

THE SELF-REGISTERING BAROMETER.

The accompanying illustration represents a self-registering barometer that has recently been put into the office of the SCIENTIFIC AMERICAN. Similar instruments are now in use in the Harvard Observatory, the Lick Observatory, Wellesley College, Central Park Observatory, New York City, and the office of city engineer at Providence, and other places. This instrument is of a very high grade, and gives a weekly record of the barometric changes.

Without any attention, it registers on a paper supported by a flat tablet the changes in pressure. To make the readings clear, the proportions are so adjusted as to magnify the variations three times. On the chart each tenth as marked really measures three-tenths of an inch in height. This provides also for any minor inaccuracies due to varying thickness of the line marked on the paper by the indicator.

In general principle it operates by weighing the mercury in a cylindrical glass tube, which forms the cistern. This tube is suspended from the frame of the apparatus by two long steel springs. When the column rises, mercury enters the tube from the cistern. The latter is reduced in weight and also rises. When the column falls, more mercury enters the cistern, which, under the increased weight, stretches the springs and descends. Thus it will be seen that the cistern moves up and down in the same direction as the actual column.

The ratio of its motion to the true variation is adjustable by varying the strength of the springs. In some instruments a ratio of 2:1 is provided, but the larger rate seems the preferable. Thus, on the SCIENTIFIC AMERICAN instrument the hundredths divisions are so large that they can readily be fractioned.

For marker, a glass tube charged with red ink is adopted. This is carried in a horizontal position, attached rigidly to the cistern, and moving up and down with it. At one end it is drawn down to a small orifice. The ink forms a species of film between it and the paper, and a strong red line is traced on the chart.

Two features of interest characterize the chart and its way of application. It covers the period of seven days. Thus the paper has to be replaced only once a week. This may seem a minor point, but it is far from being such, as it saves much trouble and the necessity for daily attendance at a specific hour. The other feature is the position of the chart. When receiving the curve of heights, the paper is stretched over a flat tablet that moves horizontally. Thus arranged, all the readings for the week, or for whatever portion may have elapsed, are visible. This arrangement is a great improvement over the cylinder or disk systems, neither of which is easily read for any period back, when held by the registering mechanism.

The adjustment for temperature is arranged by a system of compensation. As the temperature rises and the mercury decreases in specific gravity, normally the movements of the cistern would be affected. The changes in elasticity of the springs, under alterations in temperature, are mainly relied on to correct this. The expansion and contraction of the frame is also allowed for in the adjustment. The consequence is that the apparatus is self-correcting for changes of temperature.

The frame is of heavy cast iron, the working parts are of brass, and generally nickel plated. The tablet is moved by a cord which is carried once around a drum that is rotated by the clockwork. The tablet is suspended from two grooved wheels that move along a horizontal track.

This interesting instrument has now been at work for several weeks in the office of this paper, and has given a consecutive record of all changes, day and night, for that period. Owing to the use of ink, the curve is as well defined as if made by a drawing pen, and the old trouble incident to former types of recording instruments of endeavoring to follow a gray and obscure pencil mark is avoided.

The instrument was constructed by the Draper Manufacturing Company, of 152 Front Street, this city. The same firm also make other registering meteorological instruments, rain gauges, anemometers, etc., following, as far as may be, the same line of construction. The accuracy attained in some of their instruments is very remarkable. In one of their registering barometers no error exceeding three one-thousandths of an inch has, it is said, been observed.

AN impervious enamel for paper, wood, etc., is a solution of shellac in methylated spirit. A coating of this is applied, and then another coating laid at a high temperature and under great pressure.

The American Outlook.

Our English contemporary the *Colliery Guardian* takes an encouraging view of the prosperity for our railroad enterprises the next year.

