Prof. Jonnesco and Spinal Anæsthesia.

The visit of Prof. Thomas Jonnesco to New York has brought prominently before the public the method of producing local anæsthesia by the injection of anæsthetic solutions into the spinal canal.

Cocaine was introduced years ago as an anæsthetic for local application; it was welcomed by the medical profession, and equally by patients, on account of its invaluable services in operative procedures upon the eye, the nose, and the throat. By merely placing a drop or two of a solution of cocaine (or one of its salts) into the eye, or by painting a similar solution upon the mucous membrane of the nose or throat, it is possible to produce anæsthesia so complete as to enable surgical operations to be performed upon these parts without inflicting the least pain or discomfort upon the patients. Certain objections to the use of cocaine were not long, however, in showing themselves. Cocaine is a powerful alkaloid; and if the usual dose be exceeded, very grave results follow, a number of patients having actually died as the result of cocaine poisoning. Investigators were therefore led to search for other substances, either like cocaine occurring naturally, or prepared synthetically, which would possess the properties of cocaine while being less poisonous.

In this way, states Nature, a number of anæsthetic drugs have been introduced, including alypin, holocaine, eucaine (alpha and beta), scopolamine, novocaine, stovaine and tropacocaine. Of these the three latter have been chiefly employed in producing spinal anæsthesia. The method consists in injecting, by means of a syringe and needle, a quantity (usually about one cubic centimeter) of a solution of one of these substances into the spinal canal. The injection is made in the back, close to the middle line, the needle being inserted between two of the vertebræ. With regard to the details of the method, various procedures have been described, and no agreement has yet been reached as to which of these is to be considered the best. There is no doubt that modifications are desirable to suit particular requirements. Thus, many operators direct that the drug be dissolved in cerebro-spinal fluid or else in a saline solution having the same specific gravity and the same osmotic tension as the blood-serum. Others consider that the anæsthetic solution should be considerably denser or more viscous than the cerebro-spinal fluid, and for this purpose recommend the addition of glucose or of gum-acacia to the solution. These thicker solutions tend to remain at the spot at which they are injected, while solutions in cerebro-spinal fluid or in normal saline tend to spread up and down the spinal canal, and thus have a more widespread anæsthetic effect. It is usual to withdraw a few cubic centimeters of cerebro-spinal fluid from the spinal canal before injecting the anæsthetic fluid. There are two reasons for this—first, the surgeon is assured that he has actually introduced his needle into the spinal canal, and secondly he is certain to avoid increasing unduly the cerebro-spinal pressure when he introduces the anæsthetizing fluid.

On introducing the fluid into a particular part of the spinal column, anæsthesia is produced of all parts of the body deriving their nerve supply from this part of the spinal cord, and all parts below. If the fluid be allowed to ascend the spinal canal (e. g., by raising the hips) the anæsthesia rises higher and higher as the anæsthetic fluid reaches the trunks of the nerves arising from the higher parts of the spinal cord. If the patient be placed on one side while the injection is being performed, the anæsthetic fluid can be made to enter one lateral half of the spinal canal, and in this way it is possible to limit the anæsthesia to one lateral half of the body.

The anæsthetic fluid can be allowed to ascend almost to the top of the thoracic spine without fear of untoward consequences. When it reaches the base of the neck, however, the phrenic nerve, concerned with the movements of respiration, becomes involved, and it was deemed impracticable to produce anæsthesia of the head and neck by the spinal method. Prof. Jonnesco, however, has shown that the addition of strychnine to the anæsthetic solution produces so powerful a stimulant effect upon the respiratory center in the brain that it is possible to introduce an anæsthetic fluid into the upper part of the thoracic spine, and to allow the fluid to ascend the spinal canal in the neck so as to enable operations to be performed on the neck and throat. But it is as yet too early to say whether this method may be considered a safe one.

