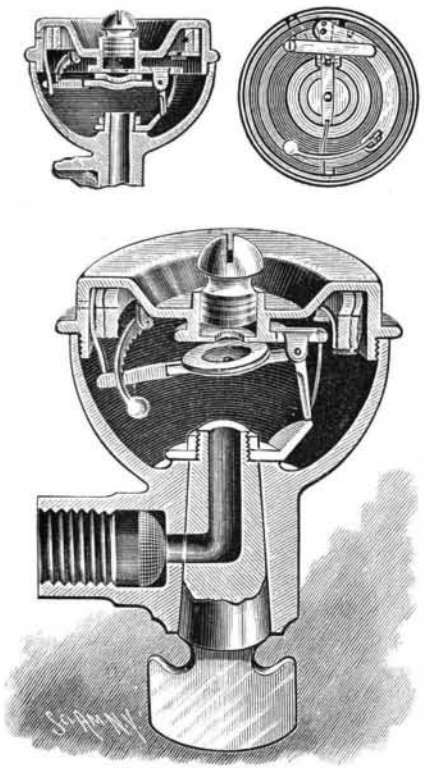
AN IMPROVED GAS BURNER.

The illustration represents a burner from which the gas is automatically shut off when the flame is extinguished while the pressure of gas continues. It has been patented by Messrs. Athanase P. Frechette and



FRECHETTE & DUPUIS SAFETY GAS BURNER.

Peter M. Dupuis, of Carson City, Nev. The larger view represents a longitudinal section of the burner with interior parts adjusted to permit the flow of gas, one of the smaller views showing the parts adjusted to shut off the gas, and the other being an inverted plan view, the safety valve being closed. The burner body or shell has a cap screwing into its top, the central part of the cap being depressed and having a cylindrical flanged aperture above which the burner tip projects. Below this aperture a disk valve is held, on the upper edge of a swinging bar pivoted at one end between depending ears, and there is integral with the pivoted end of the bar a downwardly projecting arm adapted to engage a toe projecting upward from a washer clamped on the end of the plug, so that when the washer is revolved, as in opening the plug valve, the bar will be swung downwardly, opening the disk valve. A strong plate spring returns the arm when free to vertical position, thus closing the valve. Within the walls of the cap piece are seated two rings, an inner and heavier ring of brass, and an outer ring of steel, the rings being severed and held closely to the side of the cap by a screw near one end. Two dowel pins are laterally inserted in the rings near their ends on each side of the cuts, and when the rings are differentially expanded by heat from the burner they separate at the ends, so that upwardly projecting small pins on their opposed ends will be thrown out of line. Fitting on these pins, and conforming to the curvature of the inner brass ring, on which it freely works, is a curved bar, lightly held in place by a finger spring, the free end of this bar having a ratchet-cut curved extension, on the outer end of which is a ball weight. From the inner side of the cap a post projects downward, in line with the swinging bar on which is the disk valve, and on the outer end of this bar is attached a thin steel plate laterally elastic but edgewise rigid, this extension of the bar being adapted to rest on the lower end of the post when the bar is swung downward by opening the plug valve. The latter valve is always turned far enough to disengage the toe on its washer from the arm on the pivoted end of the bar carrying the disk valve, so that after the plug valve is opened the disk valve is held open by the extension of the bar on which it rests being engaged by the opposite post. The heating of the differentially expanding rings then causes the ratchet teeth on the extension of the curved bar connected therewith to slip over the plate extending from the disk valve under the post, but should the gas be extinguished without the cutting off of its flow, the ratchet teeth would be drawn the other way by the cooling of the shell and rings, and would dislodge the plate from its engagement with the post, when the plate spring bearing on the pivotal end of the bar carrying the disk valve would close the latter. The turning of the plug valve to light the gas resets the disk valve in open adjustment.

Living by Rule.

Oliver Wendell Holmes thinks that he owes his good health and the retention of his mental vigor, in his eighty-first year, to the extreme care he has long taken of himself. Never robust, he was still wiry in his earlier and maturer life, but since he reached eighty his hygienic vigilance is unceasing. The rooms that he daily occupies are equipped with barometers, thermometers, aerometers, every kind of instruments, in short, to prevent his incurring the slightest risk of taking cold. He knows that pneumonia is the most formidable foe of old age, and he is determined to keep it at a distance if possible. He never gets up until he knows the exact temperature, during winter, or takes his bath without having the water accurately tested. He lives by rule, and the rule is inflexible. His time is scrupulously divided, so much allotted to reading, so much to writing, so much to exercise, so much to recreation. His meals are studies of prudence and digestion. He understands the specific qualities of all ordinary foods, and never departs from the severest discretion in eating.

