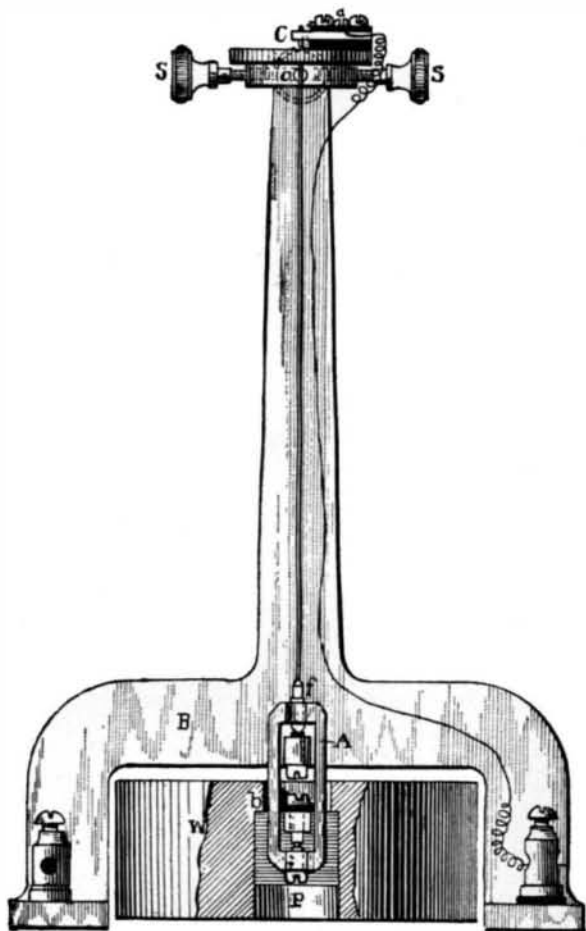


THE MARVIN SEISMOGRAPH.

BY EMMA V. TRIEPEL.

Resting upon a square stone firmly embedded in the floor beneath the southwest corner of the main building of the Weather Bureau's headquarters at Washington, D. C., is a seismograph, the only instrument in the United States by which the time and duration of earthquakes can be recorded.

This machine may be described thus: A heavy lead



THE MARVIN SEISMOGRAPH.

weight, W, is pivoted to a short steel link, A, by means of a screw, b, the sharp point of which is just above the center of gravity of the weight, so that the latter will balance and remain stable on the pointed support. The top of the link hangs from a small projection from the frame of the instrument, B, being held in place by a second sharp pointed screw. A slender flexible needle, f, about six inches long extends straight upward from the topmost edge of the link, and its platinum tipped point normally passes exactly through the center of a platinum rimmed hole in an insulated metallic plate which is held stationary with the frame of the instrument.

One pole of an electric circuit connects with the needle at the pivot, and the opposite pole is fastened to the metallic plate. A seismic shock causes the needle tip to strike the platinum rim of the above mentioned hole, thus completing the circuit and being transmitted to the recording instrument in another building.

This register is a revolving cylinder which moves by clockwork and makes one revolution every six hours. A broad band of paper cross ruled with heavy hour lines, between which the space is subdivided by finer five minute lines, passes around the cylinder. Pressing against the moving paper ribbon is a small arm, tipped with a fountain pen, which is so controlled by the clock as to make a spiral line upon the recording sheet for seven days, without changing. The clock, which keeps standard time, is connected with the arm in such a manner that the pen is made to move every hour, thus making points in the otherwise even line. An electromagnet on the base of the register, which is connected with the pen arm, is connected electrically with the seismograph; when, therefore, the circuit is closed by the needle being jarred from its normal position so as to touch the platinum rim, the vibration is indicated by offsets, in the spiral line, between those regularly made.

The time of such disturbance is ascertained by counting the hours since the revolution began, as indicated by the points regularly made, then the five minute lines exceeding the last hour point, and then applying a delicately graduated scale for the seconds and fractions thereof. Finally, any error in the clock which drives the cylinder is determined by comparison with a pendulum clock which is regulated by telegraphic signals from the Naval Observatory. The duration is indicated by the number of successive

lateral strokes made in the tracing by the fountain pen.