Of the three drugs which are now chiefly used for the production of spinal anæsthesia, stovaine is found to produce the most deleterious effect upon the kidneys, acute nephritis having followed its injection in quite a number of cases. Novocaine and tropacocaine are less injurious in this way, while they are equally efficacious as anæsthetics. It thus appears likely that they will supplant stovaine in the near future, and, in fact, tropacocaine in a one per cent solution is already being largely used for the purpose in this country, the usual dose injected being about 1¼ grain.

No doubt further experience will lead to modifications in the present method of performing spinal anæsthesia which will result in its widespread use, as there are a great many cases in which a local anæsthetic is far more advantageous to both patient and surgeon than a general anæsthetic.

A SIMPLE AND RAPID METHOD OF MEASURING THE HEIGHT OF AN AEROPLANE ABOVE THE GROUND.

The vertical plane in which the height of an aeroplane above the ground is to be taken, is determined beforehand and marked on the ground by two stakes sufficiently far apart and long enough to allow the two observers commissioned to take the measurement to note the precise moment when the aeroplane comes into the plane determined by the two stakes.

The base $O_1\ O_2$, or line of this plane on the ground, is carefully measured and with as much precision as desired. This can be any desired length, say 500 feet. At O_1 and O_2 two observers are placed, each provided with a theodolite-like instrument, or any other apparatus used in artillery for measuring the angles α and β made by the straight lines $O_1 M$ and $O_2 M$ with the base $O_1 O_2$. This measurement must be taken simultaneously by the two operators at the precise moment the aeroplane crosses the vertical plane $O_1 A B O_2$. This much given, we purpose determining the height $m M$ or h: a simple examination of the diagram shows that we can write:

$$O_1 m = h \cot \alpha$$
$$O_2 m = h \cot \beta$$

Adding these two equations, member to member, we have:

$$h\ (\cot \alpha + \cot \beta) = O_1 m + O_2 m = O_1 O_2$$

Whence

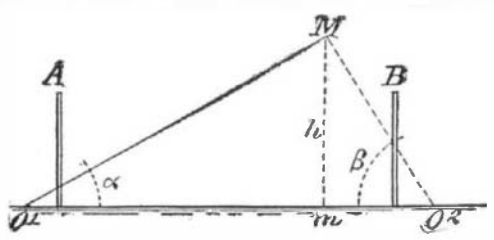
$$h = \frac{O_1 O_2}{\cot \alpha + \cot \beta}$$

If the angle measuring apparatus is graduated and gives directly the lengths of the cotangents, we shall have, supposing $\cot \alpha = a$ and $\cot \beta = b$:

$$h = \frac{500}{a + b}$$

It is easy to see that with a slide rule a simple reading will immediately give the value of h.

Instruments for measuring angles α and β are so well known in artillery that it is unnecessary to refer to them; but we will remark that this method of measuring is susceptible of great precision and should give satisfaction not only to the aviators themselves but also to the official observers.



MEASURING THE HEIGHT OF AN AEROPLANE.

Although altitude trials are not made often, the writer hopes, in the near future, to make some height measurements by this method, with the help of a very ingenious apparatus that measures the angle and at the same time determines the plane.—A. Boyer-Guillon, C.E., in L'Aerophile.

A Novel Science Entertainment.

Mr. H. Snowden Ward of Hadlow-Kent, England, is giving a new science entertainment on the plan of Prof. Pepper's and others entitled "The Marvels of Photography." After a brief explanation accompanied by a few pictures of the developing tanks, by means of one brilliant light the audience is photographed simultaneously with several cameras directed to various parts of the hall. Two very large prints are made on developing-out paper in full view of the audience.

An assistant at the same time makes natural color exposures with autochrome plates on a special subject, and also transparencies from the regular negatives of the audience. The immense paper prints of the audience are then displayed, and later the transparencies and color pictures are projected by a lantern upon a large screen. Under the auspices of the Camera Club of New York, this entertainment is to be given in this city during the winter by Mr. Ward.

To Our Subscribers.

We are at the close of another year—the sixty-fourth of the Scientific American's life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the first issue of the new year. To those who are not familiar with the Supplement, a word may not be out of place. The Supplement contains articles too long for insertion in the Scientific American, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the Scientific American and Supplement the subscriber receives the benefit of a reduction in the subscription price.

