

**ANOTHER "LARGEST LOCOMOTIVE,"**

It was not so very long ago that the engineering world was interested to learn that a locomotive had been built that exceeded 100 tons in weight, and the engine was very properly regarded as a monster of its kind. Since then the power and weight of engines have increased by leaps and bounds until to-day we can present our readers with a view of a locomotive whose total weight when in working order is not far from 150 tons, or, to be exact, 287,340 pounds. The new locomotive was built at the Baldwin Locomotive Works as the first of an order for seventy locomotives for the Atchison, Topeka & Santa Fe Railway. These engines are of the tandem compound type, in which the high-pressure and low-pressure pistons are carried on a common piston rod, the high-pressure cylinders being placed forward of the low-pressure. The former are 19 inches in diameter, the low-pressure 32 inches in diameter, and the common stroke is 32 inches. There are 391 tubes,  $2\frac{1}{4}$  inches in diameter by 20 feet long, in the boiler, which alone give a heating surface of 4,586 square feet. Adding the 210 square feet of heating surface in the firebox, we get a total heating surface of 4,796 square feet for the whole boiler.

The working pressure is 225 pounds to the square inch, and as the weight on the 57-inch drivers, of which there are five pairs, is 234,580 pounds, we find that the tractive effort is 58,645 pounds. The engine is carried on a forward pony truck, ten coupled drivers, and a pair of trailing wheels beneath the firebox, making fourteen wheels in all. The boiler is 6 feet  $6\frac{3}{4}$  inches in diameter, and is built of sheets  $\frac{3}{8}$ - and 15-16 of an inch in thickness. The firebox, which is built of steel, is 108 inches long, 78 inches wide, and 80 $\frac{1}{4}$  inches deep at the front, and 78 $\frac{1}{4}$  inches deep at the back. The total wheel base of the engine is 35 feet 11 inches, while the rigid wheel base is 19 feet 9 inches. The total wheel base for the whole engine and tender is 66 feet. The tank has a capacity of 8,500 gallons and the total weight of this huge engine, with its tender, is 225 tons. An interesting feature is the method by which the high-pressure cylinders are attached to the engine. They are held entirely by the front heads of the low-pressure cylinders, to which they are bolted, and a common piston valve, carried above the low and high pressure cylinders, does duty for both, the cylinders thus getting rid of the necessity for two pairs of eccentrics and valve gear.

Large as this engine is, it will be rivaled by another engine, which is being built by the American Locomotive Company for the Baltimore & Ohio Railroad. The weight of this engine will be about 2,000 pounds less than that of the Baldwin locomotive. Its peculiarity,

however, lies not so much in the weight as in the novel system upon which it has been built (the Mallet articulated system), which has been used for many years with great success in France and Switzerland. The locomotive has practically two engines. The forward engine, which consists of two low-pressure cylinders, is carried on a separate truck, arranged to move radially

tion curve, with reference to any given period of time. For instance, the lunar, solar, or sidereal day can each be taken as a period with reference to which tidal records shall be summed for the purpose of analysis. The solar day is, of course, the period to be associated with several meteorological phenomena, such as the diurnal variation of the barometer, thermometer, wind velocities, etc.; also with the diurnal variation of the magnetic needle. The period being a day, or some fraction of a day, the 24 hourly sums form a complete cycle of values.

