THE MECHANICAL BASEBALL PITCHER.

We present some engravings of Prof. C. H. Hinton's mechanical baseball pitcher. This new gunpowder gun for pitching a baseball was tried at the Princeton ball field on June 8, 9, and 10. The apparatus was put into position and expert players were allowed to bat the ball. The result of the test was very successful, the ball being discharged by electricity. The tension was varied and drop and curve balls were discharged by the gun with ease. Prof. Hinton has provided us with the following description of his interesting mechanical pitcher. He says:

The problem of producing by inanimate mechanism the equivalent of a ball pitched by the human hand divides itself into three parts.

First, the projection of a ball so that its velocity varies within narrow limits, and its direction is accurate.

Secondly, the imparting to a ball so delivered a spin or rotation about an axis which does not coincide with the direction of flight, but lies at right angles to it.

Thirdly, the providing an equivalent or substitute for the motion of the pitcher's arm preparatory to the delivery of the ball. The most natural plan to pursue in seeking to reproduce a pitched ball by inanimate mechanical means is to construct a catapult.

An instrument of this kind capable of projecting a fairly accurate straight ball is not difficult to make, but when it comes to combining a rotator with the projecting apparatus, the problem assumes a different aspect. And even if a solution were arrived at, the construction would, for the special purpose for which it is designed, be impracticable, on account of its cumbrous nature.

The moving parts and guides must, in their weight and friction, far exceed the inertia of the ball, and a source of energy vastly disproportioned to the effect produced would be needed.

Such, at least, were the considerations which led me to abandon the construction of a catapult pitcher and to adopt the expansive force of gunpowder acting behind the ball in a tube, as the source of projectile force.

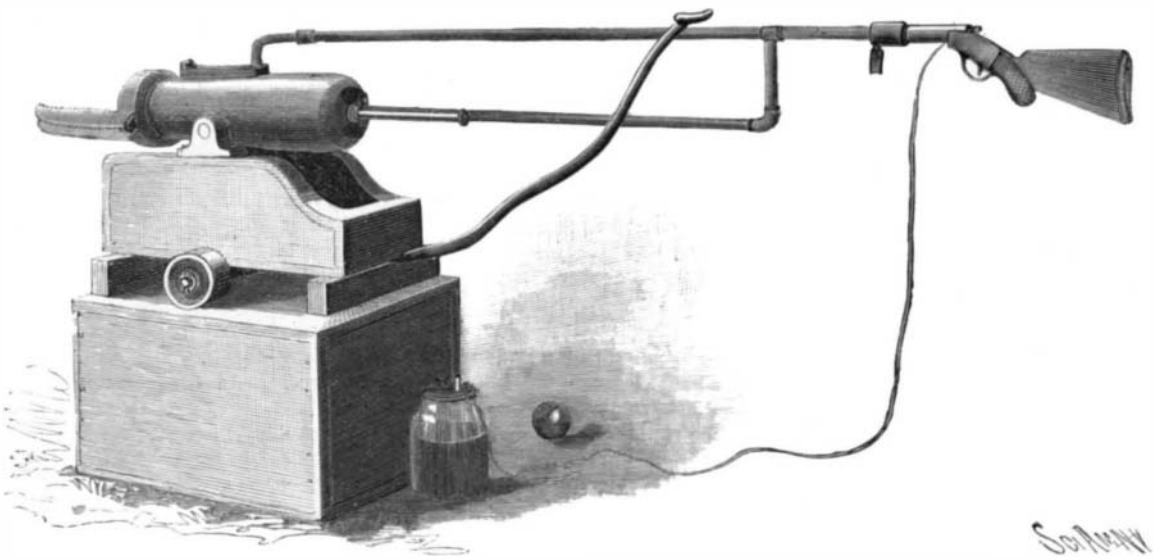
With the simple and satisfactory means, however, of producing rotation described below, a catapult form of pitcher does not seem to be at all impossible.

Adopting powder and a tube, it is by no means the case that a true and accurate ball can be produced without further thought.