The intelligence which has come to hand within the last day or two from the United States (says the editor) is of a more encouraging character. For some time past 1888 has presented itself in somber colors, so far as the American iron and steel trades are concerned; but we now learn that an impression is beginning to prevail that the demand for rails next year in the United States will, after all, be better than it was expected to be a few weeks since. Should what we may term the amended anticipation be realized, the attendant consequences can but be favorable to the iron and steel rail trades of Great Britain and western Europe, since if the American iron trade presents a fairly steady tone next year we may reasonably assume that matters will also move on pretty well upon this side of the Atlantic.

We have all along contended that there is a material difference between the panic of 1873 and the depression of 1887. In 1873 a large number of "wildcat" American railroads were projected, and sought to maintain a precarious existence with the aid of capital raised in England and Europe at heavy—and we had almost said usurious—rates of interest. It is to be feared that

carried out by previously existing American railroad companies, possessing a more or less solid and substantial credit, and fairly well able in consequence to sustain for a time the consequences of a check similar to that which we have witnessed during the last few months. In other words, the American railroad situation of 1887 bears the impress of far more respectability than was observable in the panic of 1873. We must take account still further of the consideration that since 1873 the United States have materially advanced in wealth and population, so that there has been far more real justification for the new railroads undertaken in the West, Southwest, and Northwest than could possibly be found in the "wildcat" projections of 1873.

It is in such considerations as these that we may find some explanation of the better prospect which appears to be now happily opening for the American railroad interest and for American iron in 1888. Cheaper capital, less costly *matériel*, greatly enlarged population, general industrial progress, and much more accumulated wealth—these are the supports upon which the American railroad interest and the American iron trade can happily now rely. It is probably a fact that the Americans are becoming a more industrial people than at any former period in their history. The United States are still *par excellence* the great industrial quarter of the world, since cotton growing is quite as much an agricultural pursuit as the raising of cereals or the grazing of live stock. But it is a happy characteristic of the natural resources of the great republic that they are surprisingly varied and comprehensive, and that they afford scope for the development of human industry in well nigh every form. This, it appears to us, is a point of material importance in connection with the future of the United States. A country which has only one industry must always be more or less in a precarious position, while a country with a multiplicity of industries is less exposed to climatic vagaries and commercial vicissitudes.

It is quite possible—indeed, it is extremely probable—that 1888 will witness a material contraction in American railroad construction. No nation in the world can go on building 10,000 or 12,000 miles of new line every year for an indefinite period; and, therefore, some check in American railroad establishment was inevitable. But, at the same time, it will be highly satisfactory if the shock which it was apprehended that the American iron trade would experience in 1888 in a severe form loses something of its intensity.

Good Material for Successful Engineers.

The *Railway Review* says: A number of our leading railway shops are taking in "engineering students," bright young men who come from the technical schools to learn the practical side of railway mechanics, and who enter as apprentices. They receive slightly more pay than the ordinary apprentices, but their wages are still merely nominal. The experience has been that when engineering students have been thus received, the benefit is mutual. These young men come into the shops fresh from their mathematics and their drawing tables, and while they absorb all that they can of the

