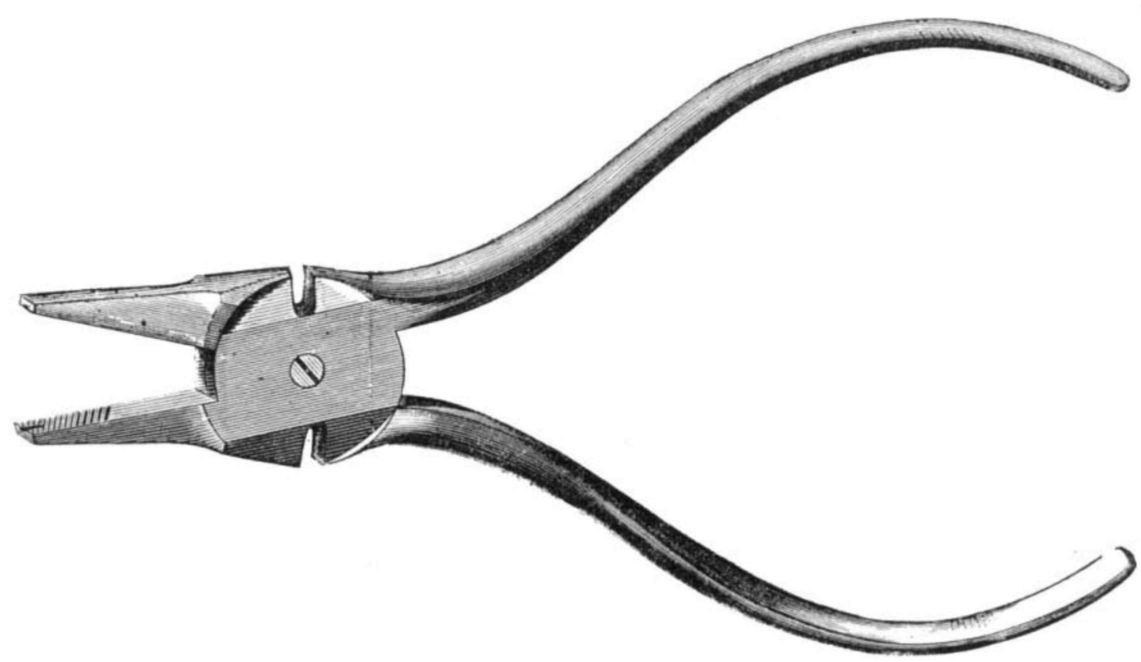
Patent Wire Shears and Pliers Combined.

Artisans have long felt the need of such a tool as the annexed engraving represents. Its advantages over others for the same purpose are very great. The jaws of the pliers are constructed in the required form, without the knives at the sides to obstruct their free use, as in the old combined cutting pliers.

The shears are made in the joint, which is formed of two smoothly faced surfaces held firmly together, and moving on a common center in opposite directions, as the pliers are opened and closed.

These surfaces are, in fact, two circular plates of steel, which being angularly notched at the periphery in one or more places, form the most perfect wire cutters in use. They are arranged so as to operate to the best possible advantage, either for ease of cutting or durability. The superiority of the shear cut, together with the increased leverage, enable the operator to cut a wire by one hand with these shears that cannot be cut by both hands with the ordinary cutting pliers; and while the mere attempt in the latter case would be almost certain destruction to the tool, the shears will cut the wire without showing any evidence of having been used. The utility of these combined pliers is obvious. Beside being useful to all who work in wire, such as tinsmiths, machinists, telegraph builders, hoop-skirt manufacturers, etc., every farmer and every housekeeper will find them quite as useful as a hammer or saw. They are made from best cast-steel, and are said to be equal in quality to the best Stubbs goods. The manufacturer has so much confidence in the success of these pliers that he will supply responsible parties in the trade with them, to be returned at his expense if found unsalable.

All orders or letters of inquiry addressed to L. Button, manufacturer of steam and hand fire engines, steam pumps, etc., Waterford, N. Y., will receive prompt attention.



WIRE SHEARS AND COMBINED PLIERS.

Inter-Communication---The Pacific Railroad and the Proposed Darien Ship Canal.

