THE NEW SUN AND ITS DISAPPEARANCE.

The phenomenon of the appearance of a new star in the heavens is rare enough to arouse the greatest interest among astronomers and other scientific persons. It is not merely an occurrence appalling in its mystery and immensity; but even in the minds of those accustomed to contemplate the majesty of other worlds, it tends to arouse questions of the gravest importance relative to the physical and chemical constitutions of the stars, and to the comparison of our own sun with other far distant ones.

On November 24 last, M. Schmidt, Director of the Observatory at Athens, Greece, at 5h. 41m. in the evening, saw a star of the third magnitude in the constellation *Cygnus*. No record of the existence of any such star was in existence. No such star was visible on November 20; but whether it appeared on one of the intervening days between that date and the 24th, M. Schmidt cannot say, as cloudy weather had then prevailed in Athens. The news was at once telegraphed throughout the world, and the astronomers watched the new star gradually wane until, on December 8, it was scarcely of the sixth magnitude. The position of the star is shown in Fig. 2, which we take from *La Nature*.

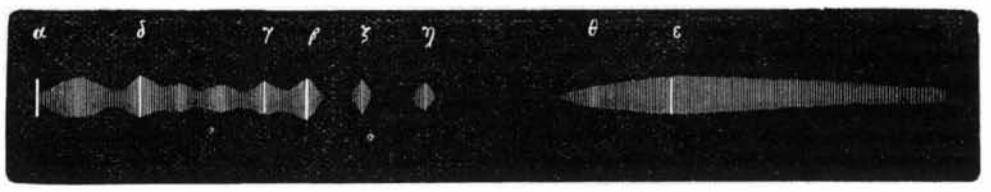

Fig. 1.—SPECTRUM OF THE NEW STAR IN THE CONSTELLATION CYGNUS.

By comparing the observations of the discoverer, M. Schmidt, with those of M. Prosper Henry, we find two important facts: First, that within eight days the star diminished from the third to the fifth magnitude; and secondly, that the color changed from a marked yellow to a bluish green. On December 2, spectroscopic observations at different observatories were made; and the general conclusion was that the spectrum, being formed in large part of brilliant lines, was that of an incandescent vapor or gas. On December 4, M. Cornu obtained a very satisfactory observation, which enabled him to identify three lines as the lines C, F, and 434 of hydrogen. A fourth appeared to him to correspond to the line, D, of sodium, and another with the characteristic line, *b*, of magnesium. Finally, two lines, of which the wave lengths are 531 and 451, appeared to coincide, one with the famous line 1474 (Kirchoff's scale), observed in the solar corona during eclipses; the other with a line of the chromosphere. M. Cornu's own account of his investigation is as follows:

"The spectrum of the star is composed of a certain number of brilliant lines on a luminous background, completely interrupted between the green and the indigo, so that at first sight the spectrum seems to be in several detached parts (see Fig. 1). . . . The brilliant lines, arranged in the order of their brilliancy, are eight in number, with the following wave lengths in millionths of millimeters: α, 661 (hydrogen, C, is 655), δ, 588 (between sodium D, 589, and chromosphere band, 587), γ, 531 (corona band, 532), β, 517 (identical with *b*, 517, of magnesium), ζ, 500 (no correspondence), η, 483 (hydrogen, F, 486), θ, 451 (chromosphere band, 447), and ε, 435 (hydrogen, 434)."

It thus appears that the light of this new star is exactly the same in composition as that of the solar chromosphere; and thus we are told that the new comer is a sun, doubtless in general respects like our own, which has met with some great catastrophe whose cause we cannot at present determine, but whose real nature is unmistakable. "Our sun," says Professor Proctor, commenting on the phenomenon, "is one among hundreds of millions, each of which is probably, like it, the center of a scheme of circling worlds. Each sun is rushing along through space, with its train of worlds, each bearing perhaps, like our earth, its living freight, or more probably each, at some time or other of its existence, becoming habitable for a longer or shorter period. Thus the suns may be compared to engines, each drawing along its well freighted train. Accidents among these celestial engines seem fortunately to be rare. A few among the suns appear suddenly (that is in the course of a few hundred years, which in celestial chronometry amounts to a mere instant) to have lost a large part of their energy, as though the supply of fuel had somehow run short. Mishaps of that kind have not attracted much attention, though manifestly it would be a serious matter if our own sun were suddenly to lose three fourths of his heat, as has happened with the middle star of the Plow, or ninety-nine hundredths, as has happened with the once blazing, but now scarcely visible, orb called η, in the keel of the star ship *Argo*. But when we hear of an accident of the contrary kind—a sun suddenly blazing out with more than a hundred times its usual splendor—a celestial engine whose energies have been overwrought, so that a sudden explosion has taken place, and the fires, meant to work steadily for the train, have blazed forth to its destruction—we are impressed with the thought that this may possibly happen with our own sun. The circumstances are very curious, and though they do not show clearly whether we are or are not exposed to the same kind of danger which has overtaken the worlds circling around those remote suns, they are sufficiently suggestive.

