

A LOCOMOTIVE DUEL SCIENTIFICALLY CONDUCTED.

BY DAY ALLEN WILLEY.

In spite of the too frequent railroad accidents, especially collisions which occur in this country, the opportunity is seldom afforded to note just what occurs at the time of impact when locomotives come together. The witnesses of such disasters are usually too excited over the occurrence to observe the immediate effects of the shock, and even if mechanical experts able to observe intelligently, they have only a chance to glance before the force developed at the time of contact has expended itself.

The accompanying illustrations are of unusual interest, for they depict a collision at the instant the engines struck each other and their condition a few minutes later when the motion had entirely ceased. Fortunately the photographer had a lens of high power and a very rapid shutter, so that even the fragments which flew into the air were reproduced on the negative as well as the jets of escaping steam and smoke. It may be needless to say that this collision was not an accident. It was one of several which have been arranged for exhibition purposes, but from it an opportunity is given to obtain valuable data as to the effect when two engines meet "head on" as in this instance,

in start being given the engine shown on the right side of the illustration. It will be noted that when it struck, none of the wheels was lifted from the rails. The truck of the left engine, however, was forced above the track, and the front part lifted a foot or two. The shock also broke one of the steam pipes leading into the cab, which accounts for the jet of steam shown in the picture. It will be noted that the cab of the right engine was torn from its fastenings by the blow, although the other cab was uninjured. A curious feature of the collision was that after the first impact, there appeared to be a rebound, the engines then closing up again and the right engine slowly forcing the other backward.

The locomotives remained in motion for about three minutes after the impact, the one on the left being driven back nearly 50 feet from the point where they came together. An examination showed that its smokestack was torn away at the base and the front of the boiler broken so that the steam entirely escaped through this vent and the pipe in the rear in five minutes. In both cases the pilots were demolished as well as the forward woodwork of all kinds. The lantern standards, headlights, and all of the lighter ironwork, including hand rails, were broken and twist-

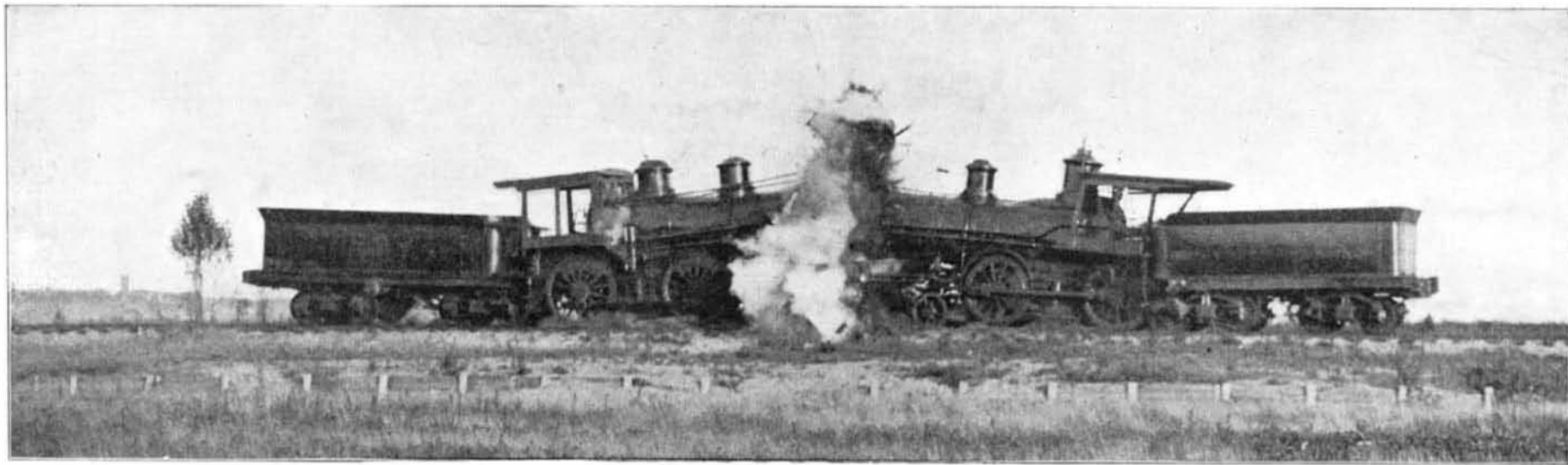
The Ninth Satellite of Saturn.

