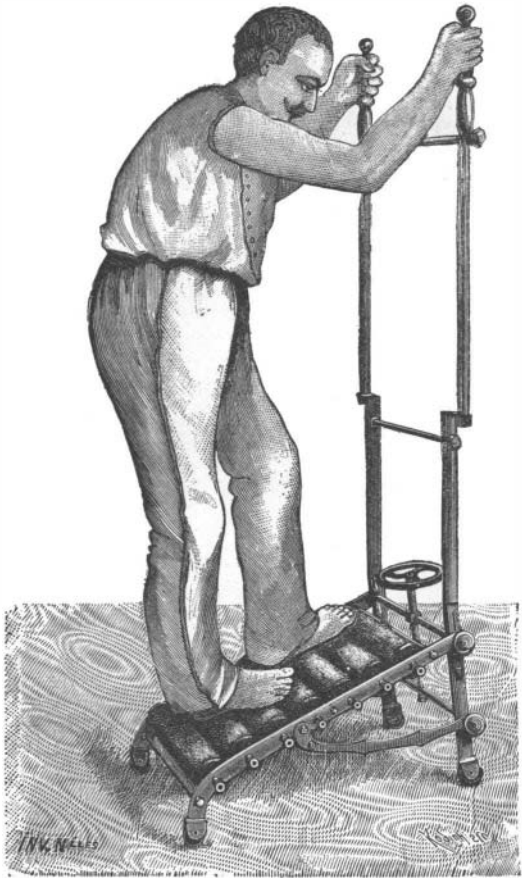


THE HYGIENIC TREADMILL.

Gymnastics are much in vogue at the present time, and the apparatus illustrated herewith is intended to assist in the development of muscular force in a similar manner to that obtained by walking or running, without the necessity of leaving the house and of being exposed to the inclemency of the weather. The apparatus illustrated also gives relief to those troubled with obesity, as exercise with it tends to a reduction in weight without the fatigue attendant upon going to and from places where more scientific treatment is administered.

It is composed of an inclined plane formed by a series of rollers kept in place by axles running in the side pieces, which, with the pieces at the end uniting them, form the principal part of the apparatus. The rollers and their mountings rise and fall in a groove in the upright support, which is composed of two uprights fastened together by cross pieces at several places. These upright pieces form the points of support for the persons making use of the apparatus. The



THE HYGIENIC TREADMILL.

rollers are made of wood covered with cloth over stuffing, or covered with rubber, which gives greater purchase for the feet. The method of working is very simple. The person desiring to exercise mounts the rollers, which are set in motion by the weight of the body. By their motion they tend to carry the feet to the lower portion of the apparatus. This can only be counteracted by a brisk movement of the limbs and feet, similar to walking or running, and must be kept

up continually, or the feet will be thrown off the apparatus. The amount of the exercise can be regulated by raising or lowering with the screw. The higher the top of the inclined plane, the more violent the exercise. The effect produced by the rapid motion of the limbs is to produce a sensation of heat over the entire body, equivalent to that obtained by running or a long walk.—*Les Inventions Nouvelles.*

ROD AND RING EXPERIMENT.

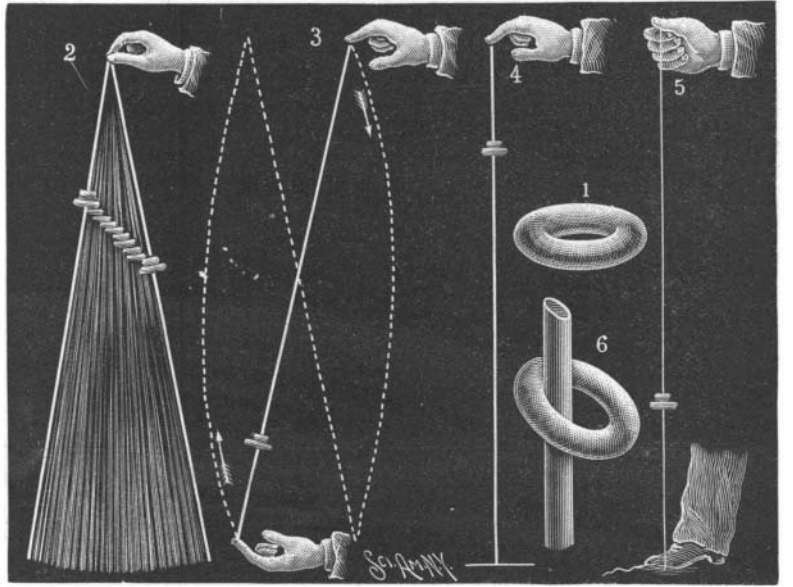
BY GEO. M. HOPKINS.

