few years at its Sherbrooke, Que., factory. The earliest ones of record were three units built in 1904 for service in a mine of the International Coal & Coke Company at Coleman, Alba. The order included a steam-driven, 4-stage air compressor of 24-inch stroke. It was rated at 1000- to 1200-psig discharge pressure, but the locomotives stored air at 800 psig and reduced it to 160 psig before using it. The Coleman installation is believed to have been the first of its kind in western Canada. Two more compressors of the same type were added later to power 2-stage locomotives that were built in the United States.

In 1905, the Crow's Nest Coal Company bought a Sherbrooke-built, 4-stage compressor for operating Porter locomotives built in the United States. (This was the installation mentioned in the December 1967 issue and referred to in the editor's note.) A little later, West Canadian Collieries adopted compressed air haulage at Lille, Alba., and the Corbin Coal Company installed at Corbin, B.C., the first 2-stage locomotive used in western Canada. Canadian Rand stopped producing locomotives about 1907, but continued to furnish compressors to serve them. In 1925, eleven of the twelve air-haulage systems operating in western Canadian coal mines were using fifteen of the Sherbrooke compressors.

RAILCON

April 24th and 25th, 1971 Inland Empire Chapter of NRHS will sponsor the fifth annual RAILCON. This is the first railcon held east of the Cascade Mountain summit and we expect to see some different scenery and activity. The theme of RAILCON 71 will be "Burlington Northern in Transition". Come along to visit the old and new as BN makes changes as a result of the GN-NP-SP&S merger. Although exact plans have not been formulated a trip on the UP mixed train to Cheny is promised. The Pacific Northwest Chapter will be having a special car on the BN train to Spokane and return via the Union Pacific if demand warrants it. Look for more details in next month's Traimmaster.

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PACIFIC GREAT EASTERN RECORDS YEAR OF PROGRESS

During a year of economic uncertainty, the Pacific Great Eastern Railway's volume of business in 1970 remained remarkably buoyant, although rising costs of wages and materials will offset to some extent the increase in revenues. For the first time in the company's history, carloadings will surpass the 100,000 level. Total revenues will rise from $30,470,005 last year to an estimated $32,000,000

Industrial expansion completed during 1970, in progress at year-end, and planned for 1971, signifies a growing volume of traffic for the PGE in the years ahead. Under construction at year-end was the 250-mile Fort Nelson Extension from Fort St. John; the Takla Extension running in a northwesterly direction for 79 miles from Fort St. James; and the 340 miles Dease Lake Extension from Takla Lake to Dease Lake which will open northern frontiers between the Rocky Mountain Trench and the Pacific Coastline. Grading of the roadbed will be completed in 1970 along the entire length of the Takla Lake Extension, the first 30 miles of the Dease Lake Extension cleared and on the Fort Nelson Extension grading completed and 180 miles of track laid. The Takla and Fort Nelson Extensions are scheduled for completion in the final quarter of 1971.

General road improvements undertaken during the year on the main line included the laying of 227 miles of new rail, 70 miles of ballasting, and replacement of 162,000 ties. In July, the Company opened a new Car Shop at Squamish, which is the location for major overhauls and building of new equipment. The new shop will facilitate repair work on freight cars. The Mechanical Division also modified 325 chip cars to provide for an alternate method of unloading.

In 1970 the PGE added to its inventory of diesel locomotives and rolling stock with the purchase of five 3,000hp locomotives and 140 wood chip cars. The Railway's motive power fleet consists of nine engines rated at 3,000hp; 29 rated at 1,800hp; 25 at 1,600hp and three yard engines rated at 1,000hp.

Last April the PGE entered into a management contract to manage, maintain and complete construction of the B.C. Harbours Board Railway from Cloverdale to Roberts Bank. Installation of a CTC board for this operation was completed in the final month of the year.

