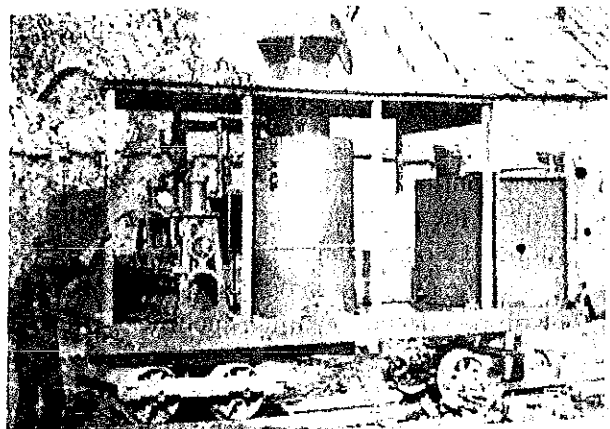


Crippen's Engine Design

was incorporated as the City of Cadillac, Michigan. Mr. Crippen had offered to construct a boiler and a pair of 5" diameter by 7" stroke cylinders giving Ephraim a 14 horsepower steam powered engine. Shay needed to consult with Crippen on the gearing necessary to link up the engine and the axle to be powered. Ephraim built a short flat car about 14' long with logging trucks near each end. The front truck was mounted normally while the rear truck was mounted fixed to the frame and could not swivel, much as normal drivers on a locomotive. He mounted the 3' diameter by 5' tall boiler centered on the car with the water tank over the front trucks and the Crippen's engine mounted crossways over the rear trucks. Shay experimented first with a chain drive from the engine through the floor to the truck axle. It is not known if he powered one or both axles however he soon found that the chain drive would not work for him and he next tried a belt drive. This worked and by mid August of 1877 Shay was testing his invention. He had spent \$1000 on this experiment, a lot of money for a time when his 10 employees were making between 12½ and 15 cents per hour.

What Ephraim Shay had invented was a locomotive capable of delivering equal torque directly to wheels on both sides of the engine at the same time. This overcame the dynamic force of his common rod engine whose normal pistons strokes jerked the engine side to side on each stroke, delivering excessive force to the wood rails, especially on the curves. You'll note that there is no outside driveline at this time. The locomotive worked but it was not perfect and Shay had to keep working on it to improve it over the winter of 1877-78. There is no exact description, photograph or drawing of the gearing on the two-cylinder engine Crippen built however, Ephraim describes in a letter that the locomotive had reversing. Since William Crippen copied and built it for other loggers we are fortunate to have a photograph of a copy of "The Original Shay" built by Ephraim Shay.



Crippen's Copy of Shay's Original Design

Shay's invention worked so well at bringing in the lumber that by 1878 he was able to reduce his selling price on lumber from \$3.50/thousand board feet down to a mere \$1.25/thousand board feet. He was also filling custom timber orders faster and cheaper than any other mill.

Colonel B. Wait, correspondent for Lumberman's Gazette, wrote an article June 7 1877, about Shay's invention drawing a lot of attention to Shay. Animal powered tramways were fairly common in the area and Shay started getting a lot of requests to build other loggers engines like his. He referred most down to William Crippen & Son who soon became backlogged building Shay style logging engines pictured here.

A New Era in Lumbering

James Alley, another logger, is perhaps the true-life key to the success of the Shay locomotive. Shay's introduction of a locomotive into logging with tramways was a turning point in the logging industry, however it was not Ephraim Shay that would push for this revolutionary concept for his fellow loggers. In fact, Shay was trying to keep his use of a logging locomotive somewhat quiet to keep ahead of his competition. Wait's story in the Lumberman's Gazette ended that. James Alley went to Shay and was