

WATERPOUT OFF COTTAGE CITY, MARTHA'S VINEYARD.

BY DR. F. C. V. H. VOM SAAL.

About 12:30 noon, August 19, 1896, one of the very dark clouds hovering over Vineyard Sound, between the mainland and Cottage City, was seen to send out a downward and sharply pointed streak of cloud matter, whose funnel-shaped basis above was not at all times visible. After a duration of about 15 minutes it broke and completely vanished. The apparition quickly emptied of their summer residents all the cottages along the Sound and adjacent islands, Nantucket included. No photographs were taken of this first spout, to my knowledge.

Shortly afterward a long tongue emanated from the same clouds, and was slowly pushed downward to a point about 100 feet from the surface of the ocean. Its height was certainly a mile, and the band-like shape gradually increased in width. With a glass, slow gyratory movements could be detected, also longitudinal stripes caused by falling water. This cloud-burst made the water below, over a surface of many hundred yards, look like a boiling pool. The jumping spray from this was also caught and drawn upward into the whirl toward the downpouring column. This latter, now of lighter color being struck by the sun, was gradually withdrawn upward, evidently thinning and broadening toward its base. With a glass, falling mists could be still seen falling into the snow-white foaming area below. The duration of this second and most perfect phenomenon of the day—there were three in all—was about half an hour.

About twenty minutes after its disappearance a third began to form, gradually coming downward from the same clouds, though from a spot a little farther north; but it hardly reached completion. It is very important to note that, in this third case, the ocean below was entirely quiet for a time, being only disturbed later on, when the same process of condensation mentioned above caused a similar downpouring, especially noticeable in the period of retraction. It was soon apparent that the agency causing the spouts had spent its energy; the column was evidently thinner in substance and its formation slower and hesitating. It stopped midway, sending only an attenuated end further, to be withdrawn upward soon after.

During almost all of the time since the appearance of the first spout there was a heavy rain storm accompanied by flashes of lightning from the northern and darkest portion of the long motionless stratum of clouds above mentioned.

Cottage City, which had been in sunshine until then, was visited by a drenching rain some hours later.

The long duration of the phenomena just described enabled the writer to form a somewhat different opinion of the nature of such waterspouts from what is commonly held. True, I must fall back upon the old (or rather older) explanation that such whirls are caused by two winds striking each other at an obtuse angle. The greatest rotary velocity must be placed at the spot, about one hundred feet above the ocean, toward which the cloud matter from above and the spray from below were drawn. As condensation was continually transforming this cloud matter into water, it stands to reason that by far greater quantities of it were drawn down than was apparent to the eye.

But the spout is from above and not from below, as a glance at the cut conclusively proves. This also definitely settles the question as to what part the ocean

takes in the constitution of the column; which is practically none. The "boiling as if in a caldron" is not caused by the action of the circling wind, but by the great quantities of falling water. Nor is there a whirlpool action in, nor a rising from, the body proper of the ocean. The way the spray, caught and drawn up, looked at times easily explained to me how this delusion originated.

The surprising tranquillity of the clouds shows that such currents of wind need not be of great height, at least not at their borders, where alone such whirls can take place. That the spouts scarcely shifted their position is proof that the velocity of the concurrent winds was almost equal. It is certain that this velocity cannot have been great. Several small vessels in close proximity at the time report that there was a great noise and gusts of wind in the immediate vicinity of the display, while beyond this there was almost a dead calm (Boston Globe, September 1). This latter statement, however, seems to be somewhat exaggerated.

The attitude of the public was almost as interesting an object for observation as the waterspouts themselves. That they would create intense excitement, expressed in various ways, as all unusual occurrences like comets, meteors, eclipses, earthquakes, etc., are apt to do, was natural. Not so easily to be explained are the accounts which some entirely honest people gave afterward in good faith. Positively astonishing were the wonders

raised so as to produce an electric arc, or lowered, so as to dip into the fused mass; they can also be rotated backward and forward, so as to form a uniform distribution of the heat. The bottom of the furnace is insulated, and forms the negative electrode; it may either be formed of carbon, or of metal cooled by a powerful air current. Estimates of the probable working expense are given in the original paper.—The Electrical Review.

