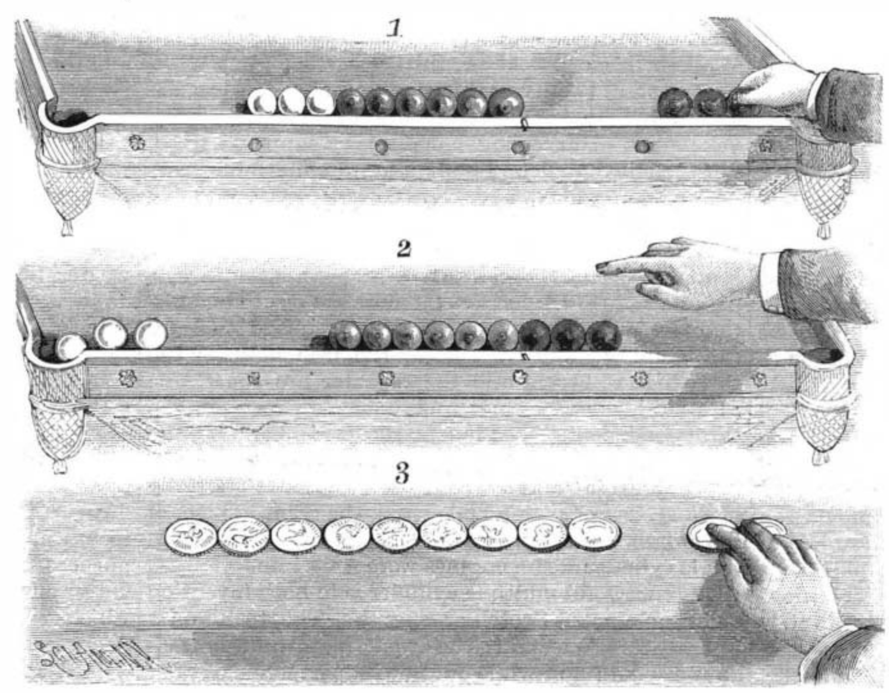
INTERESTING TRICKS.

The clever trick with billiard balls shown in Figs. 1 and 2 depends for its success on a truly scientific principle. A number of billiard balls are placed in a row against the cushion of the table. The player asks one of the spectators to name a certain number of balls to be pocketed without any apparent disturbance of the others. Suppose the number to be three. Then at the will of the player three balls separate from the others and roll into the pocket. The number is perfectly controllable, and when the hand of the player and one end of the row of balls is covered, the trick appears mysterious. It is hardly less so when the entire experiment is visible. The feat is accomplished by removing from one end of the series as many balls as are to be projected from the opposite end, and rolling them forward against the end of the row remaining. An equal number of balls fly off from the opposite end of the row and roll into the pocket. Three balls driven against one end of the series will cause three to roll off, two will drive off two, one will drive off one, and so on.

The principle of this trick is illustrated in the well known class-room experiment in which a series of contacting suspended balls of highly elastic material are made to transmit a blow delivered on the first of the series to the last ball of the series, so that the last ball will fly off without any apparent disturbance of the other balls. In this experiment, the first ball of the series is drawn back and allowed to fall against the first one of those remaining in contact. The impact of this ball will slightly flatten the ball with which it comes in contact, and each ball in turn transmits its momentum to the next, and so on through the entire series, the last of the series being thrown out as indicated.

In the case of the experiment with the billiard balls it is found by careful observation that separate blows are given to the series, corresponding in number to the number of balls removed, so that while the separation of the three balls at the end of the series is apparently simultaneous, in reality they are separated off one at a time.

In Fig. 3 is illustrated a method of repeating the experiment with coins in lieu of balls. Dollars or half dollars may be used, and the effect is produced by sliding the coins.



SCIENTIFIC TRICKS WITH BILLIARD BALLS AND COINS.

LOGGING IN MINNESOTA.

It is now no uncommon sight during the logging season of each winter in this State to see incredibly large loads of logs moved over a road through the forest by a four-horse team. During last winter the record for big loads of logs was broken by teams in the employ of the Ann River Logging Company, operating on the Ann River, a tributary of the Snake River. The scale of one of the loads, as given by the company's scaler, showed that it contained 63 logs, measuring 31,480 feet; weight of load, including sleds, 114 tons; height of load from the sleds, 21 feet; width of load, 20 feet. The load was hauled by four horses a distance of three miles, on one set of sleds and by one four-horse team. S. C. Sargent, an artist of Taylor's Falls, Minnesota, was present at the time these loads of logs were hauled, and photographed the loads as they came on the landing. We present herewith a cut from a photograph made by Mr. Sargent.

