Rail Transportation Division
History & Heritage Committee

Oral History of

David G. Blaine (1918 – 2002)
Fellow – ASME

April 3, 2001

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ASME International

Donald E. Palmer (DEP): Dave, tell us a little about your early years.

David G. Blaine (DGB): My father was a doctor, a roentgenologist, an x-ray specialist. My mother didn't work. I had one sister who was 5 years younger than me. All through my youth my major interest was railroads. So on the advice of my bosses on the Southern Pacific Railroad where I was working after high school…

DEP: You did join the SP right after high school?

DGB: Actually, I started working while I was still in high school, as I lied about my age.

Henry Christie (HC): Where was that?

DGB: Los Angeles General Shops.

DEP: Where did you go to high school?

DGB: I went to South Pasadena High School

DEP: Were there any courses that you enjoyed more than others?

DGB: There were several but I didn't like math and was told I probably wouldn't do very well in engineering because of "quote" not liking math, but I persevered.

HC: In the early years before high school, what was the attraction to railroading? DGB-We lived in an apartment in Oak Park, IL and down at the end of the block was a Chicago & Northwestern elevated six-line track. I used to go down there and watch the trains. I was intrigued with the trains.

DEP: Do you recall your first train ride?

DGB: No, but it was probably on the old Chicago Rapid Transit. My mother used it all the time to go downtown and would take me along. It wasn't too far from the Northwestern.

DEP: You mentioned your youth in Oak Park and going to high school in Pasadena. How did you get from here to there?

DGB: My dad had an old World War I medical corps buddy who tried to convince him to come to California and become an associate in an x-ray lab. He said, “thanks but no thanks”. But then in the fall of 1930, Uncle Bill died

very suddenly and Dad bid on and picked up the laboratory in California and that is how we got out there. We moved out there during the Christmas period in 1930.

DEP You attended college at Purdue. How did you select Purdue?

DGB: As I mentioned, it was recommended by my bosses at the SP. I was way down at the bottom of the seniority list and was always getting cut off, but old George Hart, General Superintendent of shops said, "Blaine, you are wasting your damn time. Why don't you go to college?" You have to remember this was during the middle of the depression and I said, “Money is too tight”. He said," why don't you go to UCLA, it only costs $40 per semester." So I started out there in pre-engineering and stayed there 3-1/2 years. When I decided to go to Purdue, I found that many of the credits were not transferable.

HC: You started at UCLA and went on to Purdue because of the Railway Engineering course?

DGB: Absolutely, it wasn't offered at ULCA. They had railroad engineering at University of California Berkley but it was railway civil engineering.

DEP: The railway mechanical course at Purdue, how did it differ from some of the other engineering disciplines?

DGB: Car Design, Locomotive Design. The study specifically of railway shops and so forth but did not get into general mechanical engineering.

HC: Was there an emphasis on braking?

DGB: Well sure, as you recall the tests that proved the AB were made at Purdue and over the period of 1924 and 1929. At that time Purdue still had an active locomotive testing laboratory.

DEP: The AB valve at that time was called FC3?

DGB: Well, FC3 or FC3A, it wasn't specifically either one; but consequently when New York & Wabco got down to real design of the commercial valve, they changed it.

DEP: While you were at school, were you involved in the student chapter of ASME?

DGB: Yes.

DEP: How did you get interested in ASME? Was it just the thing to do for most students?

DGB: It was the thing to do for all mechanical engineering students.

DEP: Was it an active student chapter?

DGB: Yes.

DEP: I assume some of the students you were in school with that took the railway mechanical course went on into the industry.

DGB: Yes, a good many of the about 12 of us when I arrived there in 1939. Six guys, as I recall, had been special apprentices on the Big 4 Railroad.

DEP: Do you remember who some of the people were?

DGB: Leon Stamples was one name that comes to mind, but he is dead. A man who went on to be chief mechanical officer of the NY Central System was another one.

DEP: But they all pretty much went into the railroad industry after leaving?

DGB: Sure, or railway supply. Both railroads and railroad supply companies made a point of interviewing students from Purdue.

DEP: That kind of points to the next question I was going to ask. Back in that timeframe how did students find jobs? Did companies come to the campus to interview?