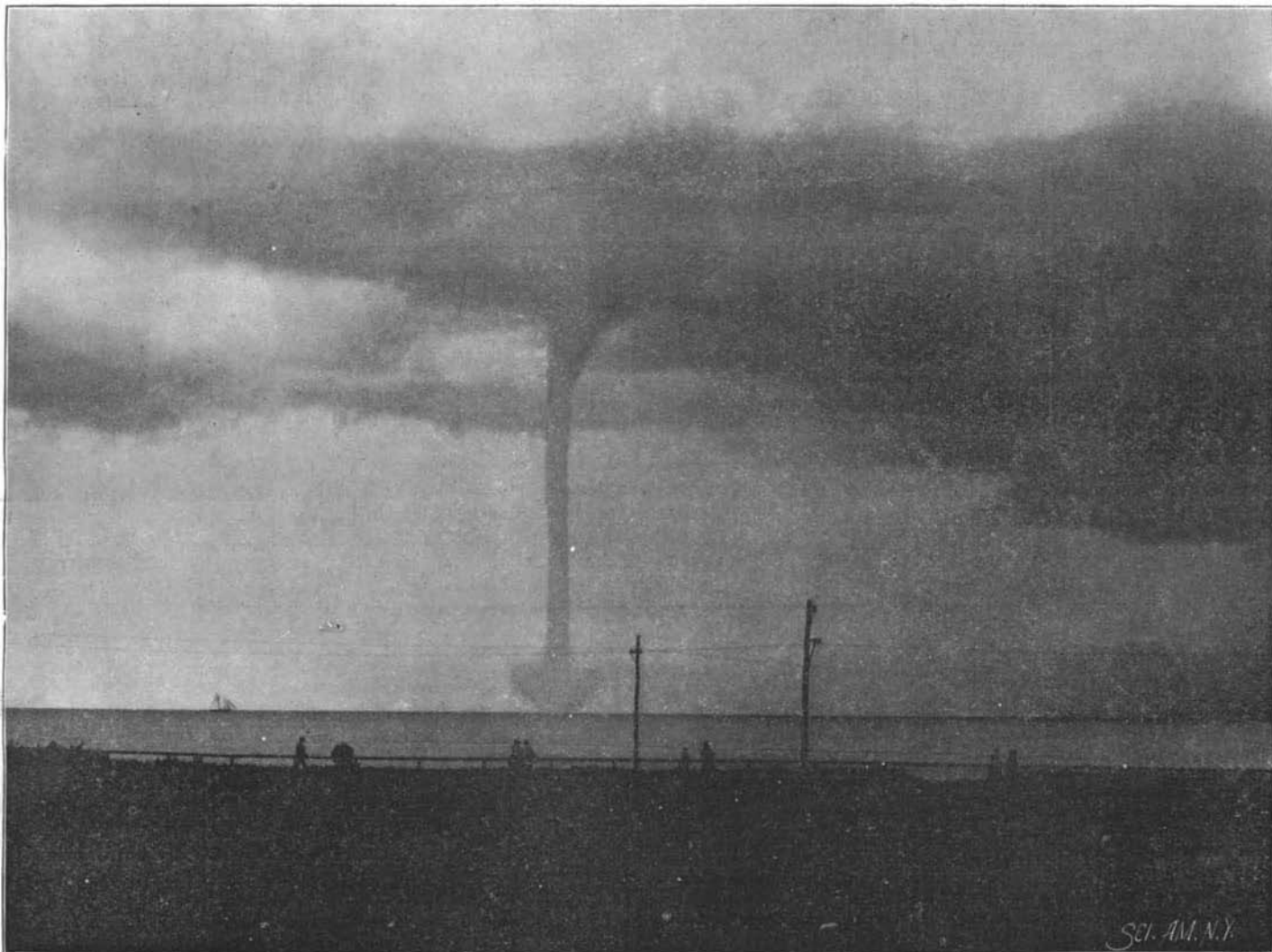
Globe Statistics.

A new computation of the population of the globe has recently been made by the French statistician and savant P. D'Amfreville, says the Literary Digest. He figured out a total of about 1,480,000,000, distributed as follows: Asia, with 825,954,000; Europe, with 357,379,000; Africa, with 163,933,000; America, with 121,713,000; Oceania and the Polar regions, with 7,500,400; Australia, with 3,230,000; or a grand total of 1,479,729,000 souls.