A curious result of the combination of the force of gravity and of centrifugal force is illustrated in the annexed sketch. The experiment here illustrated is very simple, requiring for its execution only a rubber umbrella ring and a small rod or smooth string. The ring is placed over the rod and twirled. It keeps up its rotation while slowly descending, and it will persist in maintaining its motion when the rod is swung like a pendulum as shown in Fig. 2. By dextrously turning the rod end for end before the ring completes its excursion, the operation will be reversed and the ring will again travel downward. When the rod is held vertically, as in Fig. 4, the best results are secured. A smooth string answers a very good purpose when strained in the manner shown in Fig. 5, *i. e.*, with the upper end of the string grasped firmly by the hand while the lower end is held to the floor by pressure of the foot.

This experiment is capable of some modification; for example, a pure rubber tube may be substituted for the string, or, with a rod inserted in it, it may be substituted for the rod, and a light metal ring may be used instead of the rubber ring.

The explanation of the behavior of the rubber ring will be readily understood by reference to Fig. 6, from which it will be seen that the line of contact between the ring and the rod is oblique; in fact, it corresponds to a portion of the spiral described by the ring in its passage down the rod. The friction due to the pressure resulting from centrifugal force prevents the ring from making a direct line of descent, while its inclined position compels it to take a spiral course down the rod.

The ring rolls by internal contact with the rod, but, to make one revolution on its own axis, it must roll around the rod nearly as many times as the diameter of the rod is contained in the internal diameter of the ring.



ROD AND RING EXPERIMENT.

yet so impure that its continued use deteriorates the health and vitality, so that its victims succumb readily to such germs when they do attack. And though the proclaimed "cholera-strassen" be rigorously closed, and their occupants compelled to find other quarters, this is but a drop in the cup, for there are too many such equally unhealthy "strassen" to make it possible for all to be closed without further and most dangerously overcrowding the poor streets into which their evicted tenants must pour.

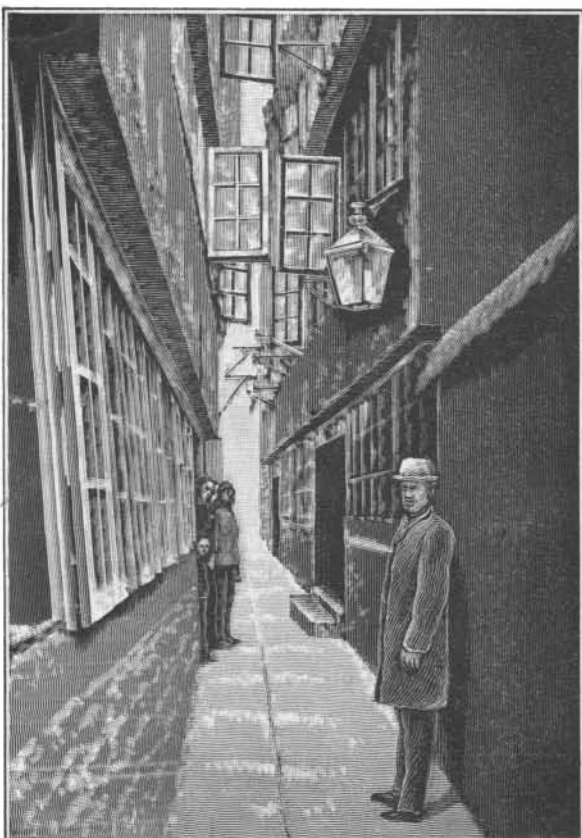
During the winter building operations must be practically at a standstill, and the spring will be upon us almost before there has been time even to make plans of the new houses which are to rise upon the ruins of the old. Many thousands of persons must, therefore, continue to occupy tenement houses so closely crowded together that one can almost touch hands from the windows of opposite houses; with doorways so low that a man must bend his body to enter; while upon the narrow, ill-paved footway more or less of the refuse of the overfilled houses is thrown.

