city and St. Lambert, each paying one-half the cost of maintenance. The iron road or the ice bridge railways between Hochelaga and Longtieuil, is a much more difficult and expensive affair. The surface has to be carefully leveled, then the sleepers are securely frozen in, and the track laid in the usual way. Last winter the Northern Pacific Railway used an ice road across the Missouri River for construction trains, transporting in this way a vast amount of material for the road beyond. During the present season the Russians have adopted the same plan for a freight railway on ice between Oranienbaum and Cronstadt.

ELECTRIC ILLUMINATION AT MENLO PARK

To subject his system of electric lighting by incandescence to the crucial test of actual outdoor use on a large scale, Mr. Edison has set up at Menlo Park a plant embracing five hundred lamps distributed over an area one mile long and half a mile wide. His laboratory stands upon a gentle eminence from which the lines of lamps extend half a mile to right and left, the entire area under illumination being, from the slope of the land, easily visible from the central station.

The lamps are in a circuit comprising seven miles and three-quarters of wire, and are supplied by a current generated by nine dynamo-electric machines driven by one engine. The lamps are of sixteen candle-power, equal to an ordinary street gaslight, and are absolutely steady, shining with a mild and serene effulgence, which is exceedingly pleasing to the eye. The division of the current is complete and economical, and the entire system of lights can be turned up or down, off or on, as easily as one can regulate the flow of gas in an ordinary burner.

Simply as an exhibition of perfect illumination under perfect control, covering a vast area, this array of lamps presents a most remarkable and delightful sight, and is alone well worthy of a trip to Menlo Park. As a demonstration of the perfected working of a great and novel system of illumination, sure to become in a little while a potent contributor to the comfort and economy of city life, it is a spectacle which cannot fail to impress powerfully the mind of any observer.

The lamps have been but slightly modified in form and construction, since they were figured and described some months ago in this paper. In principle they are unchanged. The present appearance of the lamps is clearly shown on our front page; the plan of suspending the lamps as in the chandelier, serves particularly well in elevated lights, since the shadow of the fixture is thereby avoided. Three sizes of lamps are made, one-third, one-half, and full size, or equivalent to 5⅓, 8, and 16 candles respectively. Unlike other electric lamps the incandescent lamp requires no attention; there are no carbons to change, and need not be touched save to keep the outer globe free from dust, during the entire period of its existence, which covers several months. In case a lamp is broken by accident of internal defect, another can be put in its place as easily as a candle can be set in its socket. The suspension of one lamp has no effect whatever on the others in the circuit. According to the latest tests, to supply the current for one lamp of 16 candle power, for one hour, requires the consumption of two-fifths of a pound of coal. Still greater economy of power is expected by the use of the large generator now approaching completion.

THE TEHUANTEPEC SHIP RAILWAY.

The prompt and cordial acceptance by the Mexican people of the feasibility and the entire practicableness of Mr. Eads' plan of a ship railway across the Isthmus of Tehuantepec is probably without parallel in the history of nations, as it is in the history of great undertakings. Scarcely less remarkable is the generous spirit with which the Mexican Government has welcomed the enterprise. The liberal concession which it has granted to Mr. Eads gives him the right to construct a ship railway on the plan illustrated and described in the SCIENTIFIC AMERICAN of Nov. 13, 1880, on any line that he may select, the work to be begun within two years from the date of the grant and completed within twelve years. He is to have a right of way across the Isthmus half a mile in width, with an additional half mile of width where stations are required; also a subsidy equal to 1,000,000 acres of public land, to be located on the Isthmus or elsewhere, toward the construction of a harbor on the Pacific Ocean.

The grant gives, further, the right to acquire the Tehuantepec Railway, now building, and to improve such rivers and harbors as may be of use to the ship railway service, collecting tonnage dues from vessels entering them. Liberal tariff charges are allowed for transporting ships over the road and for auxiliary service; and the enterprise is exempted from all export and import duties on money and material during the entire period of the grant, ninety-nine years. At the end of this time the government is to take possession of the works, paying therefor two-thirds of their value. Permission is given for the United States Government to lend its aid, thus making our Government practically a partner with Mexico in carrying out the enterprise.