In connection with these data the English statistician Schooling makes some interesting comments. He states that of every 1,000 inhabitants of the globe, 558 live in Asia, 242 in Europe, 111 in Africa, 82 in America, 5 in Oceania and the Polar regions, and only 2 in Australia. It then appears that Asia contains more than one-half of the total population of the earth, and Europe nearly one-fourth. Africa contains only one

ninth, and America only one-twelfth. In Australia the entire population is less than the number of inhabitants in the city of London alone or in the cities of Paris and St. Petersburg combined.

In Europe the number of inhabitants to the square mile is 95, in Asia it is 48, in Africa it is 15, in America it is 8, in Oceania and the Polar regions it is 3, in Australia only 1. Accordingly, Europe contains for each of its inhabitants 2.8 hectares of land; Asia, 5.2 hectares; Africa, 17.6 hectares; Oceania and the Polar regions, 84.0 hectares; America, 31.2 hectares; Australia, 235.6 hectares. [A hectare is equal to 2.741 acres.]



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they had seen with their own eyes, and even more astonishing was the exaggeration which prompted the description. One can now better understand the origin of many of the natural wonders which are from time to time recorded, and that they are not always the product of diseased or hysterical minds.

The Electric Furnace for Iron and Steel.

In the blast furnace method of reducing iron the metal takes up impurities such as sulphur and silicon, and these are entirely removed in subsequent treatment by the Bessemer or Martin process. The present methods of smelting must hold the field for ordinary grades of iron; but when purity is of importance, and when special qualities of steel are required, it will probably prove advantageous to prepare pure iron by electrical methods of reduction, and to carbonize this subsequently. A furnace suitable for this and similar purposes is described by R. Urbanitzky in the Zeitschrift für Elektrochemie, vide vol. ii, page 350. It is lined with a basic lining, like a Bessemer converter; this is non-conducting and almost infusible, and keeps the iron free from impurities. In the Heroult furnace used at Neuhausen, the positive carbon is vertical, and the material to be used has to be introduced into the narrow space between this and the walls of the furnace. It is preferable to have a positive electrode, consisting of four carbons arranged symmetrically about a vertical axis, and inclined at about 20° to it. These can be

The yearly increase of population on the globe is about 5 to every 1,000. At this ratio the population of the earth would be doubled every 139 years.

Of every 1,000 Europeans, 262 are subjects of Russia, 139 of Germany, 116 are Austro-Hungarians, 107 French, 106 English, 84 Italians, 48 Spanish, 17 Belgians, and 121 of the minor countries.

In reference to the density of population, Belgium takes the lead with 546 to a square mile, followed by England with 312, Italy with 263, Germany with 237, France with 184, Austro-Hungary with 171, Spain with 90, Russia with 49. The average of all the other countries is 47 to a square mile, and the average for all Europe is 96.

In Asia the 826,000,000 are distributed in the following manner: China takes the lead with 350 millions, British India with 278 millions, Japan with 40, East Indian Islands with 39½, French possessions in India with 19, Corea with 10½, English Burma with 7½, Persia with 7½, Asiatic Russia and Turkestan with 7½, Siberia with 4½, Afghanistan with 4, Ceylon with 3, Arabia with 2½, all other parts of Asia with 43½ millions.

Of every 1,000 Asiatics, 424 are Chinese, 337 are Hindus (subjects of England), 48 are Japanese, 48 are Indian Islanders, including 23 in the French possessions, 13 are Coreans, 11 are Siamese, 9 are Burmans, 9 are Persians, 9 are Russians, 5 are Siberians, 5 are Afghans, 4 are Singhalese, 3 are Arabs, and 52 belong to smaller nationalities.

Bullets Swerved by Electricity.