If the powder is ignited in a small chamber behind the ball, the most varied effects follow. The ball sometimes fails to travel its course, sometimes flies with prodigious velocity. When a short barrel is used, the results are better; but the most absolute accuracy in loading and uniformity in waddingare requisite. The whole condition, however, changes as soon as a long tube of small caliber is traversed by the exploding powder before it emerges into the large barrel in which the ball is held.

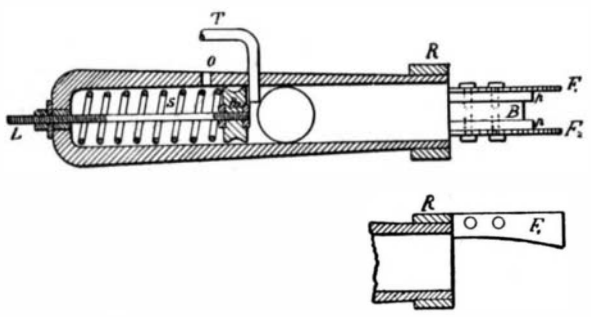
With such an arrangement, the difficulty of sending one ball after another with a uniform velocity disappears. In the experimental model and in the light gun, illustrated herewith, a tube of $\frac{38}{100}$ inch internal diameter and of a length of about 4 feet is used. The results would probably be still better and more uniform with a tube of 30 caliber, the length being the same.

It is certain that a tube of 44 caliber, even though a little longer, is comparatively extremely unreliable. The tube may be straight or coiled. If coiled, a slightly heavier charge is needed. The reasons of the effectiveness of the long tube appear to be two: In a long tube, the complete combustion of the powder is secured and the maximum amount of gas in each case produced. With such a tube, also, the delivery of the expanding gases on the ball is effected without shock. A baseball is elastic. If an elastic body is hit a violent blow when confined in a tube, its lateral expansion causes it to jam, and when released from its momentary arrestation the gases heaped up behind it urge it on with great velocity.



THE BASEBALL CANNON.

A straight ball of fairly uniform velocity being thus obtained, the rotation round an axis perpendicular to the line of flight is obtained by prolonging the inner surface of the tube in two separate lines widely distant from each other, so that when the ball leaves the barrel it is touched in two spots and retarded by the prolongation of the tube. This is effected by means of "fingers," thin plates of metal, which, fastened to a ring movable round the muzzle of the gun, project over the thickness of the barrel, so that their edges are in a line with the interior of the tube.



CROSS SECTION OF THE BASEBALL GUN.

These fingers are curved and covered with rubber. The ball, on leaving the barrel, owing to their curvature presses itself against them more and more. Owing to the nature of the substance with which they are covered, the ball slips very little. It tends to roll, and roll, not on a full circumference, but on two small circles near the poles. It thus obtains a velocity of spin greater than that which it would have if it traversed its course rolling against a surface instead of flying through the air. This spin gives it the curved path.

The cap which carries the fingers can be turned round on the muzzle of the gun so that any required curve can be obtained.

The ball curves in that direction toward which the front is moving. Hence, if, looking along the gun, the fingers are put on the right hand side, the curve will be an in curve, that is, toward the observer's right hand.

With fingers seven inches long, slightly curved, and covered with one-eighth inch rubber, the gun will send balls varying from right to left of a mark by only a few inches, and making a curve of nine or ten inches deviation from a straight line.

With fingers more strongly curved, the deviation of the ball is greater, but the accuracy is impaired. Probably with longer fingers of slight curvature a greater deviation could be obtained without loss of accuracy.

