

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

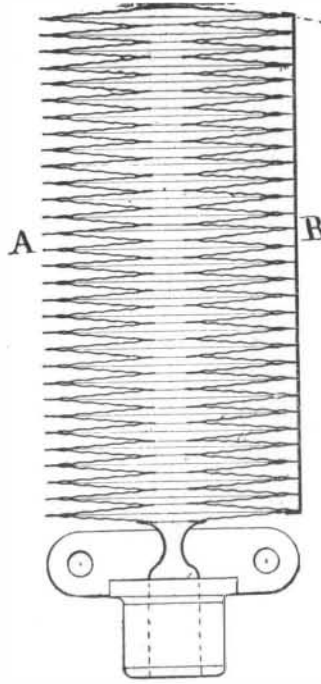


Fig. 1.—DIAPHRAGMS OF GAUGE.

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

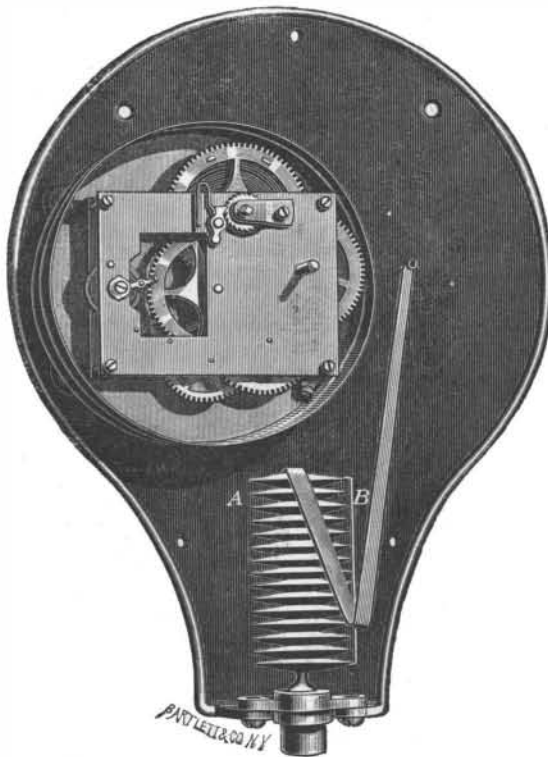


Fig. 2.—INTERIOR OF PRESSURE GAUGE.

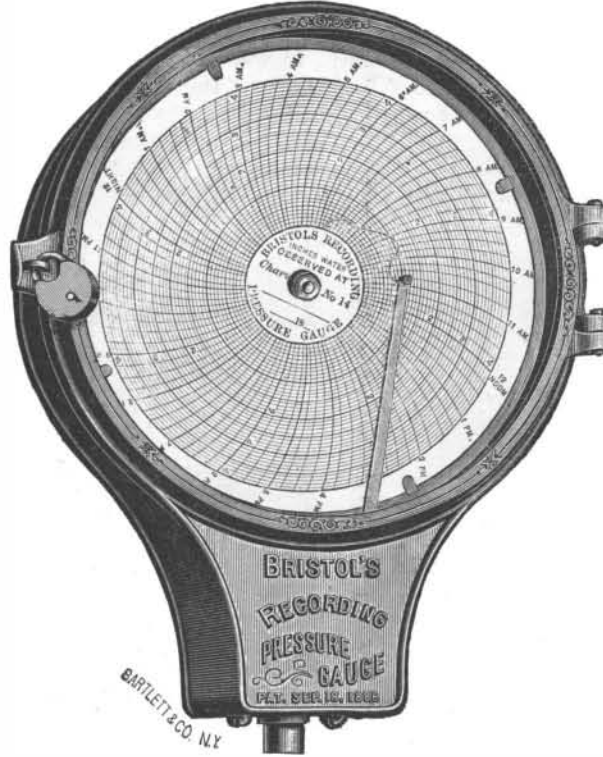


Fig. 3.—PRESSURE GAUGE READY FOR APPLICATION.

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.

Over Ninety-seven Miles per Hour.

