discharge of the gun. If our English cousins choose to dispense with the grape shot, we do not. It has served us too well to be rejected, until something better is contrived. Does the "case-grape" of the *Gazette* fulfill the conditions required?

SCIENTIFIC OBSERVATIONS ON THE SUPPLY AND OUTFLOW OF THE NORTHWESTERN LAKES--THE METER AND METHOD OF USING IT--RESULTS OF THE OBSERVATIONS.

From the Detroit Post.

It is now about two years since the newspapers of the West began to discuss whether the great lakes are fed by subaqueous springs or have hidden outlets. The parties who favored the theory of subaqueous springs, asserted that more water flowed out the St. Lawrence than could be poured in by all of the sources of supply known to exist; while the upholders of the idea of hidden outlets contended that evaporation and the visible outflow could not account for all the water which the lakes received and distributed. Both sides found encouragement for their views, in the fact of the periodic rising and falling of the waters in the lakes; in that of the occasional sudden and rapid increase and decrease from the mean level of the waters; and in other phenomena which had been observed to exist. However, no one had given the matter a complete investigation, although it was one of some scientific as well as popular interest. General W. F. Raynolds, Superintendent of the Lake Survey, determined to give the subject such consideration as, in the West, could only be afforded by the engineers employed on that work, and accordingly, for the past two summers, observations have been made in the Ste. Marie's, St. Clair, Detroit, Niagara, and St Lawrence Rivers for the purpose of ascertaining the exact amount of outflow of the lakes. These observations will also and in fixing the general laws of flowing bodies, a subject in which the owner of every mill, or other machinery, which is driven by water-power, is directly interested. The observations already made, tend to unsettle some of the theories heretofore received. The apparatus used is so much more perfect and delicate than anything else of its kind that the results are of great value.

The river gaging has from the start, been intrusted to Assistant D. Farrand Henry, of this city, who has succeeded well in his task. During the summer just past, he had three parties, under Assistants Lewis Foote, A. R. Flint, and Mr. Wallace, stationed at Fort Niagara, Ogdensburgh, and St. Clair.

The implements used are peculiar to the work, and were invented by Assistant Henry. The result of his observations, and the method pursued in making them, will be interesting to the public.

To calculate the amount of outflow of any stream, it is necessary to have the area of the body of water, and its mean velocity, at any point. These two quantities multiplied together give the discharge. The first is easily obtained by making frequent soundings across the stream on a known line. The second is more difficult. The only practical methods heretofore in use, for the determination of the velocity are, first, by the time of passage of floats past a known line; second, by the difference in the hight in which water will stand in two tubes, one of which is bent toward the current at the bottom and the other is straight; and, third, by water-mills, as they are termed, which consist of float wheels exposed to the current, the number of revolutions being recorded by a system of decimal gears or telltale. Of these methods, the first is the only one which has been used in deep water.

During the first season Assistant Henry adopted the first method, using the double floats used by Generals A. A. Humphery and A. L. Abbott, of the Corps of Engineers, in their hydraulic survey of the Mississippi River. Being dissatisfied with the results then obtained, he devised a "Telegraphic Current Meter," which he has successfully used in the several rivers connecting the lakes during the past season.

DESCRIPTION OF THE METER.

This consists of a propeller or float wheel, which has on its hub an eccentric, and on the axle an ivory lever, which has one end kept on the excentric by a light spring, while into the other end a hole is drilled, meeting another hole, drilled at an angle with it, near the center of the bottom side. Into these holes a platinum wire is forced, so that the lever rests on the point of the wire coming out of the center hole. Under this point a small platinum plate is fastened to the axle. The other end of the wire is connected by a hinge joint to a long copper wire, which is fastened to the axle, but insulated from it. At the rear of the axle are two vanes, at right angles to each other, sufficiently large to keep the wheel in the thread of the current. The whole is suspended by a yoke which has two small eyes on its side.

THE METHOD OF USING.

The method of using the meter is as follows: A boat being anchored in the stream at the point where the current is to be tested, a weight with a copper wire attached is let down from the stern. The upper end of this wire is fastened to a spring pole, which takes up most of the motion of the boat. This wire is passed through the eyes on the side of the yoke in the meter, a measured cord is fastened to a swivel ring in the upper, and a weight to one in the lower end of the yoke. The meter may now be lowered to any depth, sliding down the anchored wire, and the upper end of this wire and of that are fastened together with the platinum point, being connected with a battery in the boat, then at every revolution of the wheel the circuit will be opened and closed by the eccentric, raising the ivory lever, and thus breaking the connection between the platinum point and plate. If now a Morse's paper register be placed in the circuit, at ever revolution of the wheel a dot will be made on the moving paper, and thus the number of revolutions in any given time can be ascertained. For some determinations the Morse register was used, but on account of the amount of paper required, and the labor of counting the dots, the "counter" was generally preferred. This consists of a sounder register, in front of which a frame is fastened, carrying two gear wheels of 100 teeth each, the rear wheel having on its axle a ten-leaved pinion, with which the forward one engaged. On an extension of the armature lever is an ordinary escapement reaching a little past the center of the rear wheel, and wide enough to allow it to move freely when the armature is at the middle of its movement. The pallets engage the teeth of the wheel in such a manner, that the wheel is drawn forward one tooth each time the armature is drawn down and released, and, therefore, at each revolution of the wheel. Thus the meter can be raised and lowered on the anchored wire, can be allowed to run for any length of time at one place, and the counter can be stopped or started at any moment by a simple switch.