THE ENORMOUS CROPS OF 1909.

About a month ago, the preliminary estimates of this year's crops were published by the Bureau of Statistics. While not establishing a record, the figures were considerably in excess of those of last year, and were not far from the record established in 1906. However, figures above a thousand mean nothing to the average man, and no conception of this enormous production can be obtained unless he actually sees the entire crop. We have estimated the size of these crops, and our front-page illustration this week shows what a stupendous heap they would make if the more important crops were piled up in Madison Square alongside the Metropolitan Tower. To be sure, Madison Square and many blocks surrounding it would be completely lost under the mass of cereals and potatoes.

The corn, which is the bulkiest of the products shown, is represented as contained in huge bags piled up in pillars so as to represent mammoth corncobs, and though the piles reach up to a height of 1,780 feet, this year's production of corn would make twelve of these pillars. Next to the corn we have the production of oats, amounting to a huge total of close to a billion bushels. The huge bag containing this quantity of oats would reach up to more than double the height of the Metropolitan Tower. The wheat, which comes next in order, would require a bag almost as large which, even when laid on its side, would overtop the tallest structures in New York. If this wheat was distributed among the inhabitants of this country, every one, man, woman, and child, would receive over eight bushels for his share of the crop. If this quantity were taken to a flour mill, it would be converted into one and two-thirds barrels of flour, and out of this quantity of flour a baker could make nearly five hundred loaves of standard five-cent size. In other words, we grow enough wheat in this country to supply every individual with a loaf and a half of bread per day. This is slightly more than the average supply per capita for the last forty years.

Comparing our crops with other countries, we find that the United States leads the world in the production of corn, oats, and wheat. Last year we did not equal European Russia's oats production, but this year's estimate is 176,000,000 bushels more than that of last year; and while the figures for the 1909 crop in Russia are not as yet available, it seems improbable that they will equal our own figures for this year. When it comes to barley, we must take second place, acceding first place to Russia. Russia also leads the world in the production of rye. We stand fourth in the production of potatoes, with Germany, Russia, and Austria ahead of us.

While we may flatter ourselves on our production of corn, oats, and wheat, the figures show that we do not make the best use of our acreage. The United Kingdom seems to be able to produce more wheat from an acre of land than any other country. For the years 1898 to 1907 it has produced 32.6 bushels per acre, as against 13.9 in this country and 9.3 in Russia, which makes the poorest showing of the large wheat-growing countries. Germany leads in the yield of oats with 49.3 bushels per acre against 29.8 in this country. However, it seems very natural that the country having the largest tract under cultivation should have a poorer yield than those countries in which farming operations are carried on on a smaller scale and more particular attention can be given to the treatment of the land, so as to obtain the maximum product.

The crop estimate published in November was a preliminary estimate, and the final statistics for the year will be published while this issue of the Scientific American is on the press. The November figures are given below, showing a large increase over last year's figures in nearly every crop.

Crop.	Production (000 omitted).		
	1909 Preliminary.	1908.	Average, Five Years, 1903–1907
	Per Cent.	Per Cent.	Per Cent.
Corn..... bushels.	2,767,316	2,668,651	2,587,877
Winter wheat..... "	432,920	437,908	412,719
Spring wheat..... "	291,848	226,694	237,791
Total wheat..... "	724,768	664,602	650,510
Oats..... "	983,618	807,156	870,251
Barley..... "	164,636	166,756	148,155
Rye..... "	31,066	31,851	30,006
Buckwheat..... "	16,692	15,874	14,554
Flaxseed..... "	25,767	35,805	26,121
Rice..... "		21,890	
Potatoes..... "	367,473	278,985	289,400
Hay..... tons.	64,166	70,798	60,671
Tobacco..... pounds.	895,185	718,061	698,004

The above crops, which represent approximately 70 per cent of the value of all farm products, are this year in the aggregate about 2 per cent greater than in 1908, and 9 per cent greater than the average of the preceding five years.

