A BOY'S ENGINES AND HOW HE MADE THEM.

BY A. FREDERICK COLLINS.

While it may be no more true of engineers than of poets that the real genius is born and not made, certainly the work of Bion J. Arnold, the noted electrical engineer, when a boy living on the Nebraska plains, gave evidence that he was possessed of superior talents and sufficient perseverance to develop these talents regardless of all obstacles.

Young Arnold's first attempt at engine building was made when thirteen years of age, and the result was a small horizontal stationary steam engine about 7 inches in length; the main parts he cast out of lead and put them together with such tools as the local gunsmith shop afforded. At fourteen, he constructed a vertical steam engine about 15 inches in height, shown in the accompanying illustration, using for the boiler an old piece of iron pipe which had been thrown away by the railroad company, an old wagon-wheel hub for a firebox, an abandoned valve wheel for a flywheel, and a gas cock which had been given him served for a throttle valve. This engine is still in existence, and its dimensions are as follows: 13 inches from the base to the top of the cylinder; the boiler proper is 8¼ inches in height and 5½ inches in diameter; it sits on top of the firebox; the latter is 5 inches in height, 6 inches in diameter at the base, and 5½ inches in diameter at the top. This wagon wheel hub firebox was secured to the boiler by means of straps and hand-made bolts. The cylinder of the engine is 1⅛ inches in diameter, with a 1½-inch stroke, and the flywheel is 5½ inches in diameter. Not satisfied with a simple engine, the builder put on a link motion as shown in the illustration.

His next achievement in engine building was a year later, and that this engine might be more perfect than the preceding one he sent to a Boston supply house for four iron rods, each 1 foot in length, ¼ inch in diameter and threaded from end to end. With these as uprights and a supply of nuts threaded to fit and with castings made out of Babbitt metal he constructed his second vertical steam engine. This upright engine and the horizontal boiler with a kerosene barrel for a tank had the following dimensions: Engine cylinder 1½ inches in diameter by 2 inches in length inside measurement, mounted on four vertical rods 12 inches in length, thus making the engine from the top of the base to the top of the cylinder 12 inches in height; the flywheel was 5½ inches in diameter; the crankshaft was made of ⅝-inch round iron rod forged into shape and turned down to ½ inch in the bearings and crankpin.

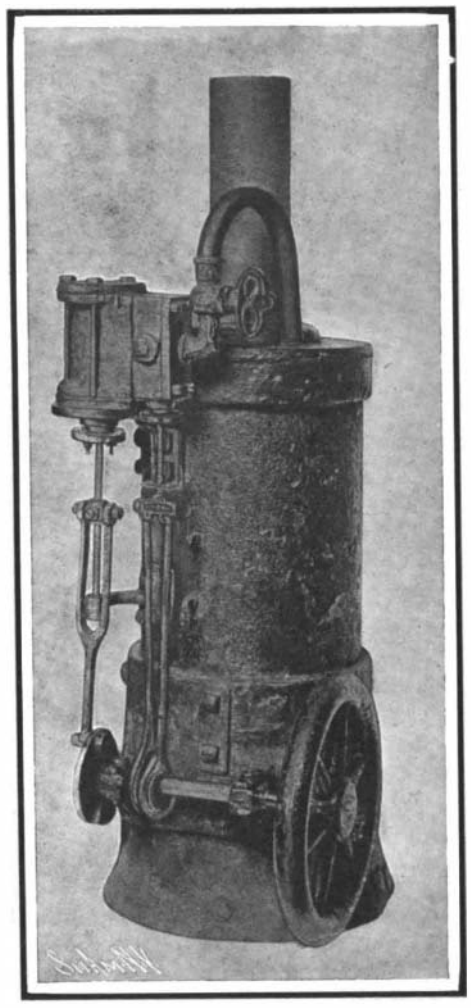
The boiler had a diameter of 12 inches, and was 2 feet 6 inches in length. It was made of ⅛-inch sheet iron, which he hammered into shape at the blacksmith's forge. It was provided with wooden heads held in place by four ½-inch rods extending through the boiler from head to head. It had no flues, as the youthful mechanic had no means of making them or even making heads to hold them; so heat was applied to the boiler underneath it by a crudely constructed brick furnace, while water was supplied to it from the elevated kerosene barrel when the steam pressure was low.