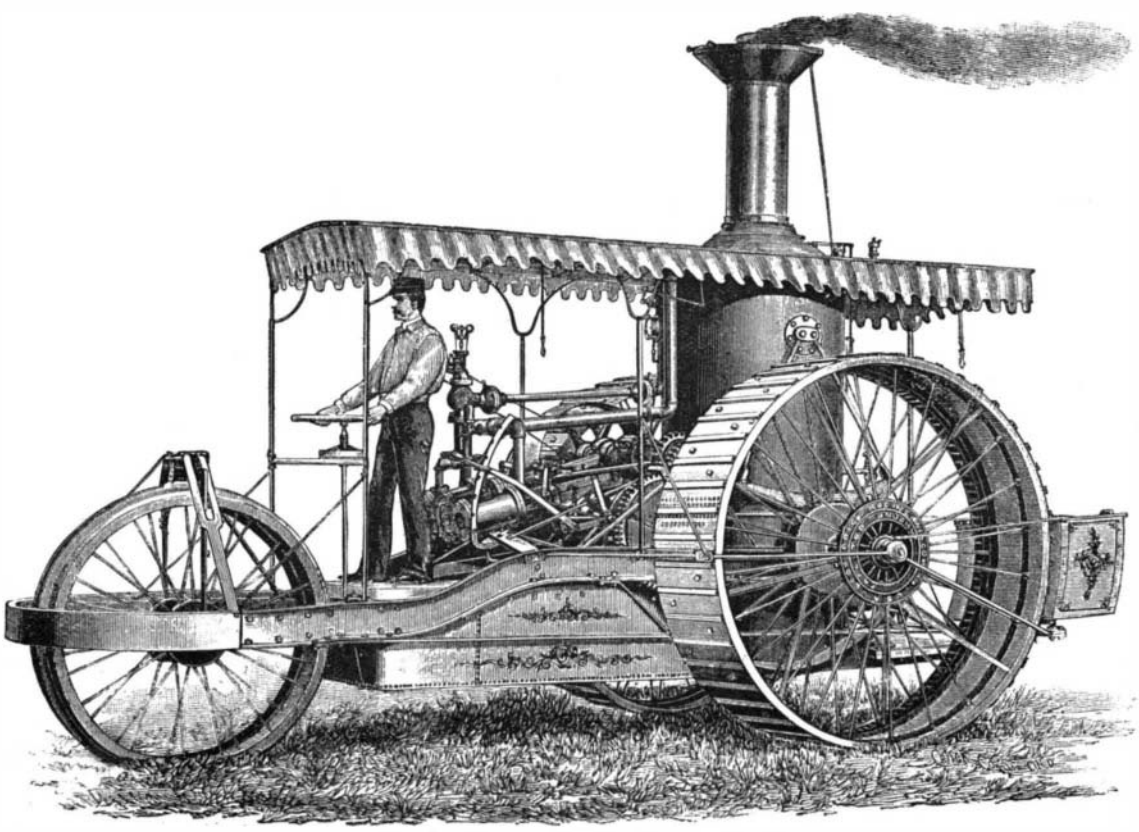
One might think that it would be a serious infliction to keep up existence by such precise, unvarying methods. But the little doctor enjoys them, having settled firmly in these habits years ago. Philosophic as he is about death, he has an eager curiosity to see how long he can live by following the laws he has rigorously prescribed for himself. He has long had various theories on the subject of health and longevity, and he relishes experimenting upon himself. He thinks sometimes that he may attain one hundred, which he would dearly like, if he could retain, as he has retained thus far, the full possession of all his faculties. —*Chicago Mail.*

IMPROVED FIELD LOCOMOTIVE.

Among the latest machines designed for use on large farms is the new field locomotive of Jacob Price, of Racine, Wisconsin, illustrated herewith. It is said that this machine pulled, near San Leandro, an outfit of twelve 11-inch plows in a dry, adobe soil, traveling at the rate of over four miles per hour in doing so, and maintaining the steam pressure at 130 pounds, without difficulty.