RESULTS OF THE OBSERVATIONS.

The observations in the river were taken on a known line, 100 feet apart, and at each five feet of depth. One of the first things noticed, was the irregularity of the beat of the counter, showing that the current pulsated. This has since been found to be the case in canals, mill races, streams, wherever it has been possible to place the meter, and it seems to be a general law of water in motion. This instability of the current had been previously noticed by Mr. James B. Francis, civil engineer, of the Lowell Hydraulic Works, in the irregular motion of floats.

The pulsations are not regular, the common maximums being from one-half to one and a half minutes apart, with every five or ten minutes a greater increase or decrease. They are least in the maximum current, and increase toward the bottom and sides of the stream.

The observations give the number of revolutions of the meter, but not the actual velocity of the current. To obtain this the coefficient of each meter, or the number by which the revolutions must be multiplied to obtain the true velocity, must be found. This can be ascertained by letting the meters run in a current of a known velocity, or by drawing them through still water. The first method being impracticable, the second was used.

Two of the meters were fastened below a small boat, which was drawn at different velocities, over a known distance in a quiet pond. It was found that the number of revolutions increased with the increase of the velocity.

One of the meters was made by taking the hemispherical cups of a Robinson's Anemometer, made by James Green, and running them in a frame upon two steel points. There was so little friction that the meter would turn in a current of a little over two-tenths of a foot, a second, or one seventh of a mile an hour. D'Aubuison gives the ratio of the resistance of plane surface, to that of a hemisphere drawn through still water to be as 100 to 35, and from this the co-efficient of three used in Robinson's Anemometer is taken. But these experiments show that when the velocity is half a foot a second, the ratio is 100 to 29 nearly, and at four and a half feet per second as 100 to a little more than 41; the mean being about the same as that given above. These quantities do not, however, increase in a direct ratio, but nearly in the curve of a parabola, so that in velocities exceeding three miles per hour, the coefficient should be from two and a half to two. This is an important fact for these meteorologists who are using this instrument for the determination of the velocity of the wind. This coefficient being thus found for each velocity, it is only necessary to multiply the number of revolutions by it to obtain the true velocity of the current.

Assistant Henry is at present engaged in running all the meters used together in the river here, to obtain the coefficient of each machine by comparison with those whose coefficient has already been obtained in the manner above stated.

The maximum velocity of the current was found to be at or a little below the surface, and the velocity at the bottom is probably not over two-thirds the maximum.

The following approximate velocities and discharges of the different rivers is taken from the computations of the work last year. The quantities for the Detroit River are computed.

RIVER.	Maximum velocity.		Mean velocity		Disch'ge cubic feet per second.
	Ft. per second.	Miles per h'r	Ft. per second.	Miles per h'r	
Ste. Marie's..........	1.921	1.30	0.967	0.66	90.783
St. Clair..............	4.544	3.09	3.514	2.39	233,726
Detroit................	4.000	2.71	3.000	2.04	236,000
Niagara................	3.370	2.32	2.258	1 54	242 494
St. Lawrence...........	1.462	1.00	0.954	0.65	319,943

THE MANUFACTURE OF ARMS IN PERSIA.

FABRICATION OF GUNS.

The manufacture of arms has always been one of the principal industries of Persia. The muskets of the old and celebrated manufacturer Mustapha, are still worth from $400 to $500 each, and all armorers follow the same methods which have been used by this famous master For the making of a gun, two old horseshoes are taken together with small pieces of old iron, so that the whole weighs nearly fifteen *sirs*, which is not quite two pounds. In the heating the small pieces are arranged in such a manner that the horseshoes form the outer rim. When a proper degree of softness has been attained they are welded on an anvil. This process is repeated for several times until the iron obtains a length of two feet and a quarter. When twelve such bars are obtained, they are bound together and then welded; the bar obtained is cut in pieces of such a size that four or six will form the desired weapon. These bars are then twisted and welded together, the resulting piece is afterward bent and again welded to one bar which finally is turned and bored.