The New York *Shipping and Commercial List*, in favorably quoting our brief article on page 345, last volume, on the facilities for international communication, very truthfully says:

Our cotemporary's views, with regard to the relative cost of water and land transportation, are substantially correct. Still, a good many light costly goods, from Japan and China, such as silks, opium, etc., must inevitably come by the Pacific Railroad. But the transportation of tea, in any considerable quantities, over this route, may reasonably be doubted, as, in the opinion of the trade, the length of the carriage by rail would result in so pulverizing the article, as to detract materially from its value. There cannot be the slightest doubt, however, that the traffic between the Eastern and Western portions of the Continent, together with the business which a short route to China is certain to bring, will afford the Pacific Railroad all the business which it can accommodate, to say nothing of an important intermediate commerce, which it must build up. Nothing is more certain than that this great highway will, within a brief period, be instrumental in thickly populating a vast extent of country, stretching away from the Missouri River to the Rocky Mountains, thus rendering necessary a network of railroads similar to that in the Middle and Northern States. East of the Mississippi and Missouri Rivers there was, in 1860, a population of twenty-seven millions: westward there was less than one thirtieth the population, though double the area. And yet this great area is full of mineral and agricultural wealth; so full, that thirty-five millions of dollars of gold and silver are drawn from it every year, and the rich valleys of the pregnant rivers yield a maximum of agricultural products in return for a minimum of toil. The greatness of the traffic which will come to the great national highway between the Atlantic and Pacific, all contributing to its success and profit, can hardly be over estimated. That it will be so vast, a few years hence, as to necessitate one or more through roads may, we think, be taken for granted. But, for our countrymen to control the rich trade of China, India, and Japan, a cheaper and shorter water route is absolutely essential. This want will be supplied, as soon as science shall assure us the projected Darien Canal; the Isthmus being unquestionably the key to commerce between the Atlantic and Pacific Oceans. Since Cortez first viewed the two oceans from an elevation on the Isthmus, this magnificent project has been the dream of philanthropy and of liberal enterprise. The Spaniards, the French, and the English have repeatedly, during the last three centuries, sent expeditions to solve the problem. No less than nineteen canal routes, and seven railroad and common road lines, have been contemplated, only one of which—the Panama Railroad, an American enterprise—has been accomplished. This avenue, in connection with the steamship lines, has been a potent element in the development of commerce; but what it has accomplished, cannot be regarded as an accurate index of the success that would be likely to attend the canal. We are pleased to know that this grand project is assuming a shape that will, sooner or later, insure its consummation. The leading merchants and capitalists of the United States have taken it in hand, and with them "there is no such word as fail."

"The Wheel, the Axle, and the Rail."

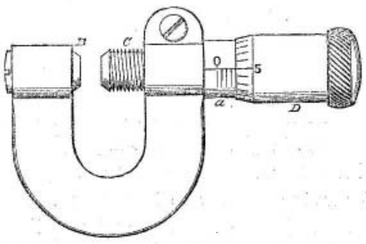
This is the title of a circular containing valuable tables and other information for railroad men, compiled for the Ramapo (N. Y.) Wheel and Foundery Co., by W. G. Hamilton, engineer. We extract from it the following statistical information about car wheels:

There are in daily use on the 37,000 miles of railway in the United States, not less than 1,250,000 truck and car wheels, under 8,500 locomotives, 5,500 passenger cars, 2,700 baggage and express cars, and 160,000 freight cars.

The available statistics show that passenger cars make an annual mileage of 28,400 miles, or 88 75-100 miles per day of 320 days per annum; the average load borne on each car wheel to be 3 1-3 tuns. With this load the average life of a wheel is 45,000 miles or 1 58-100 years. On trains running at express speeds, the average life does not exceed 10 months' service, while wheels under tender trucks have a life of 18 months. Under freight service in the State of New York, with an annual train mileage of 11,483,123 miles, transporting 75·5 tuns of freight per train, the annual mileage per car was 14,649 miles, each wheel bearing an average load of 1·47 tuns, which gives 3·08 years as the life of a freight wheel, corresponding with the experience of one of the principal roads in the State. But assuming that the average life of car wheels, under all kinds of service, as being five years, the total number of wheels worn out annually in the United States will not be less than 250,000. At an average cost of eighteen dollars per wheel, allowing one-half for their value for the old wheel, the annual loss may be stated at two and a quarter millions of dollars.

POCKET SHEET METAL GAGE.