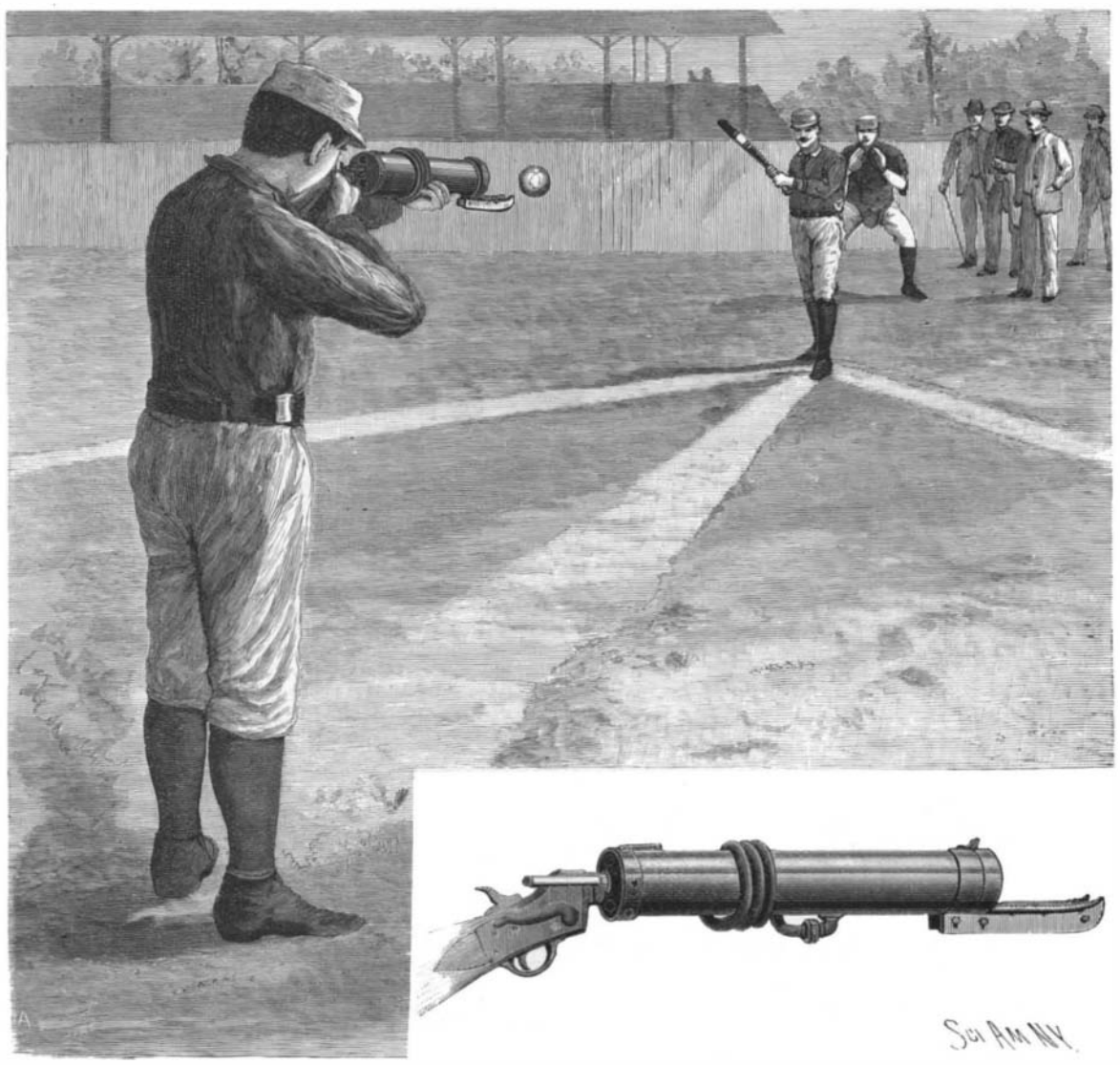
In order to obviate any dangerous velocities, and thus make the gun perfectly safe, the breech, which closes the barrel immediately behind the tube for the delivery of the expanding gases, is made movable. It fits easily in the barrel, and the necessary obstruction to the powder gas is secured by means of packing. The breech is pressed forward by a spring coiled in the part of the barrel behind it. The spring is so regulated as to press on the movable breech with the same force that the powder does when driving the ball at such a rate as to traverse 60 feet in six-tenths of a second, that being the speed at which a ball of fair velocity is pitched. If, for any cause, the pressure in the barrel becomes greater than that necessary to produce this velocity, the breech is pressed back and an aperture in the side of the gun is thereby made accessible to the gases, and thus the pressure on the ball is relieved.

Without the movable breech, a ball which fits tightly in the barrel is a possible source of danger, on account of the high velocity with which it is propelled. With it a tightly fitting ball is driven out more slowly than one which fits properly.

