ROUGERIE'S ANEMOGENE.

Monseigneur Rougerie, Bishop of Pamiers, in France, has been laboring to establish experimentally the theory that the rotation of our earth must be the principal cause of the currents and winds in our atmosphere. Ordinary text-books, such as used at schools, explain that the regular winds, the trade winds, and monsoons, for instance, are due primarily to the action of the sun; the rotation of the earth being regarded as a secondary factor. In Ganot's "Physics" the explanation is much as follows:

"The air above the equator being gradually heated, rises as the sun passes from east to west, and its place is supplied by the colder air from the north or south. The direction of the wind, however, is modified by this fact, that the velocity which this colder air has derived from the rotation of the earth—namely, the velocity of the surface of the earth at the point from which it started—is less than the velocity of the surface of the earth at the point at which it has now arrived. Hence the currents acquire, in reference to the equator, the constant direction which constitutes the trade winds, *i. e.*, from the northeast on the northern, and the southeast on the southern hemisphere."

This means, in other words, that the sun creates a wind from the poles to the equator, blowing from the north on our hemisphere. The rotation of the earth changes this wind into a northeast wind, but the rotation is not the cause of the wind.

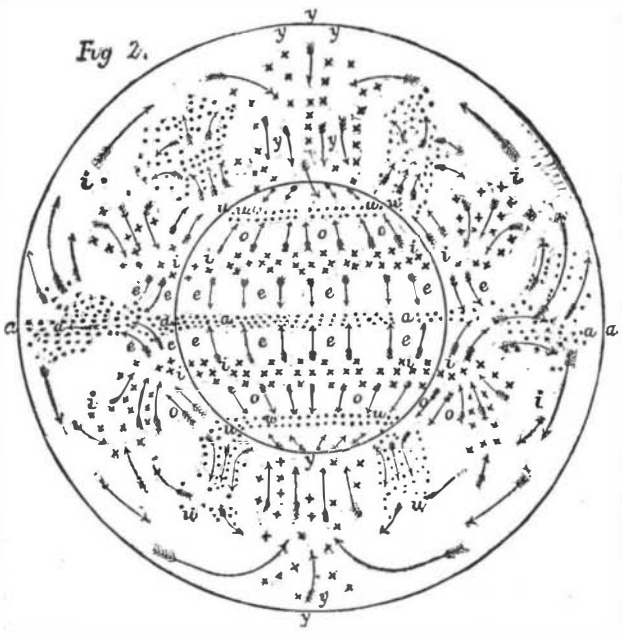
Monseigneur Rougerie takes exception to this view. He does not at all deny that a great many atmospheric disturbances result mainly from differences in temperature. If air above a certain area is heated more than over adjacent spaces, it expands, becomes lighter, rises, and flows off in the higher altitudes toward the colder regions. The equilibrium at the surface of the earth is destroyed at the same time as the barometric pressure on the colder area is greater; we have, therefore, on the surface a current of cold air rushing toward the warmer spaces, the velocity of which depends upon the difference in barometric pressures. All winds so produced, however, even if we include the monsoons of the Indian Ocean, are of a local character. And since Monseigneur Rougerie has mechanically, without applying heat, imitated the monsoons, he is all the more inclined to assign the primary cause of the air currents to the rotation of the earth.

Monseigneur Rougerie affirms that an artificial terrestrial globe, in rotation in the surrounding air, produces on its surface air currents similar to those of the atmosphere; and his "anemogene," or wind producer, shows the ordinary trade winds, the equatorial and tropical calms, the return trades, the monsoons, etc., so that his theory, as we shall more fully see, is certainly based on good experimental data. His first rather primitive apparatus is illustrated in Fig. 1, which needs little explanation. The leather cord, C D E, passes over two pulleys, D and E, and imparts motion to a vertical shaft on which the two globes, A and A_1, are fixed. The frame, F, is of iron, and about 18 in. high; the box, G, serves as a stand or case for the apparatus. The globe, A (about 10 in. in diameter), was not perfectly smooth, but was provided with a number of meridional lines in relief, simply to produce a sufficient agitation of the air particles. Light fragments of down suitably suspended, or flames, were used to indicate the directions of the currents. The globe, A_1 (3 in. in diameter), revolved in water in the basin, B, and pieces of down compressed to free them from air served as indicators.