The difficulty of accurately measuring the thickness of sheet metals is well known to all persons who have occasion to use or deal in them. The edges of metal being often imperfect, ordinary gages are prevented from going on readily. It also usually happens that the extreme edges are thinner than the rest of the sheet and cannot therefore be relied upon to give the thickness correctly. In selecting sheets for many purposes, it is desirable to have a gage to indicate the exact thickness in parts of an inch, and to accomplish this result the gage shown in the cut has been devised, which will show the thickness of a piece of metal up to three tenths of an inch in thousandths of an inch, and at some distance from the edge of the sheet. The piece in form of the letter U has a projecting hub, *a*, on one end.



Through the two ends are tapped holes in one of which is the adjusting screw, B, and in the other the gage screw, C. Attached to the screw, C, is a thimble, D, which fits over the exterior of the hub, *a*. The end of this thimble is beveled, and the beveled edge graduated into twenty-five parts and figured, 0, 5, 10, 15, 20. A line of graduations 40 to the inch is also made upon the outside of the hub, *a*, the line of these divisions running parallel with the center of the screw, C, while the graduations on the thimble are circular The pitch of the screw, C, being 40 to the inch, one revolution of the thimble opens the gage $\frac{1}{40}$ or $\frac{25}{1000}$ of an inch. The divisions on the thimble are then read off for any additional part of a revolution of the thimble and the number of such divisions are added to the turn or turns already made by the thimble allowing $\frac{25}{1000}$ for each graduation on the hub, *a*. For example, suppose the thimble to have made four revolutions and one fifth. It will then be noticed that the beveled edge has passed four of the graduations on the hub, *a*, and opposite the line of graduation will be found on the thimble the line marked 5. Add this number to the amount of the four graduations, which is $\frac{100}{1000}$, and it equals $\frac{105}{1000}$, which is the measurement shown by the gage.

The gage illustrated above, which is full size of implement, will measure the thickness of sheet metal or other material, by thousandths of an inch up to three tenths of an inch at any point within half an inch from the edge and will also answer to measure the diameter of wire. Means of adjustment are provided in case of wear by continued use.

The attention of machinists is called to the usefulness of this gage for convenient and accurate measurement. It is light, small, and suitable to carry in the pocket. Address for further particulars, Brown & Sharpe Manufacturing Company, Providence, R. I.

A CITIZEN of Mechanics Falls, Maine, has a very old coin, a Spanish silver dollar, bearing the date 1179. The figures and lettering are very perfect. On both sides there are several Chinese letters or characters, about twenty-three in number.

The Origin of Porcelain.

An apothecary's assistant at Berlin, John Frederick Bottcher by name, being suspected of alchemy, fled thence to Dresden, where the Elector, believing him possessed of the secrets of the transmutation of base metals, and their conversion into gold, placed him in the laboratory, and under the close surveillance of Tschirnhaus, who was seeking for the Universal Medicine. It was here that the contents of some crucibles, prepared for alchemical purposes, unexpectedly assumed the appearance of Oriental porcelain, which had been introduced into Europe from China, after the voyage of the Portuguese navigators around the Cape of Good Hope, and which was even then much prized by and only in possession of the wealthy. Augustus II. appreciated the importance of the discovery of Bottcher, and removed him to the Castle Albrechtsburg, at Meissen, where, with an officer as a constant attendant, he was provided with every comfort and luxury, and with every facility for his research, till, in 1709, the true white porcelain was produced; and, in the succeeding year, the great manufactory at Meissen was established, with Bottcher as director.

The secret thus discovered was carefully and jealously guarded; strict injunctions, with respect to secrecy, were enjoined upon the workmen. The establishment in the castle was a complete fortress; the portcullis raised neither day nor night, and no stranger allowed to enter, whatever the pretence. The chief inspector and all under him, were sworn to the closest silence, with the punishment of imprisonment for life attached, for divulging aught connected with the manufacture. Every where around the establishment was the warning motto: "*Be Silent unto Death.*"

Despite these injunctions and precautions, and even before Bottcher's death, which occurred in 1719, one of the foremen escaped from the manufactory; and, going to Vienna, was cordially received by Charles VI., and granted the exclusive manufacture for twenty-five years. Thence the process, no longer a secret one, spread over Europe, and the art, relieved from its cramping restrictions—and with the incentive of rivalry among various manufacturers—assumed its proper importance, and made its products available to all classes.

