

MIMICRY IN THE EGGS OF FISHES.

BY CHARLES F. HOLDER.

The study of the protective resemblances among animals is a field of no little interest, well illustrating the marvelous devices of Nature for the protection and perpetuation of life.

This is well shown in the eggs of fishes, which seem, in some instances, to be almost endowed with a special sense, enabling them to avoid their enemies and reach the seclusion necessary to their safety.

The accomplishment of this is attained by a remarkable imitation on the part of the egg, or egg-case, to plants of their various parts. An interesting, indeed striking, example of this is seen in the accompanying illustration, which shows the egg-case of a peculiar shark and an egg-case broken, the young shark being in the act of escaping. The shark which produces the egg is a member of the *Castracionidæ*; about twenty-five genera being known, of which twenty-two possess a special interest to geologists as having lived previous to the oolite. But a few years ago the fish was only known by fossil forms, but finally a living specimen was caught at Port Jackson, Australia, showing that this "ancient and fish-like form" had endured until to-day. Another specimen was soon discovered in the waters of California and described as *Gyropleurodus francisci*, the singular shark whose egg-case is figured. It is a small fish, rarely over three feet in length, beautifully marked, having a horny spine in front of each dorsal fin.

The shark is a sluggish creature, often seen lying asleep or dormant in crevices in the rocks, and occasionally caught in seines.

The eggs are deposited in a black or dark case which takes the form of a perfect spiral, and looks exactly like a leaf of kelp or weed folded up, imitating the weed not only in form and shape, but in color. This is deposited by the shark amid the kelp beds, where it clings to the leaves by the edges of the spirals, and is thus prevented from washing ashore. A more perfect mimicry it would be impossible to imagine. When the young shark attains its maximum size within the egg, it bursts open or forces the end of the pseudo leaf and swims away to become the victim in many cases of predatory fishes. Another shark on the Pacific coast has an equally remarkable egg. It is dark, barrow-shaped, with four long tentacle like handles which grasp the surrounding weed, and cling to it; not merely preventing the egg from floating ashore, but presenting a perfect case of mimicry, the egg resembling a leaf so perfectly that it is often passed by the closest observer.

Many of the eggs of fishes are almost invisible, and float upon the surface. Those of the remarkable fish *Antennarius* dot the leaves of the kelp, minute white balls, which are taken by the novice as some interesting lime-secreting animal. The long, grape-like, conspicuous eggs of the hag fish are found among the kelp in certain localities and bear a remarkable resemblance to the floats of the weed, and in this manner escape detection. Many of the egg-cases of sharks illustrate the efforts of Nature to protect her own. Some are adorned with barbels that resemble the small leaves of the sea weed in which they are deposited, and all have the exact tint and color of the objects about them.

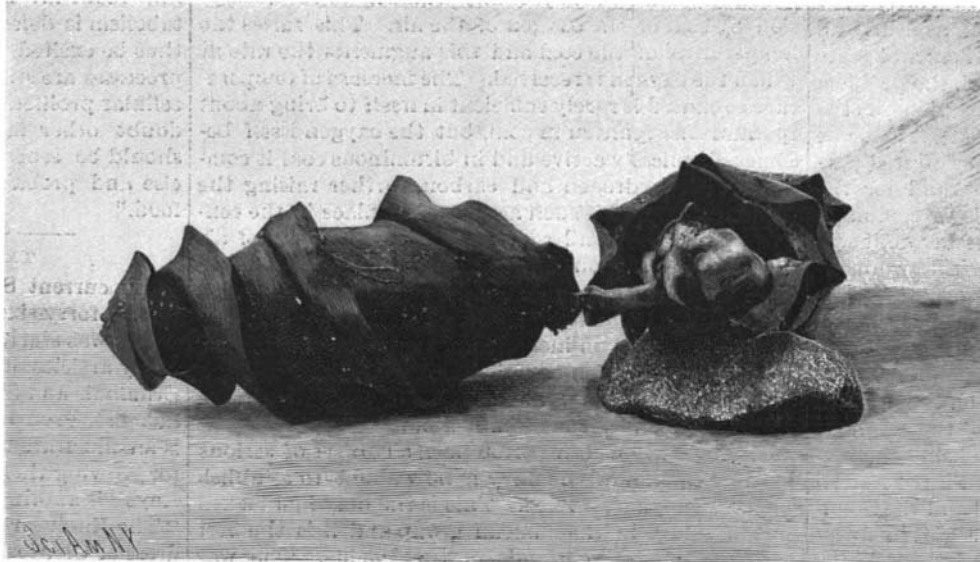
SCIENTIFIC KITE FLYING.

