THE CENTRIFUGAL BOWLING ALLEY.

A. E. BEACH.

One of the most entertaining as well as hygienic amusements is bowling. The exertion required to project the balls involves nearly all of the muscular system of the thorax. The arms, lungs, heart, back, and loins all respond to the movement, and the play is at once healthful and invigorating. For young people of both sexes it is particularly beneficial. It develops the limbs and chest, and imparts grace and flexibility to the body. But the practice of bowling is at present very limited, owing not only to the cost of the appurtenances, but chiefly to the great length of the floor space required. A first-class single bowling alley costs $250, and requires a flooring 85 feet long and 6 feet wide. The practice of bowling at home in ordinary dwellings is, therefore, out of the question. Special houses for bowling are required, except when the cellars or basements of large buildings, such as clubs or hotels, are made available.

The object of the present design is to modify the longitudinal dimensions of the bowling alley and adapt it, if possible, to the requirements of domestic life, in short, to make a bowling alley that may be used in the play room or other apartment of almost any good sized dwelling house. Instead of the long straight floor, a circular cycloidal pathway for the balls is provided, the track being thus, as it were, bunched up in the air, instead of being extended out in a straight line as a floor. This new system is illustrated in our engravings.

Fig. 1 shows a bowling alley in which the path for the ball is arranged, in part, in spiral form. The ball is projected in the usual manner, rolls up and down through the spiral path, and then proceeds straight toward the pins at the opposite end of the room.

Fig. 2 shows a similar form of path with a return spiral added, so that the ball, after traversing the spiral path, returns toward the thrower and strikes the pins at one side, as represented.

The balls are kept within the spiral pathway by centrifugal force, the principle of operation being the same as the well known spiral railway, in which the car sticks to the track, and the passengers keep their seats, although the car flies along bottom upward.

