by mounting the disk upon a proper sort of tachometer, the faculty of accommodation being connected with the appearance of the colors, and, consequently, with the angular velocity of the disk.

It is for simplifying the reasoning that the diagram is drawn for two series of rays solely. The intermediate colors in the same manner produce margins of intermediate colors that give yellow and green upon the intermediate bands.

The distribution of the colors evidently changes with the direction of rotation of the disk, and the exterior edges of the lines are fringed as were the interior edges in the opposite direction of rotation. Between the black masses and the white lines the margins of the white lines are red. Between the white masses and the white lines the margins of the latter are violet.

Such is the theory of the phenomenon as given by Mr. Gray. It does not, perhaps, present that degree of clearness and precision to which we are accustomed in the study of optics. The field remains open to investigators for varying the experiments and completing this first exposé.

We take the foregoing from La Nature, and subjoin two modified forms for the surface of the top, given by Mr. Charles E. Wolff, a correspondent of Engineering, who says, in a recent number of that publication:

When the top first appeared, I made an obvious modification (shown in Fig. 3) to try and obtain a more continuous spectrum. This was quite successful, as might be expected. The next step was to fill up the white lines, producing a continuous spiral band of black, as shown in Fig. 4, which gives a continuous spectrum.

Now, if we suppose the colors to be produced by a sort of chromatic irradiation of the white lines over the black, this latter form should have been a failure, which is not the case.

Instead of a top, any one may try this experiment by making diagrams like the above on cardboard and using a central pin to spin the same like a top.

Writing to Nature on the curious phenomena exhibited by the spectrum top, in which black and white markings give, when revolved, an impression of colors, Mr. Dawson Turner describes an arrangement constructed by Mr. T. J. Walls, of Edinburgh, by means of which the effects in question may be shown upon a screen to a large audience. The markings are painted on a disk of glass, placed in a projecting lantern, and revolved by a multiplying wheel. A great variety of effects are producible in this way by interposing colored glasses in the path of the beam of light. Thus, with a green glass, and in diffused gaslight, the dark marks appear mauve colored when suddenly stopped after rapid rotation, or when very slowly rotated, but become of a dark blue when the gas is turned off. On rotating the disk in the usual way, the lines upon it appear to be blue, green, and violet. With a blue glass in gaslight, the markings on the disk appear to be yellow when suddenly stopped, but a fine purple without diffused light. The colors given by the lines at a moderate rate of speed are red, gray, green, and blue. With a monochromatic red glass, the lines appear to be blue, gray, red, and dark red. The appearance of blue by red light is remarkable. Mr. Benham, the inventor of the top, thinks that the phenomena of color presented by it have nothing to do with the wave theory of light, but are purely subjective. It has been suggested that they are due to visual fatigue on the part of the observer.

The Treatment of Colds.

Now that the time of year has arrived in which extra precautions must be taken against contracting acute catarrhal inflammations of the respiratory tract, it may be well to inquire into some of the causes which lead to the production of these diseases, and the most efficient methods of treatment.

As the warm days approach, alternating as they frequently do with a brief cold spell, the habit of laying off winter clothing becomes seemingly imperative. The dust and germinating animalcules which float about in the air are active local irritants to the mucous membranes of the respiratory tract, and the two agents go hand in hand for the production of colds.

The relationship between a cold and influenza is not marked. We have been so accustomed to call every little cold "an attack of the grip" that we run great danger, therapeutically, of hitting wide of the mark. Grip is a distinct, emphatic disease, which, when one has it, he is not very apt to mistake for an ordinary cold; while if one thinks he has the grip, but is not quite certain of it, the malady is pretty sure to be the ordinary cold.

In the treatment of colds the danger lies not so much with the inflammatory condition itself as in the liability which arises from continued irritation or direct extension of the inflammatory conditions to lung structures. Many an incipient phthisis arises from a simple cold.

