INACCESSIBLE MARITIME LIGHTS.

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The most unique system of electric lights to guide navigation is that in use at the entrance to New York Harbor. In order that the importance of the system and its necessity may be appreciated, a general map of New York Harbor (Fig. 1) is given and referred to for more detailed information.

New York Harbor has two communications with the ocean, one by way of Long Island through the East River and Hell Gate and the other through the Narrows, between Staten Island and Long Island. The latter is the only one now practicable for sea-going vessels of the larger class, and therefore is of vast importance to the commerce of the metropolis. There are two principal channels at the Narrows, as shown on Fig. 1; in fact, there are several channels across the entrance bar, used according to their depth. Nearly all of the coast steamers and sea-going vessels of moderate draught use the South and Swash channels, as these are by far more direct than by the extremely tortuous Gedney's and main channels, which constitute the only entrance to New York Harbor by the great ocean liners and deep draught ocean freighters. An inspection of Fig. 1 will show the impracticability of navigating these channels on a very dark night without some adequate system of lights in the channelway. The direct range light on shore is 13 miles distant. It was generally necessary for steamers to lie to outside for daylight before entering the harbor. The entrance was therefore practically closed at night to deep draught vessels. It was particularly necessary to light Gedney's Channel, the main channel being quite plainly marked by a sufficient number of range lights on the shore, and then, too, the channel is wider. It became still more important to light Gedney's Channel from the fact that the government had expended large sums of money in dredging it to secure a depth of 30 feet through it at mean low water, with a width of 1,000 feet. It became therefore proper to secure the largest possible results to navigation. The great distance of the channel from the shore made it necessary to adopt some system of floating lights. After studying several methods, a direct current system of electrically lighted spar buoys was determined upon and installed in 1888, the first exhibition of the lights being on the night of November 7.

In this original system the direct current method was used, and in the improved system alternating currents; the original system required a three-conductor cable of large size in two nearly parallel lengths from Sandy Hook point to the channel; the new method, one small cable only. The size of the direct current cables was 1⅝ inches, that of the new single cable $\frac{7}{10}\frac{8}{0}$ of an inch. The original system provided six lights, the new system ten lights; by the former the channel was lighted 4,000 linear feet, by the new system 8,000 linear feet.

As early as 1890 the great electrical and other advantages of the alternating current system of operating incandescent lights on long circuits led to experiments of testing it for lighted buoy systems. These experiments showed that the proposed method would be more economical and altogether more satisfactory. The experience gained at Chicago with a cable laid in the water from the Exposition to the city, about 7 miles, and further study and experiment, led to the very satisfactory method only recently installed at Sandy Hook and above mentioned. Figs. 1 and 2 will show clearly the new system. The spar buoys are juniper wood 50 feet long, held in place by mushroom anchors weighing 4,000 pounds. The lamps, which are attached to the top of the buoys, are 100 candle power of improved design, with 5 inch globes. The length of the cable used is about 6¼ statute miles, with