LOGGING IN MINNESOTA.

Range of War Ship Guns.

A 12 inch Schneider gun, under an angle of projection of 20° (average maximum angle used on board ship), will throw a 900 lb. shell 10½ miles. There are many guns now mounted on battle ships that have the power to throw projectiles ten miles, under maximum ship angles of projection. So says Lieut. E. M. Weaver, in the *Journal of the U. S. Artillery*. At Portland, Me., the ten mile circle passes out to sea some 3½ miles from nearest land, at Boston 2½ miles from land, at Brooklyn 2½ miles from land off Coney Island. Ships of war, at the above distances, could bombard the cities named with great shells and make frightful havoc. There is pressing need for the immediate provision of effective and abundant means for coast defense. It is to be hoped our law makers will make liberal enactments for this purpose.

THE BRITISH FIRST CLASS CRUISER EDGAR.

The Edgar is a powerful cruiser, being well protected by an armored deck, and by minute subdivision. The class of which she is the prototype comprises nine vessels, designed for the express purpose of protecting commerce on the high seas, and in such a case good offensive powers and high speed were essential. It was also necessary that the cruisers should be able to keep the seas for a long period or make fast voyages to distant parts without coaling, so that it was necessary to reduce all weights to enable the vessels to carry a large fuel supply, and the measure of success is the fact that on a displacement of only 7,350 tons they have bunker capacity for 850 tons, so that they could cross the Atlantic at full speed, and might steam 10,000 miles at a speed of 10 knots.

The engines are of the triple expansion type with three inverted cylinders and three cranks. There are separate sets for driving each of the twin screws, the engines being fitted in separate compartments. Of the two engines an engraving is here given, prepared from a photograph taken while the engines were in the erecting shop at Fairfield.

The high pressure cylinders are 40 inches in diameter, the intermediate pressure cylinders are 59 inches in diameter, and the low pressure cylinders are 88 inches in diameter, and each is adapted for a stroke of 4 feet 3 inches. The cylinders are all independent of each other, and are steam jacketed. The high pressure cylinders are each fitted with a liner of forged steel, and those of the medium pressure and low pressure are fitted with cast iron liners. All the cylinder covers are of cast steel. Each high pressure cylinder is fitted with a piston valve, and the medium and low pressure cylinders are each fitted with double ported slide valves, all of which are worked by the ordinary double eccentric and link motion valve gear. Balance cylinders are fitted to the intermediate and low pressure valve gear; these valves are also fitted with relieving rings at the back. The reversing engines are of the all-round type with worm and wheel gear, and the low pressure levers are fitted with a slot and adjusting screw to allow of the expansion in the cylinder being altered. The back columns are of cast steel fitted with separate guide faces pinned on, and the front columns are of forged steel. The engines are so arranged that the starting platforms are in the wings of the ship. As is shown on the plate, the main condensers are placed alongside the starting platforms and are of cast brass. The steam is condensed outside the tubes, the circulating water passing through the tubes. There are two large centrifugal circulating pumps of gun metal in each engine room. They are worked by independent engines made by Messrs. Tangye, Birmingham. The feed, bilge, and fire engines are all independent of, and separate from, the main engines, the steam being supplied by a special range of pipes. All the exhausts are led into an auxiliary condenser of cast brass, having a small air and circulating pump, one of these condensers being fitted in each engine room.

The crank, tunnel, and propeller shafting is of forged steel and hollow, supplied by Messrs. J. Brown & Co., Sheffield. The crank pins are fitted with centrifugal lubricating apparatus. The propellers are of gun metal, each propeller having three adjustable blades constructed to work outward.

Steam is supplied by four double-ended boilers 16 feet in diameter and 18 feet long, each with eight furnaces, and one single-ended auxiliary boiler, 12 feet 11 inches in diameter and 9 feet 3 inches long, having three furnaces. The furnaces are corrugated and are 3 feet 9 inches in diameter. The total number is 35, and the heating surface in all the boiler totals 20,108 square feet. The tubes are of naval brass. The working pressure is 155 pounds. The boilers are arranged in two water-tight compartments, the steam pipes being so arranged that the steam from the boilers in either boiler room can be used for the engines in either or both engine rooms. There are two funnels, one to each boiler room. As usual in vessels of the Royal Navy, the boiler rooms are so fitted that they can be closed and the boilers worked under forced draught when desired.