Once thoroughly inaugurated, these spring colds usually occupy about a week of time, with the aid of the various remedies employed. The dangers are that we overcrowd remedies without regard to the pathological conditions presented. We must bear in mind that the system must become accustomed to a new condition of affairs, and that great prudence is necessary in exposing one's self to outdoor temperature without sufficient protection.

It is possible in the early stage of a cold, especially when such is of the nasal variety, by thoroughly irrigating the nose twice a day with warm water in which a little borax has been placed, to abort an attack. No syringe is necessary; but by simply immersing the nose in a basin of water, and making forcible inspiratory and expiratory movements, holding the breath at the epiglottis, the nasal passages may be thoroughly irrigated. Of course there are advantages in the syringe, which may be preferable from the standpoint of neatness.

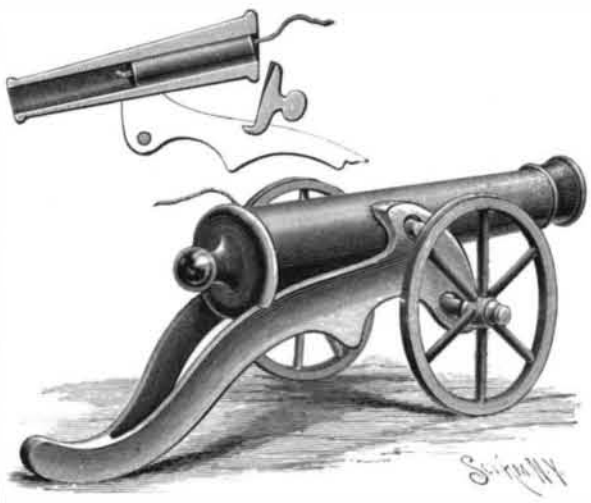
Aconite holds an excellent place in aborting colds, but care must be taken in its employment that fresh colds are not contracted. The dose usually employed should be a drop an hour, or half hour, as the severity of the case requires, which should be maintained until free perspiration results.

Quinine may also be employed, as well as the coal tar derivatives, but these are not as efficient as a well directed course of treatment by aconite.—Times and Register.

A CANNON TO BE LOADED WITH FIRE CRACKERS.

The illustration represents a breech-loading toy cannon in which a fire cracker is used for the load, the fuse or stem of the cracker being carried upward in a channel of the breech block for lighting, to explode the charge. The improvement has been patented by Mr. Milton J. Shimer, of Freemansburg, Pa. The cheeks of the carriage stock are curved inwardly, and have slots which receive the trunnions of the cannon.

At the rear of the cheek extensions a breech block is formed which may be integral with the carriage or at-



SHIMER'S TOY CANNON.

tached to it in any suitable manner. The cannon may be inclined to carry its breech upward to facilitate loading, as shown in the small view, but without being disconnected from the carriage, as the muzzle cannot be carried sufficiently downward and rearward to admit of the trunnions being displaced from their bearings.

An Inconsistent Policy.

The short-sighted and inconsistent policy which seeks to close to young men all entrance to the trades, and at the same time allows, without protest, the great influx of foreign workmen, needs little comment. It is intrinsically selfish and unnatural, and being such cannot long continue. The trade school has come to stay. It has come in answer to a great need, and must develop in answer to that need. The right of American youths to enter the trades, and to equip themselves in the most economical manner for a livelihood, cannot much longer be gainsaid or set aside. What might, under other conditions, become the tyranny of a class cannot long exist beside the free institutions of our country. On the contrary, the true interests of organized labor are to be found, not in futile opposition, but in active participation. The opportunity is at hand for the labor organizations of the country to actively influence and, to a certain extent, direct the trade school movement. By co-operation with the schools they can do much to realize the highest opportunity for usefulness that is open to them. By selfish and bigoted opposition they will do much to cripple and narrow their own power. A comprehensive system of trade training suited to the times would involve the recognition of the trade school graduate by the trade organizations of the journeymen, as well as of the masters, and his establishment with a definite place and a definite economic value in the industrial world. Such a system, while effectively preventing the admission of imperfectly trained workmen, would afford ample opportunity to every naturally qualified candidate. An arrangement of this kind would open the doors of the trades to American youth, without requiring the sacrifice of all opportunity for culture that is now demanded. Such an arrangement would mean to a large extent the Americanizing of the trades—it would mean the addition to our industrial army of young men who have had the opportunity of a good public school education, and who are fitted to assume the duties of citizenship with intelligence and patriotism, as well as to attain to the highest efficiency in the operation of labor.—Sanitary Plumber.