The speed of rotation appeared unimportant, though certain speeds showed certain phenomena best. The results were similar, both for the air and water media. On this point Monseigneur Rougerie states that "the rotation of a sphere in a medium less dense than itself, liquid or gaseous, always produces similar currents." Fig. 2 represents the results obtained, and shows the harmony between the wind currents produced with this primitive apparatus. In considering this diagram, we must bear in mind that the ordinary assumption explains those currents as arising from differences in barometric pressure due to differences in temperature, while Monseigneur Rougerie bases his theory on differences in air pressure directly due to the rotation.

We have already spoken of an ascending current in the equatorial region. This is the current *a a* of the sketch. The rising warm air flows back in the higher regions toward both poles, sinking slowly, and partly coming down to the surface at the tropics in a descending current (*i i*, Fig. 2), and returning toward the equator as trade winds from northeast and southeast (*e e*, Fig. 2), thus forming the first circular curve. The arrows, *e e*, point south and north, and the anemogene seems to be at fault on this point. In addition to the stronger currents, marked *e e*, there is, however, another current not indicated in the sketch. As the air between the tropics travels more slowly than the globe itself, rotating from west to east, a current from the east is generated. This

Fig 2.



current combines with *e* to form the ordinary northeast or southeast trade wind. For the latitudes between the tropics and polar circles we have mainly, on our hemisphere, southwest winds, the so-called return trades, which have sunk down to the surface (*o o*, Fig. 2). Monseigneur Rougerie explains the tendency toward the west in these latitudes by the air there having a greater velocity than the surface of the earth. His experimental evidence is, however, not strong on this point. The reaction to the return trade, *o o*, is an ascending current, *u u*, near the 60th degree, which partly returns toward *i i*, and partly joins the original current from the equator toward the poles. Both united form at the poles a descending current, *y y*, which afterward reaches the surface as a southerly (or northerly) wind. These views account for the calm belts near the equator and the tropics, where the ascending and descending currents without horizontal motion are suddenly influenced by stronger trades and counter winds, causing the violent tempests which characterize the so-called calms.

In the volume* in which the then Abbe Rougerie first advanced these theories, he based them mainly on the charts of M. Brault, which are used by the French Navy, and on the works of Le Gras, Privat-Deschanel and Focillon, Reclus, Glaisher, Maury, Gifford-Palgrave, and others. Somewhat fancifully he assumes, in analogy with the rings of Saturn and the belts observed on Jupiter, that our atmosphere extends to a greater height at the equator than at the poles, so that the earth should carry with it a sort of atmospheric ring. We cannot follow him here in his interesting calculations, by which he wishes to prove for the North Atlantic basin that the simple rotation suffices to produce the barometric differences and the respective winds with their mean directions and velocities; but we may mention that there exists a remarkable agreement between his calculated isobars and those deduced from the observations of Dr. Wojeikow.

* Les Courants Atmospheriques autour d'un Globe en Rotation. Limoges, 1879.

Monseigneur Rougerie soon replaced his first globes by a much larger one in relief, which he is still perfecting, so as to make it more and more similar to our planet. This more recent anemogene, of which we give a view in Fig. 3, is a hollow sphere, 1·28 meters (4 ft. 2 in.) in diameter, and supplied with little vanes placed 5 degrees apart. Ordinary vanes would permit of observations only after the globe has come to rest; little needles are, therefore, fixed to the shaft ends of the vanes, which on the inside of the globe mark the positions of the vanes; and the globe is composed of several spherical shell pieces, so that hundreds of observations may be taken in a few minutes while the globe is rotating.