In the construction of this engine he devised and used the piston valve now in common use on locomotives and other engines and he believed himself to be its inventor, only to soon find, after a visit to the railway shops at Plattsmouth, that it had been invented long before he was born and was then in use on the steam engine driving the machinery of the railway shops.

Success having smiled upon his efforts, young Arnold began the construction of a much larger engine, one that he designed to develop about two horse power and by the use of which he fondly hoped to drive the wood saw, his particular *bête noir*, for supplying the weekly amount of wood for the kitchen stove; but with this ambition his father had no patience, and the machine was never completed, for lack of funds. Relics of it, however, can still be found in his boyhood home in Ashland, Nebraska.

Prior to leaving Ashland, Bion had acted as messenger boy at the railroad station, where he started to learn telegraphy, but the attraction of the locomotives was greater than that of the Morse alphabet, and in consequence he made the acquaintance of many trainmen running on the road. He had ridden repeatedly with the engineers, while the firemen allowed him to fire and clean the engine, and he otherwise assisted them until he was perfectly familiar with the construction and operation.

He had long cherished the desire to build a model locomotive, simply to demonstrate that he had the ability to do so. Feeling that his father's consent could not be secured to so ambitious an undertaking, he remained silent about it while at home, but when he went to college at Lincoln he made frequent trips to the local round-house to secure measurements of locomotives, and set secretly to work during afternoons making the boiler in the tinshop of a hardware store, whose owner was kindly disposed toward him.



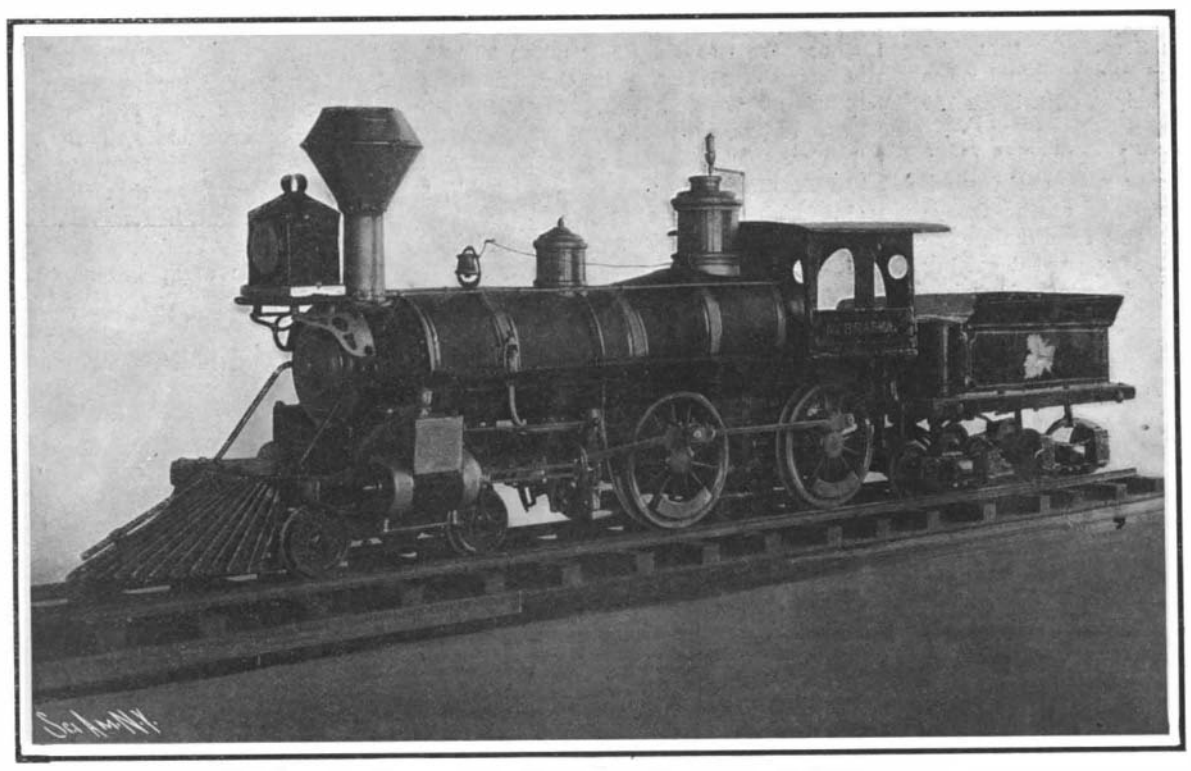
One of Bion J. Arnold's First Attempts at Engine Construction.