Lately we recorded the unprecedented feat performed by engine No. 385 of the Central Railroad of New Jersey, running a mile in $39\frac{1}{4}$ seconds, or at the rate of 91.7 miles per hour. This engine has again broken the record, like Nancy Hanks, and can justly lay claim to being the fleetest thing on wheels in the world.

On November 18 it made a mile in 37 seconds, and the next succeeding one in 38 seconds. Engineer Henry Beck, who made the previous record with the engine, was at the throttle, and Fireman David Blake was attending to the steam pressure, which was kept at 180 pounds.

Between Columbia Avenue, Philadelphia, and Wayne Junction the 385 ran 40 miles an hour on a spurt. Three minutes were consumed here, and the train then started on its 85-mile run to Jersey City. Before much speed was developed there was a slow-down for Tabor Junction, where the tracks join those of the old North Penn. Road. Between Tabor and Jenkintown the train was flagged, and the grade up hill was 78 feet to the mile; five miles of the distance was covered in four minutes.

There was some fine running between Jenkintown and Langhorne, 13 miles apart. The schedule was 14 minutes. The start was made out of Jenkintown two minutes late, and shortly after the train was under way a mile was made in 44 seconds. Between Somerton and Parkland, a distance of five miles, the longest time for a mile was 42 seconds, the first mile being run in 42, the second in 41, the two following miles in 40, and the last mile of the spurt in 42 seconds. This speed was between 86 and 90 miles an hour. The five miles were made in 205 seconds, which broke all records for a five-mile run, being 87.8 miles per hour.

After passing Neshaminy all previous records were broken, and the 385 reduced her own unsurpassed run of $39\frac{1}{4}$ seconds for a mile to 39 seconds.

Bound Brook was reached on time, but on pulling out the train was flagged, and when Plainfield was reached was three minutes late.

"Now watch her," said Engineer Beck, as he flew by Fanwood. The mile post was just beyond the station and the chronograph snapped as the engine shot by, and the long split-second hand started around the dial. It was this mile that was covered in less time than was ever traveled in, and when the next mile post shot by in the rear the time on the dial was 37 seconds—97.3 miles per hour. The train flew on with unabated speed and the chronograph was snapped as the next mile post was passed. The time for the two miles was exactly 75 seconds. This made the greatest record for one and two miles, as the performance between Jenkintown and Langhorne did for five miles.

[It is reported that there was no preparation whatever made for the test. "A more unfavorable time could not have been chosen, as the rain poured in torrents during the day and only ceased half an hour before the time scheduled to leave Philadelphia—5:15 P. M."]

But is it true that this was an unfavorable time for such a test of speed? In our opinion it was a most favorable opportunity. But for that drenching rain we might not now record this unprecedented performance. The rain wet the rails and the lubricating quality of water acted to greatly reduce the rolling friction of the wheels upon them. The reduction of this friction was the same as an addition of power in the locomotive, and the speed attained in consequence should suggest some thought concerning this form of friction and its action in increasing the resistance of trains.—EDITOR.]—*Nat. Car Builder.*

The Light of Planets.

The question as to whether the light of planets is capable of casting shadows must have, especially during the last few months, been in the minds of many, says *Nature*, and perhaps many observations have already been made, but unfortunately not published. With regard to this question, *L'Astronomie* for November contains two notes, the first of which, communicated by M. Marcel Moye on August 30, relates to the planet Mars. His observations were made just before the meridian passage and in a room where the light of the planet could enter the open window. In this way white paper, invisible in the corners of the room, was easily distinguished when placed on the wall opposite the window, while one could see well the shadows between the fingers of the hand; placing a newspaper in the light of Mars, only the place of the table and the number of the words could be recognized, but not read, as was the case with Jupiter. M. Moye concludes then that Mars certainly casts shadows, less strong than those of Jupiter, but still appreciable.

In the note on the light of Venus, M. Leon Guiot tells us that on August 29, when about to get up to observe Jupiter, he was astonished at the brilliancy of the light that entered his window. Observing his watch, which was hanging on the wall, he was actually able to trace its shadow on the wall, for he says that all was visible as in the light of the moon; one could even read the newspaper. It was about this time that Venus was constantly seen with the naked eye in full daylight.

Cut Nails vs. Wire Nails.

