

ing the engineering data, and we are free to admit that the plans, profiles, maps, shop drawings, records, etc., are as complete as the most fastidious could ask for.

The new company has evidently laid the lesson of the first failure to heart; but, in order to give further weight to the findings of the engineers, it asked for the appointment of a Technical Commission composed of eminent engineers of different nationalities, whose experience in similar work gave them special qualifications for passing upon the new surveys and plans. The International Commission included such men as Brig.-Gen. H. L. Abbot, Corps of Engineers, U. S. A.; Mr. Fulscher, formerly Engineering Director of the Kiel Canal; Mr. Koch, engineering member of the same canal; Mr. W. Henry Hunter, Chief Engineer of the Manchester Canal Company; Mr. A. Fteley, Chief Engineer Aqueduct Commissioners, New York City; Mr. C. Skalkowski, formerly Director of Mines, Russia; and four of the former General Inspectors of Roads and Bridges, France.

This commission, organized in 1896, through some of its members has made personal inspection of the canal on the Isthmus and in addition to having at its disposal the local records of rainfall and floods for the last 15 years, for two years has made its own elaborate records of rainfall and of the flow and floods of the Chagres, and has held over 100 sessions. It presented a unanimous report on December 2, 1898, which, considering the standing and experience of the members, is perhaps the most representative and authoritative document of the kind ever drawn up.

The report fully indorses the plans and estimates of cost of the new canal.

THE NEW PANAMA CANAL.—The International Commission find that the work on the canal is at present two-fifths completed, that the cost to complete the work under the new plans will be \$87,000,000. If 20 per cent be added for contingencies, the total cost is \$102,400,000, and the time for completion, not allowing for improvements in methods of working and plant, is from eight to ten years.

The canal is forty-six miles in length. The map (Fig. 9) shows its location, and the profile (Fig. 10) shows by a dotted line the amount of excavation that has been done and by a full line and shaded portions, the excavation remaining to be done. The engineers drew up three designs for a canal with locks. In the first the summit level was to be 96¾ feet; in the second, 68.08 feet; and in the third, 32¾ feet above the sea level. The technical commission recommends the second, which is the one shown in the map and profile.

As the determination of the levels and number of locks is dependent upon the means taken to control and utilize the Chagres River, it will be well to explain that this control is secured by constructing two large dams, one at Alhajuela, in the upper Chagres, about nine and one-third miles above the canal (see map), and the other at Bohio, at the end of the sea level length of the canal on the Atlantic side. The Bohio dam will be thrown across the Chagres valley at a point about half a mile to the left of the canal at Obispo. It will be of earth, upon a bed of compact clay. The general features are shown in the cross-section, Fig. 12. The crest is 1,286 feet long, and the extreme height above the bed of the river is 75½ feet, and above the foundation 93½ feet. This dam will create a vast artificial lake, which will extend thirteen and a half miles to Obispo. Its lowest level will be 52.5 feet and its highest level, when the river is in flood, 65.5 feet. The channel of the canal will lie in the bed of this lake, which will not only take care of a large part of the flood waters, but will greatly reduce the amount of excavation necessary for the canal. The other dam, at Alhajuela, will be built everywhere upon solid rock, and will consist of concrete masonry. Its crest, 936.75 feet long, will be 134.5 feet above the river bed, and 164 feet above the lowest foundation.

This dam will be connected with the summit level by a feeder with a capacity of 6,605 gallons per second. The dam will also furnish energy for the electric lighting of the canal and the electric operation of the locks, etc.