If the barrel proves satisfactory it is polished in order that the various twist marks may appear, which are produced by the different qualities of iron. It is afterward coated with a paste of two parts of sublimed sulphur and one part of sea salt, and left for twenty-four hours in a warm room, and being cleansed is then ready for sale. The price of a rifle as made now-a-days varies from $40 to $80, and that of a pistol from $18 to $40. These guns generally possess locks but often they are also fired by a fuse. In the southern part of Persia we find the infantry armed with such weapons. Their chief manufacturing place is Laar. This weapon is partly supported by a kind of fork which is fastened at the extremity of the barrel. The percussion guns are exclusively of European manufacture, the best of which are considered to be made in England, which can only be bought by the nobles. The common classes satisfy themselves with the products of native or Belgian art.

The Persians are good target shooters, and very fair sportsmen so far as ordinary shooting is concerned, but they are very poor on the wing.

THE MAKING OF DAMASK STEEL.

The blank weapons consist either of damask, ordinary steel, or iron, of which the smelting of the first is an industry peculiar to Persia. There exist various kinds of damask which we propose to describe as follows:

1. *The Indian damask.* It is made at Lucknow. All the workmen are Persians, one of the manufacturers being known from antiquity. His name is Mirza Hussein Chirazi. The said damask consists of three parts silicate of iron, one part cast iron, and two parts very pure iron. These substances are put in crucibles which contain five to forty *miskals* (25 to 200 grammes); the latter are then set in a furnace and kept therein for six days at a strong heat. Such furnaces are made to contain from 10,000 to 12,000 crucibles. When the metal is solidified they are broken to pieces, the iron being brought in an annealing oven and kept therein for forty-eight hours, where it is left to cool slowly. If this precaution is neglected the damask becomes brittle as glass does, and is then useless.

2d. *The damask of Kaswine* is entirely made in the same way, but instead of common iron the heads of old horseshoe nails are taken.

3d. *The damask of Khorassan.* This is superior to those already mentioned. Since the supremacy of Nader-Chah, who destroyed all its ovens, it is no longer manufactured.

4th. *The damask of Arsindgan, Neres, and Schiras,* is sold for an equal weight of gold, there being very little in existence, as all the furnaces of those places have been destroyed long ago and never rebuilt.

The damask of Khorassan possesses dark designs and is very brilliant. That of Kaswine possesses a gold-like reflex. The designs are intertwisted, presenting in general a series of circles.

The armorers buy the damask, the quality of which they know from long experience. For the purpose of testing it they heat, for instance, a piece to red heat and forge it then to a length of one foot and a half. If scintillation takes place it is considered of a bad quality, and also when the surface does not present a perfect evenness.

Size versus Numbers.

The Report on Obstetrics of the Medical Society of Illinois, while it states that only 653 births have been reported, humorously says:

"Our Western mothers are only keeping pace with the rapid and extraordinary development in the great West. Our wide spread and deep-soiled prairies, all must admit, produce larger corn, and more of it, than States further east are capable of doing. No one need now be surprised at anything in the great West, especially at large babies in Illinois; for we can feed, take care of, and raise more of them than any other State of equal population on the globe."

The committee is impressed with the belief that children in this country are larger than statistics show them to be in the European States. Four of the children reported weighed at birth 12 lbs. each, two, 14 lbs, and one 17½ lbs. These are all larger than any reported by Cazeaux in 3,000 births, three of them are larger than any reported by Madam La Chapelle in 4,000 births, or than were witnessed by the celebrated obstetricians Proffessors Meigs, or Hodge. We offer our editorial hat to the State of Illinois!

Hair-washes.

It is only right to refer to a source of possible disease which is peculiarly wide-spread just now, and against which the public should be cautioned. At the present time there is quite a rage for the use of hair "washes" or "restorers," which, whilst the charge of their being "dyes" is indignantly repudiated, yet in a short time "restore" the color of the hair. The active agent in these washes is, of course, lead. In the majority of cases, probably, a moderate use of such a lotion would be unattended with mischief; but it is worth remembering that palsy has been known to be produced by the long-continued use of cosmetics containing lead. But of the thousands of persons who are now applying lead to their scalps, there will doubtless be some with an extreme susceptibility to the action of the poison, and these will certainly run no inconsiderable risk of finding the "restoration" of their hair attended by loss of power in their wrists.—*Lancet.*

THE SUEZ CANAL.—There were in all 96,864,554 cubic yards of excavation to be removed on the line of the Suez Canal. Two-thirds, or 64,447,545 cubic yards had been removed on the 15th of September last, and the work of removal was going on at the rate of two and a half million yards a month. The two great piers at Port Said, on the Mediterranean, will, when finished, contain 326,750 cubic yards of blocks, of which less than 20,000 remain to be sunk. The canal is to be officially opened by the imperial schooner *Laurette*, which left Toulon for the Red Sea.