It is of about 100 horse power—as horse power is commonly figured; or, to express it in another manner, it will pull as much as 40 or 50 horses, besides propelling itself. Its weight is only 8½ tons. The carrying wheels are about 8 feet high and 26 inches wide. The steering wheel is 5 feet high and 14 inches wide. The boiler is an enlarged fire engine boiler of the most approved type, and is made strong enough to carry 200 pounds working pressure with safety. Its fire surface is 200 feet and its other heating surface (flues) 200 more, making a total heating surface of 400 feet. The main gears are steel rollers working on oiled steel pins.

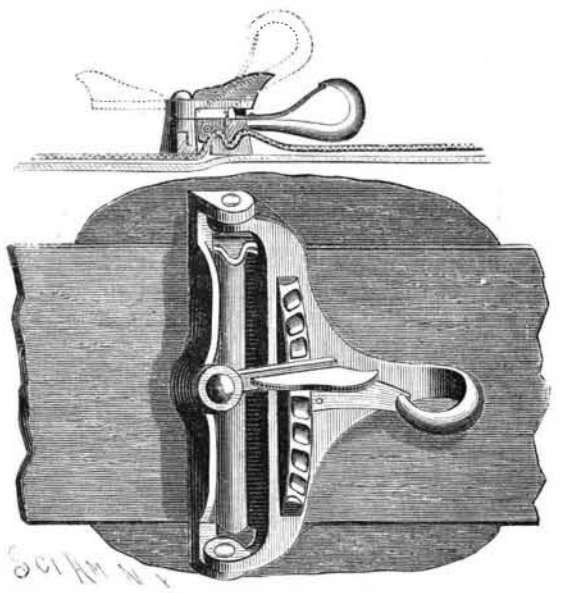
The entire machine is mounted on long, easy, elliptic springs in a manner that utterly obviates any interference with the working of the gears, a result, according to Mr. Price, never accomplished before. The machine has twin engines, piston valves, and link motion. It is adapted for plowing, running combined harvesters, freighting with wagons, hauling saw logs, or pulling of almost any kind, and is suitable for any stationary work, such as running thrashing machines, sawmills, etc.—*Min. and Sci. Press.*



IMPROVED FIELD LOCOMOTIVE.

AN IMPROVED BACK BAND BUCKLE.

The buckle shown in the illustration is designed to be quickly adjusted to place, and its clamping member is free from sharp or abrading surfaces, thereby preserving the band from mutilation. It has been patented by Mr. William D. Mitchell, of McComb City, Miss. Our engraving shows the buckle applied, and also a transverse section. In the upper surface of the base portion of the buckle are two parallel longitudinal ribs, in front of a longitudinal slot, and at the back is an offset having a central bore to receive a pin carrying a locking button, having a vertical wing to facilitate its manipulation. The hinge member of the buckle has on its under surface a longitudinal rib adapted to enter the space between the parallel ribs of the base, forcing a portion of the strap downward therein, and on its upper surface is a longitudinal ridge having a series of cavities or depressions, the ridge being higher at one end than at the other. The strap is passed upward through the slot of the base and over the two ribs, when it is locked in position by carrying the hinge member downward and moving the button to enter a convenient cavity in the ridge on top of the hinge member.



MITCHELL'S BACK BAND BUCKLE.

Magazine Rifle Firing at Bisley, England.

The report of the chief umpire of the brigade field firing with the new magazine rifle on August 16 has been issued. The troops engaged were the 1st Royal Rifles, Royal Scots, and Devon Regiment, with squadrons of cavalry and a battery of artillery. The umpire in chief remarks that the weather was stormy, with heavy showers, the atmosphere clear, and the wind strong and gusty. Firing was carried out with steadiness, and words of command were given intelligently and with decision by section commanders. The accuracy of range finders was fairly good, and the sights of rifles were properly adjusted. In the first phase of attack the percentage of hits was 14·64. In the second phase, when only marksmen and first-class shots fired, the distance being 1,100 yards, the percentage rose to 22 6, and in the third phase, when two battalions of mixed shots fired, the percentage was 14·86. This is the first time field firing has been practiced with the new rifle by a large body of troops.

IN the case of George Westinghouse, Jr., of the Philadelphia Natural Gas Company, against the Chartiers Natural Gas Company, for infringement of patent on the double safety in-vent pipe, Judge Acheson, of the United States court, decided that the defendant company had not infringed upon the patents of the plaintiff, and, furthermore, that the invention was not patentable. The suit involved vast sums of money.