What it Costs to Go Around the World.

Putnam's Monthly for January says the circumnavigation of the earth has become an easy and not a very expensive undertaking. A European journal gives the following estimate, taking Paris as the starting point; we translate the sums into greenbacks:

From	to	First class fare
Paris	Marseilles,	$25⅔
Marseilles	Alexandria,	137⅓
Alexandria	Suez,	20⅓
Suez	Aden,	266⅔
Aden	Point de Galle, Ceylon,	200
From Paris to Ceylon,		$650

From Point de Galle the circumnavigator has choice of two routes. The first and most direct is *via* Japan, as follows:

From	to	First class fare.
Point de Galle	Hong Kong	$200
Hong Kong	San Francisco,	420
San Francisco, *via* Panama and St. Nazaire, to Paris,		517
Ceylon to Paris,		$1137

The other, *via* Australia:

From	to	First-class fare
Point de Galle	Sydney,	$333⅓
Sydney	Panama,	420
Panama	Paris,	342⅔
Ceylon to Paris,		$1096

The time occupied by the two routes is thus given:

From	to	Days.	From	to	Days.
Paris	Ceylon,	25	Paris	Ceylon,	25
Ceylon	Sydney,	24	Ceylon	Hong Kong,	15
Sydney	Paris,	55	Hong Kong	Paris,	64
Total,		104	Total,		104

It is estimated, however, that when the Pacific railroad is completed, the journey around the earth will be reduced to eighty days, traveling time. Not only the intercourse between China and Japan and Europe, but between Australia and Europe, will then find its speediest route across the American continent.

A Better Umbrella Wanted.

A correspondent in one of our exchanges asks the question:

Will no inventive genius improve upon the construction of the umbrella? As at present formed this indispensable article is shockingly ill adapted to its purposes. The best part of it, where one would put his head, is occupied by the stick and wires, so that only half the sheltering cover is available. Then the roof is so contrived as to cast the rain that falls upon it either on to the shoulder or into the coat pockets, or down over one's knees and feet. To remedy these evils the stick should be placed out of the center, and a turned-up rim should be made to constitute a gutter, with one shoot or spout only, which can be turned into such a position as to throw the water always to leeward of the pedestrian. If I were an umbrella maker I would endeavor to work out these improvements; as it is I can only enforce them upon the attention of those whom they may concern.

A CONVENTION of white lead manufacturers was held in St. Louis on November 11. The object was to effect a concert of action on matters relating to the trade, and the further object of promoting the interests of Western white lead manufacturers exclusively, reducing the price of white lead, and ridding the markets of adulterated material.

Improvement in Plane Stocks and Irons.

Even when constructed of the best seasoned wood and of such necessary dimensions as to make it heavy and unwieldy, the ordinary plane stock occasionally warps and has to be redressed on the face. The common method, also, of adjusting the bits or irons tends to spring the plane and to destroy the wooden key or wedge. Both these difficulties are intended to be obviated by the improvements shown in the accompanying engravings.

Fig. 1 shows an improved plane, the stock lighter than usual, and stiffened, strengthened, and adjusted, as to weight, by an ornamental malleable iron or brass casting extending its whole length. Fig. 2 is an iron cap similar to that in Fig.1 but specially adapted to planes as ordinarily used, these being susceptible of receiving this improvement without costly alteration. Fig. 3 is a common plane iron, or bit, with a metallic wedge instead of the wooden wedge, and double or stiffening iron, both of which it supersedes.