PGE COUPLER

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BOXING PEOPLE ON FREIGHT CARS COULD SAVE PASSENGER SERVICE

The question of what to do about American passenger railroads is still very much on the administration's mind. There is no doubt that the railroads are losing money on passenger business. If they had their druthers, they would just stay with freight. At the same time, the public's need for passenger trains, particularly commuter trains, is great

What is the solution? Professor Heinrich Applebaum, who holds the Casey Jones chair of railroad philosophy at Pullman University, has come up with a radical idea that could save both the railroads and the needed passenger service.

Prof. Applebaum says the solution to the problem can be found in large aluminum containers which are now being used for freight. These containers are placed on trains already packed, and unloaded the same way. This saves the companies money in freight handling, loss due to pilferage and breakage, and also saves time. Applebaum claims there is no reason you can't use the same containers for people.

This is how it would operate; Let us assume that 150 people are going to take the 7:30am from Greenwich, Conn. When they arrived at the platform, they would be placed horizontally in the containers. (This would give everyone an extra hour's sleep to New York). The container would be insulated as well as air-conditioned. When everyone was squeezed in the container it would be sealed. Then a freight train going through Greenwich would stop and the container would be hoisted on board the flatcar.

The same thing would happen all along the way. Commuters in containers at Portchester, Rye and Larchmont would all be waiting to be picked up by the freight train. When the train arrived at Grand Central Station, the containers would be taken off by cranes and opened up on the platform, and everyone could go to work. The reverse would happen in the evening, Applebaum said, expect in this case, to break the monotony, the containers would be loaded vertically.

The beauty of the plan, says Applebaum, is that by using containers, railroads could cut the cost of a ticket from Greenwich to New York by $3.50. They could also profit by the fact that they would not have to build new paasenger cars, and they could eliminate the bar cars. Psychologically, they wouldn't have to worry about customer relations, as the commuter service would be run by the freight department.

The big advantage of this is that once the railroads were able to legitimately treat passengers as freight, they would improve their service rather than try to discourage people from using the railroads. Applebaum says that, at the moment the container idea would be practical on short runs only, but he felt that as time went on a method could be developed for long runs to freeze people in refrigerator cars and then thaw them out when they reach their destinations.

The Department of Transportation which is trying to find a solution to the passenger train problem has expressed great interest in the Applebaum plan. A spokesman for the department said: "If nothing else, it could save the Penn Central Railroad".

Art Bauchwald

ITEMS FOR SALE

Following are some items for sale from the estate of William Converse of the Tacoma Chapter, NRHS. All sales are being handled by Donald C. Dietrich, 9508 15th Ave NE Seattle, Washington 98115. If you want to reserve an item call Don in Seattle at LA5-3894 to see if the item has not been sold. All items ordered by mail should be accompanied by a check or money order payable to Wilma A. Converse, Administratrix.

Title	Author	Year	Price New	Asking Price	From*
Louisville & Nashville	Kerr	1933	3.50		WHC
Locomotive of the NYC	May/Edison	1966	4.95		WHC
Lake Shore Electric	Christiansen	1963		2.50	WHC
Locos of the Jersey Central	Owen	1960	2.50		WHC
MKT Annual Report	MKT	1967			
Locomotive of the Reading	Warner	1963	2.00		
Narrow Gauge Nostalgia	Turner	1965	7.50		WHC
Narrow Gauge Rys in America #433 autographed	Fleming	1949		25.00	WHC

CONT'd NEXT MONTH

A "GUT-BUSTER" RAILROAD QUIZ

Jack Holst compiled the following quiz from the depths of his dusty file drawers. This one is guaranteed to stump the experts: We doubt even John Labbe can get 100%! Match the railroad name with the state in which each operated. (Jack offers only one hint: All are names of logging railroads.)

___1. Boynton & Elsewhere R. R.	A. West Virginia
___2. Cornie Valley R.R.	B. Washington
___3. Hoo Hoo R.R.	C. Oregon
___4. Loop&Lookout R.R.	D. North Carolina
___5. Maxton, Alma & Southbound R.R.	E. Idaho
___6. Needmore Southern R.R.	F. Florida
___7. OK R.R.	G. California
___8. Ping Pong R.R.	H. Arkansas
___9. Yellow Jacket R.R.	I. Arkansas

Let us know if you get more than five right, and we'll publish your name in THE TRAINMASTER as a qualified Timber Transportation Archaeologist. Answers on page 12.