Subterranean Gas in Indiana.

BY H. C. HOVEY.

The terrific explosion at Waldron, while justly regarded as due to local causes and altogether an exceptional occurrence, has served to intensify the interest already taken in the Indiana gas field and its various problems. In company with several hundred scientists, we recently visited the general region, and a fortnight later went over the ground more at our leisure. Nothing seems to delight the Hoosiers more than to play with fire. They had given us some pretty exhibitions of it at Indianapolis, to which the gas is piped from Anderson. We had become used to the flambeaux in front of the Dennison House and on the capitol grounds. And when, on alighting from the cars at Noblesville, we were taken to the vicinity of a plain iron tube about ten feet high and three inches in diameter, from whose top floated a lambent flame, we were interested, of course, and exchanged opinions and surmises as to the resources and possibilities of the subterranean agent exhibited. But when the man in charge of the show suddenly opened the valve, letting loose a pillar of fire eighty feet high, roaring so as to be heard for miles around, and making the earth tremble, every scientist remembered Waldron and fled! That rejoiced the natives. The man calmly closed the valve, shutting the genie into his box again; and presently our courage revived sufficiently to enable us to call for an encore. At each stopping place, Kokomo, Marion, Alexandria, Muncie, and Anderson, the performance was repeated with variations, until we began to feel like experts instead of novices, and fully competent to give any quantity of sound advice to our generous entertainers. The grandest display of all was aquatic and nocturnal. The citizens of Anderson "set the river on fire," and many thousands besides ourselves witnessed the feat. Through two great pipes laid to White River, at points on the bank half a mile apart, gas was played for an hour or more, sometimes along the surface of the water, and frequently under it, with an incessant change of beautiful colors; now a broadside of flame, and anon a fountain of fire, and yet again breaking from the steaming surface in myriads of burning bubbles. All this magnificent display of natural pyrotechnics amid the blackness of a cloudy night produced an indescribable and magical effect never to be forgotten. As our special train moved along on its return to Indianapolis, we had a farewell salute of flames from every well and jet in town and country. No wonder that Prof. Goodale, the president of the A. A. A. S., felt it his duty, in his parting address, to warn the citizens against a wicked waste of their gaseous heritage!

WHAT IS NATURAL GAS?

We conversed not only with the intelligent officers of the various corporations, but also with those whose notions, though crude, were often very interesting. The ingenious but fanciful theories advanced by Berthelot and other European chemists find numerous advocates. More than one person assured me that the gas was stored in a vast cavern or series of caves, into which it was constantly flowing as the result of the action of salt water on the melted metals existing in the interior of the earth. In keeping with this theory I was gravely told that the flow of the gas wells varied with the ebb and flow of the tides; that when the great explosion took place at Hell Gate, the shock was felt at Kokomo; and that there was undoubtedly an arm of the Atlantic reaching westward under Ohio and Indiana. This may account, in part, for the popular conviction that the stupendous chemistry of nature works constantly to replenish the wasted supply, and that the heaviest draughts made on the subterranean reservoir cannot, therefore, exhaust its contents.

"It is practically inexhaustible" is the phrase that has met my eye again and again in the enterprising dailies of the region, and there are scientists as well as boomers who echo the saying. We shall revert to the topic presently. But, as to the nature and origin of natural gas, a theory is held by the geologists that is far more tenable than that of the chemists just mentioned. Knowing that marsh gas and natural gas are nearly identical, each being a light carbureted hydrogen, the fair inference is that they share a similar origin. Stir the sediment at the bottom of a marsh and inflammable bubbles arise. The gas they contain comes from decayed vegetable matter. So it is with the larger accumulations in the beds of lakes and seas. The Mississippi "mud lumps" are examples, being mounds rising for several yards above the water, and emitting from their tops great quantities of carbureted hydrogen gas. The Spanish navigators found what still excites the wonder of voyagers across the Atlantic, namely, an area equal to continental Europe filled with an enormous mass of seaweed, single specimens being hundreds of feet long, and their stems huge vegetable cables a foot in diameter. Imagine some ancient Sargasso Sea to have had its mass of algæ caught in a bed of calcareous mud where it underwent slow decomposition. What a measureless quantity of gas would have been manufactured and afterward imprisoned in the surrounding limestone formed from the mud! The time would plainly come when, the work of decomposition being finished, no more gas could be made; but what had been created would stay there until in some way released. It might be called fossil marsh gas. Gas, petroleum, and coal are but three distinct results of the decomposition of ancient vegetable life.