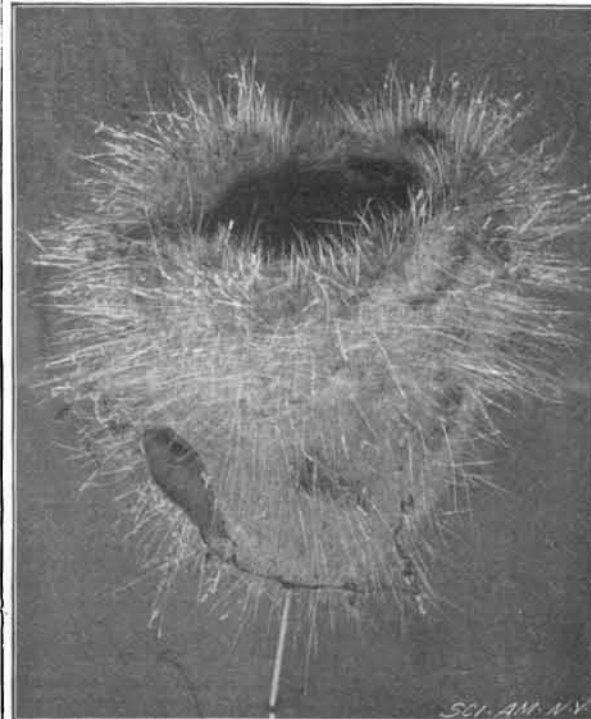
The storage capacity of the two artificial lakes thus formed will be 66 billion gallons, which provides a wide margin of safety, as shown by careful records, over any possible flood discharges of the river. The records of the flow of the upper Chagres have demonstrated that the surplus quantity of water impounded during the rainy season by the Alhajuela dam will be many times as great as will be necessary to supply the summit level during the dry season.

Commencing at Colon on the Atlantic, the first section of the canal, 15 miles in length, is tidal up to the two double locks at Bohio, by which vessels will pass into the Chagres River lake. These locks are of masonry and will be built upon rock foundations, as will all the locks of the canal. The deep cut shown in Fig. 3 is the site of the Bohio locks. The Obispo dam will be half a mile to the left of the locks in the bend of the Chagres River, which river is seen in the foreground of this same illustration. The working length of the locks will be 738.22 feet, the width of one of the twin locks being 82.03 feet and of the other 59.05 feet. Of

this sea level stretch of the canal, the first 11.8 miles are navigable, the depth varying from 16.4 feet to 29.5 feet, the finished depth. It has been excavated to the original width (see Fig. 5), and not much dredging will be necessary to complete it for the whole 15 miles to Bohio. After passing the locks the canal channel extends for about 13½ miles along the bed of the lake to Obispo, where two double locks (built like all the other locks of the company upon a rock foundation) will admit vessels to the summit level 5 miles in length, where the bottom of the canal is 68.08 feet above mean sea level. On the Pacific slope admission is gained at Paraiso by one double lock to a level 7,963 feet in length, and at Pedro-Miguel two double locks lead down to a level 7,930 feet long, from which at Miraflores one double lock will admit vessels to the tide level of the Pacific. This portion of the canal is 7½ miles in length. The depth of water in the locks will be 29.5 feet and will not exceed 32.8 feet.

It should be noted that the slopes of the canal, particularly in the Culebra cut, are to be reveted with stone, and that the curvature of the canal is easy throughout, the smallest radius being 8,200 feet and the prevailing radius 9,843 feet.

THE QUESTION OF HEALTH.—The Technical Commission examined carefully into the question of mortality and concluded that the climatic dangers have been exaggerated. It is true that, during the first years of operation, owing to carelessness as to sanitation, the employment of races not used to hard labor in the tropics, and the fact that surface ground full of fever germs was being opened, the loss of life was serious. Of late years, however, owing to the employment of negroes from the British Antilles who are used to the climatic conditions, and as a result of the fact



GLASS SPONGE FROM SANTA CATALINA ISLAND, CAL.

that the excavation is in the deeper rock formations, the amount of sickness is not abnormal.

RELATIONS OF THE NEW TO THE OLD CANAL COMPANY.—In conclusion, answering the inevitable question as to the relation of the new company to the financial burdens of the old company, we can say briefly that the old bondholders have no control over the new company, the receiver turning the property over to the latter upon the condition that the old bondholders were to have an interest in the profits (after the payment of operating expenses, depreciation, interest on construction bonds and dividend on new capital) to the extent of 60 per cent.

GLASS SPONGES.

BY PROF. CHARLES FREDERICK HOLDER.

It is not generally known that the beautiful animals known as glass sponges are found within the borders of the United States, yet one species at least is common, though rarely taken, off the coast of the Southern Californian islands, especially on the so-called grouper banks of Santa Catalina, where fishing is carried on in water five hundred or six hundred feet deep.

It was here that the attractive specimen shown in the accompanying illustration was found, being brought up on a fish hook. The sponge was a species of *Holtenia*, probably *Holtenia Carpenteria*, about twelve inches in height and nearly six in diameter; the long glass-like roots had been torn off when it was brought up. In appearance the sponge was a veritable porcupine; long needle-like spicules standing out all over it, the longest three inches in length, needles so sharp and brittle that it was difficult to hold or touch the sponge, and at a glance it resembled some odd or fanciful cactus.