DGB: Yes they did. Of course you didn't have to do that, you could do it on your own hook, and my old home road, the Southern Pacific, didn't come that far East. In any rate, they offered me a job as a tracer, at I believe it was $75 a month in Sacramento, CA at the general mechanical headquarters. New York, Air Brake and WABCO were offering $135, so you can see why I didn't take the SP offer.

HC: You went directly to WABCO and didn't go back to Southern Pacific then?

DGB: Yes. I did stay on the seniority list until about 1946 or 1947.

DEP: Tell us a little bit about when you joined Westinghouse Air Brake, what some of your duties were and what you can recall.

DGB: My duties were primarily to learn air brake systems and how they worked. They had a regular special apprentice class. Did you have one at NY like that?

DEP: Not the same way that Westinghouse did. However when I joined, a group of us were sort of a special class.

DGB: Well, it was officially called a "special apprentice" class, which of course is old railroad terminology. So we studied more damn old equipment, which I hardly ever ran into.

DEP: Tell us about the equipment that was in rail service at that time?

DGB: At that time, I'm thinking of June of 1941 on, the K Triple Valve was the number one freight equipment and there were still a few H Triple Valves around. I would say there was probably 200,000 to 250,000 AB equipment that had been applied. During the war, although I had been in the reserve in CA at UCLA, the doctors wouldn't accept my eyes back in the Pittsburgh area. They said, “You are practically blind,” as far as they were concerned. Of course in those days, everybody had to be a sharp shooter.

DEP: With a gun, not with your tongue.

DGB: That’s right.

HC: Back to the types of equipment, what kind of passenger equipment was there?

DGB: Oh, there was LN, lots of UC, and some D22s.

HC: And you got involved with all of them?

DGB: Yes.

DEP: When your apprentice class finished, then what did you do for Westinghouse?

DGB: You either started as a Junior Engineer in the design division or a test engineer in the test division, which I got.

DEP: That was in Wilmerding, Pennsylvania?

DGB: Yes. All of the work involved a 150-car freight rack and we had a 25-car passenger test rack that had a D22, F-1864 relay valves, speed governor control and so forth.

DEP: Dave, you mentioned the K Triple valve and the AB valve and there were about 250,000 AB valves in service. What was the real benefit of the AB valve over the K Triple valve?

DGB: Well from a technical standpoint, its main advantage was, quote " you could always get an emergency if you had a rapid brake pipe reduction." But with the K, if it had 15 pounds brake cylinder pressure or more it probably wouldn't go to emergency.

HC: There were two distinct portions?

DGB: That's right, there was a separate emergency portion.

DEP: About that same time, railroads were looking to run longer trains as well. Did the AB have any advantages?

DGB: Yes, the AB had the advantage of being both approved for 150-car train operation. It was certified as such by the Interstate Commerce Commission and AAR. That meant you could make an emergency at any speed and the train wouldn't automatically just derail.

DEP: What about the K triple valves, the predecessor of the AB?

DGB: They tried to run trains of 100 to 125 cars and sometimes they got away with it. But it wasn't a sure thing, primarily because of slack action.

HC: Did they have problems with releasing the brake?

DGB: Well, the AB valve had a feature called Release Insuring and the K did not. If you had piston ring leakage that was on the high side the leakage would slip right on past the pistons and the brake would stay in the applied position.

DEP: While you were at Westinghouse Air Brake and finished your apprenticeship, you went into the test department. Do you recall some of the test projects you worked on?

DGB: Remember these were the war years and many of the various government projects I worked on were for the war effort. Many of the projects were for

ship controls, pneumatic controls for small ships like sub chasers and so forth. They were operable from the pilothouse, where in the old days they would telegraph what they wanted from the bridge to the engine room.

DEP: So, much of your work was related to military projects?

DGB: Yes, but I also horned in on every railroad project we had going. I wanted to make sure they knew I was there for railroads.

DEP: After the war, in the late 40's, what types of projects did you work on?

DGB: We worked on the first diaphragm valve. The valve was ultimately called the AC valve. It came out in the mid 50's. It went over like a lead balloon. I don't think there were more than 300,000 valves sold.

DEP: Did this valve have a special pipe bracket?

DGB: Yes, and that was its downfall, from a practical standpoint

DEP: Many of these valves were used by Erie Mining, which hauled Taconite.

DGB: Sure, all of the cars were the same and it operated fine in a unit train environment.

DEP: My first recollection of you was when you were stationed here in Chicago. How did that transition come about?