On one occasion, during my stay in Hamburg, observing a quiet, orderly crowd in one of the main streets, I stood to see its cause. I found it arose from the fact of a number of work people, who, returning from some manufactory, were filing into the narrow street in which they dwelt. This was so constructed that the passage to it ran under part of a tall building

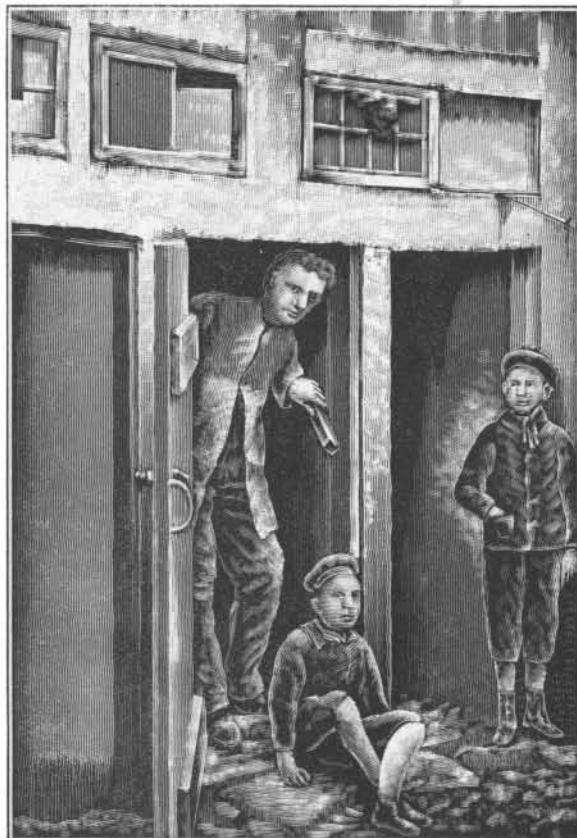
SOME OF THE "CHOLERA STREETS" IN HAMBURG.

BY ANNESLEY KENEALY.

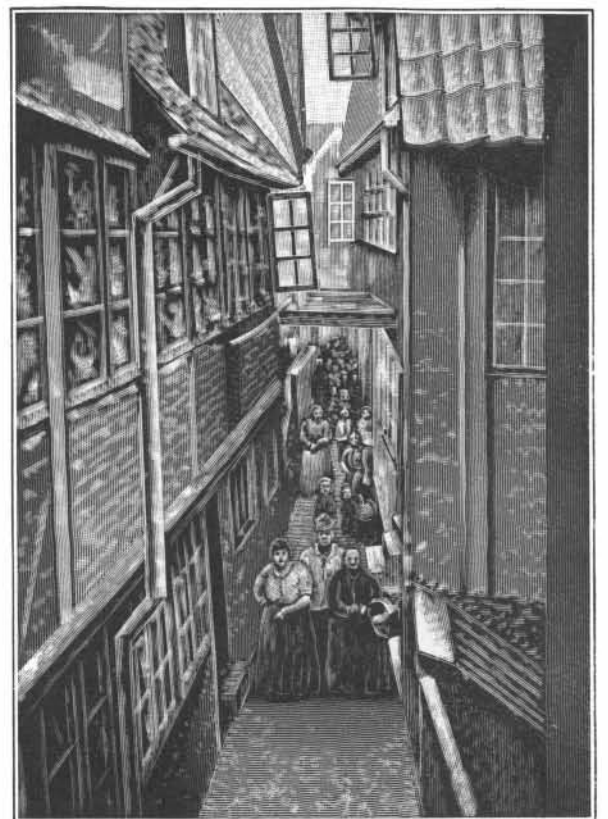
It was believed in Hamburg during the "terror reign" of the recent epidemic that the coming spring will see a revival of some, at least, of its horrors—that, with the bursting of the new year's buds, the seeds of disease, also having lain dormant during the winter months, will rise again into existence and more or less



No. 22 STEINSTRASSE.



No. 36 ALTST. NEUSTRASSE.
SOME OF THE STREETS IN HAMBURG.