The assistant places himself inside the sphere and moves with it. A bell announces the number of rotations, that is, days. An equatorial velocity of 2 to 4 meters (6 ft. to 13 ft.) per second is supposed to be sufficient. The reliefs are as exact as possible, but a hundred times too high; this has been found necessary to make the vanes respond to the modifications which the relief of the continents effects in the wind directions. This new anemogene reproduces perfectly the trade wind on all oceans; the equatorial calms, their irregular distribution on the northern and southern hemisphere, and on the three oceans, and their sudden tempests; the transition of the northeast trades into the southwest monsoons of the Gulfs of Bengal and Oman; the great ascending current on the equatorial belt, and the line of minimum pressure there; the descending current of the Azores Islands, and the center of maximum pressure there; a similar descending current directed toward the area of maximum pressure in the South Atlantic, between St. Helena and the south coast of Africa; the two descending currents on the poles, right from the zenith, which must have a climatic influence; the southeast trade on the sea near Teneriffe, and the well known wind from the west near the top of the Peak.

There are also imperfectly reproduced the variable winds which occur between the tropics and the 50th degree, both north and south latitude; and also the winds in the zones between the 50th parallels and the polar circles. These imperfections cannot be wondered at. The apparatus is much too small, and the medium comparatively much too dense; the anemogene can never be more than a most modest approach to what the model of our planet ought to be. The main difficulty appears to be to give to the anemogene the proper atmosphere. The earth has a limited atmosphere, diminishing in density with the altitude; the anemogene is rotating in a medium of comparatively infinite extension, which has a uniform density. Hence it probably results that the direct effects, the ascending equatorial currents, and the trade winds are so well characterized; while the indirect effects, as the return trades, appear less distinct. Nevertheless, the results claimed must be called remarkable.

That so easily explained a phenomenon as that of the monsoons, which simply appear to be land and sea breezes on larger scale, directly traceable to the sun's rays, should here appear as a necessary consequence of the rotation of the earth, will not be accepted without some hesitation; and as long as the experiments of Monseigneur Rougerie remain untested and unconfirmed, their apparent results will probably be questioned. Yet there seems no doubt