When the eight hours' official natural draught trial took place, the engines developed 10,178 indicated horse power with 99 revolutions. Before making the full power trial it was considered advisable to dock the ship and alter the pitch of the propeller. This having been done, the four hours' full-power forced draught took place, the result being 12,463 indicated horse power with 104·5 revolutions. The average speed of the vessel during the four hours was nearly 21 knots per hour, thus making the Edgar the fastest vessel in the British Navy. To ascertain the efficiency of the ship and machinery, the vessel was taken to Stokes Bay measured mile, and a series of progressive trials extending over two days were carried out, the trials being conducted by Mr. W. H. White, C.B., assistant controller and director of naval construction, and Mr. A. J. Durston, engineer-in-chief, assisted by other officials from the Admiralty, the Fairfield Company being represented by Mr. Andrew Laing. On the full-speed mile trial the engines developed 13,101 indicated horse power average, or 13,460 indicated horse power maximum.

During the whole of the trials the engines and boilers worked most satisfactorily, without the slightest hitch, and with an entire absence of vibration when at the highest speeds. The boilers maintained an ample supply of dry steam under an air pressure of about seven-tenths for full power, and on examination at the conclusion of the trials they were found to be in good order and perfectly tight. These boilers are the largest yet constructed for the British Navy; they are double-ended, and have a common combustion chamber to each two furnaces, and not the slightest trouble was experienced in the working. Altogether the trials of the Edgar have been most successful, and the results obtained reflect great credit on the designer of the ship, Mr. White, of the Admiralty, and on the machinery designer, Mr. Andrew Laing, of the Fairfield Works. The engines were built at the works at Govan of the Fairfield Company, while the ship was constructed in the dockyard at Devonport.—*Engineering.*

American Boasting.

BY PROF. JOHN E. SWEET.

None of us think as well of the man of real merit who appears over-conscious of it as we do of him who is less persistent in forcing the fact of his merit upon others. Is not this equally true of communities, States, districts, and industries in this country? Will it not be helpful to pause a moment in the self-glorification to which success has made us prone, and consider a little more humbly just where we stand?

While this is the greatest century of all centuries in the advancement of what we suppose to be general civilization, and of what is certainly industrial progressive civilization, and while this nation is moving on side by side with other nations, does any know less of what others do than we, and are any so stupid about profiting by what others are doing? Or if other nations are as thoroughly convinced of their merits, do they not keep their conviction more to themselves?

That we excel other people in certain lines of industry is a fact, but that they excel us in others leaves us the less to boast of. Great as are our achievements, with our facilities and the added knowledge of centuries, what have we in greatness to compare with the great works in ancient Egypt, with the art and architecture of Greece, with the paintings, sculpture, buildings, roads, aqueducts, and baths of ancient Rome? Where do we compete with the tombs and silks of India, with the palaces of Venice, with the education of Germany, the pottery, tapestry, art, industry, science, engineering, taste, and beauty of France? Are we really in the race with the carvings of Switzerland and Norway, the sculpture and music of Italy, the lacquer work and jades of Japan, the silks and ceramics of China, and with the world of achievements and supremacy in invention, mechanics, engineering, science, medicine, metallurgy, navigation, manufactories, implements and instruments of war, postal service, civil service, internal improvement, and the local government of England?

Other nations give us credit for those things in which we surpass them. Why are we so reluctant and ungenerous, if not unfair, as not to return the compliment? Is it because we are too conceited, or is it because we do not know, perhaps? But it is not to our credit if it is so. Is it because we blow our own horn and expect them to do the same? If so, that at least is not a trait to be proud of. Or is it just this, that to do so would not be American?

We boast of our great men, of our inventors, of our mechanics, of our workmanship, of our achievements, but how much allowance is made for what was done before by other men, other nations, and for the work done before we began? We may well be proud of our Franklin, but how many great men were there before? He demonstrated that lightning and electricity were one, but how much was known about electricity before?