No. 22 NIEDERNSTRASSE.

which blocked the whole upper entrance, leaving only a sort of doorway below, capable of admitting only one person at a time. Inside the street, which was a long and crowded one, two persons could walk abreast; and so they wended their way, turning off singly or in groups into the low, dirty doorways that led to what they called "home."

To beams stretched across from house to house between the upper stories lines were attached, from which many ill-washed, ragged garments drooped—I had been on the point of writing "fluttered," but that would indeed have been an exaggeration of speech in dealing with the powers of the languid air that stagnated there.

The few opened lattice windows almost met across the street, so that close, unwholesome rooms practically ventilated themselves into rooms equally close and unwholesome. That the atmosphere within was better than that outside I should have been glad to believe, but when I noticed sundry sickly-looking, fallow mortals come to the doors and windows and breathe in with evident relief the exhalations of the squalid street, I was bound to conclude otherwise.

And this was only one of many such which will certainly not be a thing of the past by the time the primroses come. A very eminent chemist, in the face of the inherent vitality of disease germs, has characterized disinfectants as dangerous on account of the false security they engender; and certainly any attempt to destroy by means of disinfection the evil factors that must abound in "rookeries" such as I speak of, would exemplify the very dangerous possibilities of the story of disinfectants.

Only the wholesale destruction of these places, and a religious devotion to the flame of their remains, will meet the demands of the case. Until this has been done, and the picturesque, gloomy haunts of disease have given place to the somewhat inartistic highways of sanitation, we may not be surprised if the offended household gods testify their wrath by epidemics like the recent one.

And humanity is so essentially one large family that Dives is infected by the cholera-stricken Lazarus at his gates. Not only this, but Lazarus at the uttermost ends of the earth may, in his primitive ignorance of sanitation, generate a bacillus which shall cross oceans and continents and rivers, and fasten upon Dives of distant race and clime, though he dwell on the very heights of sanitary science. So it behooves us to be wary in this portentous coming spring. Our illustrations are from photographs by E. H. A. Schlitte, Hamburg.—*London Graphic.*

Interesting Power Transmission Plant.

The San Antonio Electric Light and Power Company recently turned on the electric lights in San Antonio Canyon, says the Los Angeles, Cal., *Express*, and everything was found to be in perfect shape for furnishing Pomona and vicinity with light and power. The wires have been run all over the city, and the power house is nearly completed. The power plant is located in the San Antonio Canyon, where there is a minimum flow of 1,300 cubic feet of water per minute, with a head of about 400 feet. The water is brought to the power station through 1,900 feet of 30 inch and 600 feet of 24 inch double riveted sheet iron pipes, which involves a loss of head by friction by 12 feet. The laying of the pipe line necessitated a rock tunnel 1,300 feet in length, as well as several heavy open cuts. The power station is provided with four double-nozzle Pelton wheels, 34 inches in diameter, coupled directly to the armature shafts of as many Westinghouse alternating current generators of 200 horse power each. The wheels run at 600 revolutions per minute. Two exciters are provided, which are also run by Pelton wheels coupled to the shafts in the same manner, 20 horse power each. The current thus generated is carried on two No. 7 bare copper wires seven miles down the canyon to a point where they diverge, one running to Pomona, 15 miles, and the other to San Bernardino, 28 miles. By means of transformers the potential is raised at generating station to 10,000 volts and the current carried at this pressure to sub-stations located just outside the cities named, where, by means of step-down transformers, it is reduced to about 1,000 volts, and then distributed for both light and power purposes. The mo-

tors used for power purposes are of the Westinghouse synchronous type. The sub-stations are provided with regulators, by means of which the attendants can regulate the voltage of the distributing circuit independently of the generating plant.

IMPROVED RECORDING PRESSURE GAUGE.