It is probable that, in the future, there will be no difficulty in securing a sufficient number of observations of Phoebe, the ninth satellite of Saturn, not only to correct the present elements, but to study the large and interesting perturbations to which it is subject. It can be observed visually with the largest refractors, and can doubtless be photographed with large reflectors, as well as with the Bruce telescope, by the aid of which Prof. William H. Pickering discovered it. Since the observations enumerated by him in the Harvard Annals, LIII., 55, 60, Phoebe has been closely followed by Prof. Bailey.

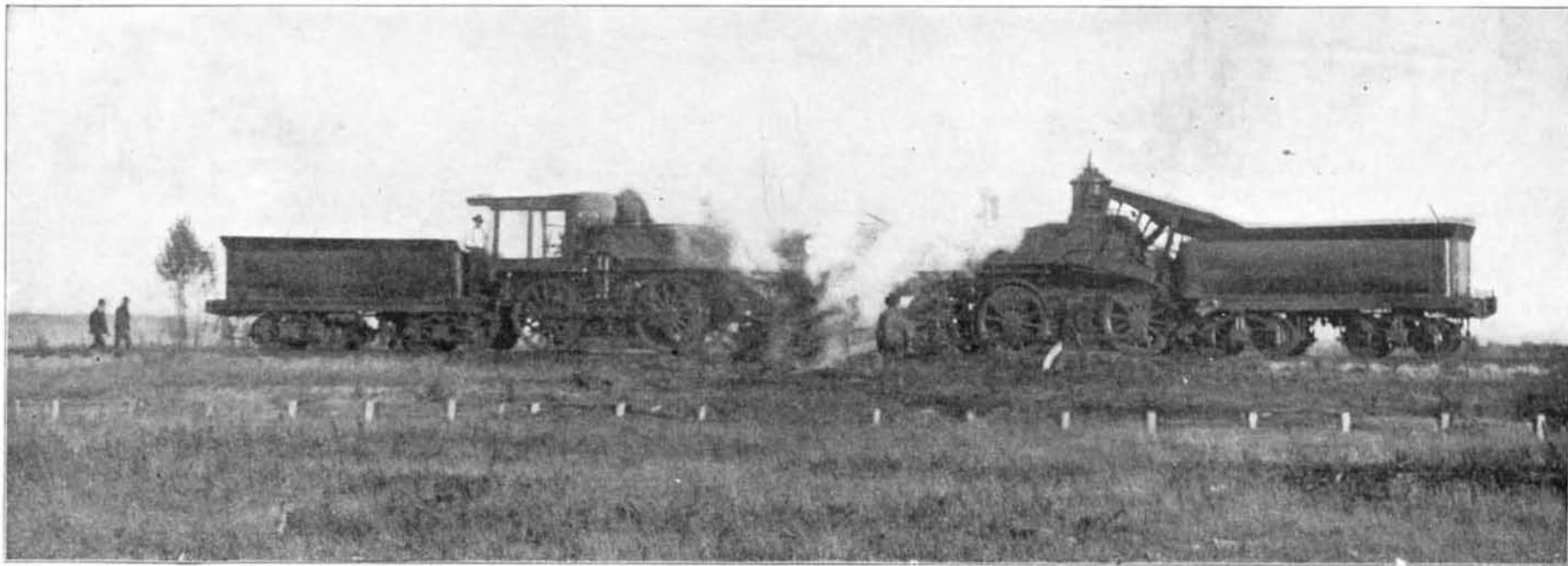
For some unexplained reason, Phoebe has not been found on the plates taken in July. The record for the plates taken in August has not yet been received from Arequipa.