THE TRENTON LIMESTONE.

The fact is at first hard to comprehend that natural gas, instead of being collected in a cavernous reservoir, is stored up in what appears to be solid limestone of the Trenton period. But this is true throughout the Ohio and Indiana gas fields. In the latter the Niagara limestone is always the surface rock, being about 400 ft. thick. Next below come nearly 600 ft. of Hudson River and Utica bituminous shales, that appear to roof over and confine the true gas bed. The sandstone found in the Pennsylvania field is wanting in Indiana. The Trenton limestone is next to the shale, and yields gas almost as soon as it is struck, although the custom is to drill into it for from ten to forty feet—never more than sixty. Very little petroleum has yet been found in Indiana. A peculiar stickiness observable in the rock brought up by the drill is taken as a sign that the boring approaches salt water, of which it is impossible to get rid when once it invades a well. The attempt has been made by great artificial pressure to force the water back and give the gas a chance, but without success. Microscopic examination proves all gas rock to be porous, no matter how solid it may seem to be. As nine-tenths of the Trenton limestone is non-porous, an observation of this one fact might have saved thousands of dollars wasted in drilling dry rock barren of what was sought. The elevation of the stratum above sea level is another important indication. At Muncie and Anderson it lies entirely above, and therefore there is no danger from salt water. At Kokomo, Marion, and Noblesville the stratum varies from sea level to 100 ft. below, and yet by due caution the salt water may be shunned. But where it lies from 200 to 700 ft. below, no gas is to be had. This partly explains the fact that, although the Trenton underlies perhaps fifty counties in the State, the productive gas region as thus far developed is limited to six or eight of them, namely: Delaware, Blackford, Madison, Grant, Hamilton, Howard, Tipton and Shelby. The average cost of a well in these counties being only about $1.200, many wells have been opened. Farmers have clubbed together for a neighborhood well merely for domestic purposes. Small factories have been started here and there in rural places. But the main borings have been in the vicinity of the larger towns.

THE USE AND ABUSE OF A GREAT TRUST.

When the first successful gas well was opened at Kokomo, in October, 1886, people simply stared at it for sixty days as one of the wonders of the world before putting it to any form of useful service. Lavish displays have been in order ever since on the slightest provocation. The rivalry between Kokomo, Marion, Muncie, and Anderson has led each to vie with the others in holding out alluring inducements to settlers and manufacturers, "free land and free fuel" being the watchword. The reward has been a very rapid growth, until each of the cities named claims from 10,000 to 12,000 inhabitants, while the smaller towns have increased proportionally. In some instances heavy municipal indebtedness has been incurred, while in others it has been avoided. Cities outside the gas belt have not only been allowed but encouraged to pipe the gas away. This was, doubtless, excusable concerning Indianapolis, as being the State capital; but what possible advantage can accrue to the favored region from permitting the two lines of eight-inch pipe that are now being laid as rapidly as possible from Kokomo to Chicago? It seems foolish for the people to allow themselves to be robbed of this precious gift of Nature, and wicked for them to waste it themselves, as so many persist in doing. Flambeaux, in country and town, have been burned by day and night. The illuminating and heating of dwellings and public buildings have been with little regard to economy. This homely virtue has been almost despised as unworthy of consideration by people to whom kind Providence has generously given "an inexhaustible supply." But the fact ought not to be concealed that the leading men of enterprise by whom the resources of the region are being developed are wisely anxious. Millions of dollars have been invested in glass works, paper mills, rolling mills, pulp works, straw board factories, and numerous other industries, and those concerned have a right to look ahead and ask how long this marvelous fuel is going to last.