The sponge was vase shaped, and would hold three pints of fluid, bulging out in the center, with an

opening at the top sufficiently large to admit the closed hand. The long spicules reaching out from it presented a splendid appearance when held up to the sun, and resembled glossy hairs, gleaming and scintillating wherever the sun flashed along their surfaces. Many of the spicules were overgrown with an attractive coralline, so that they appeared branched like the limbs of a tree. In these mimic branches hung pendant many miniature pink-hued star fishes and shrimps, while fastened to them, coiled and interlaced, were the barrow-like egg cases of a skate. These are shown in the illustration.

That these sponges are fairly common in deep water offshore is evident by the small specimens often brought up and the pieces found on the outer islands, especially San Nicolas; but never before has so large and perfect a specimen been seen.

The glass sponges are so called because their skeleton, or the spicules, resemble glass, being formed of silica instead of lime, and closely resembling spun glass.

The most beautiful of the group is the Venus flower basket, or *Euplectella aspergillum*, which represents a vase of spun glass of the most beautiful description. When the first specimen was found it was sold at a fabulous price, and its true nature was not suspected. But finally a specimen was taken by a naturalist, who made the interesting discovery that the delicate and fragile glass-like vase, that seemed to be the work of some cunning East Indian, was nothing more nor less than the skeleton of a sponge whose spicules were silicious. In the water and alive the sponge is not an attractive object, being of a gray color and half buried in the mud, anchored by long glass-like streamers. But once dead and relieved of its covering, it becomes one of the most resplendent objects of the sea—a fairy vase, that might well have been modeled by the sea gods as a gift to Venus.

This sponge has the spicules so arranged that they present the appearance of squares. It is closed at the top and sides, hollow in the interior, and is occasionally the prison of small crustaceans, which enter the interstices when very young and unable to escape become prisoners for life, and in the skeleton may be seen with their claws protruding through the opening, creating much wonder among the uninitiated as to how they obtained ingress into the glassy prison.

Another interesting glass sponge is *Hyalonema*, which resembles a glass rope. The sponge itself is a small cup, perched upon a long series of glass-like stems, which is buried in the mud. This was for a long time sold as the skeleton of the little coral polyps which are parasites on its stems.

AN INSECT BREEDING IN CRUDE PETROLEUM.

BY L. O. HOWARD.

In view of the extensive use of petroleum products for insecticidal purposes, the title of this article would seem paradoxical. That such a case should be found seems, in fact, more remarkable than the breeding of the cigarette beetle, *Lasioderma serricorne*, in pyrethrum powder, recorded by the writer in the Proceedings of the Entomological Society of Washington, volume i., page 37.

At the meeting of the Boston Society of Natural History, January 22, 1879 (Proc. B. S. N. H., volume xx., page 134) Dr. Hagen read a letter from a Mr. Dean to Henry Edwards, of Santa Cruz County, Cal., describing a small alkaline lake in the southeastern corner of Santa Cruz County, of 20 to 30 acres area, into which copious petroleum springs continually poured their contents, which, drying, formed masses of asphaltum overlying the soil and running down to the lake. The petroleum had forced passages through the asphaltum, forming little pools of about the consistence of molasses. Mr. Dean sent with the letter a number of flies of the genus *Ephydra*, which he had found sitting upon the petroleum and piled up upon one another in vast numbers just like flies upon molasses, those underneath dying and becoming embedded in the petroleum and being succeeded by others, which, in turn, were pressed down into the liquid tar by those above. On approaching they would rise in a cloud about 2 feet above the petroleum, and, on being unmolested, would return and settle upon it. The dead flies were said to rise several inches deep above the liquid petroleum. Mr. Dean further stated that the flies appear to breed upon the water plants covering the surface of the lake, which are left incrustated with the salt and covered with the empty shells of the insects.

This is the only published note with which the writer is familiar which approaches in any way or is related to the case which he is about to describe. There seems no doubt, however, that in this case the insect was a true *Ephydra*, possibly *E. californica* of Packard, which breeds upon water plants in the alkaline lakes of the far Western States.