The length of the Tehuantepec route is 112 miles; the estimated cost of the proposed road is $75,000,000. The great advantage of the route over the Panama route—aside from its superior healthfulness—lies in the saving of distance for American shipping and the avoidance of the unfavorable winds and calms of the lower latitudes, the Panama route lying 1,200 miles further south. Ships from New York to San Francisco would save 1,500 miles by way of Tehuantepec; while 2,300 miles are saved over Panama between New Orleans and California.

At Mr. Eads' request an expedition comprising about fifty individuals—engineers, assistants, laborers, and soldiers—to assist him in making a survey of the Isthmus to determine the most practical route for the ship railway, has been prepared by the Mexican Government and sent to the Isthmus. This commission is under the direction of the eminent civil engineer, Francesco De Garay, who is in charge of the drainage of the Valley of Mexico, and who was commissioned to represent the Mexican Government at the Paris Canal Convention. He is directed by the government to assist the engineers of Captain Eads in the instrumental survey of such routes as he may designate. Messrs. Williams and Corthell will direct the survey during the absence of Capt. Eads, who has returned to Washington. It is thought that a large saving in the length of the railway can be made by taking advantage of the Coatzacoalcos River and its tributary, the Usuparapa.

SHOULD A BABY BE FAT?

While there is a measure of truth in the assertion that fat babies are not necessarily healthy, the following much quoted extract from a physician's letter to a Boston paper is likely to do mischief by its extravagant condemnation of fat. Speaking of fatty degeneration the physician says:

"Most infants do become thus diseased before they are three months old. This stops the growth and leaves the poor deceived parents nothing but increase in weight to boast of; and when the poor little victim to his own greed and his parents' folly gets to the end of his tether he melts away like butter in a hot oven, and then it is seen how poor (in flesh) he has been all the time. Few comprehend the broad difference between flesh and fat. The first is lean meat—muscle—the result of growth; while fat—I don't care how hard and solid it may be—is the product or accumulation of unexcretial excess. This is why no one bets a dollar on a fat horse or a fat man—they are 'soft' and 'can't stay.' It is every whit as true of a fat baby. The only wonder is that any infant lives sixty days from birth. Fed before birth but three times a day, he is after birth subjected to ten or twenty meals in the twenty-four hours. Before birth he grows at the rate of about ten pounds per year, after birth he is permitted to fat at the rate of fifty pounds per year until chronic dyspepsia or some acute disease interferes. Feel of a kitten, calf, colt, or a young robin—they are and remain while growing but little more than skin and bones and fur or feathers, because unable to get enough to fatten them, and they never die—rarely have any sort of disease. Children are never fairly 'out of the woods' until they reach the lean age and have pipe-stem legs and arms, with no rolls of fatty tissue anywhere about them. Could they be kept so from birth and not permitted to over-indulge, so that their appetites would always be reliable for plain food, they would have no infantile diseases to enrich our pockets."

Why should the kitten, the colt, or the young robin be taken as a model of infantile health, rather than the puppy, the bear cub, the pig, or the young pigeon?

It is the nature of some young animals to be lean and healthy; of others to be fat and healthy; and there is as marked a difference in the natural tendency of young children. Infants of the same parentage and fed at the same breast will differ in this respect, and both be healthy. Fat laid on at the rate of "fifty pounds a year" is quite another matter, and one not liable, we take it, to be a common cause of anxiety. Injudicious feeding is more apt to show itself in lack of fat, and lack of proper muscular tissue as well. That sort of leanness is much too common in young humanity.

The Value of Weather Prophecies.