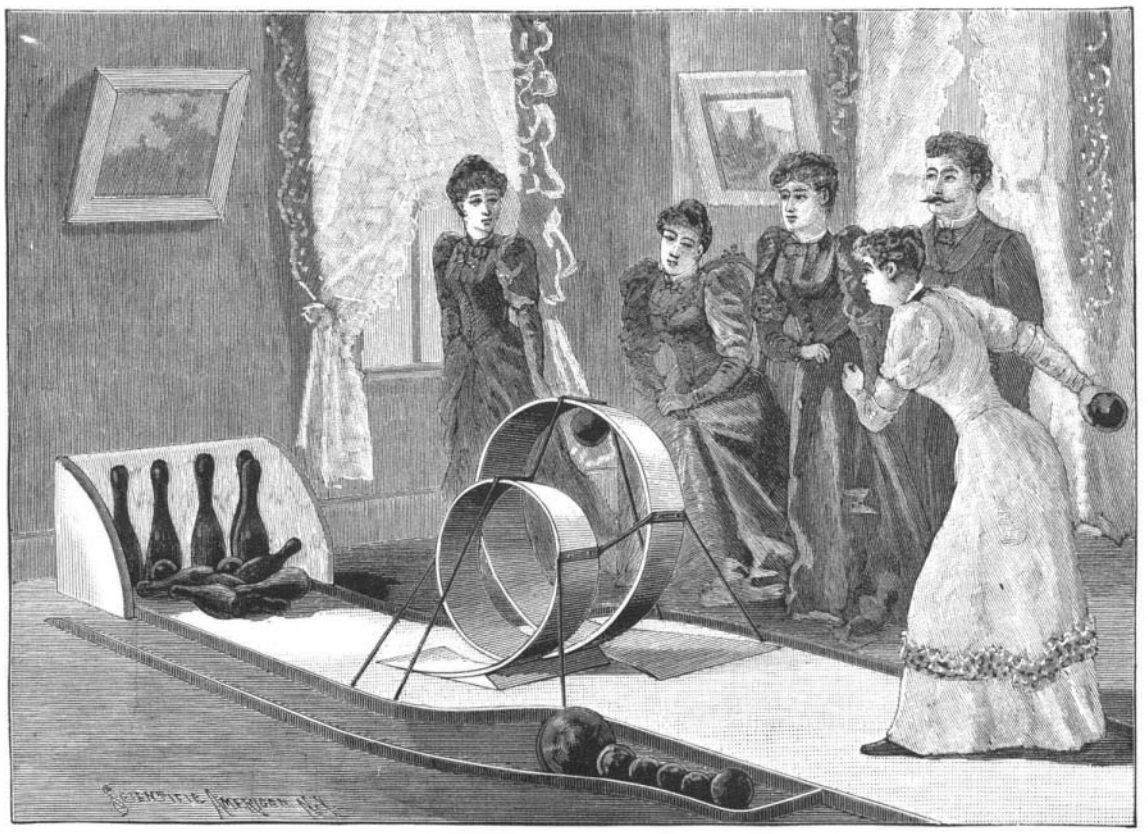

Fig. 1.—THE CENTRIFUGAL BOWLING ALLEY.

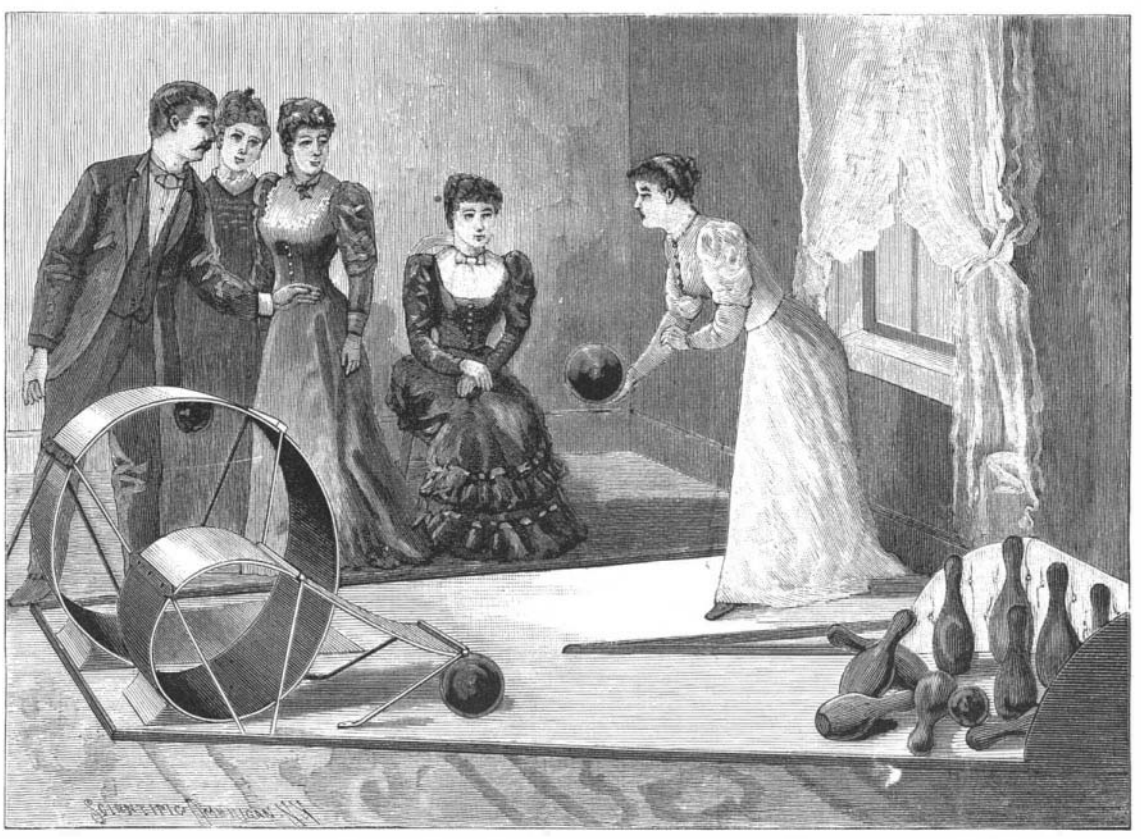

Fig. 2.—THE CENTRIFUGAL BOWLING ALLEY WITH RETURN SPIRAL.

A New Product for Oiling Wool.