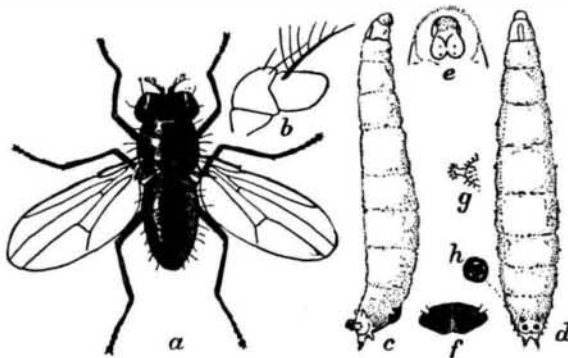
On May 20 of the past year the writer received a letter from Mr. C. G. Kellogg, Secretary of the Board of Horticultural Commissioners for Los Angeles County, of Los Angeles, Cal., transmitting in alcohol some small maggots, the natural habitat of which he wrote was "in the old pools of crude petroleum oil that is

wasted around the oil wells here in the city of Los Angeles." He further stated that there were any quantity of the maggots, and that he could furnish them by the gallon if necessary. The commissioners had been asked many times to name the insect, but could not do so, and wrote in search of information. Suspecting that these larvæ would prove to belong to the family Ephyridæ, the species of which have a habit of breeding in extraordinary substances, we urged Mr. Kellogg to make an attempt to rear the adults, which he succeeded in doing July 9. A shallow dish filled with crude oil containing about fifty of the maggots was placed in a flat box with a glass top on June 18. In nine days the first maggots were seen to emerge from the oil and crawl to the underside of the glass cover of the cage, where they pupated the following day. On July 9 the first adults were seen, having issued during the night, twenty-two days from the time of placing the maggots in the cage. Prior to this attempt, Mr. Kellogg had sent us specimens in crude petroleum, but naturally, owing to the shaking of the bottle on the trip, the maggots died from suffocation. Experiments made before shipment showed that, when the maggots were bottled up in a full bottle for twenty-four hours, they were killed. Although the writer has the most perfect confidence in the testimony of Mr. Kellogg, and of his assistant, Mr. George Compere, gained through personal acquaintance and extended correspondence, he was anxious to verify the observations himself, and therefore suggested other methods of sending the insects to Washington. The solution was reached by the shipment of the maggots in moss perfectly saturated with crude oil. They were sent from Los Angeles August 27 and arrived in Washington in good condition. On September 20 one adult issued.

This specimen, together with those previously reared in Los Angeles, were submitted to Mr. D. W. Coquillett for study, and he has decided that the insect which possesses this abnormal habit is a new species of the Ephyrid genus *Psilopa*, which he has named *Psilopa petrolei*.

There is no record in entomological literature of the habits of this genus *Psilopa*. Records of the habits of other Ephyrid genera are as follows: *Ephydra* and *Halmopota* in salt pits in Europe, the former in salt pits

in this country and in alkaline lakes in the West; *Teichomyza* in human urine; *Notiphila* on the stems of water plants; *Hydrellia* in the sap of trees; *Pelina* and *Parydra* in water—character of water not mentioned. It is obvious from this that the family is practically sub-aquatic in its larval stage. The larvæ of some forms possess branchiæ, while others breathe by means of protected anal stigmata which they occasionally protrude for air above the surface of the water. This latter method is the one by which the larva of the petroleum maggot secures its air. Obviously the stigmata are very thoroughly protected, and when we consider that only this protected pair is functional there is, after all, nothing so very curious about the habit of the insect, since the insecticidal properties of petroleum depend upon the closing of the air holes or spiracles by the oil. The adult of the *Psilopa* breathing through normal spiracles is as readily killed by petroleum as any other insect. The question of the food of the larvæ is not a difficult one, since in these petroleum pools



PSILOPA PETROLEI, COQ.

a, adult; b, antenna of same; c, side view of larva; d, dorsal view of same; e, ventral view of larval head; f, ventral plate on anal segment of larva; g, enlarged lateral tubercle of larva; h, enlarged anal spiracle of larva. a, c, d, enlarged; b, e, f, g, h, still more enlarged (original).

many insects are caught, and it is upon their remains that the larvæ probably feed.