Professor Cleveland Abbe, of the Signal Service, was recently interviewed by a Washington correspondent of the Boston *Herald*, who asked the following pertinent questions:

Has the weather bureau paid any official attention to Mr. Vennor's prognostications? A.—To test the accuracy of his work, we have occasionally compared his predictions as published in the newspapers, which accounts, of course, contain telegraphic and typographical errors for which Vennor is not responsible, with the real facts. We find that one-quarter of his predictions are verified, if they are intended for the St. Lawrence valley. If they are meant for this locality, as those who would give him credit for predicting the recent storm here must believe, then not ten per centum of his prophecies come true. In view of his continued failures, one or two brilliant successes would not justify us in adopting his system of foretelling the weather.

Q.—Upon what are his methods of announcing the weather based? A.—He keeps his system a secret to himself. There are, however, a few ways in which a comparatively truthful guess can be made at the weather months ahead. The first is by observing the average weather during each month for a long period. If we find that, for several months, the average has been wet or cold, it may be predicted that, during the immediate succeeding months, the weather will be the reverse, that is, dry or warm. Then we can get at the matter in another way. When January, February, and March have certain characteristics, the latter part of the year, October, November, and December, will have corresponding characteristics. Thus the weather may be foretold, in a general sense, some months ahead. But no man in the world has ever devised a plan which will foretell special storms on certain days, or which will offer a genuine prediction for a long period in advance. We are sometimes asked to give the weather several days in advance in the case of festival occasions. Under favorable conditions we can do this, with a very good chance of successful prediction. For instance: The chances are that the last few days of August will be clear, because the records show that this is the case five times to one. This, of course, relates to a particular locality, and cannot be made to cover the whole country. I suppose all Mr. Vennor's predictions are made by these methods.

Q.—Have you watched the weather predictions of the New York *Herald*, which are cabled to Europe? A.—Yes, sir. During the first months of that service I very thoroughly and carefully compared their predictions with the weather in Europe, and am satisfied that there is not more than 17 per centum of verifications in the predictions made by the *Herald* bureau. There are about 25 per centum of cases that might be considered doubtful, making a little more than 40 per centum of predictions which come near the truth. A perfectly independent investigation was made by the director of the London meteorological office, and he arrived at precisely the same figure, 41 per centum. This is really no better than could be done by guesswork.

ELECTRIC LIGHT GOOD FOR THE EYES.

When the electric light first began to be used in our shops, factories, and places of amusement, it was confidently asserted by its opponents that so dazzling a light must be injurious to the eye. The objection seemed plausible at least, although the light when diffused seemed to have the quality of bright moonlight, which is the reverse of irritating. People would persist in looking at the source of the light, and as the early lamps were far from steady, the observer's eyes suffered both from the intensity of the light and the sudden and large variations in the quantity of it. It appears, however, from the experiments recently made by Professor Cohn, of Breslau, whose name is so familiar in connection with the investigation of color blindness and other optical defects, that our eyes will be benefited rather than hurt by the new method of lighting, and it is obvious that with incandescent electric lighting the advantages will be still more marked.

While testing the influence of electric light on visual perception and the sense of color, Dr. Cohn proved, he thinks, that letters, spots, and colors were perceived at a much greater distance under electric illumination than by gas light, or even daylight. Compared with daylight, the electric light increased the sensation of yellow sixtyfold, red sixfold, and green and blue about twofold. Eyes that in daylight or gaslight could perceive and distinguish colors only with difficulty were much aided by the electric light, and the visual perception was much strengthened. In all cases of distant signaling, Dr. Cohn believes that the electric light will prove exceedingly and especially useful.

William A. Lighthall.

William A. Lighthall, the oldest designer and builder of marine engines in this country, and inventor of the widely used surface condenser for ocean steamers, died in Brooklyn, N. Y., January 4. Mr. Lighthall's connection with steam engineering began with the engines of the Claremont, the first steamer plying on the Hudson River; and for many years he was engaged as superintendent and constructing engineer for river and ocean lines of steamers. He was State Inspector-General of steamboat hulls and boilers in California for three years. From 1847 to 1862 he was inspector of steamboats and boilers in this State. Of late years he has been engaged in the manufacture of surface condensers.