"Now, a point to which I would call special attention, is that all the elements of the catastrophe, if one may so speak, which has befallen the remote sun in the Swan exists in our own sun. At times of marked disturbance parts of our sun's surface show the lines of hydrogen bright instead of dark, which means that the flames of hydrogen over those parts of the sun are hotter than the glowing surface of the sun there. We have all heard, again, how Tacchini and Secchi, in Italy, attributed some exceptionally hot weather we had a few years ago to outbursts of glowing magnesium. And, lastly, our sun is well supplied with that element, whatever it is, which gives the bright line of its corona during eclipses; for we now know that the whole of the streaked and radiated corona occupying a region twenty times greater than the globe of the sun (which itself exceeds our earth one million two hundred and fifty thousand times in volume) belongs to the sun. Again, though the sun has shone steadily for thousands of years, yet, so far as can be judged, the stars which, like this one in the Swan, have burst out suddenly, blossoming into flames of hydrogen, within which the star's heart core glows with many hundred times its former heat, have also been for ages shining steadily amid the star depths. We know that the one which blazed out ten years ago in the Northern Crown was one of Argelander's list, a star of the tenth magnitude, and that, after glowing with eight hundred times its former brightness for a few days, it has resumed that feebler luster. We have every reason which analogy can furnish for believing that the new star, which was not in Argelander's list, simply escaped record by him on account of its faintness. It is now fast losing its suddenly acquired luster, and is already invisible to the naked eye. It appears, therefore, that there is nothing in the long-continued steadfastness of our sun as a source of light to assure us that he, too, may not suddenly blaze forth with many hundred times his usual luster (the conflagration being originated, perchance, by some comet unfortunately traveling too directly towards him). Though he would probably cool down again to his present condition in the course of a few weeks, no terrestrial observers would be alive at any rate to note the fact, though the whole series of events might afford subject of interesting speculation to the inhabitants of worlds circling round Sirius or Arcturus. Fortunately we may legitimately reason that the risk is small, seeing that among the millions of suns which surround ours, within easy telescope distance, such catastrophes occur only ten or twelve times per century."

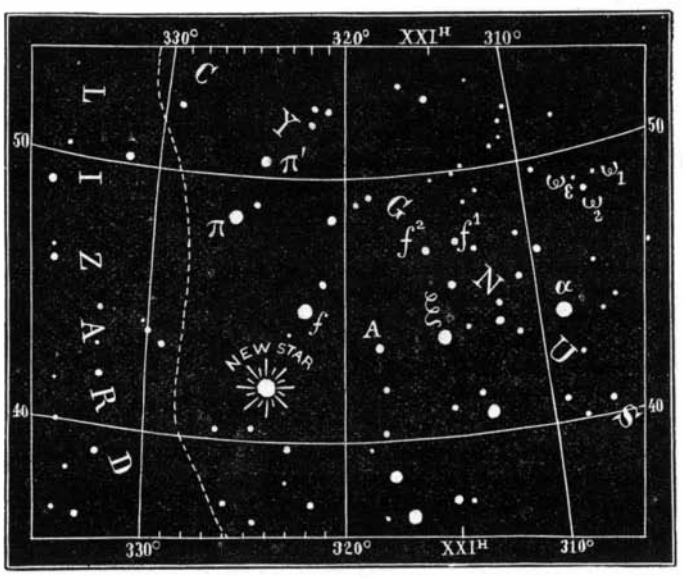

Fig. 2.—THE NEW STAR IN THE CONSTELLATION CYGNUS.

A New Method of Fireproof Construction.