Mr. E. Godschau, a Frenchman, has patented a substitute for oil, to be used instead of oleine, olive oil, or other fatty matters in the oiling of wool. It consists of a mixture of soap water, glycerine, and carbonate of potassium. Soap is used because it imparts viscosity to the water and facilitates or promotes the adherence of the fibers to be treated to each other. Glycerine is a neutral body, soluble, in any proportion, in water. It dissolves the soap and deliquescent salts and maintains in the wool the necessary moisture, while it is being made into yarn. Glycerine remains fluid at the lowest temperature, does not evaporate on exposure to the air, and is not susceptible to rancidity or spontaneous combustion. By its employment, the fibers of the wool are moistened, lubricated, and rendered flexible and supple, without being charged with grease, and they are preserved from all change. These qualities facilitate the carding, combing and spinning of the wool. Carbonate of potassium is a deliquescent salt, and is added to further maintain a state of humidity in the fibers, while it also increases the unctuousness of the mixture and renders it more consistent. Being very soluble in either water or glycerine, it renders the mixture more soluble in water at ordinary temperatures and gives it a greater homogenity. It also prevents any remaining traces of mordants, having insoluble bases, from forming insoluble soaps with the soluble soap contained in the new substance, by transforming them into soluble carbonates.

The constituent parts should be employed in the following proportions: Fifteen parts of soap, twenty-four of glycerine, and five of carbonate of potassium for each hundred parts of water; but these proportions may be considerably varied, without departing from the spirit of the invention.

Among the advantages to be gained by its adoption are increased solubility in water at ordinary temperatures, the immediate impregnation of the fibers, and a saving in cost, as compared with the usual oil or grease. In the fulling operations, an economy of time is effected and alkaline substances and soap are also saved, as there is no necessity for extracting surplus grease or oil. The fibers or the cloth manufactured from them are capable of receiving brighter and fresher colors and are much improved to the feel. As there are no unsaponified portions of greasy matter employed in the oiling, there will exist no irregularities in color after dyeing, thus obviating any necessity for the repetition of the operation. The risks of fire and disagreeable smells are very much reduced. In use, the compound of glycerine soap and carbonate of potassium is dissolved in water at ordinary temperatures, and the wool is treated with it in the same manner as with the oily matters commonly employed.—*Textile Industries.*

Mortality from Tuberculosis.

M. Lagneau, from a comparison of many European statistics, has tabulated these results:

1. That the occupations which expose the person to *dust*, whatever they are, predispose to tuberculosis to a remarkable degree; *e. g.*, according to Swiss statistics, 10 per cent of stone cutters die of it.

2. Those who follow sedentary occupations are more disposed to tuberculosis than others According to English and Italian statistics, of students and young clergymen, 459 in 1,000 die of tuberculosis.

3. Printers in England and lithographers in Italy to the number of 300 to 400 in 1,000 die of it.

4. On the other hand, people who live in the open air have almost entire immunity from the disease; this is the case with shepherds, farmers, and boatmen; only one or two in 1,000 having it, according to Swiss records.

M. Lagneau has also examined the subject with reference to the effect of habitat and density of population.

In France, sanitary statistics in regard to 662 cities show that the more the population is crowded, the more seriously are they attacked by tuberculosis. In 95 towns of less than 5,000 inhabitants, only 181 in 1,000 die from pulmonary affections; 33 towns with from 5,000 to 10.000 people lose 216 in 1,000; 127 towns with 10,000 to 20,000, 271 in 1,000; 50 towns with 20.000 to 30,000, 288 in 1,000; 11 towns with 100,000 to 430,000, 363 in 1,000; Paris with its 2,424,705, 490 in 1,000.

The progression is regular and needs no commentary; but it is a question if contagion, increased as its dangers are in crowded localities, is not sufficient to account for the statistics. Contagion as the first cause, aggravated by the profession and the habitat as accessory causes. These seem to be the summing up of science upon the subject.—*Revue Scientifique.*

A Connecticut River Sea Serpent.

Austin Rice, of East Deerfield, a plain, unimaginative farmer, who for nearly fifty of the seventy years of his life has resided in his quiet home on the banks of the Connecticut River, said a few days ago: "I was near the bridge, a little over a week ago, when I heard what seemed to me like a grunt followed by a splash. I looked into the river, and, not more than twenty-five feet away, I saw a big snake.