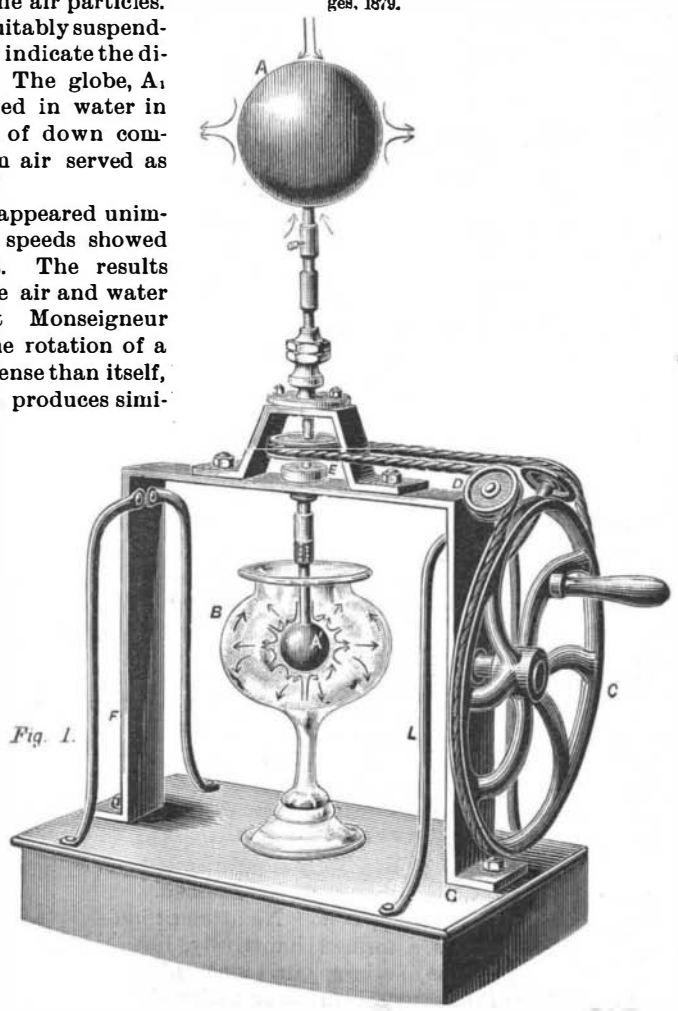
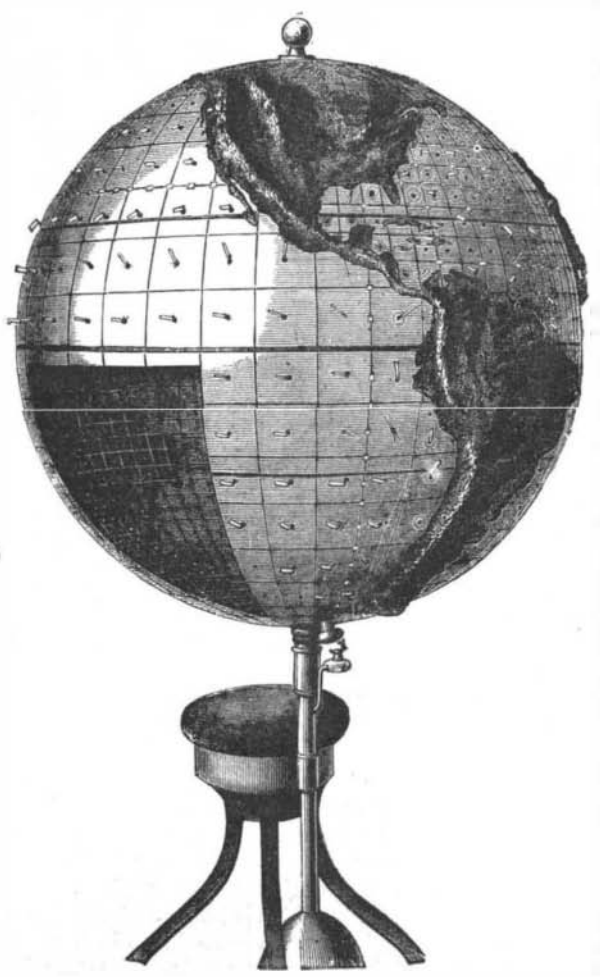


Fig. 1.



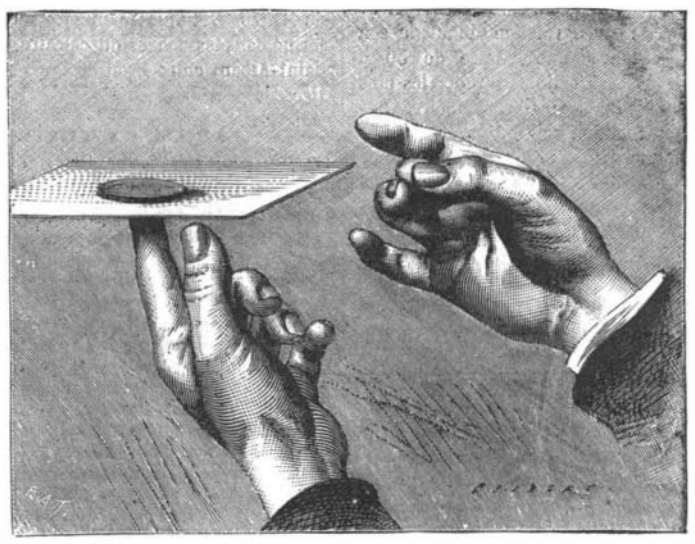
ROUGERIE'S ANEMOGENE.

that we must acknowledge the cardinal point of Monseigneur Rougerie's theory, that the rotation of the earth is the principal cause of our atmospheric currents, and not the heat rays of the sun. We need hardly mention that Monseigneur Rougerie fully grants the great importance of relief, character of the surface, and other local factors, and especially also of the sun rays, but only in the second place. Whether the sun is thus to be partially relieved of one of his many onerous duties or not, further investigation will probably disclose. At any rate, the subject is a most interesting one.--*Engineering.*

THE PRINCIPLE OF INERTIA.