A curious phenomenon was recently observed by the committee of the Swiss Federal Rifle Meeting at Winterthur in summing up the results of the practice shooting of the troops. It was found that nearly all the shots fired from the right side of the range had hit the target to the right of the bull's eye, while those fired from the left side had, with an equally singular persistency, hit the left half of the target. The great number of men who took part in the shooting precluded the idea that this singular result could have been due to the personal peculiarities of the soldiers; for while it may be true that one marksman habitually shoots too high, another too low or to the right or left of the mark, with a large number of individuals firing at the same target, these idiosyncrasies of marksmanship would be set off one against the other and the misses would be fairly distributed on all sides of the bull's eye. It became necessary, therefore, to find an extraneous and single cause for the remarkable uniformity with which the bullets appeared to have been deflected from their proper course. The wind could not have produced the effect noted, since, in the first place, allowance had doubtless been made by the riflemen for deflection by aerial currents; and on the other hand, if the wind had diverted the missiles, the deflection would have been in the same direction on both sides of the range. An examination of the steelclad bullets extracted from the targets disclosed the fact that they had become magnetic; and this led the committee to entertain the theory that the phenomenon observed by it might have been due to electric influence exerted by the large number of telegraph and telephone wires which run along both sides of the range at Winterthur. Further experiment at the ranges of Thun and Berne proved this theory to be correct; and the remarkable discoveries made at these trials may effect another complete change in military tactics. The following account of one of the experiments is given by the *Journal de Genève*:

"At Thun authorities established parallel with the rifle range, at a distance of a little more than 40 yards, an electric current of 8,000 volts, carried along four steel cables. With a view of tracing the whole effect, paper circlets were placed at every 10 yards. The first experiments were made with the Swiss model rifle of 1889. With this the influence of the electric current was at once apparent. In a distance of 260 yards the bullet took a lateral deviation of 24 yards, and after that the curve of the trajectory was still more marked. The second experiments were made with the Japanese 33 mm. rifle of Col. Yamagata, and they were still more decisive, the bullet being rapidly attracted to the elec-

tric wires and following their course with absolute serenity. Further attempts were made with artillery. The range selected was one of 3,000 yards, and 200 yards in front of the targets, but 40 yards to the side, was placed the electric battery. Every shot was diverted by its influence far to the side of the target—to be exact, the deviation was one of 14 degrees.

"The conclusions drawn from these experiments are that a section of infantry exposed to fire at 300 yards would enjoy complete safety if a dynamo or accumulator were placed on its flank; a whole company would be in the same security at 500 yards, and artillery fire could be rendered innocuous at 1,000 yards. If these facts are sound, the new small bore rifle is doomed, and we shall have to return to the heavy bullet of lead, because it is unaffected by electricity. But to military reformers this will signify a repulse along the whole line."

The facts may be as stated, but the conclusions by no means follow. We should dislike, in case of a fight, to be the man running a dynamo that had a weakness for drawing bullets to it. It would have all it wanted of them, and the attention of the commanding officer would be chiefly occupied with defending his dynamo. Besides, if skilled marksmen can allow for the deviation due to the wind, why not for the deviation due to electricity?

It would, perhaps, be premature to assert that the consequence of this discovery will be the doom of the modern small bore military rifle, with its steel jacketed bullet; for it might be practicable to inclose the leaden missile in hard bronze or some other metal not affected by magnetism. Artillery would probably remain destructive enough on the battle field by the use of explosive shells. It is in naval warfare that the discovery may have the most important consequences. In Conan Doyle's "Stark Munro Letters" the hero is credited with an invention to render a warship immune from the shots of an enemy by placing electric accumulators at its stem and stern. The idea was to deflect steel projectiles by magnetism, just like the Swiss military authorities have in fact succeeded in doing. It would certainly be a revolutionary departure if, instead of incasing our battleships in heavy bombproof armor, we could encompass them with an impalpable magnetic veil which would compel the great armor-piercing steel projectiles to pass harmlessly by.

The discovery, however, will give the military and naval experts a new problem to work out. In passing it is worthy of remark how frequently the apparently impossible feats suggested by imaginative writers have been followed by the demonstration of their possibil-

ity. Phileas Fogg's wonderful trip around the world in eighty days would to-day be a very commonplace performance; and another generation may see Stark Munro's magnetized battleship an accomplished fact. Fiction seems stranger than fact only because so small a part of the truth of science has been revealed to humanity.

Library Circulations.