"Its head was out of water, and its body raised some six or seven feet. At the neck the snake was about as large as a man's leg at the thigh, and the body was about as large as an ordinary stovepipe. His eyes were as large as those of a horse, and his mouth, which was open, was nearly a foot across. The color of his body was black, and a white stripe around his mouth extended down to his belly. I followed the snake, trying to keep alongside of him. At one place he started for the bank, and I started away from it. His power of locomotion was so strong that he had no trouble in keeping still in the river against the current. When he got alongside a boat-house where some boys were hammering, he heard the noise and raised himself about ten feet into the air and then fell back into the water and disappeared."

Mr. Rice's reputation for veracity among his neighbors and acquaintances is good.—*Boston Herald.*

HORSES sleep with one ear pointed to the front; but why, no man can tell.

Poisons on Fruit.

There has been much discussion of late concerning the danger of poisoning from eating fruit which has been sprayed with salts of copper or arsenic to destroy insects or fungi upon the plant.

It is stated that experiments have been carried on for two years at the Michigan Agricultural College with a view of finding out the truth in the matter.

The important question is, Do the poisons penetrate the skin of the fruit? The tests have shown that copper sulphate has passed into the body of the pear, though more of the solution remained upon the skin. If this peel is not a protection, what can be said of the thinner skins, like those of the plum, the cherry, berries, etc.? Dr. Kedzie, who made the analyses, says that horticulturists often use much larger quantities of the poisonous solutions than are necessary to destroy the life of the fungi; one-half or even a third of the quantity generally used would be enough.

It is not safe to eat fruit which has been sprayed with any poisonous salts, for while the poison received into the system from one pound might not be harmful, if no more were taken, repeating the doses may in time result in slow poisoning.

And how are people in the cities to know whether or not their fruit has been sprayed?

AN IMPROVED BOILER TUBE EXPANDER.

According to this improvement, a hub rotating on a tapering central mandrel carries small steel rollers which bear against the inner periphery of the tube, a stop collar arranged about the mandrel outside the hub bearing against the tube sheet and serving as a guide for the mandrel when rotated. The invention has been patented by Mr. Henry Strecker, of Marietta, Ohio. At three points on the periphery of the hub there are recesses cut through to the interior bore, and holding rectangular boxes open at the top and bottom, the boxes being of somewhat tapering form, and having outer faces smaller than the holes in the hub in which they play. The boxes are inserted from the interior bore, and projected outwardly, but by reason of their taper will not pass entirely through the holes, preventing them from ever falling through the hub away from the mandrel. In each of the boxes is loosely held a steel roller, the rollers rotating in contact with the inner periphery of the tube when the mandrel is turned, but without falling out, their outer faces bearing directly against the tube and their inner faces against the mandrel. The construction permits the largest possible opening in the hub, so that a maximum range of expanding movement for the rollers is obtained. A washer and nut on the small end of the mandrel prevents the hub and stop collar from slipping entirely off the mandrel when not in use.

STRECKER'S BOILER TUBE EXPANDER.

Coast Defense.*

Works of coast defense are required (1) to protect our cities from distant bombardment from the ocean; (2) to bar the passage of fleets through narrow channels leading to important places; (3) to forbid the occupation of harbors useful to an enemy; and (4) to co operate with naval coast defenders in closing wide entrances of value leading to important landlocked bays or sounds.

In selecting the position for the works, local topography often exerts a governing influence. The best conditions are where the ground rises some 100 to 200 feet above the water; where a wide development is offered to the land guns, and a contracted field of battle to the enemy; where the depth, tidal oscillation, and currents are moderate, thus permitting the use of submarine mines as an effective obstruction, and where the soil and sanitary conditions are suitable to the objects intended.

To forbid to an enemy the occupation of a harbor useful for his purposes is a simple operation. It only requires a few modern mortars in a battery suitably designed to facilitate accuracy of fire and well protected against the operations of landing parties.