In treatises upon physics and mechanics, inertia is defined as that property of matter which prevents it from putting itself in motion when it is at rest, or from bringing itself to a state of rest when it is in motion. As we have before stated, it is by virtue of the principle of inertia that dust is expelled from our clothes when they are beaten, every particle of it tending to a state of rest. Although we have cited numerous experiments on the principle of inertia, we shall mention another one, which has been pointed out to us by Mr. H. Gilly, licentiate of sciences.

Upon the forefinger of your left hand, held vertically, lay a visiting card, and upon this place a silver dollar and try to remove the card without touching the coin. In order to do this, give the card a smart fillip with the fingers of the right hand and it will fly to a distance, leaving the coin balanced upon the forefinger. Care must be taken to give the fillip in an exactly horizontal direction, and in the plane of the card, as shown in the accompanying figure.—*La Nature.*



EXPERIMENT ON THE PRINCIPLE OF INERTIA.

EARTHQUAKE ON THE RIVIERA.

On Wednesday, February 23, early in the morning, the shores of the Mediterranean and the Gulf of Genoa, including both the French and the Italian coast, from Cannes to Spezia, were visited by a terrible earthquake, which destroyed some hundreds of lives. Its worst effects were felt along the Italian Riviera, west of Genoa, but especially between Oneglia and Savona, the central part of that coast, round the headland of Cape delle Melle, and in the small towns or villages of Diano Marina, Bajardo, and Bussano. The fashionable health resorts of English and foreign families within the French frontier, particularly Nice and Mentone, have suffered considerably; while Cannes, Monte Carlo, and the Italian seaside town of Bordighera, eleven miles from Mentone, as well as San Remo, were more fortunate. Inland, both through Piedmont and in the south of France, and to the east of the Gulf of Genoa, the shocks were felt nearly a hundred and fifty miles from the sea, affecting Lyons, Turin, Lombardy, and Tuscany; but the destruction of buildings and loss of life took place chiefly on the Genoese western shore. None of the English residents or visitors has been killed.

The first shock, or series of five quick shakings, was perceived, at Nice, two minutes after six o'clock in the morning; the second was about eighteen minutes afterward, and the third at twenty-five minutes to nine o'clock; but the two latter shocks were slight. People ran shrieking from many of the houses at the second shock, which brought down some buildings already shaken by the first; and in a few minutes every open space in the town, the Jardin Public, the Place Massena, Place de la Liberte, and other places were full of an excited, frightened mob of women and children.

The number of houses at Nice which were so much injured as to render it dangerous to enter them is about sixty. The inhabitants of almost all the top floors abandoned their homes. In addition to people living in tents, numerous families took up their quarters in coaches, covered vans, and carts of all descriptions. The bathing cabins along the sea shore were let out as living rooms. On the Promenade des Anglais the stands raised for the Carnival were used for people to sleep in. The directors of the Casino had thrown open that establishment as a shelter for the frightened people. The fear of more shocks of earthquake was so great that about 10,000 people, foreigners and inhabitants, left Nice on Wednesday. The greater number of people who had not fled took refuge on the heights of Cimies, where there were about 2,000 Americans, English, and Russians living under canvas. After the first shock, the Count and Countess d'Eu and the Duc de Nemours, who inhabit the villas des Caroubiers and Graziella, took refuge in their gardens, camping in the open air. On the other hand, the King and Queen of Wurtemberg had not left their house. The military authorities had pitched a large number of tents on the public places and squares, in order to provide shelter for the women and children; at night the soldiers patrolled the streets.

The steeple of the German church in the Rue Augsburg was thrown down. At the Church of St. Etienne, the spire and bell were shaken from their position, and fell through the roof into the church. The most serious accident, however, was at the Ecole Maternelle in St. Etienne. The house was completely shaken down, and the schoolmistress, Madame Cheylon, was buried in the ruins. She was quite dead when, by the efforts of the sapeurs pompiers, the body was recovered.