Those high class weeklies that are in general demand at the public libraries throughout the country enjoy "circulations" that are often beyond the claims of their publishers or the beliefs of advertisers. It has been recently shown that, during eleven days, the six copies of Harper's Weekly were called for and read by 550 people in the Chicago Public Library. In the same period at the same place, four copies of the Youth's Companion were read by 228 individuals and two copies of the SCIENTIFIC AMERICAN by 213 people. If the public libraries of the whole country showed the same proportion of calls for these publications, it will be readily seen that their library circulation alone must run away up into the thousands.

But there is a vast number of weeklies and monthlies, too, that do not get into the public libraries, for the reason that their intellectual caliber is not high enough. This is an important item which all advertisers might wisely consider—whether a medium is of a sufficiently high standard to find place in the public libraries, because, if it is, it is sure of a much larger number of readers than if it is not.—John Chester, in *Printer's Ink*.

New Metals for Coins.

Advices from Washington, D. C., state that experiments with pure nickel and aluminum as substitutes for the present nickel pieces and one and two cent bronze pieces will be made at the mints by order of Director Preston during September or October. A resolution was passed by the House of Representatives authorizing such experiments. There is some doubt whether the actual adoption of a new metal for the minor coins will be recommended at an early date by the treasury officials, even if the experiments prove successful. The objection to a change in any form of coins or notes is the disposition of the public to refuse the old forms and insist upon having the new. This would drive into the mints for recoinage \$14,000,000 in nickel pieces, which are now in circulation, and \$7,500,000 in pennies. The advantage claimed for pure nickel, instead of the alloy now used in five cent pieces, is its greater hardness, durability and distinctness of impression.

RECENTLY PATENTED INVENTIONS.**Railway Appliances.**

STREET RAILWAY SWITCH.—Hugo L. Dallig and Wladyslaw Kryszewski, Jersey City, N. J. This is a switch which may be readily set by the driver or motorman on a car, according to the direction in which the car is to travel, either along the main track rails or to the side track rails. The invention comprises a pivoted switch point on the under side of which is a segmental rack meshing with a pinion carried by a rock shaft in gear with a second rock shaft carrying two arms, while an arm pivoted on one of these arms has a head adapted to be engaged by a roller carried by the car, and the other arm is connected with a lever carrying a headed arm also adapted to be engaged by a roller carried by the car.

CAR COUPLING.—Thomas Galligan, Bradford, Ohio. This invention relates to couplings of the Janney type, in which the drawhead has a pivoted laterally movable knuckle, the coupling being automatically effected when two cars come together, and the cars being readily uncoupled from the side, without it being necessary for the trainmen to go between them. The pivoted knuckle has a hooklike latching jaw, and a spring is adapted to hold the jaw in coupled engagement. The hook nose is slotted and perforated to permit the coupling of ears with a link and pin of the old style, the link being held in connection with the coupling so it will not be lost when not in use.

CAR COUPLING.—Joseph L. Linou, Narbonne, France. According to this improvement, the coupling apparatus attached to each end of the car comprises a spring jaw placed horizontally on one side and a shackle placed vertically on the other side of the ordinary coupling, the shackles being always opposite the corresponding jaws when the cars come together. The shackles are of such depth as to allow of a certain amount of variation in the height of the car. The coupling is automatically effected as the cars come together, and the cars are readily uncoupled from either side.

Electrical.

ELECTRIC RAILROAD.—Charles Sill, New York City. This invention provides for dispensing with both the overhead conducting wires and the underground conduits which have heretofore been employed for supplying the current for electric cars, and substituting therefor a conductor placed in a longitudinal duct within the rail. A sectional trolley wire extends in a recess along the inner side of the rail, the conductor and the trolley wire being normally disconnected from each other and automatically connected as the car passes along, whereby all sections of the trolley wires are cut out and remain dead except when a car is passing over them. By the construction provided for making connection between the conductor and the trolley, complete insulation is secured and all moisture is excluded from the duct in which the conductor is located.

ADVERTISING DEVICE.—Frederick A. Ruge, Springfield, N. Y. According to this device, a series of incandescent lamps is arranged in fanciful shapes or forms to attract attention, means being provided for closing the circuits through any desired series of lamps and leaving the others cut out. By this means a certain sign may be exhibited for four or five minutes, and after this exhibition the circuit closer will be turned to close the circuit through another series of lamps showing another sign.