We have repeatedly pointed out, says the London *Building News*, the futility of relying on iron as a fireproof material, when used in construction in the form of girders or columns, unless duly protected. Of course the most perfectly fireproof structure would be one built entirely of bricks, but the impracticability of employing these materials in sufficient masses to resist the immense thrust exercised by brick arches of any span, if required to carry any weight, has been universally admitted. Messrs. Evans and Swain, the patentees of a new system of fireproof construction, prefer to rely on wood and plaster, and there is little doubt but that by the judicious application of these two materials a large amount of resistance to the action of fire may be obtained. Captain Shaw some time ago conducted a series of experiments on the fire-resisting qualities of a stout wooden post, which set many people thinking whether, after all, we had done well to abandon the use of timber in favor of cast iron; while common plaster, as we have more than once had opportunities of witnessing in great conflagrations, is unequalled as a protecting material, remaining intact when wrought iron melts and stone shivers into fragments. In the construction of their new fireproof floor, Messrs. Evans and Swain take ordinary timber joists of any uniform depth, generally 9 inches or 11 inches for ordinary floors and spans up to 25 feet, but deeper where greater span or strength is required, and of any thickness (the thinner the better, as there is less chance of shrinkage and an open joint forming). These joists they place on the walls in the ordinary way, only, instead of placing them, as is usual in constructing an ordinary floor of wood joists and boards, with a space between the joists, they are placed together without any intervening space. The ends of the joists are allowed to bear on the walls in the usual way (only no plate is required), and the last joist at each end of a series of joists is also allowed to bear upon the walls. The sides of the joists are brought into intimate contact by being bolted up close at intervals with screw bolts, or spiked together with strong spikes, or screwed with ordinary screws, or any other similar method; and the result is a solid slab or floor of timber of the size of the room, bearing on the walls on all four sides, of enormous strength, and capable of bearing almost any weight that may be put on it, and yet exerting no outward thrust upon the walls. After the floor has been thus constructed, the inventors drive, at close intervals, into the under surface of the floor forming the ceiling of the room below, a number of flat-headed nails; this forms a key for the plaster, and the ceiling is then plastered in the ordinary way, with a good thick coat of common plaster, care being taken to use a rough plaster that will not shrink and crack, rather than a hard and brittle one. This coat of plaster would resist an immense heat, until it became calcined and red hot itself, but even then the under surface of the wood becomes only charred with the heat of the plaster, and its strength remains unimpaired for a very long period. In addition to its other advantages, it is noiseless in use, and in any room or building where it is applied as a floor the sound of feet is scarcely heard, whilst in the rooms below the sounds made above are unheard, the floor being practically sound-proof.

Under ordinary circumstances, it is only necessary to plane off the top surface of the joists, no flooring boards or other covering being required; but if the floor above is intended for the storage of highly inflammable goods, such as oils, spirits, varnishes, paraffin, etc., the patentees recommend that the upper surface of the floor should be floated with cement, or covered with stone or tiles, or some other similar material; before the cement is laid, it is advisable to cover the top surface of the joists with a thin layer of loam and sand, or fine concrete, to receive the cement. This will prevent any cracking in the surface of the cement caused by shrinkage, which might occur in the timber. As an additional precaution against any shrinkage in the timber, causing an open joint, a wood tongue may be introduced between the joists: but this, it is asserted, is not absolutely necessary, as, should any shrinkage occur at any time, and show a gaping joint in the floor above, a little fine plaster or cement run between the joists would effectually stop all draught, and answer the same purpose as the tongue, and with very much less cost; but of course, when the upper surface is covered with cement or paving, neither precaution would be required.

Rapid Transit in Paris.

The Paris Municipal Council has before it a scheme prepared by the engineers of the city, after an inspection of the London Metropolitan and District Railways, for the construction of underground railways in Paris. It is proposed by this scheme that there shall be two main lines running east and west. The first, starting from the Vincennes Station, will pass under the Lyons station, the Château d'Eau, the Halles, the Palais Royal, the Bourse, the St. Lazare terminus of the Western Railway, and terminate at Les Batignolles. The second, starting from the Orleans terminus, will follow the left bank of the Seine, and run beneath the whole length of the Boulevard St. Germain. This line will also have a junction with the first by means of a railway passing under the Seine and the Louvre, and terminating at the Palais Royal. The first line will also have a branch from the Halles to the Northern and Eastern railway stations. The central station of the whole system, that of the Palais Royal, will be 23 feet below the level of the pavement, and the approach to it will be from the Galérie d'Orleans, the buildings upon the north side of which will be utilized as booking offices and waiting rooms. The total cost is estimated at $31,800,000 for 17 miles, which gives an average of $1,870,585 per mile.

Illumination by Reflection.

In our issue of June 10, 1876, we described and illustrated a system of illumination introduced in Italy by Signor Balestrieri, of Naples, and stated that it was identical with that used in the locomotive head-light patented to Messrs. Lee & Baldwin, of Troy, N. Y., on July 18, 1871. We are now in receipt of a long communication from Signor Balestrieri, stating that his invention was exhibited at the Maritime Exposition held at Naples in the beginning of 1870, and citing evidence in support of his claim to the origination of the idea.

MR. M. W. WALKER, of Warm Springs, Oregon, writes to us to say that the mean daily temperature at that place ranged between 23° and 48° Fah. during the month of December, 1876. On 25 days of the month, it was between 30° and 40°. This is remarkably mild weather for winter; and it would seem from this that Oregon is a good locality for invalids.