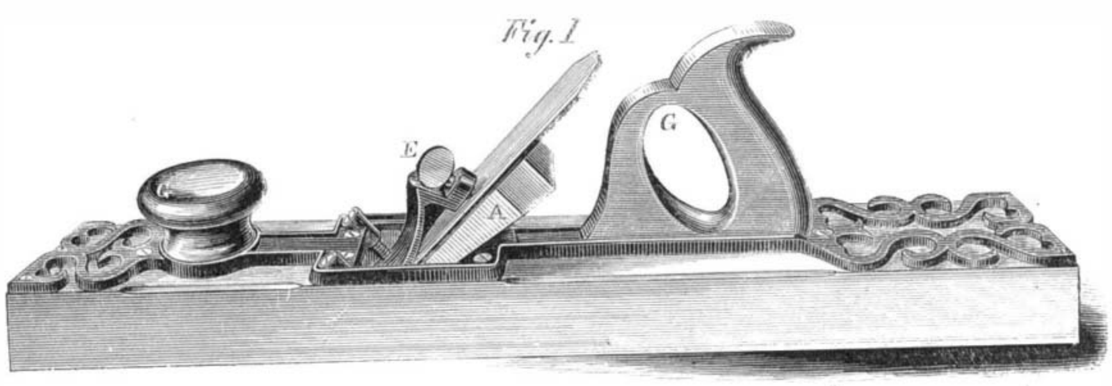


Fig. 1

SMITH & CARPENTER'S PATENT PLANE.

The plane—Fig. 1—has a fixed incline, A, secured in the throat of the plane by a common wood screw passing through a slot in the incline so that it may be adjusted as necessary. This has a bearing on the inclined supports of the metallic top, seen plainly at B, Fig. 2. The pointed, downward projections, C, same figure, engage with the upper surface of the wedge, D, Fig. 3, and the thumb screw, E, by turning one way, brings the wedge firmly against the bit near its edge, and by turning in the other direction, after being seated in the plane, presses the wedge, D, against the projections, C, holding both bit and wedge firmly. The recesses, F, Fig. 2, are for the reception of the handle and guide, G, Fig. 1. In the ordinary slotted plane iron the screw, E, turns in one end of a strap that slides in the slot of the bit, the other end being held to the bit by the ordinary flat headed screw.

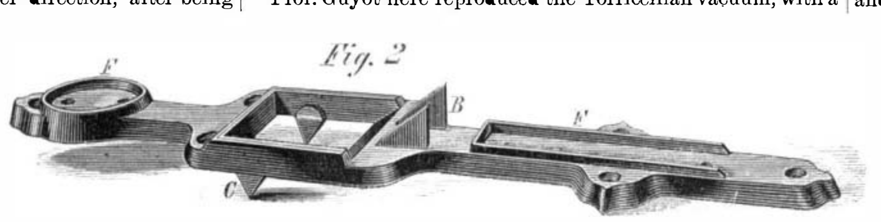


Fig. 2

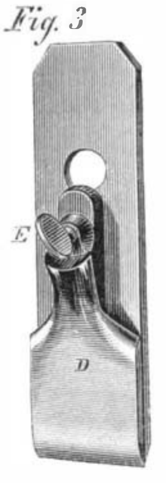


Fig. 3

In the plane represented in Fig. 1 the screw, E, sets against the plane iron or bit, which has no slot in it. In this figure two adjustable screws passing through the metallic capping serve the same purpose as the projections, C, in Fig. 2, acting as fulcrums against the wedge. By this improvement the width of the mouth may be instantly adjusted to suit the different kinds of wood worked or the different demands of the work. The metallic covering of the stock may be removed from a worn out stock and adjusted readily to another block. Practical workmen will readily discover the advantages of this improvement.

Patented through the Scientific American Patent Agency August 25, 1868, by Smith & Carpenter. Other features are covered by a caveat subsequently filed. For further information address F. Smith, 11½ West King street, Lancaster, Pa.

THE BAROMETER.---ABSTRACT OF A LECTURE BY PROF. GUYOT.

Reported for the Scientific American.

The third lecture of the scientific course before the American Institute, was delivered by the veteran physical geographer, Prof. Guyot, whose labors in this field were eloquently alluded to by Judge Daly, in introducing the lecturer to the large and appreciative audience present on the occasion.