The gauge shown in the accompanying illustrations is designed to register extremely low ranges or variations of pressure, such as those due to one-tenth

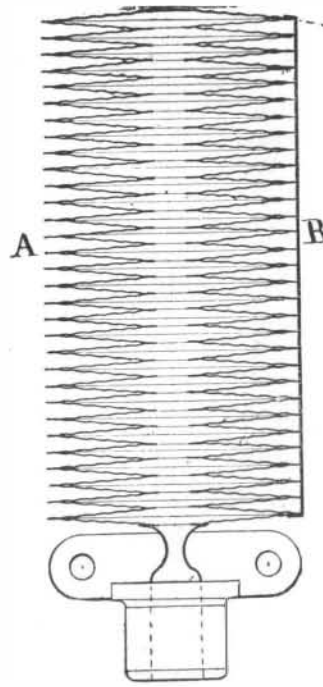


Fig. 1.—DIAPHRAGMS OF GAUGE.

of an inch or so in the head of water, as in the case of illuminating gas in street mains, where the total range rarely exceeds two ounces per square inch, or its equivalent, four inches head of water. For such very low pressure it is necessary to have a very large area for it to act upon, and this is afforded by employing a series of corrugated diaphragms, A, placed as shown in cross section in Fig. 1. The diaphragms are arranged in pairs and joined, as shown, with a continuous opening through the line of centers of the different pairs, thus permitting the pressure to exert itself simultaneously on the interior of every pair, the effect of variations being to produce an elongation of the whole. This arrangement of diaphragms is employed in the construction of certain self-registering barometers, the small motion of the diaphragms being made available by a train of multiplying mechanism. In the gauge the disadvantage of using multiplying devices is entirely obviated by securing a flexible strip, B, along the edges of the diaphragm tube, as it might

It follows that none of the diaphragms will be strained to their elastic limit, and all danger of the gauge taking permanent sets will be avoided. In the application of the diaphragm tube to a recording gauge it is mounted on a back as shown in Fig. 2. A recording pen is attached directly to the end of the diaphragm tube, and a clock is provided, as shown, timed to revolve a dial, in the plane of movement of the pen, once in twenty-four hours. In Fig. 3 the gauge is shown complete with chart ready for application. The small graduations on the chart indicate tenths of inches head of water. This form of tube is not limited to recording gauges for light pressures only, but may be used for all ranges if the diaphragms are properly proportioned as to size and thickness of metal.

The successful operation of this gauge was described by Mr. W. H. Bristol, the inventor, at the late meeting of the American Society of Mechanical Engineers. It is manufactured by the Bristols' Mfg. Co., Waterbury, Conn.

Valuable Astronomical Work at Harvard.

Professor Pickering says in his annual report, just issued, that the Harvard Observatory astronomers made a great many interesting astronomical discoveries last year, both in Cambridge and in Peru. They took 2,777 stellar photographs in Cambridge and nearly 2,000 in Peru. The examination of these plates has, as usual, led to the discovery of a large number of interesting objects. Ten variable stars, in addition to the thirty-seven previously announced, have the hydrogen lines bright in their spectra. Seven new variable stars have been discovered this year by means of this property. The number of stars of the fifth type has been increased by eight, making the total number forty-five. The hydrogen line was shown to be bright in the spectra of six stars in addition to those already known. Photographs have been obtained of the spectra of eight planetary nebulae, showing bright lines. The spectrum of the nebula surrounding some of the stars is unlike that of other gaseous nebulae. Five stars have been shown to have spectra of the fourth type.

An extensive series of observations was also made upon Mars, and the relative positions of ninety-two points upon the surface were determined by the micrometer. More than forty minute black points were discovered, provisionally designated as lakes. The polar compression of the planet was also measured and appeared to be greater than that indicated by theory, which may be due to an excess of clouds in the equatorial regions. The presence of the dark and narrow streaks, called canals by Schiaparelli, has been confirmed, and various measurements of them have been made. The clouds projecting beyond the limb and terminator have been studied, and their height has been found to be at least twenty miles. Two large dark blue areas have been detected on the planet, and other portions have been noticed to be subject to gradual changes.

Many new double stars were also found south of 30°, between 12h. and 18h. The August occultation of Jupiter was observed both visually and photographically; also the new star in Auriga and Swift's comet. Stations have been established at Mallendo, 100 feet above sea level; at La Joyce, whose elevation is 4,150 feet; at the observing station, 8,060 feet high; and at Chachani Ravine, 16,650 feet high.

New Liquid Glue.