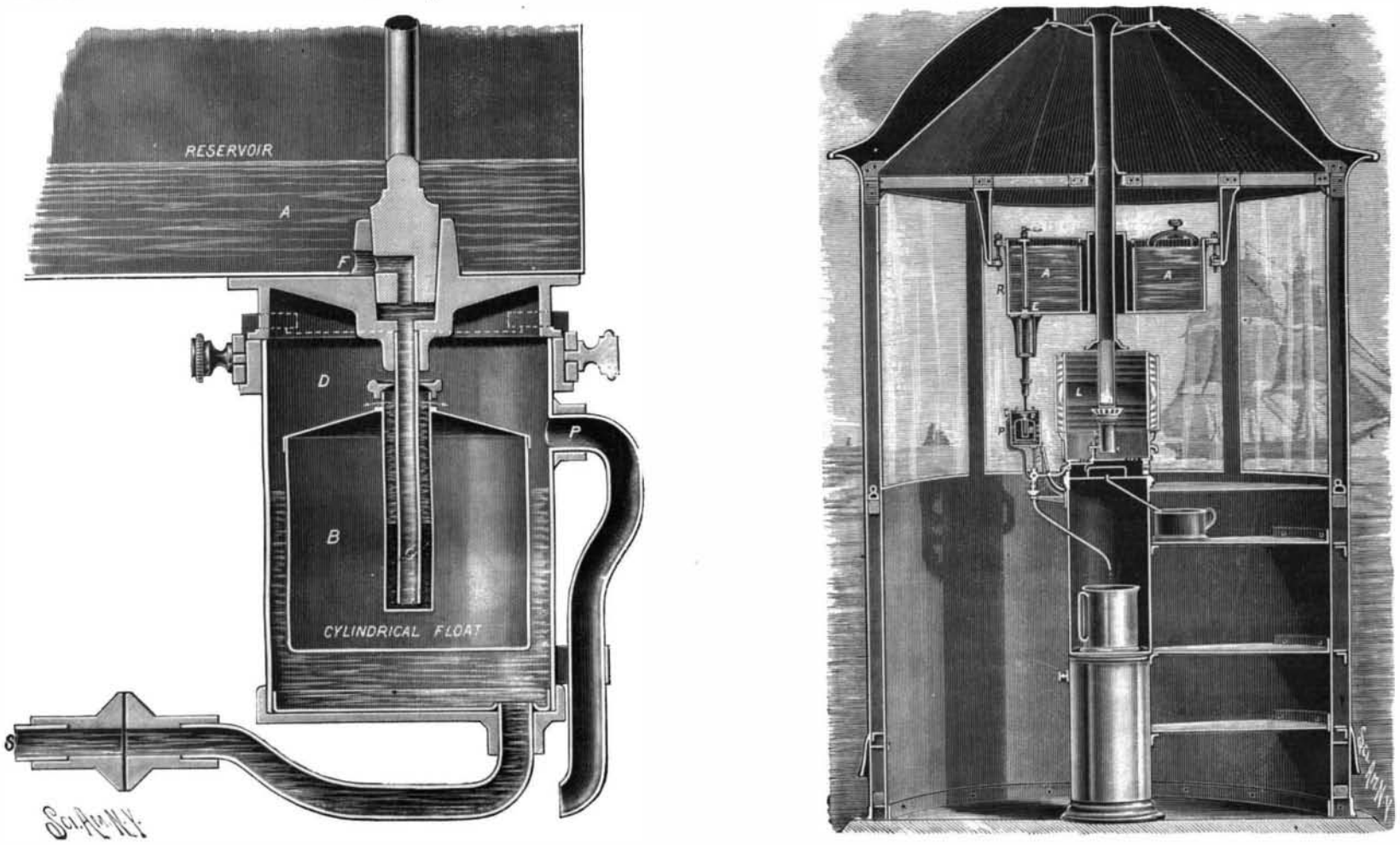

Fig. 3.—OIL RESERVOIR AND REGULATOR—FISH OIL LANTERN.

