OLD CLOCKS

A recent article upon an old clock has put us upon the track of various documents that appear to us to be of a nature to interest our readers. We shall pubhaps they will lead some clockmaker fond of his art to restorations of a few old mechanisms that deserve to be rescued from oblivion.

We shall in the first place describe - three clocks upon which very complete details have been obligingly furnished us by Mr. T. Estreicher de Rorbierski, of Cracow, to whom we take pleasure in addressing our sincere thanks in this place.

The first clock, which is in the Jagellons Library, at Cracow, is very ancient, as shown by certain peculiarities shortly to be spoken of. We willingly believe that its inventor was actuated with the idea of rendering the sun dial independent of the caprices of our atmosphere, of making it serve at night as well as in the daytime and, in short, of making an automatic apparatus of it. It is nothing else, in fact, than a faithful and somewhat unpretentious, although very exact, representation of the apparent genesis of the hours and seasons; the sun revolving around the earth while at the same time displacing itself upon the ecliptic. This clock is represented in Fig. 1.

The meridian, mounted upon a foot, consists of two circles, one of which (the external) is stationary. The other, movable in its plane, supports the earth, to the axis of which a variable inclination may thus be given. A very light frame is fixed to this circle that carries the hours in Roman figures upon its equator, then two parallel circles representing the tropics, and, finally, twenty-four meridians. Another frame in the interior of the latter forms the support of the ecliptic. The latter is

movable and is capable of revolving around the We can enter still further into the details of the meaxis of the earth. It is this circle that causes the mechanism in the interior of the globe to revolve in twenty-four hours. In its rotary motion, it drives a



Fig. 2.-EXPLANATORY DIAGRAM.

gearing, one of the wheels of which supports the sun fixed to the extremity of a curved needle. At every revolution of the ecliptic, the gearing abuts against a finger fixed to the axis of the earth. A tooth passes, and the sun moves by one division, that is to say, by indicated under the name of Mondus Novus and Terra the companies reported in 1891, the business inter-

one day, upon the ecliptic, which is divided into 365 parts classified by groups under the name of the months, written in Latin.

The mechanism, which is seen with difficulty in Fig. 1, will be easily understood with the aid of the diagram in Fig. 2. M represents the initial meridian, or that of the place for which the clock has been regulated. AA is the axis

dian, M. It is midday in the meridian momentarily indicated by the sun.

The other local hours are deduced therefrom by the distance measured upon the equator between the



Fig. 1.-ANCIENT CLOCK IN THE JAGELLONS LIBRARY, AT CRACOW.

chanism. In Fig. 2 we have represented a small wheel which, through a pinion, actuates the polar wheel of the ecliptic. The mechanism revolving in its entirety, with the sun, in the direction B, S, B', the small wheel daily lags one tooth behind, and, acting upon the large wheel, moves the sun upon the ecliptic in the direction, SF; in other words, the sun is retarded. As, according to all appearances, it effects one revolution around the globe in one mean day, the ecliptic describes one revolution in one sidereal day, which is shorter than the other by $\frac{1}{565}$ of a day, or a little less than four minutes.

It will be seen that in this fine apparatus the solution of the problem of the hour, almost entirely copied from nature, is very complete. The mean and sidereal universal hour, the calendar, and the height of the sun at every hour and in all places, such are the data that it furnishes in a very exact manner.

What is its age ? Upon this question it is difficult to pronounce, for documents are entirely wanting. It is very ancient, that goes without saying. Does it date back to the sixteenth century, as the very inaccurate manner in which America is represented might make us suppose ? A large island in the Sunda group carries the inscription America noviter reperta, while in the location of America there is a continent quite vaguely

Sanctæ Crucis. The waves are very crudely figured by small undulations.

The second clock (Fig. 3), though smaller, is, nevertheless, a pretty and original object of very artistic lish them here without comment or pretension. Per-|meridian of the place and that which marks midday. |execution. It lay dismounted and in a bad condition

in a barn, whence Mr. Poller, an archæologist of Cracow, obtained it. A skillful clockmaker succeeded in putting everything in place, so that it is now capable of indicating the hours again. It is a copper ball suspended from a steel chain. The hand, revolving around a vertical axis, marks the hours inscribed upon a horizontal equator. The motor is very curious. It is the clock itself that, in descending along the chain, causes the needle to revolve. The chain is wound around a horizontal axis, to which is fixed a spring like that of a watch. In measure as the clock descends, by a movement moderated by an escapement, the spring relaxes. When the clock is lifted with the two hands the spring carries the axis backward and the chain winds up anew. Upon putting the clock at the upper extremity of the chain it is rewound for twenty-four hours. A peculiar mechanism, which is controlled by means of a key, causes the striking apparatus to operate.

This clock dates back to the end of the seventeenth century. In fact, it bears the name of a very able Polish clockmaker, "Davidt-Schroter-In-Elbing." Now, Schroter lived in Elbing from 1680 to 1690, as shown by a work published at Cracow in 1888 under the title of "Insight into the Industries and Arts in Ancient Poland."

The third clock is of a more ordinary type, although it is, nevertheless, quite original. Fig. 4 suffices to allow the mechanism of it to be understood. The clock descends along a rack, and is wound like the preceding. Clocks of this form are not very rare.-La Nature.

American Railways.

According to Poor's "Manual," the total number of miles of railroad in the United States at the close of 1891 was 170,601, of which 4,471 miles were constructed during the year.

The total share capital and indebtedness of all kinds of all the roads making returns equaled at the close of the year \$10,389,834,228, an increase in the year of \$267, 198, 328 over the total of 1890 (\$10, 122, 635, 900), the rate of increase for the year being 26 per cent.

The cost per mile of all roads making return, as measured by the amount of their stocks and bonded indebtedness, equaled \$59,820, against \$59,577 for 1890.

In 1891 the gross earnings of \$1,138,024,459 equaled 9.1 per cent of the total investment, aggregating \$10,-389,834,228; and net earnings, \$356,209,880, equaled 3.1 percent. The total amount of interest payments in 1891 was equal to 4.25 per cent of the aggregate bonded indebtedness of all companies, as against 4.27 per cent in 1890 and 4.40 per cent in 1889; and the total amount of dividend payments was equal to 1.85 per cent on all paid-up capital stock in 1891, 1.80 per cent in 1890, and 1.81 per cent in 1889.

During the period for which a large proportion of

ests of the country were in a depressed condition. But the abundant crops of last year, and those now to a large extent assured for this year, would seem to predicate therefor an unusually brilliant showing. ----

> The New Cunard Steamers.

The Cunard Company has decided, it is said, to call the new steamships, building at Fairfield, the Campania and Lucania. Campania and Lucania were the two great southern provinces of ancient Italy, as Umbria and Etruria were the two northern provinces. Campania was the fine province of which Naples was the capital, and included the scenery and rich country down to Pæstum, including Vesuvius, Pompeii, etc., and other favorite ancient (and modern) watering places; south of that came Lucania, stretching from sea to sea, running up to the highest points of the Apennines.



of the earth. As the ecliptic, FF', revolves around the axis of the globe, the sun, S, describes a circle, BB', in 24 hours. The hour is carried back upon the equator, EE', in following a meridian, M'. The sun revolves in appearance as in nature in following the direction shown by the arrow. It is doubtless for this reason that the hours are inscribed backward (Fig. 1), in order to be read in the direction according to which they are described by this movable part. The hour that the sun indicates is that of the place situated under the meri-