It is strange that there is no reference to this particular insect, so far as we know, in entomological literature. The presence of living maggots in crude petroleum pools, however, has been known to others, the

oil men having been familiar with it for years. Discussing the matter incidentally with Mr. Clifford Richardson, Superintendent of Tests of the Barber Asphalt Paving Company, recently, Mr. Richardson stated that he had himself seen these maggots in California when visiting the West in the interest of his company, and called the writer's attention to the fact that Mr. S. F. Peckham, in his elaborate report on the production, technology, and uses of petroleum and its products, published in volume x. of the Tenth Census Reports, refers to the same occurrence as lending support to the theory that petroleum oils are of animal origin. The statement which we have just made regarding the probable food of the maggots, if true, would indicate that the presence of the maggots in petroleum has no possible bearing upon the question of the origin of this product. Not having made personal observations in the field, however, the writer is not in position to emphasize this point.

The Current Supplement.

The current SUPPLEMENT, No. 1205, is a particularly interesting number, owing to the diversity of the subjects treated in the articles. Probably the most important paper is "Ethics of Primitive Peoples," a lecture by Dr. D. G. Brinton, specially reported. "Mirage" is an interesting lecture by Major P. A. MacMahon, F.R.S. "Brick and Clay in the Bible" is a curious article and "Our Trade with Japan" and "Our Trade with China," and "Scotch Opinion of United States Goods" give timely articles on economic subjects. "Over-Pressure in Schools" is a letter by Dr. R. H. Thurston. On the front page is a view of the French battleship "Jauréguiberry" at full speed.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

POTATO-DIGGER.—ROBERT B. PATTERSON, Ludington, Mich. The potato-digger of this inventor is designed, not only to dig potatoes, but also to sort them and to deliver them to crates. The digger has a revoluble assorting-cylinder provided with peripheral pockets adapted to receive potatoes, and with peripheral openings through which small potatoes may pass to the interior of the cylinder. The potatoes, after having passed through the cylinder-openings, are conducted to a receptacle. The digging-fork is readily controlled by the driver by means of a crank-arm and rock shaft, and may be regulated as the character of the soil may demand.

Bicycle-Appliances.

BICYCLE-SUPPORT.—WILLIAM F. WILLIAMS, London, England. This invention provides improved means whereby a bicycle, when traveling very slowly or when stopped, may be maintained in an upright position. The support consists of a bracket having a vertical member fitted to slide up and down and to turn upon a spring-surrounded tubular pillar which projects down from the crank-hanger of the machine. The frame has horizontal arms provided with rollers adapted to rest on the ground in order to afford the lateral support required. By pulling upon a cord, a lever will be caused to bring the arms and rollers to operative position.

BURGLAR-ALARM.—CHARLES T. KUNZ, New York city. The burglar-alarm is arranged so that when an opening door presses down upon the device, a part will be released and caused to explode a cap or cartridge. The alarm comprises a casing, a breech-block, a spring-actuated plunger, and a latch for holding the plunger. The plunger, in operation, is drawn back against the resistance of its spring and held by the latch. A blank cartridge is then placed in the breech-block. When pressure is exerted on the casing, the latch is released and the plunger violently hurled by the spring against the cartridge.

Mechanical Devices.

PUMP-GEAR.—LOUIS H. NICOLAS, Louisville, Ky. The improved, hand-operated ship's pump-gear provided by the present invention has a spring-beam adapted to be connected with the upper end of the pump-rod. A link is connected with the pump-rod, and a crank shaft is connected with the link and is provided with a driving pulley. Over the segmental pulley-rim of a pivoted hand-lever, a rope extends. A pendulum and a fly-wheel are secured on the shaft. The operator, by moving the hand-lever in one direction, starts the pendulum in the opposite direction, and the momentum acquired carries the lever to the end of the stroke.

ALVEOLI-AMPUTATING FORCEPS.—DR. GEORGE B. CLEMENT, Macon, Miss. A novel construction of forceps has been devised by this inventor, for the purpose of amputating or trimming the jagged edges of the alveolar processes after the extraction of teeth. Of the two beaks of the forceps, one has an interior flat face, the other an interior concave face formed with a curved cutting edge, extending around the sides and ends and shutting against the flat face of the other beak. The flat-face beak is tapered to a sharp, wedge-shaped end and is made relatively thinner and of wider con-

tour than the other beak, so as to project beyond the edge.