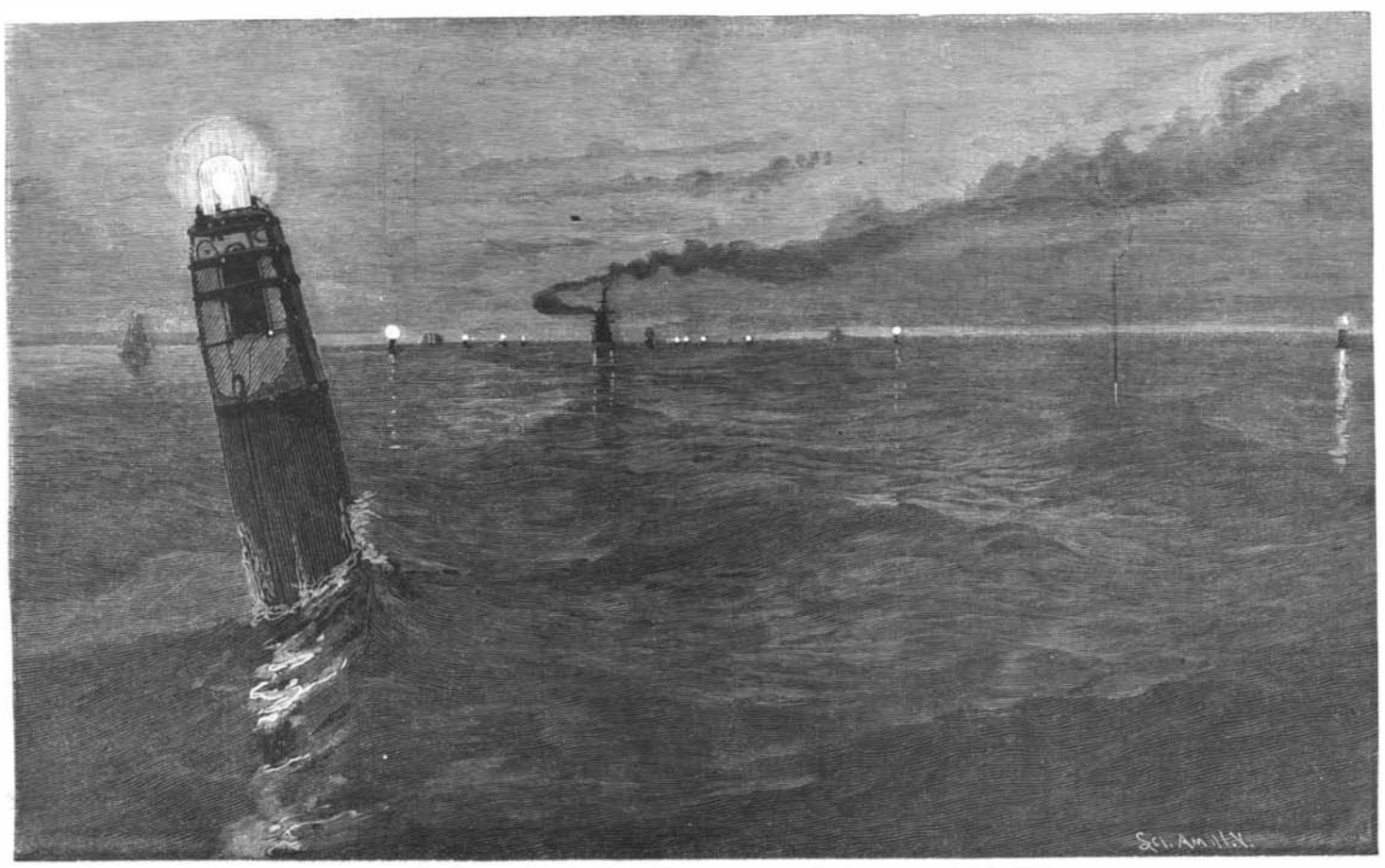

Fig. 2.—ELECTRIC LIGHT BUOYS IN NEW YORK HARBOR.

the additional length of nearly 2 miles to the southwest spit buoy.

We come now to perhaps the most fully developed method, that by common mineral oil. In Sweden and England, but particularly in France, has this method been highly perfected. Some very ingenious methods have been devised to overcome what will at once be seen to be serious obstacles, particularly the uneven burning of a wick and its early wasting away by being constantly lighted. It is well known that the chemical action upon a wick causes the light after a while to go out, but if the same charred wick be raised again it will continue to burn. In order, therefore, to obtain permanency to the lights, it is necessary to use a wick already charred and to regulate its height in some way so as to have a uniformly steady flame for perhaps several weeks without attention. It was found necessary to deposit upon the wick a layer of tar by a peculiar method of incrusting the wick. The supply of oil is in a reservoir, the capacity of which is sufficient to keep the light burning during the entire time it may possibly be inacessible. The decrease of pressure by the lowering of the oil in the reservoir is provided for by a very ingenious contrivance. It consists simply of interposing between the reservoir and the burner a supply regulator that serves to maintain a constant pressure of oil at the lamp. A section of this apparatus is shown on Fig. 3, in which S is the supply pipe to the lamp, A the reservoir, which may perhaps hold 100 quarts of oil, B a cylindrical float, D a cylindrical box in which B rises and falls, E is a gage and P a waste pipe. Without further description, it will be seen that the supply of oil to the box, D, is maintained at a fixed point, and the supply is renewed from the reservoir as the oil is consumed at the lamp, for the opening at F is regulated by the float and the latter by the supply in the box, B, and this is drawn upon by the supply tube, S, as the lamp burns. The supply, therefore, is made automatically, constantly and economically. The contrivance works with great sensitiveness and with entire satisfaction. The method is used at several points in France.