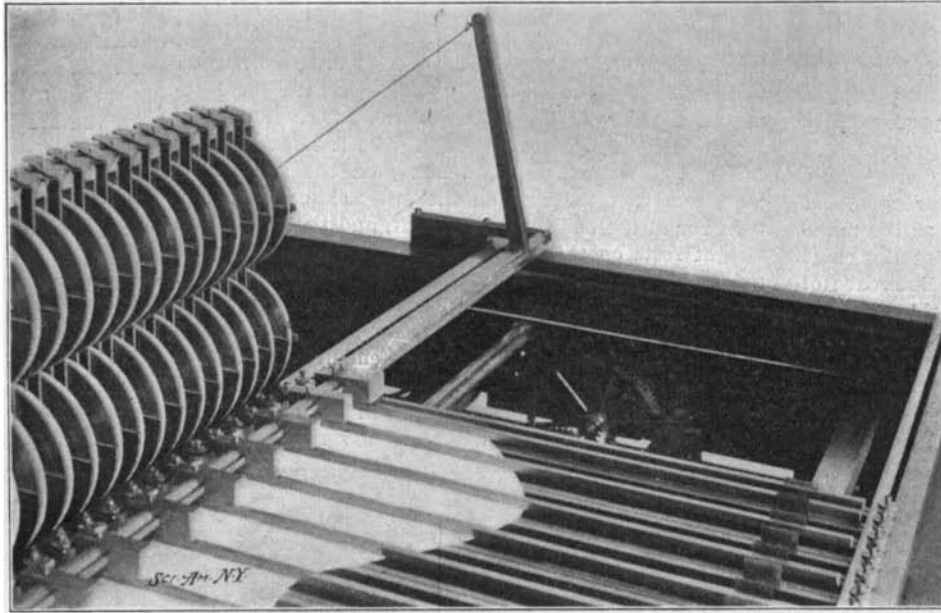
The machine consists essentially of 24 adding machines suitably mounted in a substantial frame. The individual machines are connected by jointed parallelogrammic frames or lazy-tong arrangements, which insure their parallelism and equable distribution over a length representing a given period. But to secure as great accuracy as possible, each machine, when in use, is clamped to fixed scales by means of thumbnuts, its exact position having been previously computed. The addition in each case is performed by means of a rack and a pair of wheels, the lower wheel having 200 teeth and the upper 199. The difference in their readings indicates the number of complete revolutions made by the lower wheel; the direct reading of the lower wheel shows the number of teeth in excess of multiples of 200.

The mechanism by which all racks are raised and lowered can be seen in the figures.

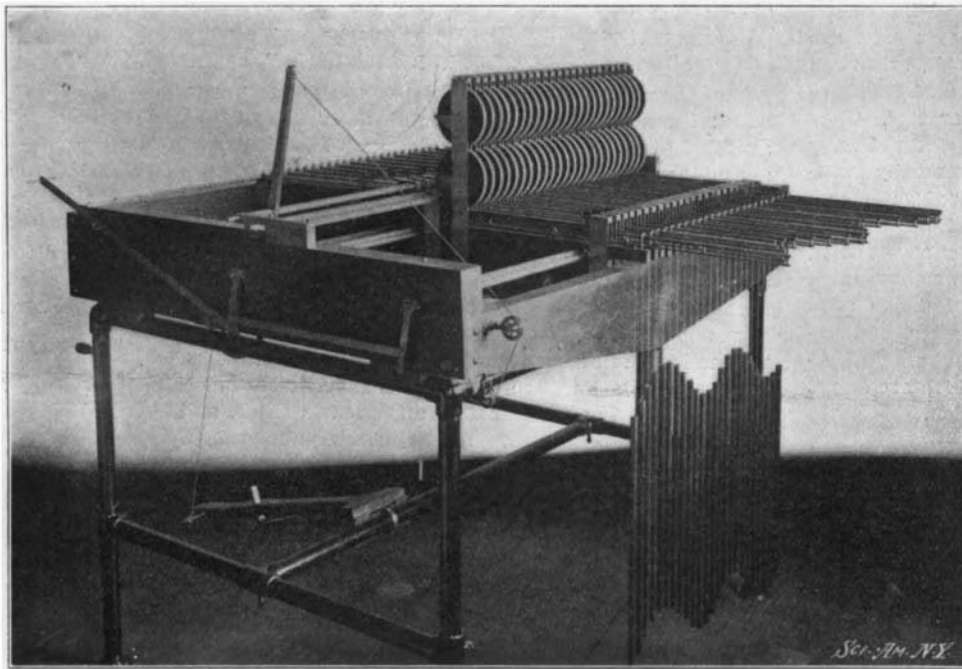
The "record," consisting of sheets of Manila, Bristol, or cardboard cut along the observation curve, rests upon a series of 24 grooved bars, through which slide indexes moving with the racks. The "record" is held in place by the weight of a series of bars, which are tilted up and down by aid of a treadle. The 24 racks are simultaneously drawn to their initial position by means of a straight edge mounted upon two comparatively heavy racks, which are driven by gears in the manner shown in the figures. The crank to which the necessary power is imparted is also shown. In the machine as constructed the racks and indexes can move forward and back over a range of 13.3 inches.