Volcanic Ash for Phylloxera.

It is reported that a Neapolitan gentleman residing at the foot of Mount Vesuvius has cleared his boeyard of phylloxera by the use of volcanic ashes. Seeing that the soil of the country about Vesuvius is largely composed of volcanic ash, it is hard to reconcile the existence of the vine pest there with the alleged inability of the insects to endure its presence.

Charles B. Stewart.

The eminent civil engineer, General Charles B. Stewart, died in Cleveland, Ohio, January 4. General Stewart was engaged in the construction of the Philadelphia, Wilmington, and Baltimore Railroad, one of the first railroads in the country built for passenger service. Subsequently he constructed the Brooklyn dry docks, displaying therein an ability which secured his appointment as Engineer in Chief of the U. S. Navy. His volumes on naval architecture, the construction of dry docks, etc., attracted wide attention at home and abroad, and gained him much distinction at the hands of foreign authorities. He was for one term State engineer of New York, and deserves much, if not most of the credit for the first Niagara suspension bridge. His title was gained during the late war, in command of a regiment and afterwards a brigade of engineers.

BROKEN DIKES IN HOLLAND.—A break in the embankment of the river Maas, between Nieukuik and Vlymen, Holland, December 29, resulted in the submergence of eighteen villages. The whole country called the land of Heusden and Altena was inundated.

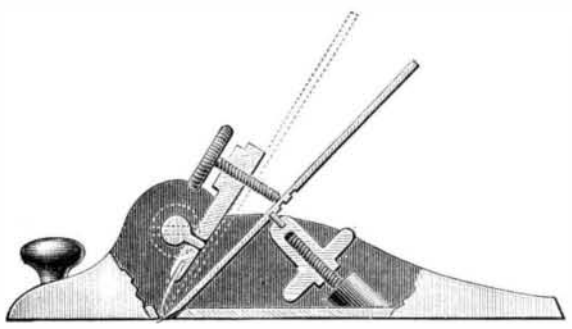
Wormwood as an Insectifuge.

In a communication to the French Academy (*Comptes Rendus*, p. 607), M. Poirot attributes to the wormwood (*Artemisia absinthium*) extraordinary properties as an insectifuge. He states that among the plants of this species that cover the vast plains of North America, he has never seen flies, ants, or any other kinds of insects; and to these he adds worms, scorpions, rattlesnakes, and other serpents. He proposes to use this property in the extinction of the phylloxera, as he believes this pest would not be able to go through the necessary metamorphoses in a soil manured with the leaves and stalks of the plant.

IMPROVED BENCH-PLANE.

The engraving shows a device by which the knife or "iron" of the plane is adjusted to various inclinations and secured in any position to suit the various degrees of hardness and grain of the different kinds of wood on which it may be used. The cap or back iron is adjusted to suit the required angle of the knife, and at the same time the back iron serves the double purpose of both holder and back-iron or cap as ordinarily used.

In planing soft wood the plane will be adjusted as shown in the engraving, but when it is desired to use it on hard wood, the thumb-screw above the iron is retracted, and the nut below the iron is unscrewed from the threaded stud until the iron touches the cap as shown in dotted lines, or the iron may be placed in any intermediate position. The nut upon which the back of the plane iron rests carries an eccentric pin which engages one of three or four slots in the back of the iron, and serves to regulate the distance the iron projects from the face of the plane.



STEERS' BENCH-PLANE.

A shaft extending across the plane has a pin which projects into a hole in the cap; by turning this shaft the cap is moved in one direction or the other as may be required.