In the matter of mortar or high-angled fire it is believed that American ideas are in advance of any existing European constructions, although indications are not lacking that the subject is now attracting serious attention abroad. We have adopted a single caliber, 12 inches, in order to secure sufficient weight in the projectile to insure deck penetration, and sufficient capacity for large charges of high explosives. Recent experiments at Sandy Hook, as well as reports from Europe, induce the belief that either of two varieties of high explosive may be safely used in charges as large as 100 pounds in high-angled fire, and that ranges of at least 5 miles may be employed with sufficient precision to render the service appalling to shipping. The greater the distance of the vessel from this kind of battery, the greater her danger if struck.

Rapid-fire guns, chiefly of 12 centimeters (4·72 inches) caliber, are favored for sweeping the mined fields and water approaches. They will be mounted on the balanced pillar principle, so that perfect concealment in pits will be practicable until they are brought into action.

Submarine mines will be used to obstruct the passage of vessels past the batteries. They will not be restricted to single lines, through which it is too easy to countermine, but will be distributed over considerable lengths of the channel where they can be covered by a heavy fire of flanking guns. The mines are of the electric type, exploded automatically at contact with the vessel or by judgment at the will of the operator. Ground mines of cast iron are preferred for shallow water, not exceeding 30 feet, and buoyant mines of steel, spherical in form, for deeper channels. The size of the latter is adjusted to furnish the requisite buoyancy, which varies with the depth and strength of the currents. Experience has shown that where the depth exceeds about 100 feet and the velocity of the current is over 7 feet per second, the size becomes too great to admit of successful working. Tidal oscillations greater than 10 feet introduce serious difficulties in obstructing a channel by mines, but it fortunately happens that at none of our important ports is this range exceeded. Where more than one passage exists, channels not needed for our vessels will be closed by self-acting mines dangerous alike to all comers. A pattern perfectly safe to plant, self-destructive if set adrift, and exceedingly difficult to remove has been adopted.

Firing mines by judgment meets with but little favor in our service. The destructive range increases even less rapidly than the square root of the charge, and unless wasteful quantities of the explosive are used, the difficulty of determining the exact relative position of the mine and the ship will lead to failures, especially in the case of buoyant mines which swing considerably with the tide. By night and in fogs a judgment system would be worthless. Hence many small charges well distributed and exploded automatically at the shock of the vessel are preferred. By the use of electricity as the igniting agent, such mines will be harmless to our own vessels. The usual charge for contact mines is 100 pounds, and explosive gelatine or dynamite No. 1 is preferred for service. The electric fuse contains 24 grains of mercuric fulminate, and is ignited by a current of half an ampere. Mines are usually designed to be spaced at 100 feet apart, thus allowing for moderate errors of planting, since they are not mutually destructive at distances of about 40 feet. A 500 pound countermine works no injury at a range of 80 feet. It is considered that a channel defended upon the system adopted cannot be traversed with impunity until cleared by the operations of the hostile fleet, and the extreme difficulty of effecting this object under the close fire of the land guns will render such obstructions far more formidable than any other kind now known.

Space is lacking to consider, except in a very general manner, the engineering details of the coast batteries now under construction to receive our modern armament. Magazine accommodation for 200 rounds, of which at least 100 rounds will be stored in the immediate vicinity of the pieces, is provided for all high power guns. Shells will be stored loaded, but without the fuses, and the propelling charges will be kept in service cartridge bags protected by waterproof zinc cases. No handling of loose powder will thus be needed in the magazines. This condition is demanded by reason of the immense amounts of powder required by modern high power guns. Thus for 200 rounds the amount called for by an eight inch gun is 13 tons; by a 10 inch gun, 25 tons; and by a 12 inch gun, 45 tons.

As no funds have thus far been made available for the construction of armored land defenses, no definite decision as to the kind of armor to be adopted has been made. The matter is held in reserve to benefit by the latest developments. It is hardly probable, however, that the immense expense of the new types of ship armor will be demanded, especially as on land weight is rather an advantage than otherwise.

The batteries under construction are protected by earth and concrete. With a view to deflecting the projectiles, and to reducing cost, as many bowlders or large masses of rock are incorporated in the latter as is consistent with the formation of a solid monolith. The rule has been adopted that the magazine cover on any probable path of a projectile fired from the larger high power guns should be 40 feet of such concrete and 10 feet of sand, or their equivalents—2 feet of sand being regarded as the equivalent of 1 foot of concrete. Near the surface the full thickness of concrete is used, and its exterior face is given a slope of 1 on 1 for the purpose of deflecting the shot. For parapets a breast height wall of 25 feet of concrete with exterior covering of earth sufficient to fill out to the plane of magazine cover is adopted. This total protection corresponds to a thickness of about 70 feet of sand.