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STEAM LOCOMOTIVE FOUND IN SACRAMENTO RIVER
(reprinted from the Sacramento Bee, Jan. 21, 1971)

ANDERSON, Shasta County, Calif.: A wood-burning steam locomotive believed to have begun hauling logs from Anderson to Bella Vista, Shasta County, more than 70 years ago, has been found in the Sacramento River.

The locomotive was discovered at the bottom of the river, east of Anderson, during the dismantling of the Deschutes Logging Bridge, a former railroad span later converted to carry cars and trucks. The bridge, damaged in last year's floods, was replaced by another structure this year.

The engine is presumed to have belonged to the Anderson and Eastern Railroad, a short-line logging railroad which served Terry's Mill near Bella Vista north of Redding from 1897 to 1911. The line crossed the Sacramento River in the area where the engine was found. Prior to the building of a railroad bridge, the engine and cars were ferried across the river. It is presumed that the engine slipped off the ferry at some point.

The locomotive was found by construction workers who built the new Deschutes bridge and are dismantling the old one. Con-

STEAM LOCOMOTIVE FOUND IN SACRAMENTO RIVER
(Continued from page 11.)

tractor C. K. Moseman has indicated he would like to salvage the engine, but the county has advised him that until the ownership is determined, no salvage attempts should be made.

Shasta County Counsel Robert Rehberg said the state may own the engine because it owns the riverbed where it was found. Shasta County [illegible]visor Floyd Morgan, in whose district the engine was found, said when title to the engine is determined, he would be willing to pledge money for its restoration and seek other donations so the locomotive can be placed on public display.

Morgan said the engine would probably be raised when the water level of the Sacramento River is at its lowest.

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PEGGY PROGRESS - Jack Holst, Mech. Chmn.

Work on "Peggy" (Stimson Lumber 2-truck Shay #1 at Oaks Park, Portland) is progressing at a rapid rate. PNW Chapter has had 12 work parties since November with a total of 35 man-days of work lavished on the old girl to date. In addition to members' labor, several significant donations of materials and labor have been received from non-members. Dick Samuels contributed the use of his truck several times and loaned us a pile of ties for cribbing up the tender tanks. Ron Harr and Tom Mathen are other non-members who have pitched in. Accomplishments to date are numerous. The best news is the successful welding of the broken frame and the restoration of the loco to its rightful position of carrying its weight on its wheels once again. Conversion of the firing controls back to the left side of the cab is nearly complete, with only the blower line remaining to be plumbed in. After many days of struggle, a new 10x14 pilot beam is in place and the draft gear and coupler remounted. Conversion of the firing equipment revealed much broken plumbing which is being replaced. Dick Samuels arranged donation of and delivered new decking for the tender deck. Hydrostatic test soon!

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QUIZ ANSWERS (See page 11)

1 -	H or I	(Boynton Land & Lumber Co., Ark.)
2 -	H or I	(Edgar Lumber Co., Ark.)
3 -	E	(Rose Lake Lumber Co., Idaho)
4 -	A	(Meadow River Lumber Co., West Va.)
5 -	D	(Alma Lumber Co., No. Car.)
6 -	F	(Robinson Improvement Co., Florida)
7 -	C	(Cline & Taylor, Oregon)
8 -	B	(Elma Shingle Co., Washington)
9 -	G	(Diamond Match Co., California)

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MEMOS: Nezperce Railroad, Nezperce, Idaho, has purchased a Plymouth locomotive at Columbus, Ohio, which will move west on BN for servicing at Lincoln Shops, Nebr., then to Lewiston for delivery to the NPRR via the Camas Prairie RR. . . . Longview, Portland & Northern has for sale diesels 1002 at Gardiner and 80 at Grand Ronde.

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