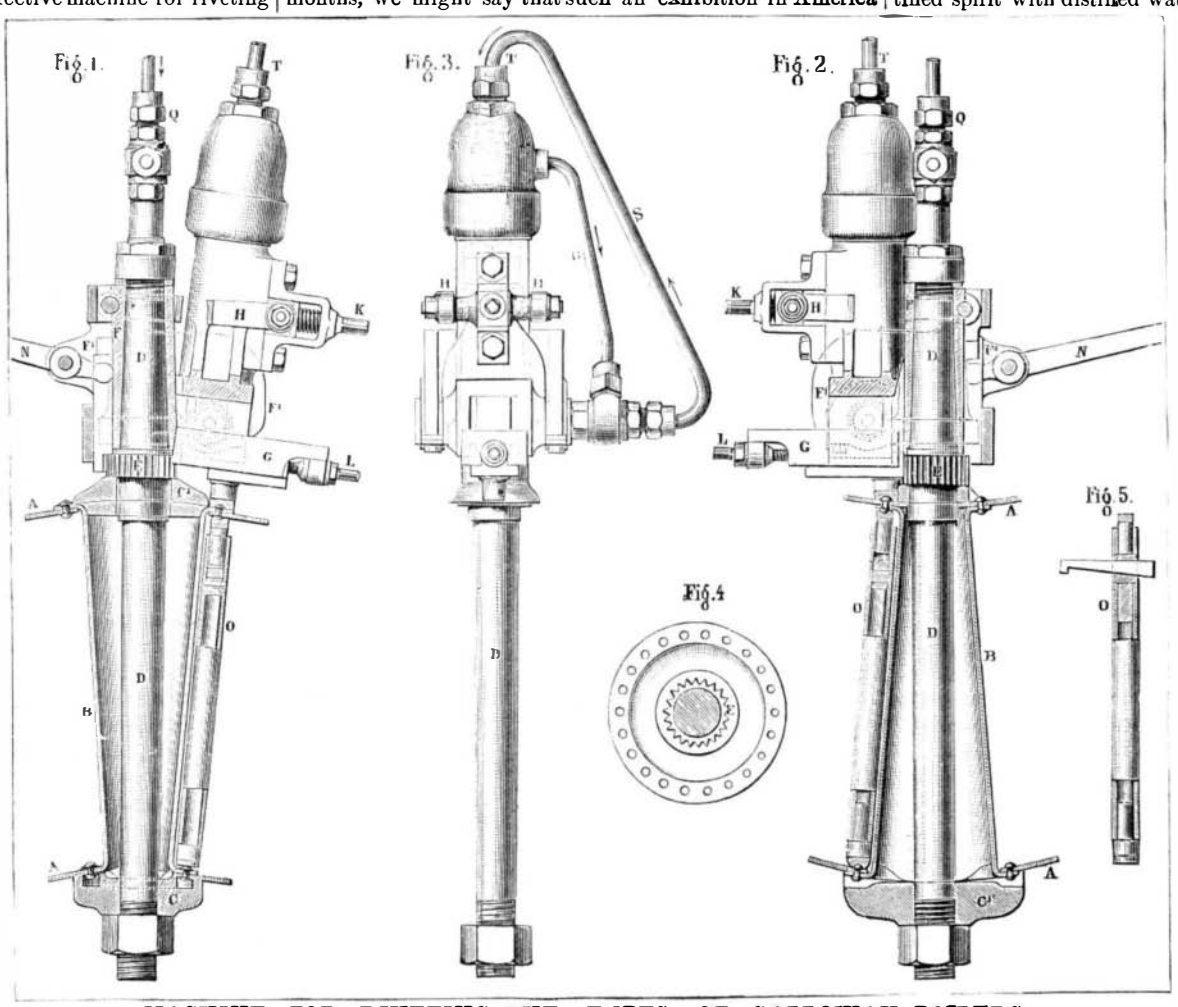
When all of the parts are in the required position they are made fast by turning the thumb-screw that bears upon the back of the iron.