This seismograph was invented by Prof. C. F. Marvin, and has registered six earthquakes during its four years' service, that of May 31 being most pronounced. It is so situated that only a tremor of the earth itself can affect it, but although its utility for recording the time and duration of seismic shocks has been fully demonstrated, it does not indicate their direction, being in that respect inferior to many instruments now in use in Japan.

Scientists are anxious to have accurate seismographs placed in all the observatories throughout the country, believing that with a network of such apparatus, carefully installed, such phenomena could be observed upon a broader scale than ever before within the world's history.

A HORSELESS BROUGHAM.

In the SCIENTIFIC AMERICAN for March 13, 1897, we illustrated the hansom cab of the Electric Carriage and Wagon Company, of Philadelphia and New York; we now show the Morris & Salom brougham. It is just about to be put in operation in New York City. The hansom cabs in New York are giving great satisfaction and are in constant use, and it is expected that the brougham will be as popular as the hansom.

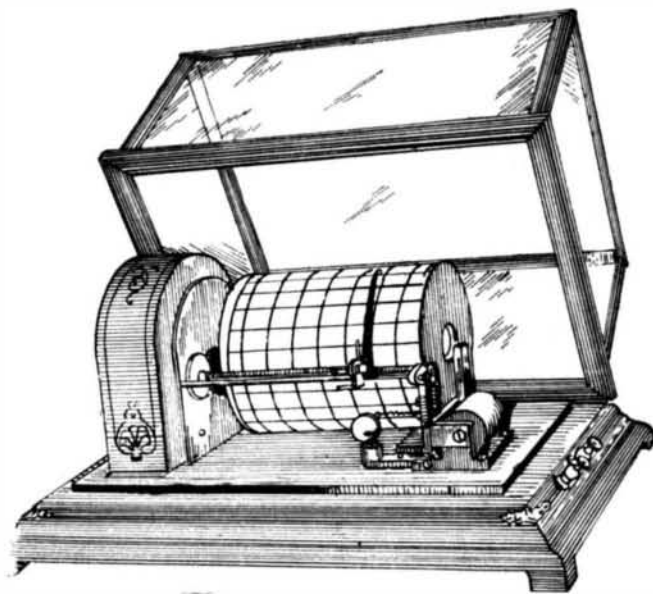
It embodies many features considered of great importance, the principal one being what is known as the "Tracteur" principle, and consists in mounting the motors, gears and batteries on the front truck or axle, thus maintaining back of the battery line all of the features of standard carriage construction, the body part of the brougham being built on precisely the same line as those intended to be drawn by horses. It is evident that this principle adapts itself to the construction of all sorts of carriages, such as landaus, victorias, cabriolets, opera coaches, etc. The new brougham is provided with 2 horse power Londell motors and a battery of 443 F. elements of the Electric Storage Battery Company. The motors are wound for 900 revolutions per minute and gear directly with a single reduction to the internal gears on the 36 inch driving wheels. As the motors are independent, the differential action in turning is obtained without the necessity of countershaft with balance gears. Motors are mounted on the axle and swing radially about the same; and are supported on the opposite side by spiral springs attached to the body.

The accumulators have a capacity of 100 ampere hours each, making the total battery capacity about 12 horse power hours, which is amply sufficient, owing to a very high efficiency of the motors and the means of the transmission of power, to drive the vehicles fully twenty-five miles under ordinary street conditions. On asphalt pavements and small gradients thirty-six miles have been run without recharging. The average speed is six miles per hour. The wheels are of the wire suspension type, fitted with brass hubs and ball bearings and pneumatic tires of three inch section. The steering is accomplished by moving the rear wheels in parallel planes by means of a lever placed on the right hand of the driver. The controller is placed under the

driver's seat and is operated by a small lever with the left hand, it being arranged so as to permit of three speeds ahead and one back. The carriage is elegantly finished and has luxurious fittings, and weighs very little more than the horseless hansom cab.