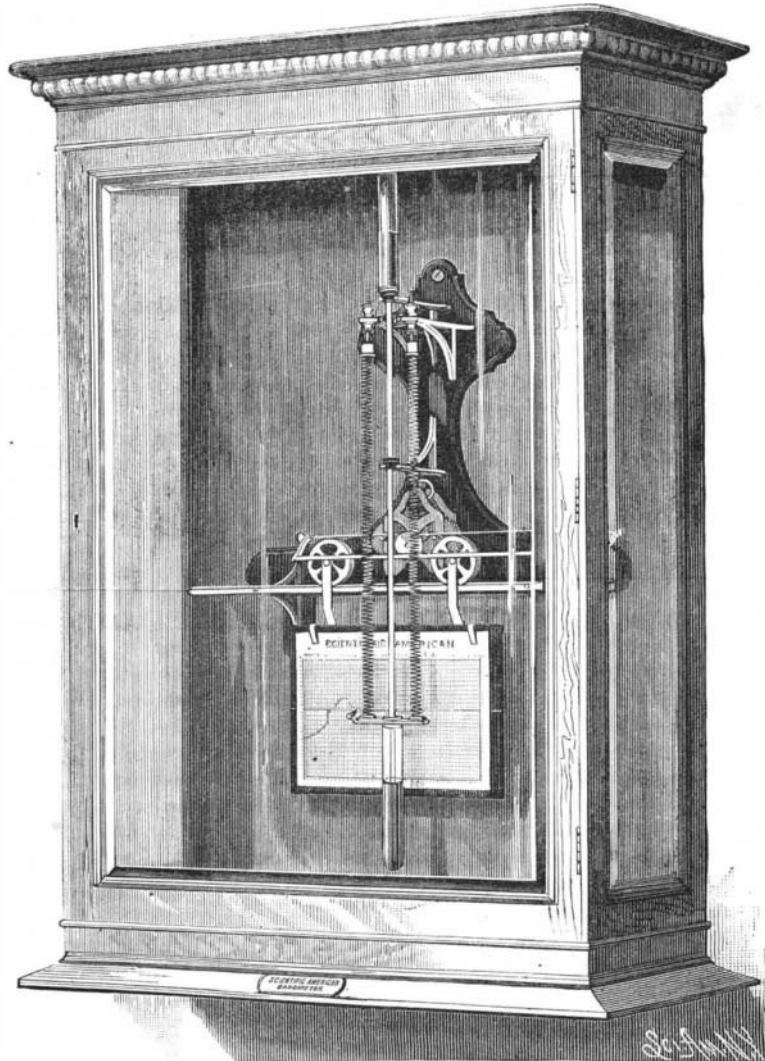
practicalities of their chosen work, they are found to be very useful by their employing officers, because of their familiarity with mechanical theory and drawing. There are not a few master mechanics in the country who are invaluable in their places—first class men in every respect—but who, in early life, had not the advantages of education which this younger generation of students has had, and they find many directions in which these educated young fellows are made useful. Especially useful are these students as a detail for special work of investigation. They are well equipped for such work, and they know how to make a good report on the same.

A New Tanning Agent.

By digesting coal dust with caustic soda at a boil and neutralizing this liquor with hydrochloric acid, the author obtains a new tanning agent, which he names pyrofusine. He considers that the new process is more complicated than the usual tanning processes, but that it is 50 per cent cheaper than the bark process and 20 to 30 per cent cheaper than the alum process.—*P. F. Reisch, in Dingler's Polyt. Journal.*

A Practical Suggestion.

We know of no better way in which an employer of intelligent men can invest \$3 than by subscribing for the SCIENTIFIC AMERICAN for a trusty superintendent, foreman, or other employe whose services for faithfulness he wishes to recognize. It would be a weekly reminder of the donor's generosity.

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in too many cases these projectors of the "wildcat" schemes had little or no serious intention of fulfilling the engagements into which they entered. The inevitable result was a very serious collapse of American railroad credit, affecting alike all American railroad property, good, bad, and indifferent. From this collapse the recovery was so slow and painful that the ground lost can scarcely be said to have been recovered much before 1878.

When we endeavor to analyze the American railroad situation of 1887, we find a very different state of affairs happily existing. It is true that with their usual impetuosity American railroad men have somewhat overbuilt themselves in 1887, and that American railroad credit has been strained, to a certain extent, in consequence. But it must be borne in mind that American railroad companies have profited materially from the fall in the value of money which has taken place throughout the United States since 1873, while the work of railroad establishment has also been rendered easier by the great decline in the price of rails and rolling stock. Yet another distinction between the panic of 1873 and the depression of 1887 will be found in the fact that the new lines undertaken in the United States during the last three years have been of a more *bona fide* character than many of those projected in 1873 and 1873, while the capital required for the railroad works undertaken in 1885, 1886, and 1887 has been principally provided by the Americans themselves. A large extent of the new railroad mileage established in the United States since 1884 has also been