This invention has been patented by Mr. William Steers, of Sherbrooke, Canada.

MACHINE FOR RIVETING THE TUBES OF GALLOWAY BOILERS.

Messrs. Galloway & Beckwith, of Manchester, England, have constructed a simple and effective machine for riveting the conical tubes of the Galloway boiler.

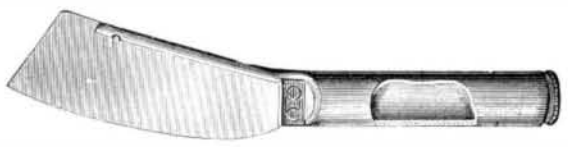
In the engravings, from *Annales Industrielles*, the walls of the boiler are indicated by A, and the tubes to be riveted thereto by B. Through the cast iron blocks, C and C′, at the ends of the tube, the shaft, D, passes, held at the top by gear wheel, E, at the bottom by a nut. The conical extension of the shaft, D′, is surrounded by a cast iron sleeve. By the lever, N, the sleeve can be locked in any desired position. A hydraulic riveter is pivoted between the jaws, F and F′, at the lower end of the sleeve, the upper end of the riveter being held by the rods, H, pivoted at the upper end of the sleeve. The inclination of the riveter can be varied at will by means of the screw, K. Since the die must be adjusted to the diameter of the tube to be riveted it is not attached to the piston, but slides in the box, G, and is held in any desired position by the screw, L. The die rest, O, carries a die at each end, and is placed in proper position by a workman within the boiler, the lower die being set over a rivet at the bottom of the tube, and the upper so as to hold the head of a rivet to be completed. The water reaches the piston, J, after passing through the rotating joint, Q, and the tubes, R and S.



MACHINE FOR RIVETING THE TUBES OF GALLOWAY BOILERS.

TOBACCO-LEAF CUTTING KNIFE.

The principal objection to the ordinary cigarmaker's knife is that after using it for a short time a gummy substance collects on the blade near its cutting edge, and unless this is frequently removed, the wrapper-leaf, while being trimmed, is liable to adhere to the blade, and the leaf is often torn in cutting, and rendered useless as a wrapper. The common way of removing this gum is by drawing the blade horizontally between the lips. This method is not only inconvenient and unpleasant, but its necessarily frequent repetition is a great waste of time and no doubt injurious to the health.



TOBACCO-LEAF CUTTING KNIFE.

The invention consists of the ordinary cigarmaker's knife-blade, attached to a hollow metallic handle closed at the end by a movable cap; the handle and a small tube extends from the handle along the back of the blade to within a short distance of the end. Near the end of the tube there is a small opening on each side of the blade.

The handle is filled with water and then closed by the cap The simple motion of the knife, when in the act of cutting, will force sufficient water from the small perforations in the tube to keep the blade wet, and thus prevent the accumulation of sufficient gum to interfere with the cutting. The blade in this manner is kept in order as long as any water remains in the handle.

This invention was lately patented by Mr. S. M. Dougherty, of Lancaster, Pa.

Manufacture of Wrapping Paper.

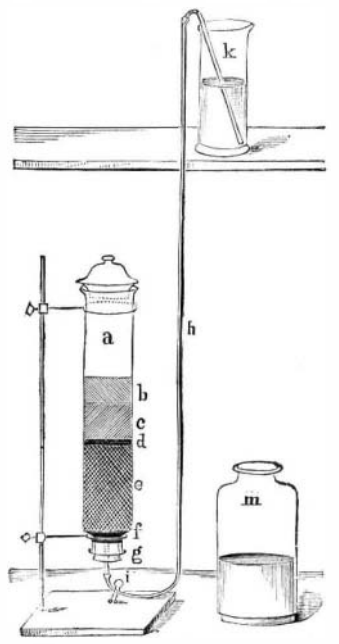
Nearly three thousand tons of wrapping paper were made in the month of October by the fifty-one mills included in the report of the Western Wrapping Paper Manufacturers' Association—an increase of one hundred and sixty-eight tons over the previous month's work. The amount on hand at the end of the month, however, was *less* than that of the month preceding—a fact which shows a healthy and active trade.