DGB: I let it be known I would really like to be working out of San Francisco but George Cotter encouraged me to move to Chicago. George L. Cotter was the WABCO manager in Chicago and then he moved back to Wilmerding to be Director of Engineering, replacing Carl Stewart, who was a former SP man. Since the AB Valve acceptance tests were conducted on the SP, Carl Stewart took a position at Wilmerding.

DEP: After you made it known you wanted to move to San Francisco, did you ever get there?

DGB: No, they made it known the hottest district office for railroading was Chicago and that was where I ended up. At the same time the hot spot for rapid transit was New York. While in Chicago, I worked my way up from Field Engineer to District Engineer with opportunities to travel to the west coast on roads such as the Northern Pacific, Union Pacific, and Santa Fe and got part way there on the Burlington.

HC: As district engineer were your duties primarily with installation of equipment?

DGB: Yes, I dealt with installations but much of the work was related to trouble-shooting.

HC: Was that freight, passenger, or both?

DBG: Usually freight, but sometimes passenger. There was a DC electric-pneumatic system on a D-22 and it was prone to develop all kinds of hard-to-find grounds and shorts.

DEP: While you were at Wilmerding, were there mentors that you feel helped your career advance?

DGB: Yes, there was a gentleman who was a manager in Chicago, named Patrick Henry Donovan, who had been the Chief Engineer at Wilmerding in the earlier days of AB valve development, but had fallen out of the good graces of top management. Another mentor was A. B. Wood. He was also an employee of Westinghouse Traction Brake Company. He let me cut my eyeteeth on what we know today as the CTA and North Shore Electric line.

HC: So you were actively involved in the development of the brake system used today on the Chicago Transit Authority (CTA)?

DGB: Yes.

HC: In those days it was primarily pneumatic brake wasn't it?

DGB: No, there was some equipment operating with the pneumatic but much of it was electric. We were in on the development of the famous 6000's, which were a PCC car-type brake adapted to passenger car systems.

HC: Were the PCC cars a Westinghouse brake system?

DGB: Yes, we had the SC2A Actuators and the A-2 and B-2 Drum brakes that fit on the end of the motors so in effect there were four friction brakes per car. But if you cut a truck out, they did not apply on that truck.

HC: Did you do a lot of field-testing on the system?

DGB: Yes, we did, and these were coordinated through Harold Otis, who would have been the equivalent to a Chief Mechanical Officer for the Chicago Rapid Transit Company that later got taken over by the CTA.

DEP: At this time in the industry, railroads and suppliers both had strong mechanical departments, where now the railroad mechanical departments have been downsized. Were the working relationships between the railroads and supply companies different than they are now?

DBG: Yes, but the customer is always right and this was hard for many of the engineers back at the home office to accept. While the AAR had control of specifications, at the same time the Interstate Commerce Commission (ICC) was just getting involved with freight car braking and the Power Brake Law was being formulated. The actual Power Brake Law was enacted in 1958 and it was essentially a copy of the AAR's Red Book or braking standard.

DEP: Would you compare the typical freight and passenger train from the period when you first joined Westinghouse Air Brake and the time when you retired?

DGB: To be honest, the AB tests hit it on the head when they said 150 cars was a practical maximum train length to operate trains. There were trains operated longer than that, particularly coal trains operated between southern Ohio, Kentucky and the Great Lakes. C&O were known for operating 250 and 270 car trains.

DEP: Did they run into problems in operating trains of those lengths, and if so what were the problems?

DGB: Severe slack action was the main problem. Particularly, if a heavy reduction had been made or if you had been in power for a long time. At about the same time, pressure maintaining was being developed which made it easier to operate 150 car trains. That is 150 50-foot cars. If the cars were piggybacks or 89 feet long then the number of cars were cut back to about 75.

I believe pressure maintaining was the one feature or invention to help railroads most to operate trains during my lifetime. Pressure maintaining was a feature incorporated into the brake valve that replenished air that leaked from the brake pipe during a brake application. Before pressure maintaining, leakage in the brake pipe would cause the brake application to increase. If the train had the maximum leakage allowed of 5 psi per minute then the total brake application would increase from a light reduction to a full service application in a few minutes. The engineer could stall the train if he didn't closely watch his train. On long descending grades, brakes would have to be cycled on and off to keep the train speed in check but this could lead to false gradients, which could also result in braking problems. Pressure maintaining prevented these braking problems. On SP, Santa Fe, D & RG, NP and GN most enginemen practiced "bridge braking" with the H-6 Brake Valve. This was a form of manual pressure maintaining.