A NEW VARIABLE IN HERCULES.

The meridian photometer, like other meridian instruments, is not adapted to the discovery of variable stars. It may therefore be of interest to note the discovery of such an object by the writer, with the 12-inch meridian photometer. On August 23, 1904, while measuring the star + 24 deg. 3419, magn. 9.4, it was noticed that a brighter star, having the photometric



SNAPSHOT OF A LOCOMOTIVE DUEL. THE RIGHT-HAND ENGINE HAD A GREATER MOMENTUM THAN THE OTHER AND LIFTED ITS RIVAL FROM THE TRACK.



THE TWO ENGINES, IMMEDIATELY AFTER COLLIDING, APPARENTLY REBOUNDED, AND THEN CRASHED TOGETHER AGAIN.

for their position at the actual period of colliding has been clearly reflected by the camera.

For the mechanical "duel," as it might be termed, a section of track 5,600 feet in length was laid on a level grade at Point of Pines, Mass. The locomotives utilized were secured from a railroad company which had discarded this type for heavier equipment, but they were not defective or disabled in any respect except that their cabs had been replaced. The weight of each engine, including tender, was about 50 tons and they were modeled after the same specifications, each having four 60-inch driving wheels, and four truck wheels supporting the forward portion of the boiler. Prior to sending them together, steam was generated for two hours and the engines "exercised" so to speak, by moving them slowly up and down the track. Finally the boilers were subjected to as much steam pressure as the engineers deemed safe and each machine was backed to its end of the line. The engineers took their places in the cabs and at the signal arranged each opened the throttle to the limit and pushed his lever to the full-speed mark, then leaped to the ground. One locomotive attained a slightly greater momentum than the other engine. Consequently the point of contact was not midway between the terminals, but about 300 feet distant, the advantage

ed beyond repair. The boiler of the right engine was also crushed in to such an extent that the steam escaped. Neither of the locomotives, however, was derailed, although the trucks were torn from their supports and the piston rods and cylinders dismounted as well.

Although the actual speed of the engines at the time of contact cannot be calculated, the force was such that an iron bar weighing 75 pounds, detached from one of the pilots, was thrown 150 feet to one side of the track, and such small pieces as bolts and nuts were found as far away as 300 feet. When the engines were started the whistle valve of each was opened. As soon as they met, the shock shut off the whistle of the left engine, but that of the right continued until steam had been exhausted.

The Committee on Awards of the Louisiana Purchase Exposition, St. Louis, has conferred upon the Wellcome Chemical Research Laboratories the distinction of a grand prize and three gold medals, in recognition of the importance and educational value of the chemical and pharmacognostical researches conducted in these laboratories under the direction of Dr. Frederick B. Power.

magnitude 9.5, and not in the Bonn "Durchmusterung," preceded it. An examination, the next day, of the photographs of this region at once showed that the star was a variable of long period having a range extending at least from the magnitude 9.5 to < 13. The approximate position for 1855 is R.A. 18h. 20m. 26.0s. Dec. + 24 deg. 56.4 min.

EDWARD C. PICKERING.

The French Admiralty have been carrying out prolonged experiments with a new type of accumulator, which it is expected will enable the design of submarine boats capable of attaining a speed of 16 knots an hour. The greatest secrecy is being preserved in regard to the invention. All that is known about it is that it is lighter than any accumulator now in use, and is said to be able to store sufficient energy for propelling engines of 1,000 indicated horse-power at the above speed. At present the accumulators actually in use upon the last completed submarine only yield 250 horse-power and give a speed of 11 knots; the "Emeraude" type of boats will be fitted with 600 horse-power accumulators, giving a speed of 12 knots. The utilization of the latest type of accumulators therefore will mark a great development in submarine propulsion.