In order to give a more detailed idea of the method, a vertical section and horizontal plan of the light used at Morées is given, see Fig. 4. Some details should be stated. The lantern, with a diameter of 5¼ feet, supports the oil reservoir, R; the lamp, L, rests on a central column and supports the supply tube. A little railway is provided on which the lamp can be moved to one side for cleaning, etc. Provision is made for thorough ventilation by admitting air below, which passes up through the entire apparatus and out at the top, so regulated that it prevents the formations of mists and frosts or any other conditions that would obstruct the light or in any way affect it. The cost of the installation, with the necessary duplicate parts, is about $15,000. The apparatus established at Cette is similar to this.

Official information has been received through some recent correspondence in reference to the development of this system of mineral oil by applying an ingenious mechanism to make the lights revolve and flash.

The French lighthouse service has succeeded, by means of electricity generated from batteries, in maintaining a rotary motion of a revolving apparatus for at least two months without the care of a keeper. It applied a method which had previously been used in "lightening lights" to obtain permanent occulting lights in which the occultations are produced by a system of screens supported on a revolving mercury float, but the rotation had been performed by a clockwork movement. It was necessary to adopt some other rotating power. In the new method of rotation without clockwork the shaft itself which guides the float forms the axis of the armature of the electric motor. This armature consists of a Gramme ring containing 64 bobbins. The current from one cell enters the armature by means of two brushes which have an arrangement for adjusting the pressure. The inductor consists of two permanent magnets separated from the armature by a slight air gap. The current comes from two battery cells called "Bloc," filled with a soldified liquid, set up in series, and having a capacity of 550 ampere hours. Under these conditions a rotary velocity of about one revolution in ten seconds is obtained; this produces a proper rhythm, while a constant velocity is secured by means of a very sensitive regulator. The experiment shows that the apparatus may continue to revolve for five months without the intervention of a keeper. In practice, however, it would be well to change the batteries every two or three months. This would cost only about $50 annually.

A fuller treatment of this most interesting subject, in an important paper from the pen of the same author, will appear in an early issue of the SCIENTIFIC AMERICAN SUPPLEMENT. The above is an abstract of the more immediately interesting parts of the paper in question.

TWO-THIRDS of all the letters which pass through the post offices of the world are written by and sent to people who speak English.

Science Notes.

Hitherto no substance has been known which would absorb nitrogen gas at the ordinary temperature. M. Guntz has been the first to discover such a substance in lithium prepared by his own process, which rapidly and with incandescence absorbs nitrogen at a temperature below dark red. This observation has been confirmed by H. Deslandres, who has repeated the experiment for the purpose of preparing argon from atmospheric nitrogen, as well as from gas from the spring of Maizières (Cote-d'Or).—Revue Industrielle.

A biography of Prof. Huxley is now being prepared by his son Mr. Leonard Huxley. All who are in possession of letters or other documents of interest to the biographer are requested to send them to him at Charterhouse, Godalming, Surrey, England. They will be returned after being copied.

M. Moissan has been elected president of the Chemical Society of Paris.

The British warship Penguin, while engaged in making deep sea soundings between Tonga and New Zealand, got bottom at 5,155 fathoms. This surpasses the American warship Tuscarora's record off the northeast coast of Japan, when bottom was reached at 4,655 fathoms.