Bion, who was then just past seventeen years of age, soon produced a complete locomotive boiler one-sixteenth full size. It attracted the attention of a Union Pacific locomotive engineer and the secret was out, for he told the boy's father. The latter changed entirely his attitude toward his son's endeavors, and from that time on did everything possible to assist him in his chosen field. The next mail brought a letter from the father inclosing a check, with the request "not to neglect your studies," and a statement that "If the construction of the locomotive is worth doing at all it is worth doing well," and finally "not to waste money, but not to slight the machine for lack of it."

The result of the boy's labors, continuing over a period of many months, during which time he worked from sixteen to eighteen hours per day, was a complete locomotive three feet long, as pictured herewith, and this beautiful and brilliant testimonial of Bion Arnold's perseverance and skill now stands in a glass case in his offices in Chicago where its builder plans and executes gigantic traction schemes.

The locomotive was built on the plan of the 17 x 24 American type, such as was in common use on the Burlington & Missouri River Railroad of Nebraska from 1876 to 1880 or perhaps a little later. It has cylinders 1 inch in diameter, with 1½-inch stroke; driving wheels 4 inches in diameter; the boiler is fitted complete with pump, injector, whistle, steam gage, pet cocks, cylinder cocks, water-gage cocks, dampers, blowers, sand box, and bell—in fact, all the devices to be found on an engine of that date, except the air brakes and pump for the latter. These were partially completed, but never put on. Every part and parcel of the locomotive, from the cow-catcher to the tank bumper, is perfect, and every piece, down to the smallest screw, was made by young Arnold. At different times he had gotten up a few pounds of steam and set the engine into motion, to the great delight of the beholders.

Mr. Arnold's advice to all boys and young men who aspire toward engineering callings is to get the best theoretical schooling possible, but at the same time to learn to use tools and instruments like a skilled mechanic. The services of such an engineer will command the highest figures as long as there are problems to be solved in the engineering world.



Miniature Locomotive Constructed by Bion J. Arnold When a Boy.

A BOY'S ENGINES AND HOW HE MADE THEM.

Board to Test Block Signals and Automatic Stops.

The Interstate Commerce Commission has appointed a board of experts to conduct experimental tests of block signal systems and other safety devices used on railroads in the United States, as provided for by act of Congress last winter. The members of this board are Prof. Mortimer E. Cooley of the University of Michigan; Azel Ames, Jr., signal engineer of the New York Central Railroad; Frank G. Ewald, consulting engineer of the Illinois Railroad and Warehouse Commission, and B. B. Adams, editor of the Railroad Gazette. Prof. Cooley has been named as the chairman of the board. Mr. W. F. Borland, who has been designated by the commission as secretary of the board, has been employed by the commission for the past five years in charge of safety appliance work. A meeting of the board was called for Friday, July 12, when organization was completed and a plan of work outlined. In the appointment of this board of experts, the commission had the co-operation of the American Railway Association. A sub-committee of that association went to Washington and conferred with the commission with reference to the proposed tests and the composition of the board of experts. This sub-committee was composed of Mr. F. C. Rice, general inspector of transportation of the Chicago, Burlington & Quincy Railway; A. M. Schoyer, general superintendent of the Northwest System, Pennsylvania Lines West of Pittsburg; W. G. Besler, vice-president and general manager of the Central Railroad of New Jersey; A. T. Dice, general superintendent of the Philadelphia & Reading Railway; E. C. Carter, chief engineer of the Chicago & Northwestern Railway, and D. C. Moon, assistant general manager of the Lake Shore & Michigan Southern Railway. The committee has tendered the commission the use of railway tracks and other facilities for conducting the tests and will co-operate further, if necessary.

Massachusetts has a new law compelling railroads to clean up the brush on both sides of their tracks in order to lessen the danger from forest fires, and is also considering the need of spark arresters for locomotives. Other States are behind Massachusetts, for our loss in the needless destruction of our woods is enormously heavy.