Superstition of a Well-Known Writer.

There are many persons who have a superstition regarding figures, and who believe in their influence, good or bad, upon the events, important or unimportant, of their existence. The eminent writer, M. Emile Zola, is numbered among such. Quite recently, while he was going down Rue de la Chaussee d'Antin, at Paris, he was knocked down by a hack, which passed over his legs, without, fortunately, doing any other



SEISMOGRAPH RECORDER.

damage than bruising him. M. Zola has a superstitious horror of the number 17. This number is to him unlucky. After he arose, he looked at the number of the hack, added up the figures in a flash, and found the total to be 17. The great writer had, for a long time, held the belief that the number 17 had a malign influence upon him, and that aggravated the case.

Dr. Toulouse has recently devoted a volume to a study of M. Zola, in which he character, temperament, and the very sources of the illustrious writer's talents are analyzed with all the resources of psychology and physiology. On pages 251 and 252 of this book, the author says:

"Thus, certain figures have a bad influence upon M. Zola. If the number of a hack, when added up, forms this figure, he will not engage the vehicle, or, if he is obliged to do so, will fear that some misfortune may happen to him. For example, that he may not succeed in the business that he has started out to do. Such superstitious idea may supervene apropos of any of his arithmomanical impulses. For a long time the multiples of 3 appeared favorable to him; but now it is the multiples of 7 that reassure him. Thus, in the night, it often happens that he will open his eyes seven times in order to prove to himself that he is not going to die. On the contrary, the number 17, which recalls to him a sorrowful date, seems to him to be unlucky, and chance has ordained that he should recognize a coincidence of certain unfortunate occurrences with that date. Similar superstitious ideas exhibit themselves outside of all arithmomania. Thus, he will perform certain acts with the idea that, if he does not do so, some annoyance will happen to him. So he will touch the gas burners that he meets with in the streets, surmount an obstacle with the right foot, walk upon the pavement in a certain way, etc. For a long time he feared that he would not succeed in the proceeding that he was going to undertake unless he started out of the house with his left foot foremost." — La Vie Scientifique.



A HORSELESS BROUGHAM.

THE American X Ray Journal is a monthly journal devoted to practical X ray work and allied arts and sciences. The June issue contains a number of interesting radiographs, but we regret to notice a newspaper story about an English lady who lost her diamond ring in the dough of a cake. She did not discover the loss until the baking was complete, and rather than sacrifice her production or run the risks of having her guests swallow her ring, she sent the cake to an X ray studio, the ring being located by the shadowgraph without spoiling the form of the cake, and the extraction was readily accomplished. This very improbable story undoubtedly originated in the brain of some reporter.

The Number of Physicians and Medical Schools in the United States.

An interesting statistical article on the medical colleges, physicians, etc., of the United States, based on the last edition of Polk's Medical and Surgical Register and the census of 1890, appears in the Virginia Medical Semi-Monthly of recent date.

According to the above authority, the ratio of physicians of all kinds in the United States is about one to six hundred and thirteen of the population. This estimate is based on a population of sixty-five millions, and one hundred and six thousand of the physicians are thought to come under the head of "regular," while twenty-six thousand represent the eclectic, homeopathic, physio-medico, and other sects, together with professional quacks and irregulars in general. They are distributed throughout the Union in the various States and Territories as follows:

State	Population.	No. of physicians.	Ratio of population.
Alabama.....	1,513,017	1,609	1: 940.3
Alaska.....	32,052	5	1:6,410.0
Arizona.....	59,620	95	1: 638.1
Arkansas.....	1,128,179	1,841	1: 558.5
California.....	1,208,130	3,152	1: 383.4
Colorado.....	412,198	918	1: 449.0
Connecticut.....	746,258	1,139	1: 656.9
Delaware.....	168,493	239	1: 704.5
Dist. of Columbia.	230,392	857	1: 264.2
Florida.....	391,422	764	1: 512.3
Georgia.....	1,837,353	2,021	1: 909.5
Idaho.....	84,385	109	1: 772.3
Illinois.....	3,826,351	7,331	1: 521.9
Indiana.....	2,192,404	4,778	1: 458.8
Indian Territory..	172,321	291	1: 592.3
Iowa.....	1,911,896	3,400	1: 562.4
Kansas.....	1,427,096	2,210	1: 645.6
Kentucky.....	1,858,635	3,104	1: 598.8
Louisiana.....	1,818,587	1,460	1: 766.2
Maine.....	661,086	1,164	1: 567.9
Maryland.....	1,042,390	2,003	1: 520.4
Massachusetts...	2,238,943	4,032	1: 555.2
Michigan.....	2,093,889	3,730	1: 561.3
Minnesota.....	1,301,826	1,576	1: 826.0
Mississippi.....	1,289,600	1,397	1: 943.3
Missouri.....	2,679,184	4,736	1: 565.7
Montana.....	132,159	247	1: 575.5
Nebraska.....	1,058,910	1,595	1: 663.8
Nevada.....	45,761	48	1: 953.3
New Hampshire...	376,530	669	1: 562.6
New Jersey.....	1,444,933	1,844	1: 783.5
New Mexico.....	153,593	97	1:1,584.5
New York.....	5,997,853	11,132	1: 538.7
North Carolina...	1,617,947	1,358	1:1,191.4
North Dakota....	182,719	203	1: 900.1
Ohio.....	3,672,316	7,575	1: 484.7
Oklahoma.....	61,834	326	1: 189.7
Oregon.....	313,767	653	1: 480.5
Pennsylvania.....	5,258,014	8,439	1: 623.0
Rhode Island....	345,506	543	1: 536.3
South Carolina...	1,151,149	1,060	1: 991.7
South Dakota....	328,808	364	1: 903.4
Tennessee.....	1,767,518	3,079	1: 574.0
Texas.....	2,235,523	4,617	1: 484.2
Utah.....	207,905	254	1: 818.5
Vermont.....	332,422	626	1: 531.0
Virginia.....	1,655,890	1,978	1: 847.3
Washington.....	349,390	650	1: 537.5
West Virginia....	762,794	1,236	1: 536.4
Wisconsin.....	1,686,880	1,974	1: 854.9
Wyoming.....	60,705	60	1:1,011.7

The medical schools number about one hundred and seventy-five. Of these one hundred and twenty are regular, nineteen homeopathic, seven eclectic, two physio-medico, and twelve unclassified. Eight are for women specially; five of these being regular, two homeopathic, and one eclectic. In eight of the other colleges women are permitted to matriculate, and four are exclusively for colored people.

Statistical Research and Methods.

The Royal Statistical Society held the first meeting of the session 1896-97 in the theater of the Royal United Service Institution at Whitehall, London, November 17, when the inaugural address of the president, Mr. John Biddulph Martin, on "Some Developments of Statistical Research Methods During Recent Years," was delivered.

It was pointed out, says the Colliery Guardian, that the existence of the society was practically synchronous with the duration of her Majesty's reign. Ample material was now available for statistical treatment which at the commencement of that period was non-existent. Among subjects of this kind might be mentioned the statistics of railway locomotion as well as the statistics of steam tonnage, which last had furnished matter for papers covering a space of four decennial periods, contributed to the society by Mr. John Glover. Electric locomotion was already beginning to furnish matter to be dealt with statistically, and it was impossible to say what might be the result during the next sixty years of the application of science to the service of man. It was conceivable that by that time some of the problems of aerial navigation would have been solved. Even the art of cycling, usually regarded as a pastime, was already beginning to exercise an economic influence. It was for the statistician to discriminate between the ephemeral phenomenon and the inception of an economic movement, and to

present essential facts in a well digested form for the consideration of the economist.