For several years past, the making and flying of kites upon scientific principles has been recognized by many amateurs. We have already on several occasions illustrated the Eddy kites and the experiments of Lieutenant Wise and Mr. Hargraves

are also well known. Both the Eddy kite and the box kite have great efficiency, but Mr. Warren H. Smith, of Pontiac, Mich., writes us that he has devised a square box kite which is superior to either. Mr. Smith's box kite has the flying bridle on one corner and has its flying surface greatly increased by a pair of fixed triangular wings, thus making the entire width somewhat greater than the height of the frame. The first kite of this sort was only 30 inches high and 38 inches wide, with the wing piece bent back to a depth of bow equal to one-tenth of

its length, the wings presenting a convex surface to the air. The covering was light paper and the frame covered weighed but a few ounces. Experiments showed that even this small kite had good points for either single or tandem flying. Flown in tandem with two moderate sized Eddy kites at an elevation of 1,500 feet, the main line was carried up at an average angle of forty-five degrees, and sometimes as much as seventy degrees. This kite was, of course, too frail for anything but a gentle breeze.

The next kite was built of solid wood sticks, and



EGG OF THE SHARK, SHOWING THE YOUNG EMERGING.

the cells were covered with manila paper, and the wings had a spread of 4 feet. This kite weighed one pound and did fully as well as the first. It presented 12 feet of flying surface and had a pull varying from 3 to 6 pounds in a moderate wind. Later in the season kites 4, 5, and 6 feet in height were built, and they were covered with paper or cambric, cloth being more suitable for high velocity. The largest two-cell kite was 7 feet high, and weighed 6 pounds. This kite was flown many times singly, and in tandem with lighter ones. In a breeze blowing 12 to 15 miles an hour, the tension was from 20 to 30 pounds. The last kite of the season measured 14 feet from wing to wing.

There were three cells, one at the top, one at the bottom and one midway between the other two, each cell being covered with a strip of cambric two feet wide. The whole structure was stiffened by many diagonals of heavy twine, and it weighed 15 pounds, and presented a flying surface of 170 square feet. This kite was flown with a 3-16-inch rope, running from a windlass. The kite rose steadily, flying at a high angle until over three-quarters of a mile of rope was reeled out. It was in the air continuously for six hours, and reached



VARIOUS TYPES OF MODERN KITES.

an altitude of nearly 2,000 feet, and proved very efficient. The only difficulty in handling resulted from the great tension of from 100 to 150 pounds, and the inefficiency of the reel to withstand a heavy strain. Mr. Smith's conclusions are that, in general, it is better for each kite to be attached to the main line by its own string, 100 feet or more in length, as it will then fly at the most effective angle. Kite flying is an interesting and exciting sport, and doubtless many amateurs will make kites this winter for use during the spring and summer.

Elevator Air Cushions in a High Office Building.

Even with all the experience and skill which have been devoted to the study of elevator safety appliances, with the best material and workmanship, with the most rigorous and continuous systems of inspection, and with competent persons in charge, yet passenger elevators sometimes fall and cause more or less serious accidents. The manufacturer of elevators uses the best and most efficient safety devices he can obtain to control the movement of the car and to surely arrest it if a certain speed should be exceeded. The very nature of his business compels him to do this, because the result is financial embarrassment to him if his elevators drop occasionally. This applies with equal force to owners of buildings, who would have difficulty in securing tenants if the elevator apparatus were suspected of being dangerous. Many even go beyond the purely mechanical device and introduce a pneumatic arrangement as a last resort, only to be brought into action when all else fails.