Another product that made a significant impact on train operation was the composition brake shoe.

DEP: Let's talk about passenger trains. What were typical train lengths and was there much change in their operation during your career?

DGB: The typical train length was 20 cars.

DEP: Later, passenger control valves came along with diaphragms much like freight control valves. Did this introduction change passenger operation?

DGB: As I recall, the typical practical train remained at 20 cars. This has much to do with graduated release. When trains got too long it would be common to be dragging a few cars brake at the end of the train.

DEP: Would you tell us what graduated release is?

DGB: The ability to release from a service brake application in small steps.

DEP: Why would you want to do that?

DGB: Often you had too much brake as you slowed down, particularly with cast iron brake shoes and you needed some method to reducing the brake without fully releasing the brake, which is what happened with direct

release of the brake. You wanted to keep some brake applied to avoid harsh slack action. The introduction of graduated brake on passenger systems was made in 1912 and in 1911 the first Empty and Load system came along for freight.

DEP: Why wasn't graduated brake used on freight trains?

DGB: Small changes in brake pipe pressure could not be adequately controlled on freight and it was not practical on longer freight trains.

DEP: During the 1940's, while we were in the war years, was anything special done to operate trains? For example, what happened to the maintenance cycle of control valves?

DGB: It brought about an increase on the cleaning period on control valves that has gotten us to a ridiculous situation.

DEP: What was the cleaning period of K Triple Valves and AB Valves?

DGB: The K triple valve was one year, meaning the valves had to be reconditioned each year. The AB valve was approved to operate up to three years or 36 months. And then later it was increased to four years.

HC: Were you involved with the development of the ABD valve and what did you see as the major improvement of the ABD Valve?

DGB: The ABD added diaphragms, which improved internal leakage.

HC: Weren't there some problems with operation when the valve was first introduced?

DGB: Yes, the accelerated service release feature could result in a very fast release of a service brake application, and until locomotive engineers got used to it, they sometimes were surprised by the speed in which a service brake would release.

DEP: You mentioned Empty and Load equipment, what is it?

DGB: It's equipment that senses the load in the car and if it is over a certain amount the braking effort will be greater. It keeps the braking ratio or braking effort more uniform over the load of the car.

DEP: Is it required that a person change something to make it function?

DGB: Originally it did require a man to operate a handle from “empty” to “load” position. A heavy train that had several of these cars in it that were set in the “empty” position was a 'dog' to operate.

HC: Wasn't the design methodology of the brake equipment to design for the loaded car and then reduce the empty cars braking?

DGB: Yes, later empty and load systems were designed to automatically weigh the car and alter the braking effort in usually two steps, for loaded braking or empty braking.

HC: Was the reason it was needed due to the fact the single capacity braking changed drastically if the car was empty or loaded?

DGB: Yes, single capacity was fine in the days of 20-ton cars.

DEP: You said the Empty and Load Systems went from manual to automatic, how and when did the cars measure themselves?

DGB: Well, every time you recharged the brake pipe. For example, the car that operated on the Mesabi would be moved to a tipple to be loaded. Once they were loaded, the brake would be applied and released so the empty and load brake system would be properly conditioned for the load.

HC: The sensing was done based by spring deflection so when a car was loaded the gap between the car body and the truck side frame would be less and this distance would be used to determine if the car was loaded or empty.

DGB: Yes, that is correct.

DEP: I would like to discuss train inspection. How often were trains inspected?

DGB: In the early days, a freight train would be inspected every hundred miles, at least every 100 miles.

DEP: Would this typically be when there was a crew change?

DGB: Well, sure. It was based on the old railroad operation that said if you went a hundred miles that you had done a good day’s work.

DEP: We have talked about the periodic inspection of trains being at 100 miles. Did this grow to 500 miles or was there some other incremental distance?

DGB: I believe so, this was defined in the AAR's "Red Book" and later became a federal requirement.

DEP: So now we are at 1000 miles and looking for more.

DGB: I believe 1000 miles is too much for every train.

DEP: We have many intermodal trains running from Chicago to the West Coast that make it quite successfully. Let's discuss the evolution of brake systems on passenger trains over the past 50 years or so. Are there any features that were added that stand out to you Dave?

