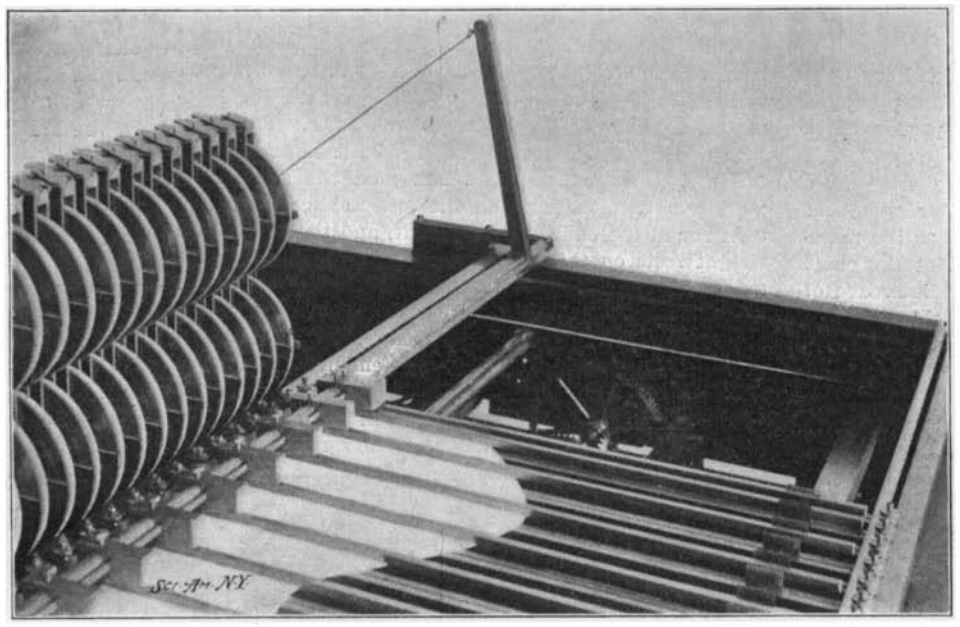
ANOTHER "LARGEST LOCOMOTIVE."

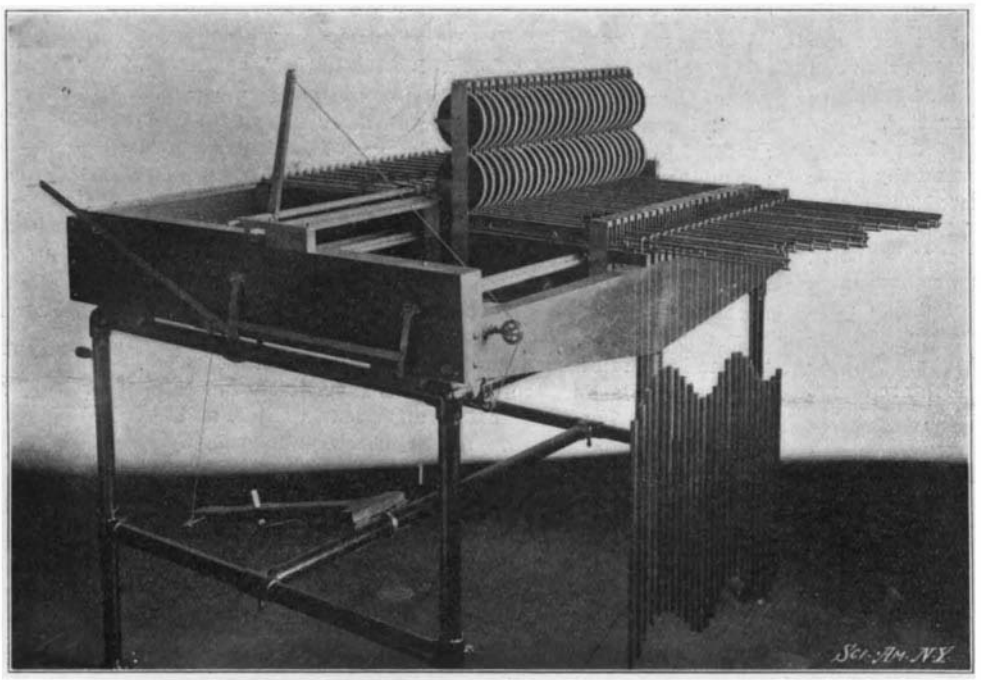
It was not so very long ago that the engineering world was interested to learn that a locomotive had been built that exceeded 100 tons in weight, and the engine was very properly regarded as a monster of its kind. Since then the power and weight of engines have increased by leaps and bounds until to-day 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, 2¼ 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 6¾ inches in diameter, and is built of sheets ⅞ and 15-16 of an inch in thickness. The firebox, which is built of steel, is 108 inches long, 78 inches wide, and 80¼ inches deep at the front, and 78¼ 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 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 DETAIL OF THE MACHINE.