The air cushion, located at the bottom of an elevator shaft, possesses peculiar inherent advantages which cannot be gainsaid. First, and most essential, it is always ready to perform its work instantly, and to do it successfully, under all conditions. Of itself, it cannot get out of order, since, practically, it is only a hole into which something may drop, some time. Whether the car dropped one or twenty stories, its movement would cease, not suddenly, but gradually, and without shock. The first cost of the air cushion is small and the outlay for its maintenance nil. It occupies space not otherwise valuable. All things considered, it is difficult to understand why it is not more widely employed.

One of the most extensive and elaborate applications of the elevator air cushion is to be found in the Empire building, New York. The building is a twenty-story office building, recently completed, and provided with all the most modern appliances and conveniences. There are ten elevators, of the high speed hydraulic type, arranged in two groups of five each. While nine of the elevators are distinctly for passenger service, one is more powerful and is capable of lifting safes weighing 8,000 pounds. Each shaft is entirely independent from the floor of the third story to the bottom, and is inclosed by walls which are not perforated except by the door openings. This forms the air cushion proper, which is about 50 feet in depth. The doors of the main floor and of the second floor are in two parts, which slide in recesses in the wall. These are of bronze and of ample strength to resist the air pressure that would come upon them if a car should fall. The usual open iron work is entirely absent on these two floors, solid masonry replacing it. The cars have also been strengthened with the view of resisting this pressure. The shaft walls are battered for a short distance below the third-story floor. The shaft at this point is 10 inches wider than the bottom, the batter extending just below the second floor. This provides a graduated air escape and adapts the cushion to any fall which the car may make. The car fits more closely in the lower portion of the shaft, the walls of which are vertical. It has been estimated that the air cushion should be in proportion of 1 to 6 of the travel; in the present instance the cushion is 50 feet and the travel 287 feet. In the bottom of each shaft is a suction valve which opens inwardly as the car ascends, thus preventing the vacuum which would result from the car leaving the cushion. There is also an escape valve, which opens outwardly into the atmosphere. It is so adjusted as to sustain the

weight of a car under ordinary conditions, but will, in case of accident, relieve the cushion of undue pressure when the car falls. It has been calculated that the pressure in the air cushion, if a car should fall from the top, would be 3½ pounds to the square inch.

On July 18, a car weighing 2,000 pounds was dropped from the twentieth story. The efficiency of the cushion was shown by the fact that the eggs and incandescent lamps carried upon the floor of the car were uninjured.—Iron Age.

Coal for the Navy.

The subject of coal for the navy has been of great importance since the war with Spain began, not because of danger to the vessels themselves, as was so strongly suggested in the recent case of spontaneous combustion in the bunkers of the battleship "Oregon," at the New York navy yard, but because of the apprehension that enough might not be obtained for the ships, in view of the effect of the neutrality laws. This question has been recently discussed by The Evening Post, from which we glean the following facts. There was no apprehension felt that there would be any famine in anthracite, of which the United States is, of course, the great producer; but inasmuch as nearly all the vessels of the navy are fitted with boilers and grate bars for the use of bituminous or soft coal, the problem was one that was feared might become vexatious, as the vessels would have to return to the United States or be supplied from colliers at sea. The situation was particularly embarrassing for Dewey's fleet, and for the "Oregon" and for the vessels of Schley's command when cruising in search of Cervera's fleet before it was safely locked up at Santiago. This is a great argument for coaling stations at a distance from home ports.