The breech is kept in place against the spring by a rod passing through an opening at the end of the gun, and secured by a nut.

Variation of speed without a change of cartridge can be obtained by shifting the position of the breech. If it is drawn back so as to leave a space behind the ball, a "windage" is provided, which moderates the speed.

There are difficulties, however, of a psychologic nature in the way of the successful use of the gun as hitherto described. The ball comes too suddenly; there is nothing to compensate for the motion of the pitcher's arm. As a substitute, signals of various kinds have been tried, but an effective plan, and the one at present adopted, is to dispense with the necessity of signals



GUN FOR DELIVERING A CURVED BALL AS USED ON THE PRINCETON BALL GROUNDS.

altogether. By means of a very simple electrical arrangement the batter fires the gun himself. When throwing his foot forward to take the position for striking he presses on a plate, breaks an electric circuit, and so releases a spring which pulls the trigger. He thus, after a few trials, is able to know the exact instant at which the ball will appear at the mouth of the gun, catches it with his eye at the moment of its emergence, and finds no difficulty in following its course. The problem of delivery is thus altogether eliminated, and a practice ball is sent which can be judged entirely by its course in the air. For general use a trigger must be devised which gives a short but definite interval between the pull on the catch and the explosion of the cartridge. With such a trigger the batter can accustom himself to the delivery of the gun when fired by another than himself as easily as to the delivery of a pitcher.

The fingers form the essential feature of the gun, and they, it may be observed, can be used with any form of projector. A catapult is in the process of construction in which a rigid arm moved by springs is suddenly arrested. The arm carries the ball in a holder, from which project two curved rods. At the moment of arrestation the rods are momentarily stationary, the ball then, rolling along them exactly as in the case of the gun, acquires a spinning motion.

But, on account of portability, ease of manipulation, and handiness, the gun appears to be the preferable form, and it remains to be seen whether it will supply the need which exists in baseball—the need of a generous supply of curved balls for practice.

The Passing of the Narrow Gage in America.

The passing of the narrow gage is again evidenced by the transformation of the track of an Iowa road from a gage of three feet to that of standard, which has just been accomplished without interrupting traffic an entire week day, says the International Ticket Agent. The road referred to, the Des Moines and Kansas City, having 112 miles of narrow gage track, was operated in connection with a standard gage road, the Keokuk and Western, 148 miles long, under the same ownership and management, making diversity of gage particularly undesirable. By widening 72 miles a continuous line 220 miles long is established between two important cities, and the immediate result will doubtless be increased traffic and reduced expenses from abolishing transfer of freight and passengers. Forty miles of the road are left unchanged for the present, but will inevitably join the majority ere long. Besides this, the only narrow gage track remaining in Iowa is that of the Burlington and Western and Burlington and Northwestern roads, aggregating 123 miles. These roads, which are conjointly operated, independently of the C., B. and Q. system to which they belong, are so situated that they are giving pretty satisfactory results, although their ultimate change to standard gage may be considered certain.

New Facts About Fishes.

Prof. A. E. Verrill, of Yale, has recently received new details concerning the great octopus which was found some time ago on the shore near St. Augustine, Fla. The professor classifies it as a species distinct from all known forms and proposes as a name for it Octopus giganteus. The part washed ashore was of at least six tons weight, which was about half its weight when living. The true length of the body is about 21 feet with a maximum width of about 7 feet and a diameter of at least 5 feet when living. Prof. Verrill thinks that two posterior stumps, looking like arms, may be the remains of lateral fins. Some of the arms were probably about 73 feet long. The dimensions of the Florida octopus are decidedly larger than those of any of the Newfoundland specimens which Prof. Verrill brought to public attention years ago. Prof. Verrill adds that the species is probably one of the kind upon which the sperm whale feeds regularly on our Southern coasts, and that the specimen found may have had suckers as large as a dinner plate, corresponding to the size of suckers once described to him by a trustworthy whaling captain.