GENERAL VIEW OF THE ANALYZER OF PERIODIC PHENOMENA.

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 observation 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.

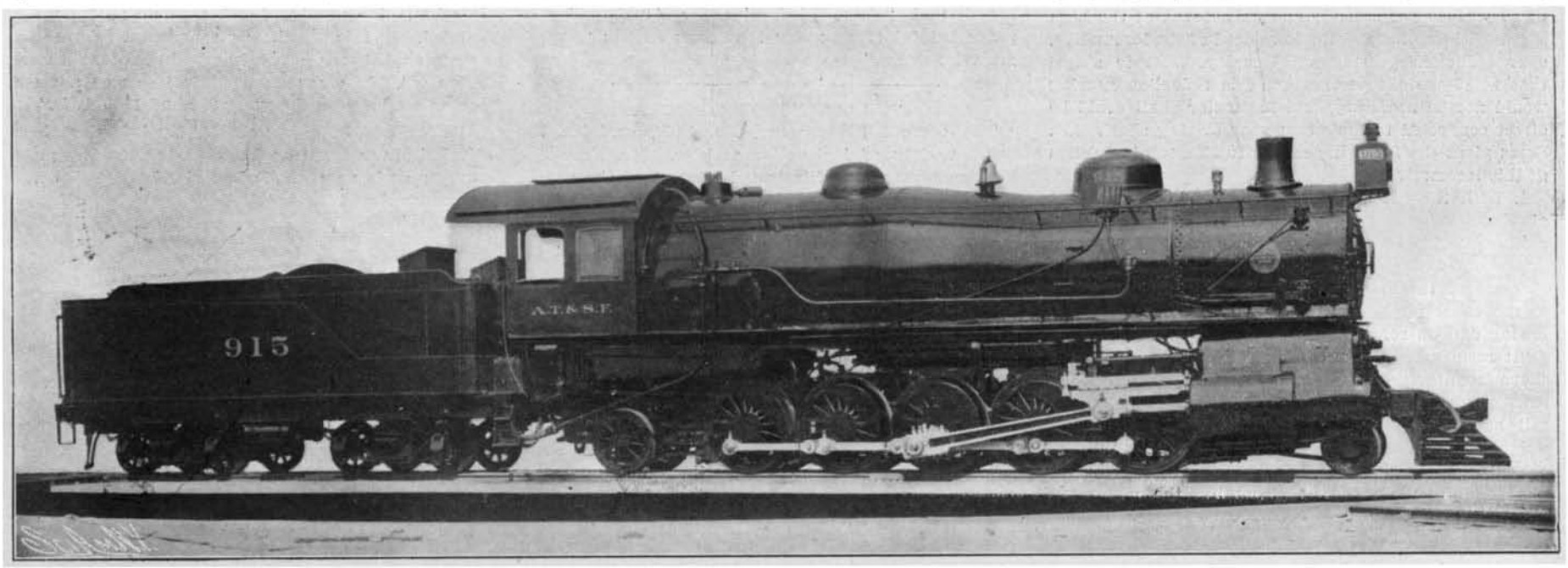
The machine consists essentially of 24 adding machines suitably mounted in a substantial frame. The individual machines are connected by jointed parallelogrammic frames or lazy-tong arrangements, which insure their parallelism and equable distribution over a length representing a given period. But to 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 ¾ of an inch up to 1½ 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



Weight of engine, 148⅛ tons. Cylinders, 19 and 32 inches diameter by 32 inches stroke. Heating surface, 4,796 feet. Tractiveeffort, 29⅛ tons.

THE LARGEST LOCOMOTIVE EVER BUILT.

record and insert the record of another day. So proceed until the entire record has been passed through. It requires but a fraction of a minute to perform all of these operations upon a properly prepared day's record.

Forty-eight partial sums can be obtained by passing the record through twice, and 72 by passing it through three times.

In order to derive the full benefit from this mechanical treatment of the records, it is obvious that the instruments used in procuring the observation curves should trace the same upon tolerably strong boards, and not upon paper. Each sheet can then be cut in two along the curve; one portion of the sheet can be put away as an original record, and the other portion used upon the analyzer.