Recently the Anthracite Coal Association has made strong efforts to have the navy introduce that variety of fuel, without apparent success. It is claimed by the officers who were in the fleet that destroyed the Spanish vessels at Santiago on July 3 that it was the excellent American soft coal that enabled them to bring the vessels up to their highest efficiency, and that if the American ships had been using anthracite coal and the Spaniards bituminous, the latter would have gotten away from the American fleet. The subject of the relative values of anthracite and bituminous coal for the navy has been a matter of careful inquiry by the Navy Department for years, and a recent report says:

"When it is considered that nowadays one fleet under full steam might be alongside of another at anchor in a little more than an hour after they sighted each other, it will be seen that, even under heavily banked fires of anthracite, the fleet at anchor would be at a greater disadvantage for maneuvering; while with low and dirty fires, or with cold boilers, the destruction of that fleet could only be prevented by means extraneous to itself. Promptness of ignition may also be of vital importance on a lee shore, or in a sudden gale in a harbor, and under other circumstances. Nor is it in emergencies alone that rapidity of ignition is useful, for it gives much more uniform action in all

steaming, since the fires quickly attain their maximum efficiency, instead of, as with anthracite, being almost inert for twenty minutes or more after each coaling. In short, the board is of opinion that this quality is so valuable in a naval vessel that it almost precludes the employment of anthracite in time of war, in favor of more free-burning coal, and that it has considerable advantages in time of peace also."

A narrow escape from disastrous fires in several war ships from spontaneous ignition of the coal would suggest that it was a very dangerous cargo. The examination into the causes of the spontaneous ignition on board ship shows that it is due primarily to the absorption by coal of the oxygen of the air. This raises the temperature of the coal and this augments the rate at which the oxygen is received. The increase of temperature so caused is rarely sufficient in itself to bring about spontaneous ignition in coal, but the oxygen itself becomes chemically active and in bituminous coal it combines with hydrogen and carbon, further raising the temperature, and if such action takes place in the center of a heap of small coal, a sufficient quantity of air being supplied, spontaneous combustion will probably follow. The introduction of high steam pressures, with the consequent increase of fire-room temperatures, has been followed by an increase in the number of cases of spontaneous ignition on ship board. It is also claimed that the pyrites in coal plays an important part in promoting spontaneous combustion.

Coaling stations have often been a subject of serious consideration, and the navy is now about to establish one at Pagopago, Samoa. This is the only landlocked port of refuge in the Samoan group and it is the best harbor among the islands of the Pacific. The war with Spain has demonstrated that coal is a contraband of war, and in time of war, when away from their home ports, United States steamers are practically useless for fighting purposes unless they can obtain coal from their colliers; so that coaling stations at various points are not only important, but are absolutely necessary.

Increase of Cancer in England.

In England four and a half times as many people die now from cancer as half a century ago, and no other disease can show anything like such an immense increase, W. Roger Williams says in The Lancet. "Probably no single factor is more potent in determining the outbreak of cancer in the predisposed than high feeding. There can be no doubt that the greed for

food manifested by modern communities is altogether out of proportion to their present requirements. Many indications point to the gluttonous consumption of meat, which is such a characteristic feature of this age, as likely to be especially harmful in this respect. Statistics show that the consumption of meat has for many years been increasing by leaps and bounds, till it now has reached the amazing total of 131 pounds per head per year, which is more than double what it was half a century ago, when the conditions of life were more compatible with high feeding. When excessive quantities of such highly stimulating forms of nutriment are ingested by persons whose cellular metabolism is defective, it seems probable that there may thus be excited in those parts of the body where vital processes are still active such excessive and disorderly cellular proliferation as may eventuate in cancer. No doubt other factors co-operate, and among these I should be especially inclined to name deficient exercise and probably also deficiency in fresh vegetable food."

The Current Supplement.

The current SUPPLEMENT, No. 1200, marks the end of the forty-sixth volume of this unique publication, which was started twenty-three years ago. It contains many articles of exceptional interest. "Games Among Criminals and Savages" is a paper by the great criminologist, Prof. Lombroso. "How to Grow Mushrooms" is an illustrated article giving government directions for growing them. It is fully illustrated. "Roentgen Rays" is another original memoir by Prof. Roentgen. "The Engineer and His Work" is the presidential address of Charles Wallace Hunt, delivered before the American Society of Mechanical Engineers. "An Outline of the History of Geological Societies of America" completes this very interesting paper.