The Heat in Australia.—Mail advices bring details of the unprecedented period of intense heat which afflicted Australia during the first two weeks of this year. The warm wave seems to have extended over all of Australia. For two weeks the temperature was nowhere below 90° F. and in some localities it reached 122° in the shade. There were many cases of sunstroke, horses dropped in the streets and, with cattle and sheep, died by hundreds in the fields. Springs, creeks and wells dried up and the damage to crops was very great. Many bush fires occurred as the result of the great heat. An unusual feature of the heat wave

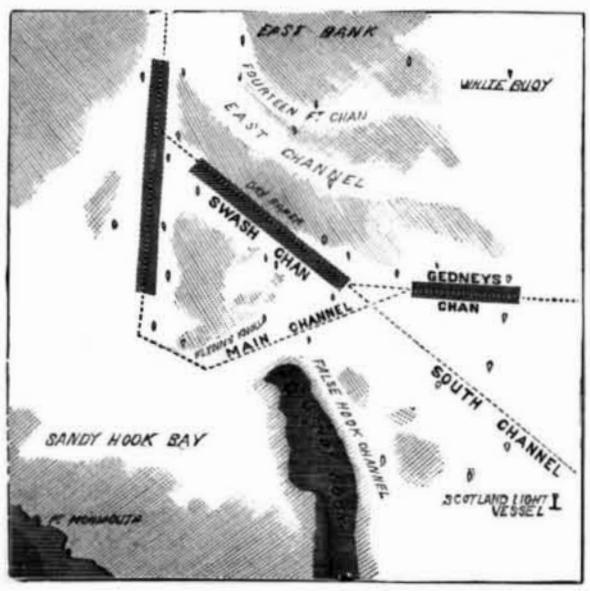

Fig. 1.—CHANNELS OF NEW YORK BAY.

was that a high wind blew most of the time; in some places the velocity of the wind was fifty miles an hour. It brought suffering instead of relief, as it was like the blast of a furnace and blew blinding clouds of dust as well. The heat was felt for a long distance out at sea.

It is said that the Swiss calcium carbide made at Neuhausen yields a large quantity of acetylene gas, from 4·01 to 4·81 cubic feet being produced from a pound of the carbide.

The Royal Academy of Medicine, of Belgium, offers prizes of 25,000, 8,000 and 5,000 francs for the most valuable researches on diseases of the central nervous system, with special reference to epilepsy. The competition closes September 15, 1899.

M. Flammarion, in the course of experiments on the radiation of spectrum colors, has made some interesting observations on sensitive plants. Four plants, sown the same day and of the same size, were placed under glass, excluding respectively all but the red, green, and blue rays, the fourth plant being under ordinary white glass. At the end of six weeks the red plant was twice as high as any of the others, the green came next, then the white, while the blue had not grown the fraction of a centimeter. The red plant was healthy, but abnormally nervous, curling up at a breath. The plant kept under white glass, exposed to the ordinary sun rays, though third in the order of growth, was vigorous and stout.

A German "viking" ship, said to be about 1,000 years old, has been discovered near the East Prussian frontier. It is 40 feet long, and the remains are fairly well preserved.

Corrosion of Aluminum.—Herr Donath, according to the Gas World, says that aluminum is not at all attacked by boiling distilled water free from air, but that it is distinctly attacked by ordinary boiling water. Gypsum in the water renders it harmless, but chlorides, and especially nitrates, make it attack the aluminum. Fat or carbolic acid have no effect by themselves; but with ordinary water, boiling seems to make these attack the aluminum. How about our new aluminum kettles if this be the case? Herr Zmerzliker confirms these results, and says that hydrogen is given off.