How to Fight Microbes.

A writer in the Evening Telegram very truthfully says that water, air, and sunshine are the best sanitary agents.

Within a few days the warm rays of the sun will begin their work of penetrating into the secret corners of the back yards and alleys where the snow and ice have kept in check for four or five months the disease-breeding bacilli, and the work of freeing the millions of disease microbes which have lain dormant for so long will have been fairly launched.

Water and air are the greatest sanitary agents. The germs of many of the worst diseases are conveyed in drinking water, and it, therefore, becomes a duty to use pure water only. Fresh air is something we all may obtain without money and without price. Sunshine is easy to obtain under most circumstances. There is nothing which will kill disease germs so quickly as the application of fresh air and the rays of the sun. Although the germs of most diseases may be frozen solid during the winter, without resulting in their destruction, hot water will kill them under ordinary circumstances.

Water can be rendered perfectly pure and safe by boiling and filtering. It is dangerous to drink water which has stood overnight in a closed room, especially in a room which has been occupied by persons or other living animals. Not only should the body be bathed systematically, but every nook and corner of the house, of the cellar, and the door yard should be closely scrutinized at this time of the year, and every particle of dirt of whatever character removed. It is impossible to tell how many microbes of disease may be lurking in a handful of dirt found in the corner of the woodshed or in the cellar or under the disappearing ice and snow in the yard.

Disinfectants should be used freely in all suspicious places, but even the best disinfectants will not purify the air without the aid of the sunshine, wherever it is possible to give the latter access. Copperas is a good and cheap disinfectant for many purposes. It is easy to obtain, and readily dissolves in warm or cold water. It should be used in the proportion of two pounds to the pailful of water.

Chloride of zinc is superior to copperas as a disinfectant, but is more expensive, and therefore not so available when large quantities are required. The proportion is half a pound to the gallon. This is a very effective solution to use in kitchen sinks, house drains, etc.; also in vessels used about the sick room. Corrosive sublimate in a solution consisting of one part of the salt to a thousand parts of water is one of the most effective disinfectants known. It is a poison and should be handled with great care. Quicklime and chloride of lime are valuable to scatter around wet places, under buildings, in stables, etc. A solution of sulphate of zinc, one pound; carbolic acid, two ounces; and water, four gallons, answers every purpose for washing soiled clothing taken from a sick room. After washing the bed linen and other clothing in this a thorough boiling will destroy all disease germs.

Fumigation will reach every corner where germs of disease are apt to lurk. The best thing to burn for this purpose, as well as the cheapest, is sulphur. But fumigation is not worth much unless all the windows, fireplaces, flues, keyholes, doors, and other openings are securely closed by having strips of paper pasted over them.

How to Find the Horse Power Expended in Climbing a Hill With a Bicycle.

An experiment which may be performed by any one riding a bicycle is the determination of the horse power of the rider, by a simple calculation after the ascent of a hill. The mechanical equivalent of a horse power, being 33,000 pounds raised through a distance of one foot in one minute, may be directly applied to a machine and its rider. The only requirements besides a man and wheel are a stop watch and a steep, smooth hill of known altitude. The hill should be steep enough to prevent one from ascending with any great velocity, and thus have the wind resistance vitiate the result. The weight in pounds of machine and rider being almost always known and the time readily taken, the altitude of the hill can be found by a level and staff. It will be seen that the length of the hill does not matter, so long as the incline is steep enough to prevent fast riding when the whole energy of the man is expended in propelling him up the grade. The figures found, when compared with the ones above, give the horse power in a pretty accurate way. N. MONROE HOPKINS.