Contents.

(Illustrated articles are marked with an asterisk.)

Birds, poisonous, food of.....	424	Locomotives, American, for	
Bridge, Brooklyn, increasing ca-		England.....	418
capacity of.....	418	Locomotive with oscillating	
Cabmen, electric motor, educa-		cylinders*.....	421
tion of.....	424	Navies, world's, strength*.....	417, 422
Channel for New York Harbor.....	418	Papers, preserving.....	419
Elevator air cushions.....	425	Subscribers, a word to.....	424
Fishes, eggs of*.....	425	Sulphur industry.....	421
Flying machine*.....	424	Supplement, current.....	426
Forests of the world.....	418	Telephone, new French.....	420
Heavens in January.....	419	Tire, Ramsey's*.....	420
Kite flying, scientific*.....	425	Trees, absorption of copper by.....	421
Labrador, wealth of.....	420	Wheels, friction*.....	420

RECENTLY PATENTED INVENTIONS.**Agricultural Implements.**

HILLSIDE OR REVERSIBLE PLOW.—EDSON C. ROBINSON, Canandaigua, N. Y. A simple and durable jointer has been devised by this inventor, which is of duplex form, and is made in one piece, one point being a duplicate of the other, occupying, however, a reversed position, while the moldboards are in the same horizontal plane. An effective and light reversing device is also provided and a means whereby the jointer-standard will be inclined usually in a forward direction, the inclination permitting the jointer's being reversed at the rear of the standard, according to the direction of the inclination. A frog-box is likewise provided, which receives the pivot-post on the beam, and which obviates the present necessity of frequently removing the frog.

LAWN-MOWER.—MARK N. CORMACK, New York city. The mower of this inventor is provided with a series of separate individual cutters traveling in a continuous endless line and disposed in two oppositely moving runs, situated one above the other, in direct contact with each other, so that the edges of the cutters move directly past one another to perform the cutting. By the peculiar construction of the cutters, it is possible to cut grass of any height without danger of clogging the machine.

Bicycle-Appliances.

SPROCKET-CHAIN.—CHARLES J. COOK, New York city. The bicycle sprocket-chain patented by this inventor is especially designed for use on bicycles, and has alternate block and plate links. The block-links have oil-cups, by means of which every pintle can be lubricated. The chain may be readily separated, and is so constructed that the parts run easily without undue friction.

FOOT-PROPELLED VEHICLE.—THOMAS H. BROWN, Livermore Falls, Me. This vehicle is a tricycle, having a frame in the front end of which a steering wheel is fitted. On an axle carried by the rear end of the frame, wheels are mounted, one of which is fixed and the other loose. On the rear of the frame a seat is mounted. Crank-shafts in front of the axle are provided with gear-wheels, one of which meshes with a pinion on the axle. A clutch on the axle carries a pinion in mesh with the other gear-wheel of the other crank shaft. Arms are pivoted at their upper ends to the frame below the rear portion of the seat. Links connect the arms with the crank-shafts. Two pairs of foot-levers are pivoted at their lower ends to the forward part of the frame and project up in front of the seat. Links connect the foot-levers and arms.

STEERING-GEAR.—ARTHUR DOYLE, Seattle, Wash. The steering-gear forming the subject of this invention comprises a transverse fixed bearing; a slide mounted to slide thereon; and a link pivotally connected with the slide, and attached to the fork, and made in telescoping parts. When the slide is shifted to turn the wheel, the rider, by clamping both the slide and the bearing, can readily lock the slide in place until the turn has been made.

Electrical Contrivances.