Most of those who read the history as given in the "Royal Encyclopedia" will be astonished. We are proud of Morse, and well we may be; but his great achievement was not in the invention of the electric telegraph, for that was done by others at the time or earlier; but he invented the best one, and with the aid of such men as Ezra Cornell erected and put in operation a telegraphic line. The electrical part had all been preceded by Faraday and other European electricians. The mechanical part was crude compared to the present perfect instruments. Among our present electricians there is a small army of them, each a tooth or a wheel in the great machine, but there are many and many a tooth and wheel in the great machine besides. The genius of one man seems great to-day, but it is but another step added to the genius of another man who added his step to that of the others who preceded him. Corliss was a great man, but he came after Watt, a greater one. Our machine tool builders are great men, but they follow Whitworth, Maudsley, Roberts, and Nasmyth. We excel in woodworking machinery—not in every respect; and nine-tenths of every woodworking machine tool is but the carrying out of Bentham's patents granted in England a century ago. Watt invented and constructed the copying lathe before Blanchard. Newbery, of England, invented, and Perin, of Paris, perfected and introduced the band saw machine.

We manufacture clocks, cheap clocks, good clocks, and Yankee clocks, but few of the best, and the science of timekeeping and clockmaking is old. We manufacture watches as pieces of small machinery better than others, yes; but as timekeepers, no. The highest priced and best watches are still made in England and Switzerland.

We make fine machine tools—more ingenious than others, yes; better than others, no. We make standards of measure of straight and flat surfaces, standard gauges, after Whitworth's models, and a good while after Whitworth produced and introduced the same things. Darling's scales were ahead and better than all others. Pratt & Whitney's gauges are better than Whitworth's of twenty or thirty years ago, but Whitworth's *were* twenty or thirty years ago. Sewing machines were an American invention and American development. Harvesting machines are supposed to be, but Bell invented and built a mowing machine years before McCormick, and the mowing machine is an American development, not an American invention.

The typewriter in its perfected form is American, the lawn mower and bicycle are not. Some things in textile manufacture are American, far more are not. The knitting machine may be American, the Jacquard loom and the spinning jenny are not. In the iron industry the three high roll train and the repeater are American; cast steel, the Bessemer and Siemens processes, the Whitworth compressed ingots, the steam hammer, the hot blast, and the Whitwell stove are not. The sleeping car and air brake are American; the locomotive, the block system of switch and signal, the point in place of the switch, are English. The greatest improvements in single cylinder steam engines were American.

The successful multiple cylinder is in both invention and development Scotch or English. The turret on a war vessel is American; the armor plate and built-up guns are not; and while our newspapers make out our vessels and guns to be superior to others, the gun trials seem to be made on a half charge of powder, and the claim based on the assumed full charge, and the armor-clad vessels that we are *going to build* are the ones that are superior.

According to our papers the Pennsylvania depot at Jersey City is the largest single room in the world. That would be true if it were not for the Machinery Palace in Paris, which is more than twice the size. We have the largest bridge in the world, or would have, if it were not for the Forth Bridge in Scotland. Our Washington Monument is taller than the Pyramids, taller than St. Peter's, each of which is something besides what some one has called a "marble railroad spike," and the Washington Monument would be the tallest structure in the world were it not for the Eiffel Tower, which is not quite twice the height. We have the largest statue in the world, but it was made in France. We perform wonders both in large things and small, but there are few things, indeed, after all, either large or small, that are not better done in other countries; so few, indeed, that it seems hardly worth while to boast of them, even if boasting were not a detriment to us in the eyes of other people—a detriment to ourselves because such a thing is detrimental to progress, and a thing that is in shocking bad taste at the best.

Among the things most boasted about, and upon which we have the most reason to pride ourselves, are our mechanical inventions and the products of our mechanical engineering establishments.

In noting the things in which we surpass the world it will be well to balance them against the following on the other side:

Lumber is much better sawn and with much less waste in nearly all other countries than here. Joiner work was first much better done in Austria. Iron casting is a fine art in nearly all countries, except England, compared to our productions. Steel in all its forms is as good or better. Steel casting to shape, Muntz metal and Mitis metal are of foreign origin. Solid drawn steel tubes, laminated gun barrels, and Stubs wire are imported. The most economical and best built horizontal engines are built in Switzerland. A better built Corliss engine than was ever seen in this country was exhibited at the Paris Exhibition, built at Creusot—an engine with work about it that no American could even tell how it was done. There were also exhibited engines better finished than the highly-finished Brown and Straight Line engines, with even a greater difference between the American and the Mulhouse in workmanship than between the others. Machine tools with better material, better designed, and better workmanship than the best of the American.