WRENCH.—FRANK T. VERHAREN, Spencer, Iowa. The movable jaw of the wrench may be quickly adjusted on the toothed shank by means of an internally-toothed adjusting sleeve having a longitudinal groove on its inner side. This groove may be brought into register with the toothed edge of the shank to permit the sliding of the movable jaw to and from the fixed jaw. By turning the sleeve in an opposite direction, the teeth or threads on the jaw will be caused to interlock with those on the shank.

MACHINE FOR PICKING CURLED HAIR.—EDGAR BEERS, Georgetown, Conn. This machine comprises two sets of feed-rollers, one set being mounted rearwardly of the other; a reciprocating comb rearwardly of each set of rollers; and mechanism consisting of a sectional shaft and clutches whereby both sets of feed-rollers may be operated while the other set is at rest. In operation the ropes of hair are fed between the rollers. At each downward stroke of the comb, the teeth will engage the ends of the rope and draw the hairs downward, so as to loosen the rope and to pick the hairs thoroughly.

APPARATUS FOR CONCENTRATING AND AMALGAMATING PRECIOUS METALS.—WILLIAM W. HABERSHAM, Gainesville, Ga. In ordinary sluicing operations the heavier gold-particles are precipitated into sluice-boxes and are either united with the quicksilver in the riffles or raised on the bottom of the boxes, whereas the fine or flour gold is washed away and lost. To obviate this difficulty, this invention provides a construction of sluice boxes and riffles in combination with tubs, vessels, and wheels, the principle of which construction being that embraced in the action of water in streams in which eddies are formed, and in which the sediment carried off by the natural current is stayed and deposited. With the aid of a sodium amalgam, the miner is enabled to save the greater portion of the gold now lost.

CIGAR-CUTTER AND MATCH-SAFE.—ANDREW R. FOSSUM, Cottonwood, Minn. To provide a combined cigar-cutter and match-safe arranged to cut the cigar and to deliver a match to the user, is the purpose of this invention. The combined cigar-cutter and match-safe has a manually-operated lever, which actuates a cutter. A match-picker in the form of a man is mounted to turn, and is arranged to be swung into an inclined position to pick up a match. The movement of the lever serves to turn and to swing the picker.

CAR-LOADING APPARATUS.—PHILIP OBERST, West Superior, Wis. It is the object of this invention to provide an improved apparatus for loading rails and logs upon cars. The apparatus includes three "horses" or movable supports, which are adapted for use either upon the ground or upon a flat-car. The horses have each a top section which is hinged and adapted to be thrown back for the purpose of lessening temporarily the height of this support, so that the rails may slide into the car by gravity.

HYDRAULIC PROPELLER FOR SHIPS.—ANDREW PLECHER, Savannah, Ga. This invention is an improved jet propeller, and consists of a rotatable screw or spiral blade propeller arranged in a tube traversing the vessel from stem to stern and taking in water at its front end to discharge it at the other. The improvements are found in the use of cut-off valves ar-

ranged on each side of the screw, and other valves for controlling the admission of water from the hold.

PAINTING MACHINE.—M. G. BARRIER, Louisville, Miss. The painting machine is especially designed for painting high smoke-stacks, and consists of a guide-pulley having a support adapted to be hooked over the edge of a stack, and a paint-box and brush attached thereto, suspended from the pulley. An operator below may, by manipulating the rope from which the paint-box is suspended, paint the sides of a tall stack.

Miscellaneous Inventions.

LUBRICATOR.—HEINRICH FROBOESE, Bielefeld, Germany. The present lubricator is especially applicable for use on cycle and similar bearings. The device is provided with a double closure for preventing dust from penetrating into the bearings, the inner closure being effected by a plug completely shutting off the lubricator-hole from the bearings, while the second additional closure is formed by a cover.

DUMPING ATTACHMENT FOR WHEELED SCRAPERS.—ANSON TITUS, National City, Cal. In connection with the wheels of the scraper and the scoop, bars are used, mounted to slide at the rear end portion of the scraper and having their ends arranged for clamping engagement with the wheels of the scraper in order to be automatically operated thereby. A lever is connected with both bars, and is arranged simultaneously to move the bars in opposite directions.