LAMP.—WALTER S. DOE, Jersey City, N. J. This invention is an improvement upon a lamp patented by the same inventor. The improved lamp has a battery-jar formed with one or more cells, each containing an exciting fluid. A cathode in the form of a hollow perforated cylinder of carbon contains a suspended perforated tube of non-conducting material, within which tube an anode is adapted to be dropped. A contact-wire is held in the tube, and on it the anode rests. The contact-wire and the cathode are connected with the filament of the electric incandescent lamp.

Engineering Improvements.

LINK VALVE-GEAR.—JOHN A. ROSE, Axtell, Neb. The purpose of this invention is to provide a link valve-gear for steam engines, which is arranged to produce a complete center action by placing the eccentric and valve in a true line at all times, thereby preventing undue friction and pinching of the parts under heavy pressure. The valve-gear is provided with a yoke adapted to be raised or lowered. To a link made in sections fastened together, trunnions are secured and mounted to turn in bearings on the yoke. Link-blocks fitted to slide in the link are connected with the valve-stem. Lugs projecting from the link are adapted to receive the pivot-pins for the eccentric-rod heads.

Mechanical Devices.

REGISTERING DEVICE.—JESSE ALEXANDER, New York city. This register is especially designed to be applied to type-writers, in order to show the number of folios written. The register is also applicable to all other purposes in which it is desired to keep a consecutive count. The spacing-bar of the type-writer is made to actuate a finger, playing over a registering dial, through the medium of ratchet wheels and levers. By pressing down upon the central spindle, the locking devices are thrown out of engagement with the registering mechanism, thus enabling various springs to return the registering mechanism to its initial position.

LOCK.—ALBERT E. ORMOND, Winnipeg, Canada. The purpose of this invention is to provide a lock which may be freely operated by the knob at the inner side of the door, but which cannot be operated from the outside without first manipulating a predetermined combination. The lock comprises a series of notched tumbler-disks, means for imparting a step-by-step rotary movement to the tumbler disks, a spring-pressed dog controlled by the tumbler, a bolt-actuating plate, an outer knob, a clutch operated by a movement of the dog to put the outer knob in operative position with the plate, and an inner knob having connection with the plate, whereby the bolt may be operated by rotating the inner knob.

Railway-Appliances.

AUTOMATIC RAILWAY-GATE.—DORIS BERNARDIN, St. Eustache, and ZENOPHILE PATTEAUX, Winnipeg, Canada. These inventors have devised an apparatus which is automatically operated by a railway-train or its motor to close a highway-crossing of a rail-

way before the approach of a train, and to open the crossing after the train has passed. The apparatus consists of two principal parts: an improved operating mechanism which is provided with a bar so placed as to be engaged by the tread of the wheels, and a novel gate or closing mechanism, which is operated by the bar through the medium of connecting mechanism. The gate being entirely automatic in operation, dispenses with the use of a gateman, and thus removes the danger of accidents resulting from the carelessness of the men placed in charge of the usual railroad-crossing gate.

RAILWAY TIME-SIGNAL.—HENRY J. WEMETT, Lima, N. Y. In this improved device a signal is operated in such a manner that it will clearly indicate to an engineer what length of time has elapsed since the preceding train passed a certain point. The signal comprises a clock-mechanism adapted to be mounted adjacent to the track. The mechanism is provided with an easily visible clock-face and dial, and with a hand which may be freed from the clock-mechanism and returned to zero by the action of a trip operated by a passing train.

CAR-COUPLING.—WILLIAM C. SHAW, White Plains, Md. The improved pivoted jaw-coupler patented by this inventor has a lateral shoulder and a coupling hook pivoted on one side of the draw-head. A locking or safety catch is pivoted on the opposite side of the draw-head, adjacent to the shoulder, and is adapted to engage the coupling hook. Uncoupling is effected by the use of a lever and rod without difficulty or danger, and the coupling devices may be set in position to hold them out of action by the same means employed in uncoupling. The car-coupler is designed automatically to couple cars on the shortest curves as easily as on straight tracks.