The dimensions of the main frame are 35 by 40 inches, inside measure. The distance from center to center of the adding machines may be anywhere from a little less than  $\frac{3}{4}$  of an inch up to  $1\frac{1}{2}$  inches.

To operate the machine when once properly set, proceed as follows: Starting with the holders-up we first insert the first day's "record;" then lower the holders by unlatching the treadle; hoist the racks by pulling and latching the rod at the end of the frame; revolve the crank until a catch indicates that it has turned sufficiently; unlatch the end rod; revolve the crank back to its first position; raise the record holders by stepping on the treadle; slide forward the



A DETAIL OF THE MACHINE.



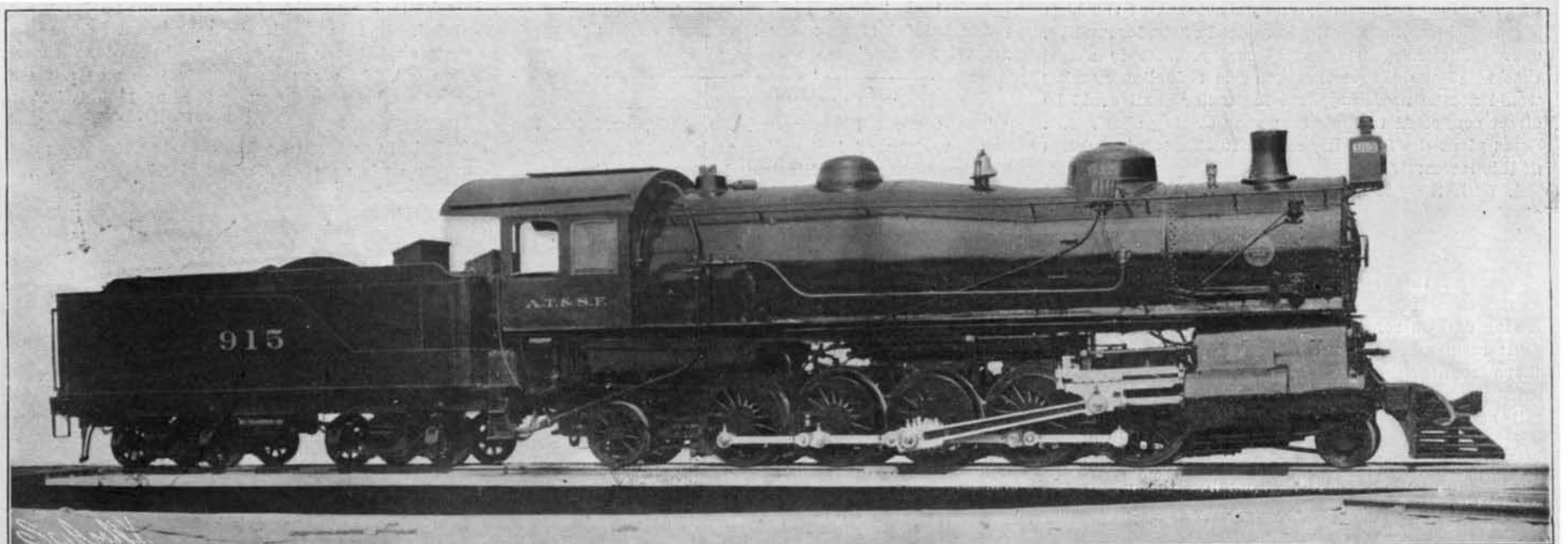
GENERAL VIEW OF THE ANALYZER OF PERIODIC PHENOMENA.

below the boiler, and is held in place by a massive vertical hinge located just in front of the high-pressure cylinders, which are placed about the center of the boiler. Each engine is coupled to six driving wheels, which carry the whole weight of the locomotive.

**A MACHINE FOR FACILITATING THE ANALYSIS OF CURVES REPRESENTING PERIODIC PHENOMENA.**

BY R. A. HARRIS.

The purpose of an analyzer like the one shown in the accompanying figures is to sum up into 24 partial sums the ordinates of a continuous record, or observa-

Weight of engine, 148 $\frac{1}{2}$  tons. Cylinders, 19 and 32 inches diameter by 32 inches stroke. Heating surface, 4,796 feet. Tractive effort, 20 $\frac{1}{2}$  tons.**THE LARGEST LOCOMOTIVE EVER BUILT.**