Erich Brand makes an animal glue, which is always ready for use and keeps any length of time, by dissolving 60 kilogrammes of borax in 100 kilogrammes of water, adding to the solution when boiling 4 kilogrammes of 90 per cent calcined potash, and adding this mixture while boiling to 1,450 kilogrammes of hot glue

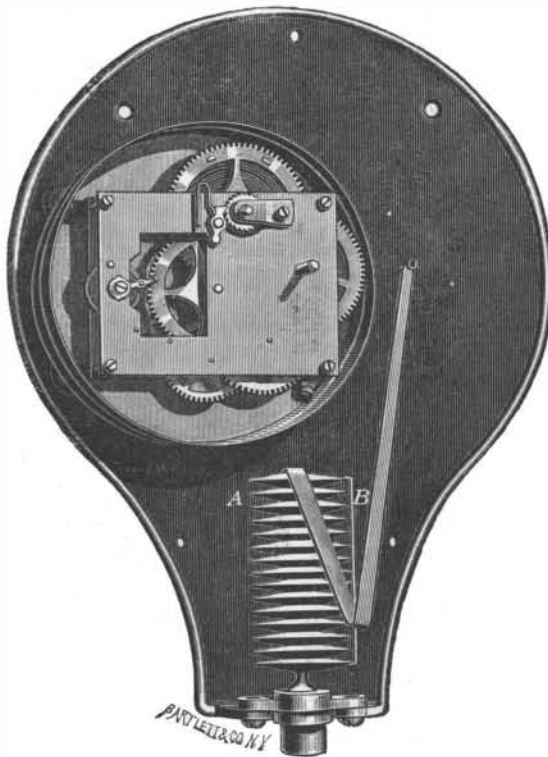


Fig. 2.—INTERIOR OF PRESSURE GAUGE.

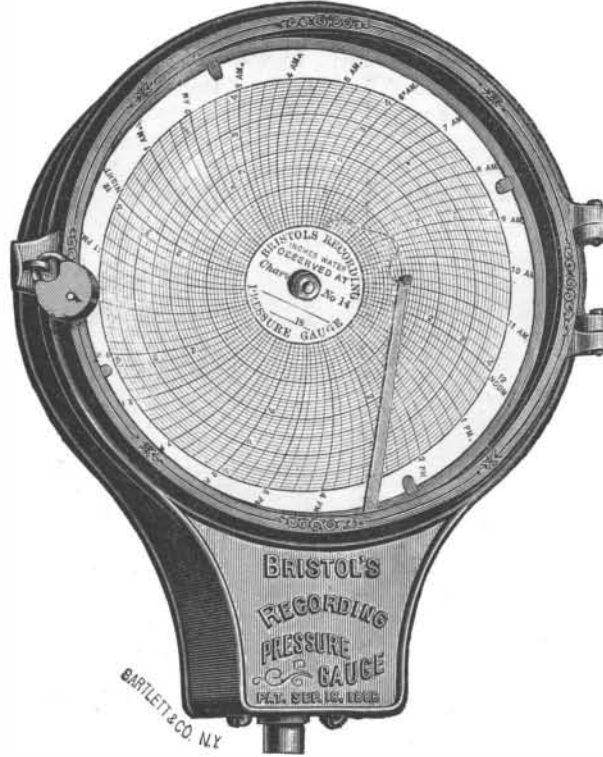


Fig. 3.—PRESSURE GAUGE READY FOR APPLICATION.

be called. The effect of applying the flexible strip is two fold: first, it stiffens the diaphragm tube as a whole; and second, it performs the most important function of resisting the tendency of the pressure to elongate it, which naturally results in producing a greatly multiplied lateral motion.

As in the sinuous tube, the motion thus produced by variations of pressure is ample for directly indicating or recording in connection with a moving chart. By the use of a large number of diaphragms, as shown, it is evident that the change of form of each individual member is very slight for complete range of pressure.

liquor, showing a density of 12° (Baume).

BORO-BORAX is a new preparation, discovered by Jaenicke, which is formed by mixing equal parts of borax and boric acid in boiling water. When the water cools the greater part of the substance crystallizes out. Its antiseptic and therapeutic properties resemble those of boric acid, but it has a neutral reaction and is much more soluble. At ordinary temperature, 16 parts of boro-borax dissolve in 100 of water; at 100° F., 30 parts dissolve in 100 of water; while boiling water dissolves 70 per cent.