A series of interesting and valuable tests to decide the much controverted question as to the comparative merits of wire nails and cut nails have been made recently at the United States arsenal in Watertown. The relative value of these two kinds of nails has always been a subject for many conflicting and confusing claims on the part of competing manufacturers, and it is a matter on which builders and others interested are far from being satisfied. An agreement was recently reached among some prominent manufacturers to submit the matter to a decisive test which should demonstrate the real facts beyond possibility of argument. The use of the government's testing machine at the Watertown arsenal was secured, and the tests are being made by a committee representing manufacturers in all parts of the country, under the direct supervision of Major J. W. Reilly, commandant of the arsenal.

At the first test the size of the cut nails tested ranged from $1\frac{1}{2}$ inch, three penny, 764, to 6 inch spike nails, forty penny and sixty penny, six to seventeen to the pound. Wire nails to correspond as nearly as possible were used. The nails were driven into a well seasoned spruce plank to a depth of precisely four inches. The weight of the nails differed only two grammes, the wire nails 214 and the cut nails 212 grammes.

In the first test a force of 733 pounds was required to draw the wire nail and of 836 pounds to draw the cut nail of similar size. The second wire nail was pulled with 673 pounds and the cut nail with 742. The third wire nail required 675 pounds of pressure, the third cut nail 804, the fourth wire 594, the fourth cut 964. These were the character of the variations of the fifth and sixth nails. The seventh wire nail was pulled with 879 pounds pressure, but 1,200 pounds of force was required to draw out the cut nail of like size. Every care was taken to have the tests strictly fair and accurate. The results from the initial tests were highly satisfactory to the manufacturers and advocates of the cut nail.

The Galveston Deep Well.

An interesting experiment was recently concluded in Galveston, Texas, in the boring of an artesian well over 3,000 feet in depth. The water supply of the city is furnished by 13 artesian wells, varying in depth from 825 to 1,350 feet, but the water is totally unfit for drinking and domestic use. The city concluded to invest \$75,000 in order to procure a supply of pure water. The well was started with a 22 inch casing. Inside this casing a 15 inch pipe was sunk to a depth of 870 feet, and inside of this a 12 inch pipe was telescoped to a depth of 1,500 feet. Then a 9 inch pipe was telescoped to a depth of 2,363 feet. A 6 inch pipe was then inserted and a depth of 3,070 feet 9 inches was reached. No water was found nor was any rock penetrated. The contractors have complied with their contract, which was to bore to the depth of 3,000 feet, were paid \$76,000, and further work abandoned.

The well is the deepest on the seacoast in the United States, and a description of the different strata pierced by the boring is interesting. From the surface to a depth of 46 feet there was a stratum of gray sand, thence to a depth of 64 feet was a layer of red clay and shells, thence to a depth of 100 feet was a stratum of blue clay, sea shells and fragments of rotten wood. From this to 315 feet sands and sea shells were encountered, and from that depth to the 815 feet level sand and clay were discovered. From the 815 feet level to the depth of 1,288 feet sand, clay, sea shells and decayed wood were found, and from that depth to the 3,070 feet level varying strata of sand, clay and large logs were encountered. At the very bottom of the hole a bed of sea shells was struck. The contractors expended \$63,000 before they completed the work.

Matches.

If the worthy gentlemen who control a monopoly of the trade in matches in the United States will give ear to reason, they will improve the quality of their product, even if in so doing they have to sacrifice a tithe of their present profits. Some of the matches now sold are a nuisance because of their unreliability, while others are a constant source of danger to property, if not to life, even in the hands of careful people. A portion of these latter drop a portion of the inflammable composition invariably, and if it happens to light on combustible material, a fire is pretty sure to result. Much clothing has been ruined in this way, and no end of profanity provoked. Another class of dangerous matches is the kind so highly charged with explosive that when struck a part of it flies through the air to a considerable distance, and is likely to do harm to whatever it happens to reach in its flight. At least one instance is known where the sight of an eye was lost through material from one of these percussion matches, to say nothing of less serious hurts and annoyances following their use. The match plays an important part in increasing the fire losses of the country, and will no doubt continue to do so until human ingenuity evolves a substitute for it. But the

match makers could decrease its harmfulness in this as in other respects if they desired to do so.—*Insurance World.*

The Canals of Mars.