The new system of coast defense is fairly inaugurated, and will be prosecuted as rapidly as Congress provides the funds. Mortar batteries are now under construction at both entrances to New York Harbor, at Boston, and at San Francisco. A gun lift battery for two 12 inch guns has been constructed and successfully tested at Sandy Hook. Disappearing gun batteries are completed or under construction at Portland, Boston, both entrances to New York Harbor, Washington, Hampton Roads, and San Francisco. Mining casemates are built with their cable galleries at all the most important harbors, and a fair supply of the mines and their accessories are in readiness for use.

*Abstracts from a paper by Brevet Brig. Gen. Henry L. Abbott, U. S. Army, Colonel, Corps of Engineers, read before the International Congress of Engineers at Chicago, and published in the *Journal* of the Military Service Institution of the United States, by permission of Major Clifton Comly, Chairman of the Division of Military Engineering.

RIGHTHANDEDNESS AND LEFTHANDEDNESS OF SIGHT.

Are you righthanded or lefthanded of sight? At present, in hunting and in pigeon shooting, good marksmen generally fire with both eyes open. How can they aim, that is to say, place the eyes, the two extremities of the barrel and the target upon the same straight line? It is possible to put the gun sight, the target, and a single one of the two eyes upon the same line; but to do this with both eyes is as difficult as it is to put the foot of the large arm of a cross and the two extremities of its small arms or the three angles of a triangle in a straight line. And yet these marksmen assure you that they aim with both eyes, and, in fact, at the moment of firing, they have both open; but they aim often with one eye only, without being aware of it.

In order to convince yourself of this, take a piece of paper or cardboard or a playing or visiting card, and, with a sharp pencil, make a hole in it of the diameter of the pencil. Place this card at 30, 40, or more centimeters from your eyes and at 10, 15, 20, or more from any point upon say a table or wall (Fig. 1). This point will represent the target, and the hole in the card will be the sight. With both eyes open, look at the point in placing the card, or rather the aperture, between such point and your eyes, and, while you hold it, first close one eye, and then open it and close the other without changing the position of the card. Now, you will at once perceive that you see the point sighted with but one of your eyes, unless the perforated card be shifted; that is to say, the aperture in the card and point sighted are in a straight line with but one of your eyes, without your in the least mistrusting it, since you sighted with both eyes open. The same thing happens to the marksman who aims with both eyes; one eye alone operates usefully for aiming.

Instead of performing this experiment with a perforated card, it can be made with the hand. To this effect, place the end of one of your fingers in a straight line with any more or less distant point and your eye, both eyes being open. Afterward close your eyes alternately, and you will become aware of this fact, viz., that with one of your eyes you will see your finger tip and the point that is sighted upon the same straight line, and that with the other there will be a wide space between such point and the extremity of your finger. Many of those who shoot with the two eyes open are excellent marksmen, and many of those who formerly closed one eye have changed system, having found that the advantages of this method are real. The object is seen better, the distance is calculated better, and, at the moment of pulling the trigger, one avoids the muscular effort necessary to close the eye, and which has required practice. Children do not succeed in it upon the first trial, and without grimaces. Many grown people cannot close a single one of their eyes or can close only one of them—the right or the left.

In England, as we know, where first-class marksmen are very numerous, and where guns of remarkable precision are made, gunsmiths are not ignorant of the fact that the marksmen who aim with both eyes open make use effectively of but one eye for pointing; but they have, it appears, observed that this eye in some is the right one and in some others the left; that is to say, there is righthandedness and lefthandedness for the sight as well as for the hands. We say here *for the sight*, as we do not intend to speak of those who cannot close the right eye or the left eye, or of those who are blind in one eye or the other, or of those whose right eye or left eye sees objects more distinctly than its mate.

Those who are blind in the right eye might, if need be, shoulder to the left or slightly modify the position of the head or weapon. Still, no one is ignorant of the fact that there exist special guns for those who are