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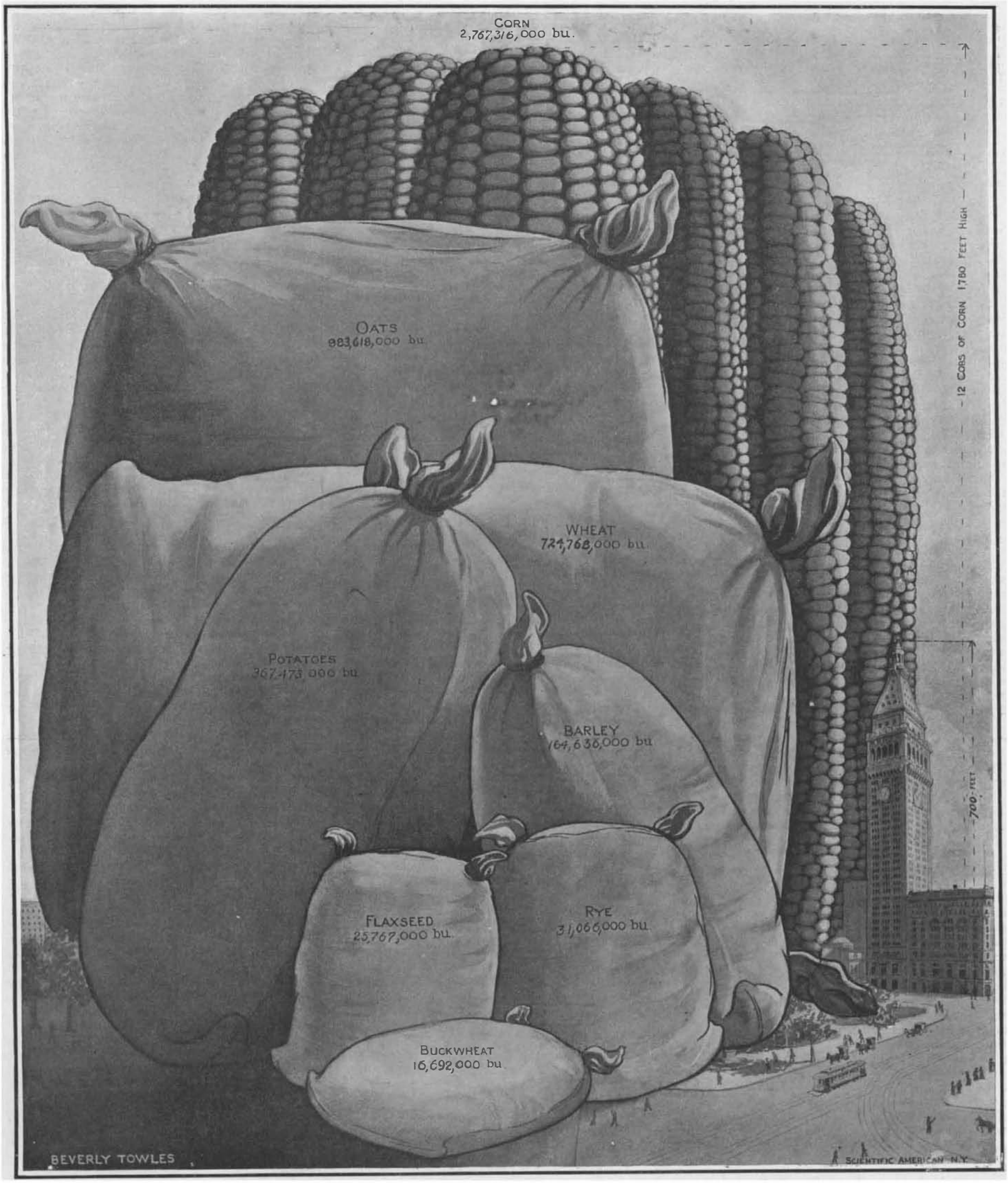

If piled up in Madison Square the crops of this year would completely dwarf the Metropolitan tower.

THE ENORMOUS CROPS OF 1909.—[See page 466.]