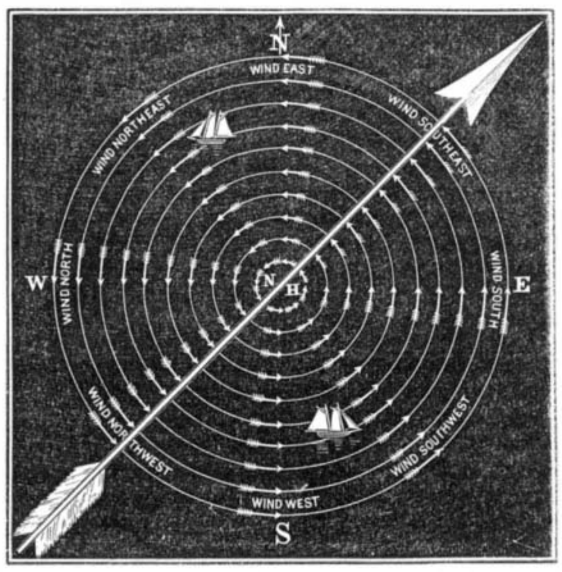
The lecturer introduced his subject by an allusion to the three forms of matter of which the earth is composed, viz., solid, fluid, and gaseous. The aqueous portions of the globe contain all, or nearly all, the lowest types of animal life, the solid land being the home of the higher types, including man, the crowning work of creative power. The gaseous portion of the globe —the atmosphere—is composed chiefly of oxygen and nitrogen; one volume of the former to four of the latter, or 23·82 parts by weight of oxygen to 75·55 parts of nitrogen.

The motive power of animals, as well as much of that used in engines for the propulsion of machinery, is derived from the union of the oxygen contained in the air with other substances. Most of the influences which affect the life and growth of the higher orders of animals and plants, and to which the general name of "climate" has been applied, originate in the atmosphere and depend upon changes in its heat, moisture, and weight. Although the subject of the present discourse pertained strictly to the weight of the atmosphere, it could not be considered independently of some of the phenomena of heat and moisture.

Prof. Guyot next discussed the depth of the atmosphere, and its variations of density for different altitudes. The depth of the atmosphere is estimated at forty-five miles, but the lower four miles of this depth contain more than one-half its entire weight. This point was illustrated by a large and beautiful colored diagram, in which the blue color of the atmosphere was shown gradually shaded out toward its upper limit, and the hights of the loftiest peaks of the Alps, Andes, and Himalayas, contrasted with the entire depth of the ærial ocean. It must not be supposed that a definite upper limit to the atmosphere can be fixed although it can be approximated. A very thin pellicle of air surrounding the globe contains nearly all the organic life upon it. If a globe fifteen feet in diameter should be taken as a representative of the earth, a stratum of any substance taken to represent the layer of air in which organic life exists would be only a small fraction of an inch in thickness.

The lecturer next proceeded to define the word barometer—a measurer of weight. Until the 17th century the air was generally believed to have no weight. Aristotle tried to demonstrate the weight of the atmosphere but failed to do so. Galileo determined it first. He showed that water would only rise in a tube when the pressure of the air was removed from its upper extremity beyond a definite hight. His pupil, Torricelli, following in the footsteps of his illustrious master, conceived the idea of substituting mercury on account of its greater weight for the water column. He filled a tube, closed at one end, with mercury, and, inverting it in a cup containing the same substance, found that the mercury settled to a given point, above and below which it fluctuated as the outside pressure varied.

Prof. Guyot here reproduced the Torricellian vacuum, with a glass tube and a tumbler, and stated that that apparatus was the best barometer that had yet been invented, although some improvements for convenience of transportation, but not affecting the essential principle, had been added to better adapt the instrument for scientific investigation. Scales of different kinds have been devised, but they all have for their object the measurement of the distance between the level of the mercury in the cup and the top of the column in the tube. This being the case, it is always important that the mercury in the cup should be adjusted to a fixed level, the zero of the scale, or that the error arising from its variation from that point, should be allowed for in reducing the observation. Other sources of error arising from differences in temperature, etc., were pointed out. The Torricellian vacuum could not be relied upon as being sufficiently perfect, unless all air had been removed from the mercury by boiling it in the tube before inverting it. The surface of the upper end of the column is convex, owing to the mutual repulsion of the glass and the mercury. The highest point of the convexity, is therefore, not the true reading. A mean between it and the lowest point must be taken. This can, however, be easily corrected by calculation.