Passing to the more limited period during which Mr. Martin had been connected with the society, he thought that he would be justified in laying before the society a résumé of the information which he had been enabled to collect by the kindness of numerous correspondents abroad, whom he wished specially to thank. He then proceeded to show the increased attention which had been devoted, both at home and abroad, to statistics under the following heads: (1) The increased attention bestowed on the collection of statistics by various governments; (2) the increased pursuit of statistical inquiry by private societies, whether, as in some cases, purely statistical in their aims, or, as in others, politico-economic; (3) the increased attention given to education and training in statistics, either at the initiative of government or at that of independent educational bodies. The information furnished to him showed that under all these three heads a marked impulse had been given to the pursuit of statistical inquiry. It could not be denied that the numerical method of statistical inquiry as applied to social and economic phenomena was an implement of the highest value and the most delicate temper. It was for statisticians to see that it be not used in any but a strictly workmanlike manner. Cases had occurred in which it had been willfully misused; misuse through carelessness was more frequent, and an imperfect statement of facts had in many cases led to divergent views on certain social problems.

Reference was made to the paper contributed by Monsieur A. de Foville to the jubilee meeting of the society, on the subject of "Statistics and its Enemies." Among such enemies were the laborious compilers of figures which were of no value when obtained. The statistician, so called, who aimed at minute accuracy in figures which it was impossible to estimate save approximately, was another of such enemies. A third class was composed of those who were ready to state in absolute figures the quantity and value of the imports and exports of Central Africa, or the tonnage statistics of Timbuctoo. Of faulty or fraudulent statistical returns willfully made there was nothing to be said. They not infrequently led to their own detection. It was through extravagances of this kind that Monsieur Thiers defined statistics as the art of stating in precise terms things which one does not know. The true statistician, if he would be justified of his pursuit, must learn to discard the superfluous, the imperfect, and the false, and to come under the definition which describes him as the man who can reason as well as count.

The next portion of the address dealt with the graphic method of statistics with reference to the various forms of expressing statistical totals by geometrical figures, accompanied in some cases by the employment of colors. It was to be regretted that the use of the graphic method, which had sprung up automatically, had not been developed on any conventional lines. Were the employment of particular graphic forms invariably applied to the exposition of the same phenomena, and if this conventional agreement could be made international, the interpretation of statistics graphically presented would be vastly facilitated, and might also serve to exchange ideas more efficiently than the illusive Volapuk, of which so much had been expected and by which so little had been achieved.

Reference was next made to the application of the higher mathematics and the laws of probability to the elucidation of statistical problems, and, next in order, an historical account of the development of the idea of index numbers was given. The most recent inquiry into this elaborate subject had been made by a very strong committee, consisting entirely of members of the Statistical Society, appointed at the British Association of 1886. This committee had held frequent meetings, and had reported annually until 1890. The labors of the committee resulted in a draft proposal for a government commission, which should watch and record the fluctuations in prices, and publish at frequent intervals an adjusted standard of value. It was, however, doubtful whether public opinion was yet ripe for such a sliding scale in contracts extending over a series of years. While the committee on index numbers aimed at establishing, on a sufficient series of individual averages, one comprehensive average of the price of all commodities, it was sufficiently difficult to establish a simple average. One eminent statistician raised a voice of warning against large figures; another warning voice bade "beware of averages"! The question of averages had been under the consideration of the society on more than one occasion. The difficulty of allowing for all disturbing elements was admitted.