A few points among the many: Successful hardened and ground steel journals and boxes; cast steel hardened and tempered gears and pinions; turret heads on screw machines with hardened and ground tool steel turrets; and here the writer, by way of parenthesis, would beg to suggest that perhaps the number of American steel makers, machinists, and smiths that court the job of making a piece of tool steel 6 inches thick 10 inches diameter, boring seven or more holes through it, and hardening the thing as hard as fire and water will make it, are rather limited, with many another job which we possibly could do, but don't. Of the machine tools we have originated, how many of them but are the natural outgrowth of the original slide lathe, planing machine, gear cutting machine, drilling machine, shaper, trip hammer, steam hammer, rolls, punching machine, shearing machine, bending rolls, and later forging machine, hydraulic press, hydraulic riveter, cold iron saws, and band saws for iron—none of which originated with us—which shows that the outgrowth from the early machines has not been wholly confined to this country, and that all the bold departures do not stand to our credit.

We have done nothing further in advance of precedent than rolling tubes from the solid bar.

In the foregoing I have intended to be strictly fair, and though I may be here and there in error, there are no doubt scores of things better done abroad than here, or not done at all here, that I have not mentioned.

Things are done in India, China, and Japan in the way of working metal, and that, too, by the crudest of tools, which we, with all our ingenuity and appliances, could not accomplish. It will be said in reply that "we don't want to;" true, but on the other hand, when we question why everything abroad is not done as we do it, would it not be well to think perhaps they, too, "don't want to," instead of ridiculing their way, and thus setting it down to inability or ignorance?

In fine, are we legitimately boastful, or are we not?

It is the practice among foreign periodicals to publish everything they find of ours that seems to them superior, and they do it both that their people may profit by the information and as a stimulus to keep their industries up to the times. It is the practice with our technical journals to copy these notices; but for what purpose or why it is hard to tell. What it does is to flatter our vanity and cultivate our conceit, neither of which seems necessary.

There will be among my readers hundreds who have gained their knowledge from reading, who will set down the above as the chattering of a crank, as a libel on our national greatness, as the prattle of a man void of patriotism; and, too, there may be scores of others equally as competent to form an opinion as myself, who can find abundance of evidence satisfactory to themselves that shows the above claims are wrong, and to those I would reply in advance as follows: Admitting it to be so, is not cultivating the notion that we can learn nothing from other nations detrimental to progress? Is not boasting in every form bad taste?—*American Machinist.*

Large Electric Mining Plant.

One of the largest electric mining plants yet installed in the United States has been put in the Virginia group of mines near Ouray, Colo. The water power plant is located nearly four miles from the mines, and consists of a small duct from which an iron pipe is extended a distance of about 4,000 ft. along the side of the canyon, producing an effective head of 485 ft. Two Pelton water wheels, one 5 ft. and the other 6 ft. in diameter, are used, capable of developing 500 horse power and 720 horse power, respectively, or a total of 1,220 horse power. The wheels are connected independently, so that the entire station may be run with either one. The electric generating plant consists of one 100 kilo-watts and two 90 kilo-watts Edison dynamos, giving a total output of 295 electrical horse power. The machinery which is operated by this current at the mines consists of one pump of 60 horse power capacity and another of 25 horse power, one 25 horse power hoisting machine, two 60 horse power Edison motors running stamp and concentrators, and one 15 horse power blower. The hoisting engine is an Edison motor of standard type, the winding and controlling switch being the same as used on street cars. This motor is geared to the drum through a friction clutch. Coal at the mines, it is stated, costs $18 per ton, and before this plant was put in the power cost the mining company nearly $40,000 per annum, and they are expecting by the use of this system to practically do away with this expense.

The Cape Hatteras Light.