In a number of the American Journal of Science, Prof. Verrill describes some singular nocturnal changes in the colors of fishes and their curious habits when sleeping at night. His observations were made between midnight and two o'clock A. M., the gas jets near his aquaria being turned as low as possible. Most fish, the professor says, sleep very lightly and are roused by almost imperceptible vibrations of air or water. Flounders thus seen sleeping at night showed their dark markings much more strongly than by day, and the same was true in greater or less degree of the markings of certain minnows, king fish, the black sea bass and trout, the latter becoming much darker by night than by day. This change is of a protective character. Describing other changes, Prof. Verrill says :

Other fishes, however, show much more remarkable changes. Among these the scup or porgy is one of the best examples. This fish, when active in the daytime, usually has a bright silvery color with iridescent tints. But at night, when asleep, it has a dull bronzy ground color and the body is crossed by about six transverse back bands. When one of these fishes with this coloration was awakened by suddenly turning up the gas, it immediately assumed the bright silvery colors belonging to its daytime dress. This experiment was repeated many times on different individuals with the same result. As this fish naturally rests among eel grass and seaweeds, the protective character of its nocturnal colors is obvious.

A common file fish was observed that presents a very decided change in color pattern. This species in the daytime is mottled with brown and dark olive green and the fins and tail are a little darker than the body, but when asleep at night its body becomes pallid gray or nearly white, while the fins and tail become decidedly black. These colors are decidedly protective at night or in a feeble light among rocks and weeds, where it lives. This and other species of file fishes when sleeping would usually rest on the bottom with the back leaning against the glass of the aquarium or against a stone at a considerable angle.

The common tautog or black fish has the curious habit of resting upon one side, half buried among gravel, or partly under stones, and is often curved in strange positions. It is easy to imagine that the flounders originated from some symmetrical ancestral form that acquired, like the tautog, the habit of resting upon one side, at first only when sleeping, but afterward continually, owing to the greater protection that this habit and its imitative coloration afforded. The one-sided coloration and the changes in the position of the eyes, etc., would gradually follow in accordance with well known laws of evolution.

The common squid was observed sleeping on several occasions. At such times it rests in an inclined position on the tip of its tail and on the basal parts of the arms, which are bunched together and extended forward, so that the head and anterior part of the body are raised from the bottom, so as to give room for breathing. The siphon tube is then turned to one side. Under these circumstances the color is darker and the spots more distinct than when it is active, owing to the expansion of the brown and purple chromatophores.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM TURBINE.—Louis Bollmann, Vienna, Austria-Hungary. This invention, also patented in the principal European countries, is for turbines worked by steam or gas, and provides for reducing the speed at which such motors have heretofore been rotated, and expanding the steam or gas usefully to a high degree. It comprises a bucket wheel with guides at the entrance and exhaust sides, and central plates adapted to receive steam at high pressure, while plates surrounding the first named plates have mixing chambers for receiving steam from the first named plates and openings for the admission of air. The central plates draw or throttle the high pressure steam and form it into a flat or conical jet to be mixed with a proportional large quantity of air or gas of low pressure, the invention contemplating a serial turbine having more than one circle of buckets and guides with their plates.

LOCOMOTIVE ENGINE. — Charles H. Booth, New York City. A large tender, having driving wheels and driving engines receiving steam from the main engine, is provided by this invention, the driving and fuel carrying capacity being such as to allow for long runs without stopping for fuel and water. On the forward truck are a high and a low pressure cylinder, the latter exhausting into the smoke stack, and connected to the rear of the main engine are a high and a low pressure cylinder on the truck of the tender, the exhaust here being into the water tank of the tender, which has drive wheels arranged under its overhanging sides.

Railway Appliances.

SWITCH OPERATING DEVICE.—Eduard von Haken, Charlottenburg, Germany. Pivoted centrally in the bed of the railway, according to this invention, is a three-armed lever, one of the arms being adapted to engage a switch point, and the other two arms, which extend rearwardly from the switch, having at their ends each a cam lying within the flange grooves of the rails. A vertically movable rod at each side of the car platform is held normally raised by a spring, but to move the switch point one of the rods is depressed to run through the flange groove of the rail and strike the cam. When one cam is within the rail groove the other will be outside its groove, and vice versa.