I had the opportunity of sounding the officers of several natural gas companies, and every one of them felt that the time had come to call a halt on the reckless abuse of a great trust. Some of the largest consumers have very sensibly laid their plans on the theory that the natural gas will presently fail, in which event they expect to make use of ordinary fuel gas. It has been stated that certain wells which have failed have revived after being closed awhile, and have even been stronger than before, the plain inference being a continuous generation of gas. But I found no such instances in Indiana. On the contrary, the universal testimony was that when a well failed it was never resuscitated. Professor Orton's note of alarm has been sounded none too loud. Warning should be taken from the experience at Findlay and other Ohio towns. In 1886 the rock pressure at Findlay was 380 pounds to the square inch, but now in the original field it is but 170 pounds. The Natural Gas Company, of Lima, O., reported at the August meeting of the city council that within a single year the rock pressure had been reduced 120 pounds, with a prospect that the supply would wholly run out within two years! Meanwhile farms in that vicinity that were rented at $20 per acre yield at present only $10 or $15 per acre, leaving the lessees in a constantly increasing arrearage. In Indiana the rock pressure has likewise shrunk in four years from 340 pounds to 300, and in certain wells to 200, or even to 150, at which point the salt water begins to flow and the wells are worthless. At this rate the supply cannot last beyond five years. In new wells the pressure usually falls from 30 to 40 pounds soon after being drilled in, then it is stationary for several months, after which it fails rapidly, the rate being greatly augmented when it falls below 275 pounds. The fact should also be noted that new wells draw away from old ones if located too near them, the distance varying from a quarter of a mile to a mile and a half.

Practical men complain not only of the foolish waste of gas, but that scientific writers give them little definite information on matters so vitally important to thousands of people. They also complain because their own conservative measures are not suitably backed up by public sentiment and timely legislation. We are told that rock gas has been burning for ages along the shores of the Caspian Sea and amid the salt mines of China; but the consumers have practiced the proverbial Oriental economy. In Madison County alone seventy-five wells are reported, and it is claimed that each well yields an average of 8,000,000 cubic feet of gas per day. Of course but a very small per cent of this immense quantity can be used under existing circumstances. The attempt is being made to pack and anchor such wells as are not in immediate demand, holding their contents in reserve. The plan is a wise one. The Diamond Plate Glass Works at Kokomo own twenty wells, besides many acres of gas land; and yet they actually use but about 5,000,000 cubic feet of gas per diem. The remainder is held in reserve. Let this idea gain prevalence, let it be emphasized by men in authority, let it be enforced as far as possible by sound legislation, and while speculators and charlatans come to grief, the subterranean resources of Indiana may yet be husbanded till another generation enters the arena.

Wool Production of the World.

ESTIMATED BY THE LONDON BOARD OF TRADE.

Countries.	1860	1870	1880	1889
	Pounds.	Pounds.	Pounds.	Pounds.
United Kingdom.....	140,000,000	150,000,000	149,000,000	134,000,000
Continent of Europe..	500,000,000	485,000,000	450,000,000	450,000,000
North America.....	110,000,000	176,000,000	270,000,000	330,000,000
Australasia	60,000,000	175,000,000	308,000,000	450,000,000
Cape of Good Hope...	26,000,000	43,000,000	60,000,000	70,000,000
River Plate...	43,000,000	97,000,000	256,000,000	360,000,000
Other countries.... ..	76,000,000	69,000,000	133,000,000	156,000,000
Grand totals.....	995,000,000	1,295,000,000	1,626,000,000	1,950,000,000

The Acme Automatic Safety Engines.

These engines, manufactured by the Rochester Machine Tool Works, of Rochester, N. Y., and arranged for using either natural gas or kerosene oil, as ordered, are said to be in greater demand this season than ever before. They are made in sizes of one, two, three, and four horse power, and are exceedingly well adapted for use for almost an infinite variety of purposes. There has been an especial call for these engines for use with natural gas in Buffalo and Pittsburg, where they have been largely employed for driving ventilating fans in restaurants and for furnishing electric lights. One of these engines, of three horse power, in Buffalo, is said to have a record of running, for several weeks, thirty sixteen-candle power lamps on a fuel consumption of 120 cubic feet of natural gas per hour, delivered under a four-ounce pressure. The engine has a fourteen-inch band wheel, and runs 450 revolutions per minute under a boiler pressure of 110 pounds. During the day time the outfit is otherwise employed.

An Ocean Flume to a Fresh Water Lake.

Mr. James F. Milligan writes us that Virginia Beach, Princess Anne County, Va., has a recently constructed ocean flume, from the low water line, and supplied with water at high tide, which empties into Lake Holly, 800 feet from the shore, making the lake salt instead of fresh, as heretofore. The construction has been simple and inexpensive, the mouth of the flume being Y-shaped and strongly backed with piling to withstand the heavy surf. The work has been done upon the plans of Mr. J. J. Powers, a Brooklyn, N. Y., sanitary engineer, Mr. P. W. Van Houghton, of Hackensack, N. J., having been the superintendent and contractor.