The late opposition of Mars and the reobservation of the doubling of the canals has brought forward many theories relative to this very curious phenomenon. There seems to be no doubt now, says *Nature*, that this doubling is not due to instrumental deficiencies, or even to an optical delusion caused by the fatigue of the eyes; but that it is a real observed fact, and therefore requires a rigid explanation.

In *Comptes Rendus* (No. 18) for October 31, M. Stanislas Meunier relates another possible cause, and illustrates the phenomenon experimentally. The experiment is as follows: He takes a polished metallic surface and on it traces a series of lines and spots, representing as nearly as possible the Martial surface as seen by us, and illuminates it all by sunlight. He then stretches at some distance (a few millimeters) from it a fine transparent piece of muslin. Looking at the surface through this medium, he finds that all the lines and spots are doubled. A fact observed by M. Schiaparelli is that the canals, when doubled, are not always exactly parallel, and that sometimes there is an "aspect de nebulosité." These and other peculiarities are, according to M. Meunier, reproduced by simply undulating the muslin.

His explanation is that the solar light is reflected from the planet's surface very unequally, that from the continents exceeding that emitted by the deeper parts, seas and canals. Although the atmosphere is a limpid one, we are unable to see its motions; but if, as he says, the aerial envelope includes a transparent veil of fog at a suitable height, a contrast would be produced, as was the case with the muslin, by the production of shadows. This explanation of the phenomena of shades by reflection, if valid, should, of course, hold good for the planet Venus when properly situated, and that it is not observed on the moon is only another proof that our satellite has no atmosphere.

Lengthy Aerial Voyages.

Two very interesting balloon ascensions took place at the end of the month of October. Mr. Mallet started at 6 o'clock in the evening of Sunday, October 23, from the La Villette gas works, in a balloon of 28,660 cubic feet capacity. The aeronaut took an easterly direction and passed over Chalons, Metz, Coblenz and Frankfurt. The descent was effected at Wallen, in Hesse (Germany), on the other side of the Rhine. The balloon touched earth in the midst of a snow storm at half past 6 o'clock in the morning of Tuesday, October 25. The trip lasted 36 h. 30 m. No balloon has, up to the present, remained so long in the air.

On Wednesday, October 19, Mr. George Bans started for a voyage of long duration, in a 120,330 cubic foot balloon, in company with Messrs. William Sossa, George Besancon and Louis Baisses. The inflation, as in the former case, was effected at the La Villette gas works. On account of a rain, the start could not be made until seven minutes past ten in the evening. Three batteries of accumulators furnished a brilliant illumination of twenty-five incandescent lamps around the car. The latter carried also an electric lamp, registering barometers, etc. The balloon directed itself toward Pithiviers, Orleans, Chateauroux and Confolens, and landed under excellent conditions at Marsac, near Angouleme, at 5 o'clock in the afternoon of Thursday, October 20. The trip of about 270 miles was effected in 19 h. 13 m.—*La Nature.*

People Who Fall Safely.

A fall, as a rule, injures a drunken man much less than a sober one, because, the controlling power of the mind being rendered nil through intoxication, the body falls as an inert mass, and thus the chances of injury are lessened, for, strange though it may appear, it is no less a fact that the most numerous cases of injury arising from a fall are caused by the effort, voluntary or otherwise, to avert the consequences, thus straining the muscles and tendons. Very rarely are injurious effects from a fall known in a lunatic asylum, for the same simple reason—the mind has no influence over the action of the body. And it is a remarkable and well known fact to those who have to deal with such cases, adds the *Boston Herald*, that whatever injuries are so caused heal much more rapidly than in the case of sane people, the mind having more to do with retarding or assisting nature's efforts than is generally known or realized.

Opening of the Elevated Railway, Liverpool.

The first train on the Overhead Electrical Railway, Liverpool, was run on November 9, carrying the directors and their friends. The trip was very satisfactory, the behavior of the main engines and dynamos being all that was anticipated, and the experiments indicated a very successful issue. The construction of this railway resembles in general appearance that of the Sixth Avenue elevated railway, New York City.