The advantage of this treatment depends largely upon the number of summations required for analysis. In the discussion of tidal observations, the number of periods used is about 20, and the saving of labor through mechanical additions should be much greater in this case than in the case of meteorological discussions.

TERMINATION OF THE NEW YORK-PITTSBURG AUTOMOBILE ENDURANCE TEST.

The 800-mile test of American-built automobiles, referred to in our issue of the 17th instant, was completed October 15. Of the 34 machines which started the first day, 20 succeeded in reaching Pittsburg on the date mentioned, and the following day 5 more concluded the run, thus making a total of 73½ per cent of the contestants who finally succeeded in getting their cars through. In view of the extremely bad weather encountered on the second and third days of the run, it is remarkable that such a large percentage succeeded in finishing. The very heavy rain storm which swept over New York city and a great part of New York State on October 8 and 9, and which was so heavy as to cause a precipitation of 10 inches, first came upon the automobilists about 10 A. M. during the second day of their journey, the second stage of which extended from Pine Hill to Binghamton; and the rain soon turned the roads into rivers of mud and water, through which the cars plowed as best they could, the majority of them doing so with considerable difficulty only by using their low speeds. The White steam tonneau, which acted as a pilot car, left Pine Hill at 6 A. M. for the purpose of scattering confetti along the route at all cross-roads, forks, or other places where the contestants were liable to miss the road. Being the leading car, it had a hard time, as the roads were soft from rain all the night before. The machine, however, overcame the adverse conditions, and reached Unadilla, 62 miles distant, in 7 hours. After its passengers had had dinner, they again started onward through the fast deepening mire, and finally arrived at Binghamton, 44 miles beyond, a little before 5 P. M. A Pierce "Arrow" machine, also acting as a pilot car, arrived just before the White.

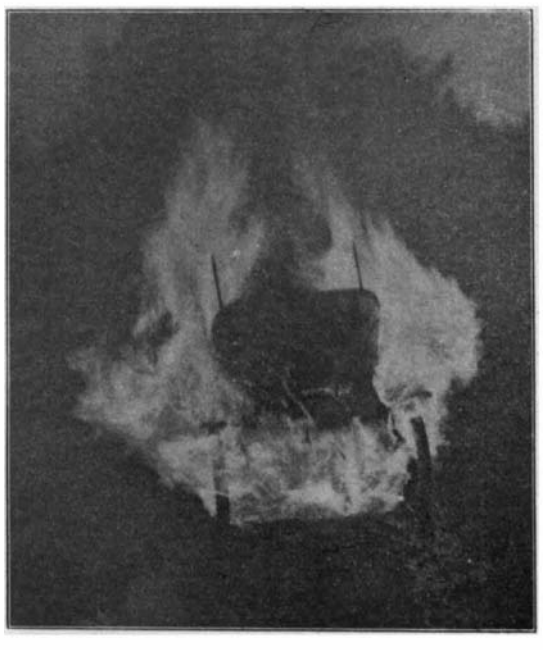
The first of the contestants to reach the noon stop, Unadilla, were the Stearns gasoline and the White steam tonneaus, neither of which had stopped throughout the morning's run. The third car, a double-cylinder Toledo tonneau, arrived at 1:54, and was followed at 2:18 by its mate, a four-cylinder car. The fifth to arrive was Oldsmobile No. 40, which also got in second at the night control at Binghamton. During the morning's run a Columbia touring car slid down a 7-foot embankment. A Toledo machine and a pair of horses, by their united efforts, pulled the car back on the road. The Phelps three-cylinder tonneau came to grief after covering about 30 miles of the day's run, due to the stripping of the driving pinion of the planetary gears used to produce the low speed; and the St. Louis single-cylinder tonneau sheared off a 1⅛-inch gear shaft while climbing a hill near Delhi. Its operator pluckily went to work and made a new shaft, which, with the facilities

The Automobiles Stored in the Official Garage at Pittsburg.

Knox Tonneau Arriving at Erie After an All-Night Run.

Helping Each Other up a Steep Hill.

Two Fredonia Machines Encountering the Flood Near Binghamton, N. Y.



A Franklin Machine Burning in the Rain.

TERMINATION OF THE NEW YORK-PITTSBURG AUTOMOBILE ENDURANCE TEST.

The report from the American consul at Tientsin describes the Chinese plow as very small and with but one handle and the mold-board having but a few inches of surface. It simply scratches the surface of the soil, and is frequently drawn by men and women. The Chinese have no conception of deep plowing, and it would be contrary to their traditional agricultural training to turn the valuable surface soil underneath.