In conclusion, the president said that he was not ashamed to confess that the scope of statistical inquiry was essentially utilitarian. The papers read before the society from time to time must not be considered as limited to the exposition of the problems with which they dealt, but their ultimate object was to show how the body politic would be affected by the advance of industrial enterprise or applied science. Abstract science, save as it bore on the improvement of the human race, had no interest for statisticians. The humanita-

rian aims of the society had been placed on record in an eloquent passage of the presidential address of the late Dr. Guy. Dr. Guy's views still held good. No improvement in the condition of society could be hoped for as long as the essential facts which make it such as it is at any point of time are imperfectly known or inadequately appreciated. It was for society patiently to investigate essential facts, not to be led astray by any incomplete data or preconceived theories, but to keep a true balance, and to give proper weight to all concomitant circumstances or countervailing influences. Truth must be followed fearlessly wherever it might lead. It must be the object of the fellows of the society to hand on to their successors the torch of knowledge that had been intrusted to them by those who had gone before, and to maintain in the future the prestige which had been deservedly won in the past.

The Number of Living Animal Species.

For the benefit of the curious, as well as the zoological student, the following table, from the American Naturalist, gives the census of the animal kingdom as known in the years 1830, 1881, and 1896. The first two columns are taken from a note by A. Günther, in Annals and Magazine of Natural History, and the last from a note in the Zoologist. The last was compiled in February, 1896, by the contributors to the Zoological Record.

	1830	1881	1896
Mammalia.....	1,200	2,300	2,500
Aves.....	3,600	11,000	12,500
Reptilia.....	443	2,600	4,400
Batrachians.....	100	800	1,200
Fishes.....	3,500	11,000	12,000
Tunicata.....			900
Mollusca.....	11,000	33,000	50,000
Brachiopoda.....			150
Bryozoa.....			1,800
Crustacea.....	1840	1,290	7,500
Arachnida.....		1,400	8,000
Pycnogonia.....		8	70
Myriapoda.....		450	1,300
Protacheata.....			3,000
Hexapoda.....		49,100	220,150
Vermes.....		412	6,000
Echinodermata.....		230	1,843
Celetterata.....		500	2,200
Spongia.....		1835	50
Protozoa.....		305	3,300
	71,588	311,553	366,000

The Polar Problem.

A discussion took place at a recent meeting of the Royal Geographical Society on the North Polar problem. Sir Clements Markham, president of the society, who occupied the chair, introduced the subject in a comprehensive address. He was disposed to regard the whole line of heavy ancient ice pressing upon the shore of the American continent, of the Parry Islands, and of the northern side of Greenland as evidence of a continuous drift from the eastern to the western hemispheres, across an ocean uninterrupted by land of any magnitude. The presence of warmer water in the depths of Nansen's polar sea was an important discovery. It commenced 100 fathoms below the surface, and extended down to 250 fathoms. There was still much to be learned. An expedition should be sent up to Jones Sound to connect the 400 miles between Prince Patrick Island and Aldrich's farthest, and to examine the line of ancient ice in that unknown region. Another expedition should complete the examination of the northern side of Greenland. A third, equipped on Nansen's plan, should commence the drift much further to the eastward, and pass over the Pole itself. This would probably occupy four years, but it would bring a further installment of knowledge respecting the depths of the ocean, the current, and temperatures of the vast unknown area, and another series of magnetic observations. It should also decide the question of the existence of land between Prince Patrick and Wrangel Islands.

Dr. Nansen, opening the discussion, said they could have great certainty in saying that the Pole must be situated in the deep sea basin. He thought perhaps there were some small islands to the north, where the ice drift closed in from time to time in order to get into the layers which were noticed. If it did not form into layers somewhere, he did not think it would take such a time as it did to drift across the polar region. The oldest ice he saw in the polar region was probably of five or six years of age. The ice which he saw was on an average from ten feet to twelve feet deep, and he did not believe the ice of the polar sea would freeze any thicker. He did not think it was difficult to reach the Pole itself. If they cared for it, they could reach it in one summer. If they took 200 dogs, they could reach it quite certainly, but he did not think it was worth while; he could not see the importance of it, for they would not bring back sufficient observations, and it would be a waste of time and labor. If they wanted scientific observations from the Arctic regions, there was no better plan than the one he adopted—of going into the ice. The ship was an excellent observatory. Sir J. Hooker, Sir Leopold McClintock, Sir G. Nares, and other speakers followed.