Bicycles, Etc.

PNEUMATIC TIRE.—John Carlyle Raymond, New York. A tire made of a series of interlocking rubber sections, according to this invention, is contained within a casing of canvas or other suitable material, the casing being slotted at the inside, and its sides fastened to a rim in which are door closed openings giving access to each section, and permitting of conveniently removing any one of the sections through its door. Set screws fasten the overlapping ends of adjacent doors, and should one section become punctured, it may be conveniently removed and a new one inserted without deflating the remaining sections or disturbing their positions on the wheel.

PNEUMATIC HANDLE.—Seward M. Gunsaul, Omaha, Neb. To take the place of the ordinary rigid, inelastic bicycle handle, this inventor has devised a handle with elastic body or casing secured to an iron stem with a bore at its outer end in which is fitted an air inlet and outlet valve. Provision is made for the admission and escape of air and easy regulation of the degree of distention and firmness of the body by the same valve attachment, which is perfectly protected in the bore of the stem, without unsightly projection. The elastic body of the handle may be of rubber or other preferred fabric.

BICYCLE ALARM.—John L. Leavitt, Albuquerque, and Emil Bibo, Bernalillo, New Mexico. According to this invention a gong is held by a clamp on the inside of one of the members of the front fork, the gong having a tubular hub in which slides a plunger, the forcing of which outward brings the outer end of a tongue of novel form in contact with projections or lips on the spokes of the wheel, causing the gong to sound, while, if the tongue be forced still farther out, the hammer is free from the gong and the alarm makes only a buzzing, whistling or rattling sound. The alarm may be intermittent or continuous, as desired. The plunger and tongue are forced outward by a lever having a link connection with a lever fulcrumed on the handle bar.

BICYCLE GEAR.—Joseph Wheatley, Memphis, Tenn. According to this improvement, a sprocket wheel on the rear brace bar, under the seat, is rotated by a chain whose ends are connected to pedal levers whose rear ends swing on the axle of the rear wheel, the levers being connected near their forward ends by a strap extending around a roller on a depending hanger. The sprocket wheel is a bevel gear meshing with two bevel gears loosely mounted on a shaft at right angles, rotating in bearings on the rear fork, and rigidly mounted on this shaft, at the outer side of each bevel gear, is a ratchet wheel engaged by dogs. There is also rigidly mounted on the shaft a sprocket wheel from which a sprocket chain extends to the sprocket wheel on the rear wheel axle. This gear is designed to facilitate attaining a high speed and give a notable increase of power.

Mining, Etc.

SAFETY GRIP FOR MINING CAGES.—William H. Beakey, Walkerville, Montana. An appliance by which a cage may be easily and safely stopped at any time or place, in case of accident, is provided by this invention. In the shaft are vertical guides and locking mechanism to engage them, the mechanism being connected with a lever arm normally engaged by a pivoted crab, there being a lever and connecting rod to operate the arm and a catch to support the lever. By depressing a hand lever, a crab is raised to release the lever arm, which rotates gears to throw toothed cams into locking engagement with the fixed vertical guides on the sides of the shaft.

Mechanical.

WRENCH.—Henry A. Smith, Elgin, Ill. This is an adjustable "alligator" wrench, of light weight, strong and inexpensive to manufacture, and capable of use in any way in which a monkey wrench may be applied, but particularly adapted for holding round objects. The adjustable jaw is closed by a nut and screw, entirely disconnected from the jaw, and opened by a spring when released from the tension of the screw, the latter serving in a great measure as a brace for the movable jaw, enabling the wrench to be used on very heavy objects within the range of its adjustment. The wrench is flat, taking up but little space, and is designed to be especially convenient and handy for a wide variety of uses.

BAR AND SHAFTING TURNING MACHINE.—Jacob Fitz, Hanover, Pa. In this machine the head may be arranged to turn or used stationary and put on the ordinary lathe carriage. The tubular stem has a face plate on which tools are held to be movable in and out, a tool block for each tool and the blocks being engaged by an adjusting band, a beveled surface being provided whereby the band may force the blocks inward and so adjust the tools correspondingly. Carriers on opposite sides of the stem are provided with means for clamping the shaft, and the carriers may be engaged with or feed from the feed screw.