DGB: The first commercial application of Electro-pneumatic braking systems was on the New York City Subway in 1906. It recognized the uniformity of the response to the braking command was of immense advantage and I pushed hard for that while at the AAR and think my white paper on Electro-pneumatic freight brake helped the ECP get put on the agenda.

HC: One of the things you might like to comment on is the advent of speed control.

DGB: Yes, speed governor control was unique with the D-22 equipment. It had been tried out in various forms on the "infamous" or famous Wilmington tests conducted on the Pennsylvania Railroad in 1935 and 1936. Of interest, the Pennsylvania test department said, "yeah, that is great, but we ain't going to buy any of that expensive stuff."

DEP: What did speed governor control do?

DGB: It overcame the friction disadvantages of the cast iron brake shoe.

DEP: I 'm glad you mentioned that because a while ago you mentioned you thought the composition brake shoe was one of the great inventions. Why is that?

DGB: Because you didn't need all that speed governor control.

HC: You might comment on the advent of disc brakes.

DGB: Well, remember disc brakes were first broadly applied on passenger cars. I think about 1935 or ’36, courtesy of the Budd Company by C. LaVergne Eksergian, who was looking for a quiet, uniform passenger car friction brake.

DEP: Over your career are there other inventions or features other than automatic pressure maintaining and composition brake shoes that stand out in your mind as being significant?

DGB: Those two are the ones I consider the most significant.

DEP: If you had a crystal ball to see into the future, what do you think will be the next big change that will happen to our industry?

DGB: Well, I would like to see a universal application of automatic pressure maintaining.

DEP: How do you see the growth of ECP on freight equipment?

DGB: I believe it is going to become a standard.

DEP: Where it is used now is primarily on bulk commodity trains such as coal but it has not gained great success on interchange trains. Each car has to have a wire run through it and that seems like an obstacle that will be difficult to overcome.

DGB: Unless you use a radio.

DEP: Okay, we have talked quite a bit about your railroad career, let's talk about ASME. You started off in ASME while you were in school, tell some more about your involvement with ASME.

DGB: In those old days, railroads were represented by the Railroad Division, which was famous for its steam locomotive boiler test codes. This was becoming rapidly out of date as the diesel electric came along, so in 1964 several of us finally convinced the management of the division to call it the Rail Transportation Division in order to include transit. That's why it's Rail Transportation Division rather than Railroad Division.

DEP: You mentioned the boiler test codes. The Pressure Vessel Codes are a major moneymaker for ASME, were they a spin-off of the Rail Transportation Division?

DGB: I don't believe so. Because going back to the late 1800's and early 1900's, boiler explosions both industrial and railroad were quite a problem.

DEP: Do you recall the first ASME technical conference you attended?

DGB: It is kind of vague.

DEP: Do you remember if you were at school or working?

DGB: I am pretty sure I was with Wabco. Junior engineers didn't have enough pull to attend conferences. For some reason I convinced a test department manager to let me go. As I recall the meeting was in Pittsburgh.

DEP: You have held several positions in ASME and RTD, which include being the Chairman of RTD. What are some of the other positions including ones on the national level?

DGB: When you say the national level, The Rail Transportation Division is on the national level.

DEP: Yes, I stand corrected. One of the things I remember about you was the emphasis you placed on getting our division more involved with honors. You were a driving force encouraging the Division to get more involved.

DGB: I felt that when you looked at other divisions or areas of mechanical engineers, they were giving out more awards and honors than we were, so we should turn that around. That is how the Stucki Award really got going. Don Weibe and I and Bill Hansen, President of A. Stucki Company.

DEP: Since you have been so heavily involved with ASME over the years, can you think of any basic organizational change that might make the society grow and prosper and also the same question related to the RTD.

DGB: Grow and prosper? No, not specifically.

HC: Do you feel the RTD would be improved if they took a greater interest in air brakes?

DGB: Let’s call it air brakes and braking systems. Yes I do.

HC: The reason I ask the question is the Air Brake Association is about the only thing out there that is a little bit all embracing and it needs to be jacked up a bit technically from where it sits today. Maybe the ASME is the place where it should be driven.

DGB: Yes, maybe that is true.

DEP: Dave, I don't have any further questions. Are there any closing comments that you would like to make?

DGB: Thank you very much for coming to interview me. I really appreciate the time you have taken to come on out here.

DEP: Dave, it was our pleasure.