The projected lighthouse on Outer Diamond Shoal, about eight miles off the mainland at Cape Hatteras, which was undertaken by Messrs. Anderson & Barr more than two years ago, has been abandoned, and the contractors, after having expended nearly $100,000 upon the undertaking, have canceled all orders for further work. The lighthouse was to have been erected for $485,000, the light to be ready January 1, 1892, and to remain continuously lighted a year before any payment should be made. In the effort to fulfill the contract a caisson of iron and steel was built weighing 1,200 tons, and towed from Norfolk to the shoals, but in attempting to sink it in place the structure was totally wrecked and the men at work narrowly escaped drowning. The present light is in a tower 165 feet high upon the mainland, but in running in toward the shore to get bearings from the light, vessels are frequently caught in the currents and breaking seas of the shoals stretching far out to sea.

Tinplate Definitions.

From *Tin and Tinplate*, by Joseph D. Weeks. Tinplate, or to speak more accurately tinned plate or tinned sheets, is thin sheets or plates of iron or steel coated with tin.

Terne plate is sheet or plate iron or steel, covered with an alloy of tin and lead, usually two-thirds lead and one-third tin. It is this union of three metals, iron, lead and tin, that gives rise to the name terne plate, terne being the French equivalent of the English adjective tern, meaning threefold. The oft-repeated statement that terne is from a French word meaning dull is incorrect. Terne plate, because of the presence of lead in the coating, is duller than tinplate, which is frequently called bright plate, but it is not this fact that gave rise to the appellation terne, but the union of the three metals.

Taggers tin is a thin tinplate, 30 wire gauge and lighter. This name is not applied, as is often stated, because the iron out of which the plate is made was at one time and is even now used for tags or marks. The term was originally used to designate the very thin sheet iron which ran below the gauge—"tagged on" to the regular gauge—and hence these thin sheets tinned are called "taggers tin."

There is a question as to whether the tin used forms an alloy with the iron or is only a simple coating. It seems to be more firmly attached to the iron than a mere coating would be, rarely, if ever, when the sheet is properly prepared, scaling off, but requiring absolute rubbing away to remove it. It is probable that the tin coating forms an alloy with the iron.

The plates thus coated form the well known tin and terne plates of commerce, the sheets varying greatly in size, from 10 in. by 14 in. to 40 in. by 84 in.; in gauge of plate from 22 to 30 for tin and terne plate and 30 to 38 for taggers; put up in boxes containing 14 to 225 sheets, and varying from 7¼ pounds to 400 pounds a box. The standard size of tinplate is I C coke plate 10 in. by 14 in., with 225 sheets to a box, and weigh nominally 108 pounds to a box.

Tinplate is thin sheets of iron or steel, 22 w. g. to 30 w. g., coated with tin. It is called also bright tin, tinned sheets, tinned plate. The French name is *fer blanc*, or white iron, a name that was at one time used in England.

Taggers tin is very thin tinplate 30 w. g. and lighter.

Terne plate is sheets of iron or steel coated with tin and lead. The proportions of these two metals and the consequent quality of the terne plate vary greatly; the more lead, the inferior the plate. Roofing plates, from their almost exclusive use for this purpose; Canada plates, from their extensive use for roofing in that country, are other names for ternes.

Charcoal plates are tinplates, the iron plates of which were made of charcoal iron. But few charcoal plates are now made.

Coke plates are tin or terne plates made from puddled iron plates.

Bessemer plates, Siemens plates, open hearth plates, indicate the kind of steel out of which the plates are made.

A mender or return is an imperfect plate returned to the tin house to be mended or repaired.

Wasters are imperfect plates, sold as such.

Black plate is the iron or steel plates or sheets as they come from the rolling mill, having been cut to the proper size. They are termed black pickled plates after the first pickling or immersion in dilute acid. Cold rolled plates after cold rolling. White pickled plates after the second pickling, and when they are ready for the tin pot.

Large Glass Cells.

Hitherto glass cells have been blown, and owing to this their size has been very limited, the largest being only about 22 inches long by about 12 inches or 14 inches deep, and the same in width. By the process now successfully carried out by Armstrong's Glass Company, of Birmingham, tanks and cells of any dimensions can be constructed. The process consists in welding or fusing plates or sheets of glass together, thus forming a solid glass tank, with all the advantages of having the sides straight, the bottoms level, and the angles all square and to accurate measurements, the blown boxes being frequently quite the reverse in these respects. Armstrong's Company show at the Crystal Palace one tank 4 feet 6 inches long, made by their new process, which is briefly as follows:

A mould of iron of the interior dimensions of the tank is placed into a furnace, and upon this mould are fastened the plates of glass. The furnace is gradually heated until red hot. Then an oxyhydrogen blowpipe or an electric arc burner is introduced to heat the edges. A small roller which is attached to the blowpipe is next brought over the junction, and the joint formed. When all the joints have been finished the cell is left to anneal, and when perfectly cold the glass box or tank, thus formed out of five glass plates welded together, is lifted off the iron mould, being a perfect tank, solid throughout, and capable of resisting acids and alkalies. The same company show an underground conduit for electric cables, formed of slabs of glass, grooved with longitudinal parallel grooves. In laying these, after the trench in the ground has been formed, a cement concrete trough is made; inside this trough a layer of pitch or asphalt is run in. Upon this soft pitch the bottom sections of the glass slabs are placed. Upon these the upper sections of the glass slabs are placed, the joints being broken by each section. The whole is then run in with pitch or asphalt, and covered up with the concrete.

NOVEL TOYS.

On any pleasant day may be found on lower Broadway and other down-town thoroughfares venders who sell almost anything in the way of novelties. Among these may be seen culinary implements, toilet articles, cheap microscopes, magnifying glasses, and various toys. Nothing takes better in the way of articles for this kind of trade than some new toy. Whether a toy

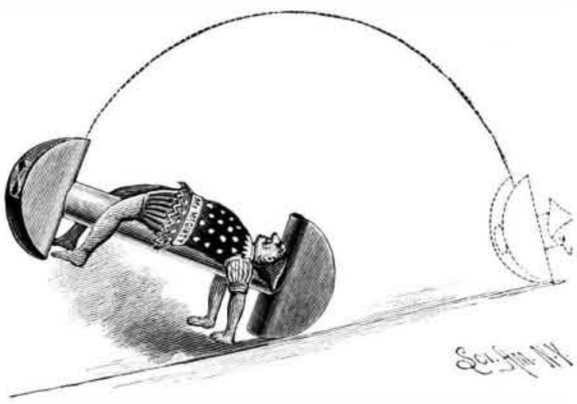


Fig. 1.—ACROBAT WITH MERCURY WEIGHT.

will probably have a good run can be determined by these venders in a very short time. If it takes well, crowds gather around him, and he drives a thriving business, making money for himself as well as for the inventor. If, however, the article is not wanted, the vender very soon finds it out, and looks for other wares.

Some of the toys are scientific, others are not. We give two examples of scientific toys which have sold very well. They are similar in character, and illustrate what shifting the center of gravity can do. They are both acrobats. The one shown in Fig. 1, and designated "McGinty," consists of a paper figure attached to a tube closed at both ends and inserted in paper disks which are bent down on the tube, forming semicircular end pieces on which the device may roll. A drop of mercury placed in the tube completes the toy. When placed on a slightly inclined surface, with the tube parallel with the surface, the mercury rolls to the lower end of the tube, causing that end to preponderate. The lighter end, by its own momentum, moves forward until it strikes the inclined surface, when the mercury again rolls to the lower end and causes another half revolution, and so on. This toy moves down the incline with a slow and stately movement.

The toy shown in Fig. 2 is made upon the principle just described, but the round ends of the figure

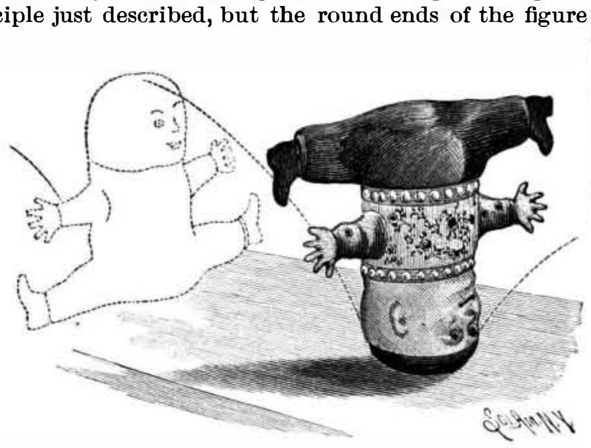


Fig. 2.—TUMBLER.

furnish the rolling surfaces, and a bullet is used for the weight instead of a globule of mercury, the body being simply a straight paper tube with convex ends.