ROOF FRAMING TOOL. — John Parkhill, Rochester, Minn. This invention relates to a formerly patented roof-framing tool of the same inventor, and provides a tool principally designed for automatically indicating and marking the proper side bevel of a jack rafter of any pitch. It has a member with a straight marking edge in the plane of a bearing, and a finger pivoted thereto about an axis arranged transversely of the marking edge, to swing in line with the marking edge and at an angle to the plane of the bearing.

Agricultural.

CULTIVATOR.—Talbot Andrews, Monmouth, Ill. This invention is for an improvement in wheeled straddle row cultivators for corn and cotton, the cultivating devices being adapted to act on two rows of corn at once, and being shiftable laterally by levers without necessitating any change in the direction of the team. The draught attachment has a three-horse evener by which the draught of the middle horse equals or balances the other two. There are two double sets of cultivating devices, each set being composed of two gangs of rotary disks, a vertical arch which rigidly connects them, and two pivoted draught bars attached to the gangs and arch. The bars may be adjusted different distances apart, thus contracting or widening the arches, according as it is desired to have greater or less space between the two sets of disks.

MILK AERATOR. — John Littlejohn, Aurora, Ill. To eliminate from fresh milk the animal gases, odors and heat, rendering the milk more pure and palatable and enabling it to be kept a longer time without becoming rancid or sour, this inventor has devised a novel straining and spraying device to accomplish the aeration in one operation as the milk is transferred to the cans in which it is to be shipped or stored. The milk is passed through a strainer into a receiver, a bottom flange of which has upwardly opening holes to spray the milk up against the walls of a surrounding vessel, from which it falls in drops or a thin sheet, to be again divided by perforations in the bottom of a pan below. From a still lower pan the milk is conducted through a cooler to the storage or shipping cans. The parts are all detachably connected, to facilitate packing and shipping.

CAPTURING AND DESTROYING INSECTS.—Joseph Strouhal, Beeville, Texas. Two patents have been granted this inventor for means for destroying insects destructive to plants and vegetables, more particularly the cotton boll weevil, machines being devised to run over a row of cotton plants and dislodge the insects, causing them to fall into pans where they will be killed by poison, the cotton removed at the same time being received upon screens and held out of contact with the poison. A wheel-supported frame on which is a driver's seat carries another movable frame, supporting pendent pans and screens, between which, as the machine is driven over the field, the plants project upward. According to one of the patents, the plants are simply struck by arms to dislodge the insects, while, according to the other patent, they are brushed by revolving brushes, the latter being adjusted higher or lower according to the growth of the plants, but in both cases the insects are dislodged and fall through the screens which support the cotton into the poison receptacles. The most effective poison for destroying the weevil and its eggs and larvæ is composed of turpentine, crude kerosene oil and carbolic acid.

Miscellaneous.

COPYING CAMERA STAND. — Owen Linley, London, England. To facilitate the production of negatives to be used in making "process" engravings, this inventor has devised a camera in which gearing connects the camera front with the sliding copying board, to shift the latter in its own plane in correlation with the focusing motion, so as to maintain constant during the focusing the predetermined position of the picture on the focusing screen, and enable the camera to be adjusted for dimension and focusing while continuously viewing the picture on the screen. Links connect the slide rest with a hand lever at the back of the camera, and a micrometer screw stop limits the rearward movement of the screen carrier. There is also a mechanism for adjusting the ruled screen within the camera in front of the plate.

AUTOMATIC FLUID GOVERNOR. — George W. Browne, Brooklyn, N. Y. A governor more especially designed for use on gas supply pipes has been devised by this inventor. It comprises a casing with longitudinal bore, at one end of which is a bell-shaped mouth engaged by a valve, while a chamber at the other end is connected with a supply, the chamber having a movable and perforated bottom for increasing or diminishing its capacity. The ball valve in the bell-shaped mouth of the bore regulates the amount of gas delivered automatically to the desired quantity, irrespective of the pressure in the gas mains.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.