That botanical gardens are popular in England is shown by the following figures: The visitors to Kew Gardens in 1895 numbered 1,407,369; the total for 1894 was 1,377,588, the average for 1885–94 was 1,416,887; the total number on Sundays was 536,181, and on week days 871,188; the maximum number of visitors on any one day was 13,583, on June 3, and the smallest 104, on November 28.

Dr. Kitasato, of Japan, is reported to have discovered a remedy for leprosy by inoculation.

It is found that a 50 year old camphor tree yields about 173⅓ pounds of camphor, and that a still, charged with about 200 pounds of camphor wood chips, yields from 4½ to 7 pounds of camphor as a fair day's work. The chips are boiled in water over an open fire, and the resulting steam, upon cooling, yields both essential oil of camphor and camphor. In Formosa, most of the oil is thrown away; in Japan, it is employed in lacquer making and for other purposes.

The metric system came into force in Turkey on March 1. The local authorities have received instructions to call together the various trade corporations in order that they should provide themselves with the new weights and measures. The metric system becomes compulsory this year in Mexico and Costa Rica. It is recommended in the British Parliament that it be rendered compulsory in England in two years. In the United States serious consideration is being given by the House Committee on Coinage to the bill introduced by Mr. Hurley to make the metric system mandatory in all official transactions after July 1, 1897, and in all private transactions after July 1, 1899.

La Nature contains a short note in which the horse power of a cannon is calculated. An Italian cannon of 100 tons, with a charge of 550 pounds of powder and a shot weighing about 2,000 pounds, will give an initial velocity of 523 meters per second; the length of time during which the power acts is less than one hundredth of a second, from which it follows that the horse power developed is about 17,000,000. The writer adds that after about 100 shots the cannon is put out of service, and its total active life is therefore only one second. In large modern cannon the horse power runs as high as 24,000,000. If the writer had carried out these calculations still farther, he would have found that, after all, this 24,000,000 horse power does not represent a large amount of energy, as it would be just sufficient to run 31 incandescent lamps for only one day.

The Russian government is to send an expedition to the Amoor to observe the eclipse of the sun on August 9. It will be under the charge of three astronomers from the Pulkowa Observatory. An American expedition will go to Japan to observe the same eclipse.

The Italian statesman, Chevalier Cristoforo Negri, who was born in Milan in 1809, has just died. He founded the Italian Geographical Society, and spent much time in promoting expeditions to Central Africa and to the polar regions.

Pictures Under Artificial Light.—Interesting experiments are now being conducted in the South Kensington Museum, London, relative to showing pictures under artificial light. Capt. Abney has closed a skylight with alternate layers of green, blue and yellow glass. All of the most important actinic rays of light are thus excluded. Artists say that the pictures exhibited under this light are seen in their true colors. The rays which cause paintings to fade are excluded, and the effect of white light is obtained. The experiment is being tried in the Raphael Cartoon Gallery. The general public do not appear to notice any difference between the lighting of this and that of the other galleries.

Oil of cassia has a higher refractive index than cedar oil, and Dr. H. G. Piffard, of New York, finds it brings objects examined in it into sharper contrast. In a paper read before the New York Academy of Medicine, he stated he had worked with a sample having a refractive index of 1·593. Bacilli, examined in this oil, exhibited an unrivaled brilliance and sharpness of contour. The minuter details also, such as spores, flagellæ, etc., are shown with a distinctness impossible in cedar oil. The oil of cassia, like the oil of cloves, tends to abstract the color from bacilli stained with some of the aniline dyes, a disadvantage not shared by cedar oil, but it is stated that this does not take place with sufficient rapidity to interfere with the diagnostic examination.

CELERY OIL.—This is a new industry which Germany is endeavoring to foster. Distillers of essential oils have experimented with the distilling of celery during the past season, producing a few pounds. It is distilled from the green leaves, possesses the powerful aromatic odor and taste of the plant, and may arouse considerable interest among manufacturers of concentrated soups and preserved meats and vegetables. It requires 100 pounds green leaves to make one pound of oil. If it proves feasible to distill celery for flavoring purposes, why not utilize other herbs in the same manner for like purposes?