Yearly Tides.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. W. S. Auchincloss read a paper on yearly tides. The author stated that he proposed to show that confined bodies of fresh water are subject to yearly tides of greater or less magnitude, depending upon the nature of the basin or upon the strata to which they are confined, and upon the effect of evaporation if in an open basin.

In March, 1885, we had occasion to sink a well near Bryn Mawr, Pa. Natural anxiety as to the permanence of the supply led us to observe the depth of the water at intervals of about ten days. It soon became evident that the water was receding. In 1886 there was a gratifying rise of the surface and a total gain of 12 feet. Our curiosity was aroused and we determined to study the law, if such a law existed, of this ebb and flow. These observations have been continued during the past seven years. We found that in normal years the surface of the water reaches its lowest level in December, rises until June, and descends during the autumn.

An examination of the amount of the rainfall shows that while the amount of rainfall was as great or greater during the last half of the year as during the first, the level of the water in the well continually lowered. Atmospheric temperature had practically no effect, as the temperature of the water in the well is practically constant all the year round. The depth of the well prevented evaporation from its surface from having any effect.

The author believes that the true cause is the result of the influences of gravity and of the sun's attraction at different seasons of the year. When the sun reaches its furthest point south of the equator, gravity exerts its maximum influence on the waters of the northern hemisphere. The waters of the earth will be drawn into the minutest crevices and the surfaces lowered, but in June they will, in a measure, be released and, under the influence of adhesion and friction, will be held at a higher level than during any other season of the year.

Data obtained from the government records, showing the depth of water in the great lakes, show that there is a similar rise and fall, the range of yearly ebb and flow being from 12 to 15 inches in our northern lakes. So far as we are aware, no data exist for the small lakes. More extended research will, we believe, secure as complete a recognition of yearly tides as physical geography has always accorded to the phenomenon of daily tides.

The author presented two diagrams, one of which showed the rise and fall of the water in the well covering a period of seven years, and also the northing and southing of the sun for the same period.

The Poor Children of New York.

Mr. Riis, in an article on the poor children of New York, in the May *Scribner's*, says that "in ten years, during which New York added to her population one-fourth, the homelessness of our streets—taking the returns of the Children's Aid Society's lodging houses as the gauge—instead of increasing proportionately, has decreased nearly one-fifth; and of the Topsy element, it may be set down as a fact there is an end."

"Half the poverty, the ignorance and the helplessness of the cities of the Old World is dumped at our door by immigration," while the procession of the strong and the able move on to the West.

The police census returns show that in 1890 there were in all the tenements of New York City, 160,708 children under five years of age. This does not imply that there were so many really poor children, by a good many thousand. The census taken more than a year ago, for a special purpose, of the Jews in the East Side Sweaters' District, showed a total of 23,405 children under six years and 21,285 between six and fourteen, in a population of something more than 111,000. All of these were foreigners, most of them Russian, Polish and Roumanian Jews.

According to the tenement house census in New York, in the entire mass of nearly a million and a quarter of tenants, only 249 children under fourteen years of age were found at work in living rooms by the sanitary police. This is one of the encouraging facts mentioned by Mr. Riis in his article.

Of the 60,000 Hebrew children in New York, fully one-third go to school. "The poorest Hebrew knows that knowledge is power, and power, as the means of getting on in the world that has spurned him so long, is what he yearns for. He lets no opportunity slip to obtain it. Day and night schools are crowded by his children, who learn rapidly and with ease.

"There are 5,000 children in the twenty-one industrial schools scattered through the poor tenement districts of New York City. A count made last October showed that considerably more than one-third were born in twelve foreign countries where English was not spoken, and that 10,000 knew no word of our language."

Without doubt, the longest step which has yet been taken in the race with poverty in New York City is the establishing of many kindergartens for the poor children, to which access is made easier every day. There they get their earliest notion of order and harmless play.

The lack of small parks and playgrounds in the tenement house district of New York, and the consequent perpetual tussles between the children, at harmless play in the street, and the police, are the chief forces in the development of the "tough." The germ of the gangs, he says, that terrorize whole sections of the city at intervals, and feed our courts and jails, may, without much difficulty, be discovered in these early and rather grotesque struggles of the boys with the police.

Drunkenness is the vice that wrecks about half of the homes of the poor which do not cause it. It is that which, in nine cases out of ten, drives the boy to the street and the girl to a life of shame.