RAILWAY-CROSSING SIGNAL.—JOHN D. TAYLOR, Chillicothe, Ohio. This invention seeks to provide an automatic alarm-signal to be placed at a railway-crossing, which signal will sound an alarm when a train is approaching the crossing; but only when the train is actually approaching and not when it is standing or backing. The invention consists in the novel arrangement of a signal-sounding mechanism; an open track-circuit at one side of a crossing; a resistance connecting one portion of the track-circuit with another, the resistance diminishing as they approach the crossing; a primary coil in the track-circuit; a secondary coil operating by an induced current from the primary to actuate the signal; and another primary to bring the signal to rest.

Miscellaneous Inventions.

TEMPLE FOR LOOMS.—PATRICK DUFFY, New Bedford, Mass. By means of this invention, cloth may be drawn longitudinally and kept properly extended in a transverse direction to permit the filling to be properly beaten in by the lay without injury to the cloth and without danger of the selvage's chafing. A ribbed roll is employed, which turns but does not slide axially. On this roll a ribbed loose cover is superimposed, between which and the roll the fabric passes. The cover automatically adjusts itself according to the pull on the cloth and its thickness, so that there is no strain on the loose cover when pulling transversely on the cloth. The cloth,

consequently, is not jammed against the ribs of the roll. The roll is thus permitted to revolve freely with the forward movement of the cloth.

DRESS-STIFFENER.—MINNIE T. SELLERS, New York city. Stiffeners made of wire, reed, or whalebone are objectionable because they become easily broken and the projecting ends are liable to tear the clothing. The present stiffener, in order to be free from these faults, is made of a facing of fabric to which a strip of haircloth is secured, having one edge folded upon and extending partly across the main portion of the material. A greater rigidity is thus obtained at one edge of the stiffener than at the other, whereby a skirt may be made to hang better than would otherwise be possible.

LOCKING DEVICE FOR TELESCOPING-BOXES.—OLIVER B. HICKS, Chicago, Ill. This invention seeks to provide an improved locking device for telescoping cases such as are used by commercial travelers. The device comprises a combined ratchet and guide plate; a casing having a sliding engagement with the guide; a bolt fitted to slide in the casing and adapted to engage the ratchet-plate; a spring-pressed lever engaging the bolt to withdraw it; a finger-piece to actuate the lever; and a locking-lever actuated by a key and arranged to swing into the path of the bolt to lock it against withdrawal.

BOOK-SHELF BLOCK-CASE.—ADELBERT E. FOUTCH, New York city. The case is especially designed to receive photographic views, and is so constructed that it may be used as a book-shelf block to hold books in place. The case has an unbroken front wall and is open at the rear. Drawers are mounted in the case and may be withdrawn from the rear. A spring-actuated presser plate is hinged to the upper front edge of the case and lies over the top thereof to engage the shelf above the case and to hold the case in place. The presser-plate has flanges at its side and rear edges, which flanges project down outside of the upper portion of the case. When in place, the case cannot be distinguished from the usual book-shelf blocks.

NON-REFILLABLE BOTTLE.—EDWIN WILBUR, Newport, R. I. In making non-refillable bottles after the design of this inventor, a valve-seat is formed in the bottle-neck, and a ring is fitted above the valve-seat and provided with a central cup projecting down within the ring and connected with the upper portion of the ring by arms. A ball is adapted to be seated in the valve-seat. The ball will drop into the cup whenever the bottle is turned up. When the bottle is turned right side up, the ball will drop into its seat and prevent the entrance of all liquid.

FENCE-POST.—ARPHAD SNELL, Tice, Ill. The purpose of this invention is to provide a clay fence-post and a simple means for securing the wires thereto. The fence-post is provided with a series of transverse notches and an opening below the lowermost notch. A binding strip crosses the notches in the post and is provided with a flange at its lower end, which flange enters the opening in the post. A flange at the upper end engages with the top of the post. Clamps secure the binding strip to the post. The wire which forms the fence is passed around the end post between the post and the