TAILPIECE FOR STRINGED MUSICAL INSTRUMENTS.—GEORGE F. WELLS, Philadelphia, Pa. In most tailpieces the string is attached in such a manner that it is bent over a sharp edge; so the string consequently soon breaks. In the present invention a plate is used, upon which a cam-lever or shoe is pivoted. The lever or shoe has a split at the toe adapted to receive the knotted end of a string. The strain upon the string is hence more nearly a direct pull.

GLORY-HOLE.—ANDREW DAUBENMEYER, Nashville, Tenn. To provide improvements in glory-holes for fire-polishing glassware, whereby a large amount of ware can be subjected to a uniform heat, is the purpose of this invention. The furnace used is provided with a heating-chamber having a transverse wall and a semi-circular outer wall. The transverse wall is formed with openings for the entrance and exit of the glassware. The outer wall is formed with a slot for the passage of the arms carrying the rotating supports for the glassware.

SUSPENDERS.—EDWARD DENIS, Green Bay, Wis. The suspenders have shoulder-straps provided at their ends with snap hooks carrying two chains or wires arranged, respectively, at the sides of the wearer. The chains or wires are adapted to be connected with the trousers.

GAME-APPARATUS.—CHARLES EDWARDS, Brooklyn, New York city. This apparatus comprises two revoluble wheels, a belt or cable passing over the wheels, and horizontally extending yielding arms secured to the cable, each carrying a ball. The device is used by stationing a striker with a bat alongside one of the runs of the cable, so that the ball is traveling toward him. As the ball approaches, he endeavors to hit it with a bat. By the curving of the ball's path, this is sometimes very difficult. It may be made more difficult by causing the ball to travel in an undulating path.

RUNNING-GEAR FOR VEHICLES.—LAFAYETTE L. NICHOLS, Inverness, Fla. The present invention pro-

vides a durable connection between the reach of a vehicle and the forward axle and bolster without the aid of a king bolt, the connection being so effected that all the advantages of a fifth-wheel will be obtained and the running-gear will be rendered stronger than in the usual construction. A coupling is also provided which permits the use of a long or short reach.

PROTECTIVE HEAD-SCREEN.—HENRY E. BEACH, Grand Forks, Canada. To provide a combined cap and screen which can be worn without discomfort and which will serve as an effectual protection against mosquitoes and other insects is the purpose of this invention. The head-screen consists essentially of a globular screen inclosing a cap and adapted to surround the head of the wearer.

DUMPING-VEHICLE.—THOMAS HILL, Jersey City, N. J. In most dumping-vehicles, the body works from one special bearing to another and rests on both at the same time until a second action in tilting is made in order to dump the load. In the present invention, there is no sliding motion and the dumping action is continuous. This is due to the fact that the vehicle-body of the present invention has its trunnions working in guides extended at an upward angle to metal boxes.

NON-REFILLABLE BOTTLE.—PHILIP J. FRIEDRICH, Coytesville, N. J. The neck of the bottle has a tube in which are arranged two spiders, between which a valve-stem and valve are adapted to move and to be held normally in position by means of a ball and spring. The bottle can be readily emptied, but cannot be filled owing to the position of the ball on the valve-stem and the seating of the valve.

CARBURETER.—ROBERT D. BRADLEY, Linchester, Md. This improved gas apparatus comprises a vertical casing in which a frame is arranged. On the frame an oil-pump and a vertically-movable gas-receiver are arranged. In the frame a rotatable air-carbureting apparatus is mounted and connected by mechanism with the gas-receiver for automatically and intermittently rotating the carbureter. The peculiar merit of the invention lies in the automatically-controlled generation of a measurably-fixed aero carbon gas.

Designs.

SAD-IRON HOLDER.—GEORGE W. CLEWELL, Reading, Pa. The sad-iron holder of this inventor is intended to be sunk into the ironing-board so that its supporting surface shall be flush with the board. Hence, when one has finished ironing, the sad-iron is not lifted from the board, but is merely pushed into the holder.

GAS-METER-DIAPHRAGM HOOP.—JOHN HEARNE, Brooklyn, New York city. This hoop at the gas-inlet is provided with a shield in order to prevent the leather's being burnt during the process of soldering the hoop to the diaphragm.

HAND-WHEEL.—JOHN ORMEROD, Brooklyn, New York city. The leading feature of the design consists in providing the wheel with a continuous chain of closely grouped spheres. The wheel is designed for use on sodawater fountains, and fits the form of the hand better than the ordinary wheels.

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