The speaker next proceeded to describe various other barometers. The aneroid barometer was described as being an airtight box with elastic walls, which are compressed when the weight of the atmosphere increases, and expand when the external pressure diminishes. The motion caused by the compression and expansion is multiplied by an ingenious mechanism and marked upon a dial by a hand. Although the instrument is sufficiently accurate for many purposes of observation, it can not be reccommended for scientific investigation. The circumstances which render elasticity constant are subject to frequent disturbance; and a slight blow upon the exterior of an aneroid barometer is sufficient to change its zero, and give rise to grave errors. The instrument, although good for home use, is a bad traveler. Another instrument, invented by a French savant, consists of a hollow angular tube bent like a bow, which straightens or contracts with the varying external pressure, and which, by mechanism similar to the aneroid, marks the variations upon a dial. The same remarks were applicable to this instrument as were made of the aneroid barometer. The siphon barometer is the only one that approaches in reliability the original Torricellian barometer. This form of instrument, instead of having a tube of mercury inverted in a cup of mercury, has the lower end of the tube bent upward in the form of the letter *U*. The external pressure upon the open end of the upturned leg of the tube sustains the column in the leg of the tube, sealed at the upper end, so that the mercury in that branch receives no pressure from the external air. The addition of an ivory float upon the surface of the mercury in the open end of the tube having a thread attached to it, the thread passing over a small wheel attached to a hand upon a dial, and a counterpoise fixed to the end of the thread opposite the float, the whole being inclosed in a case, constitutes the common well-known wheel barometer. Another common form of the barometer is the tube and cup fitted into a wooden case with a vernier scale at the top. These different forms of the instrument were illustrated by diagrams. Two of the diagrams displayed upon the stage, one illustrating the self-registering and printing barometer invented by Prof. Hough of the Albany Observatory, and another the curve of hights from Oct. 5 to Nov. 3 1868, as delineated by that instrument, were not alluded to by the lecturer, probably for want of time. It is much to be regretted that an explanation of this beautiful and intricate device could not have been given. It depends upon the making and breaking of an electric circuit by the rising and falling of the mercury, for the communication of impulses to electro-magnets, which unlock a train of clockwork so devised as to not only to describe a constant curve upon a piece of paper, representing the hight of the column at any time of day and night for many days in succession, but also to print upon pages, which may be subsequently bound, the hights of the column as often as may be desired; thus, making a printed record with great accuracy, and with scarcely any attention being required other than to renew the battery and to substitute new slips of paper as often as they are filled with the record. The tube used is a siphon, and the means by which the above results are accomplished rank among the most ingenious and remarkable of modern ventions. The value of such an instrument to science can scarcely be overestimated. Neither was any mention made of the barometrograph, illustrated and described on page 149, of the current volume of the SCIENTIFIC AMERICAN, but it could scarcely be expected that more than a mere allusion to these ingenious devices should have been made in a single lecture. Such an allusion, however, was due to these instruments, as a tribute to their great scientific value and the genius displayed in their construction.

The speaker pointed out the fact that in the use of the ordinary wheel barometer errors were liable to occur, owing to the friction upon the float caused by the oxidation of the mercury and from other causes. These errors, and the fact that the public had in general been led to expect too much from them as weather indicators, had tended to make this form of the instrument unpopular. The value of a barometer as a weather indicator depends upon the correctness of the interpretations put upon its indications. It does all that it purports to do, that is, it indicates variations in the weight of the atmosphere. These variations are intimately connected with changes of weather, as they depend upon differences in heat, moisture, and direction of winds; but as the precise nature of the relations existing between these phenomena are in general very imperfectly understood, it follows that observers are by far more numerous than competent interpreters.

The form of instrument best adapted to scientific use is that adopted by the Smithsonian Institute, and hence known as the Smithsonian instrument. It is a mountain and observatory barometer, so called from its use in measuring hights in mountains and for observatory purposes. The lecturer himself had the honor of introducing these instruments into this country on behalf of the Smithsonian Institute. It can be divided into pieces of suitable lengths for easy transportation; has an adjustment for bringing the level of the mercury in the cistern to zero, a vernier scale for reading fractions of an inch, and adjustments which can be made to correct all the errors above enumerated, so that a simple reading can be made as exactly as can be done with the old form of the mountain barometer, without the necessity of subsequently reducing the results of the observations. This instrument is so perfect in its operations that a variation of $\frac{1}{5000}$ of an inch can be read. The lecturer has determined the hights of mountains with it within three feet of their actual hight as determined by angular measurement.

The lecturer next proceeded to show the causes for fluctuation of the mercurial column. These fluctuations may be divided into regular and irregular. The irregular fluctuations increase from the equator toward the poles. At the equator the fluctuations are mostly regular and uniform. The regular fluctuations are monthly, daily, and hourly. The monthly