Cannes escaped almost without any serious damage to property or accidents to persons. At Cannes and at Antibes, when the second shock of earthquake occurred, the level of the sea sank over three feet, and then rose about six feet, before resuming its ordinary level.

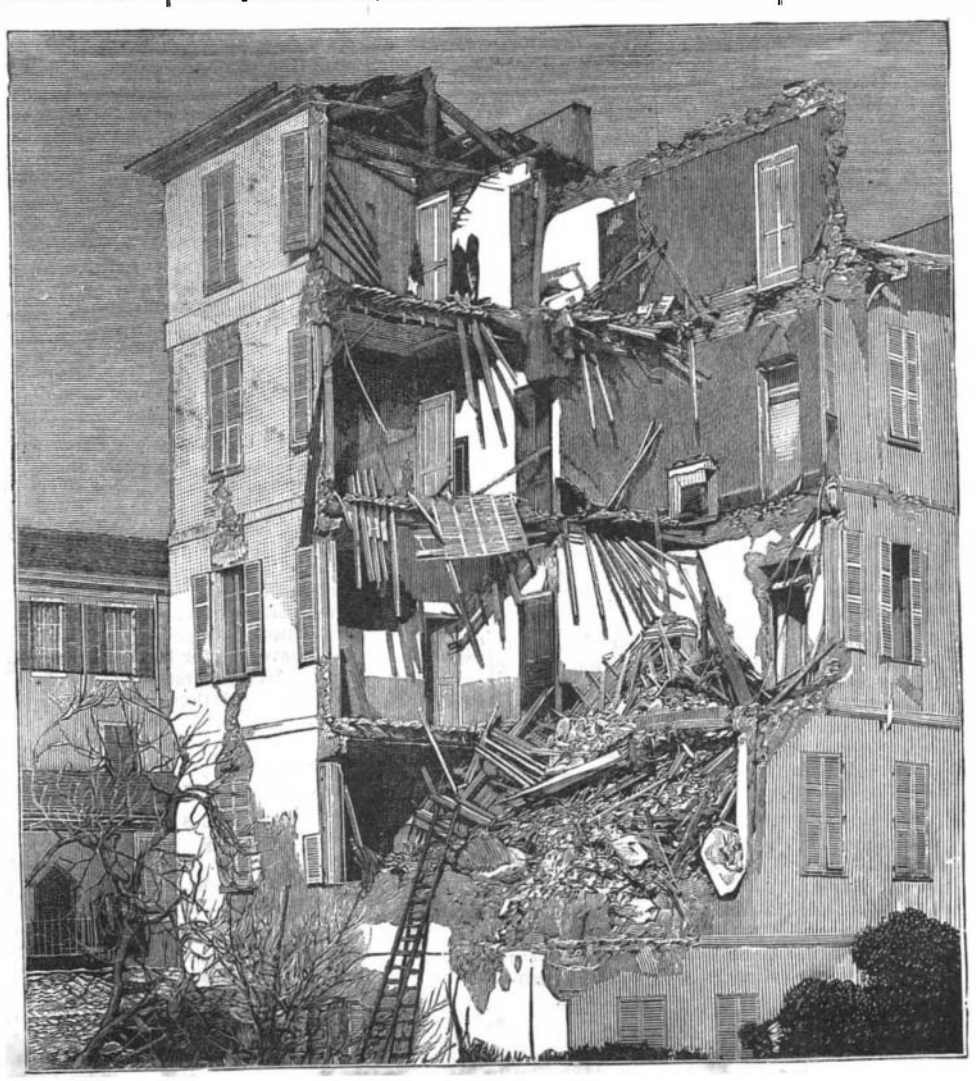
At Mentone, the head Post Office and the villas Cipollino and Molinari are in ruins. The earthquake at Mentone is described in the following letter to us from Lieutenant-Colonel A. F. Bingham Wright:

"Just as the day was breaking, on Ash Wednesday, we were roused from our sleep by a fearful noise and by the violent shaking of the room, with the crash of falling masonry and breaking glass and china. There was, of course, no doubt about the cause. It was an earthquake shock, and one of the most violent I ever experienced; and I expected every moment to find the house falling with us. We dragged our little boy out of his bed, fortunately untouched by the falling rubbish, and rushed for the stairs just as we were, for there seemed no time to spare, if we wished to get down alive. Having got the child down in safety, we returned to aid our friends, and found a gentleman and his little girl were both buried under the debris, in rooms close to ours. With frantic exertions, they were both recovered; the father much hurt, but the child, most providentially, quite uninjured. She was completely covered, not merely by loose rubbish, but by masses of stonework so heavy that the ladies who were trying to rescue her had not strength to move it. I helped them with all my might, and we were fortunate enough to get at the right spot to find her, and to get her out before she had suffered from want of air. While we were doing so, another severe shock came, but, fortunately, not enough to add much more to the ruin, and, in a short time, all were out of doors.

"During the day and night there were frequent shocks, but, as a rule, diminishing in force. I noticed that a wave of disturbance came on about every three hours; but there were other shocks as well. Hardly any one on the west side of Mentone slept in a house that night. We lay on mattresses under the orange trees in the garden of the Hotel de Venise, close by; some under an improvised tent. Though but little mention has been made of Mentone, I believe it has suffered more than any other place on this part of the coast. I have, since the occurrence, passed in daylight along all the Riviera from there to Marseilles, spending some hours at Nice; and nowhere is there a twentieth part of the damage visible. Mentone, in fact, has much the appearance of having undergone a bombardment. It is sad, indeed, to see this lovely place reduced to such a state. The accompanying rough sketches were taken hurriedly in a pocket-book, but may be of interest."

The destruction of houses at Oneglia was considerable, and at Savona; fourteen were killed in those towns. In the province of Porto Maurizio there are a considerable number of villages in the mountainous districts built in terrace fashion upon the side of hills. Scarcely any of these have escaped; the buildings on the upper slopes first collapsed, and crushed down on those below. At Bajardo, a small town of about 1500 inhabitants, when the first shock was felt, the inhabitants, men, women, and children, rushed in mad affright to the parish church, where, upon their knees, they implored divine protection. The priests moved about among the terrified people, trying in vain to calm their fears. Suddenly a severe shock caused the massive walls of the church to bulge, and in another moment the edifice collapsed, burying beneath its ruins several hundred people, of whom nearly 300 were killed or terribly mutilated. At Bussano, a village of 800 inhabitants, successive shocks razed to the ground nearly every house, and beneath the ruins lie one-third of the population, with no prospect of rescuing any alive. At Diano Marina, most of the houses fell, killing 250 persons.

In the city of Genoa, the ducal palace and other houses were damaged. At the Carlo Felice Theater a masked ball, the crowning fete of the Carnival series, was in progress. The first shock caused a panic; the dance was instantly stopped, and the fantastically dressed people flocked into the streets. Beyond Savona all railway traffic has been suspended; in several places huge masses of stone, loosened from overhanging cliff-brows, threaten to fall at any moment. No further shock occurred after the night of Wednesday, February 23.—*The Illustrated London News.*



EFFECT OF THE EARTHQUAKE AT THE ECOLE MATERNELLE AT ST. ETIENNE.

Furniture Polish.

The subjoined simple preparation will be found desirable for cleaning and polishing old furniture: Over a moderate fire put a perfectly clean vessel. Into this drop 2 ounces of white or yellow wax. When melted, add 4 ounces pure turpentine; then stir until cool, when it is ready for use. The mixture brings out the original color of the wood, adding a luster equal to that of varnish. By rubbing with a piece of fine cork, it may, when it fades, be removed. —*Eclectic Medical Journal.*

AN English and American syndicate is formed to work the coal fields in Zacatecas, Mexico.