Electric Exhibition in New York.

The Operator, a paper devoted to telegraphic matters, suggests to American scientists, in view of the forthcoming exhibition of electricity in Paris, that arrangements be made for a similar exhibition in this country, at an early day, subsequent to the Paris Exhibition. America has, long ago, taken the lead in electrical research and invention, and such an exhibition in this city, the metropolis where Morse lived and died, or in Philadelphia, the home and final resting place of the immortal Ben Franklin, would be peculiarly appropriate, and, we believe, profitable. The quadruplex, the telephone, the phonograph, the microphone, and the photophone have all been invented, or have come into use, since the Centennial Exhibition, only four years ago, and, with the wonderful possibilities of even the next twelve months, we might say that such an exhibition in America would be not only a patriotic expedient, but an absolute necessity for the proper appreciation of the progress of electrical science.

IMPROVED APPARATUS FOR UPWARD PERCOLATION

Mr. William Elborne, in a paper entitled "The Recovery of Residual Tinctures from Marcs by Upward Displacement with Water," in pointing out the various processes heretofore proposed for the preparation of tinctures, draws attention to the objections which have been raised against the displacement of the residual tincture in the marc by pouring water upon it. He says: "It will be convenient to allude to these objections, as the result will show that they tend favorably in support of the process which I am about to bring forward: First, the specific gravity of water being higher than that of rectified or proof spirit, it naturally permeates down into the spirit, which at the same time has a tendency to rise into the water, thus materially assisting the diffusion or mixing of the two liquids; secondly, vegetable tissues, possessing a greater affinity for water than for spirit, the latter is readily liberated from them and rendered free to rise in the water. Having mentioned the disadvantages of this process, I arrive at that which forms the leading feature of this paper, namely, upward displacement or the removal of the residual tincture retained in a marc by means of water (the heavier liquid) rising from below.



ELBORNE'S APPARATUS FOR UPWARD DISPLACEMENT.

Working on this principle, the objections above mentioned are inapplicable, and the results are fairly satisfactory. One impediment, however, is the slight diffusion which takes place at the line of contact, but this may be partially remedied by using a modification of the menstruum. Of the group of tinctures prepared by maceration and percolation, the following proof spirit tinctures were made: Tr. aurantii, calumbæ, cinchonæ, cinnamomi, lupuli, rhei; and with rectified spirit: Tr. aconiti, and zingiberis (fortior). The quantity prepared of each was one pint, and in those made with proof spirit, spec. grav. 0·920, I used spirit having the spec. grav. 0·915, made by diluting the requisite quantity of rectified spirit with distilled water to 19 ounces instead of 20, and adding 2½ drachms extra of rectified spirit, thus allowing for the contraction of volumes, and for use of the mixture immediately. My mode of procedure is to powder the ingredients and macerate them with the whole of the spirit. spec. grav. 0·915, for the specified time with occasional agitation; the supernatant liquid is then drawn off, the dregs stirred up and transferred to a cylindrical percolator, and allowed to drop until the liquid passes clear and bright; the receiver is then attached, and both the turbid and supernatant liquids returned to the percolator. Instead of tying a piece of muslin over the bottom of the percolator, as is usually done, a cork is inserted with a hole bored through the center capable of admitting a piece of ordinary glass tube, above which is put an inch layer of coarsely pounded glass to prevent the orifice becoming choked. Percolation being complete, another half inch layer of glass is placed on the top of the marc to prevent the floating of solid particles. Having removed the receiver and supported the percolator on a retort stand, the open end of a piece of glass tube two inches long is inserted in the cork, the other end of the tube being previously drawn out in the flame so as to leave only a capillary opening. To this end