Mechanical.

PIPE WRENCH.—Joshua Musgrave and William Cook, Aguilar, Col. This is an improvement in wrenches which have a chain to engage around a pipe, and provides for such construction of the wrench that an equal pressure may be brought to bear on substantially the entire circumference of a pipe, obviating the danger of crushing in the pipe. The wrench jaw has a curved serrated inner surface, and on its outer end are fingers designed to be engaged by lateral shoulders on the chain links, each of which has a bifurcated portion and a stem portion, and is preferably curved on its inner edges to conform somewhat to the curvature of the pipe.

MACHINE TO HULL COFFEE BERRIES.—Afredo D'Costa Gomez, Bucaramanga, Colombia. Beneath the nopper, from which the berries drop in a stream, according to this improvement, are two rollers of unequal size revolving in opposite directions at different rates of speed, the larger roller being roughened and the smaller one smooth, a knife separator projecting upwardly between the rollers. The berries are subjected to sufficient crushing or squeezing pressure by the rollers to cause the fibrous hull to adhere to the rough surface of the larger roller, the grains going toward the small roller, and the separation being completed by the knife below.

PAPER MAKING MACHINE.—George W. Lewthwaite, Greenwich, N. Y. This invention provides yielding perforators for puncturing the felt belts for carrying wet pulp while the water is being extracted from the latter, instead of the rigidly mounted pins heretofore employed, by which the felt is torn or cut. The pins, according to this improvement, are supported in a yielding material, such as rubber, held in troughs secured in V-shaped longitudinal grooves in a roller provided for each endless felt apron over which the wet pulp is carried, whereby the pins will yield out of the felt without slitting it, and thus preserve the strength and porosity of the felt apron.

Miscellaneous.

CASH RECORDER.—David J. Wilson, Washington, D. C. This is an instrument for use by bank tellers and similar officers, the teller printing in the depositor's book the amount and date of the deposit and simultaneously printing the amount upon a record strip,

there being also mechanism for calculating the aggregate upon the record strip and printing the sum at the foot. The book, on presentation, is placed in an opening in the side of the casing of the machine, where a type bar has two sets of adjustable type, strip holding devices being adjacent to one set of type, and a book clamp holding the book in position to receive the impression from the other set of type, while printing devices operate the type of both sets simultaneously.

BICYCLE RAILWAY.—William F. Mangels, Brooklyn, N. Y. This invention provides an apparatus by means of which an unskilled person can safely mount and ride around a track without incurring danger. Within a suitable building is arranged a track, preferably but little wider than the tire, and having low side guards, and adjacent to the track, at about the height of the handle bar, a continuous rail is supported by fixed standards, the top and bottom edges of the rail being adapted for engagement by grooved wheels carried by hangers on an auxiliary frame attached to the bicycle. The frame is light and readily attached to the bicycle, the latter being then securely held in vertical position on a good track, where it may be propelled with but little friction by an inexperienced rider.

PORTABLE FIRE ESCAPE.—Edward Raley, Spokane, Washington. This is a device which may be carried in a satchel or in the pocket, and consists of two metal tapes wound on a pulley having differential sections inclosed in a metal case, a combined suspension and brake device of elastic rod or wire being wound around the enlarged central portion of the pulley and extending below the case for connection with a strap, to be attached to the body of the person to be lowered. The friction device acts as a brake to prevent too rapid paying out of the tapes, and this friction may be increased by manual pressure as desired. The apparatus is very compact, a case about three inches in diameter accommodating tapes fifty feet long.

SASH LOCK AND OPERATOR.—Michael F. Robinson, New York City. To raise and conveniently lock a sash to form any desired opening, for ventilation or other purposes, or to securely lock it when entirely closed, without using the ordinary weights and sash cords, this inventor has devised a construction which comprises gearing suitably located in a small casing in the side of the window casing and engaging a rack on the sash, a spring operating the gearing in connection with a locking device composed of a clutch, one member of which is connected to the gearing, while the other member is movable in and out of connection. The locking mechanism cannot be interfered with by any one from the outside.

CURTAIN FIXTURE.—Alderic F. Girouard, Leominster, Mass. This is a fixture which may be adjusted to any length of shade roller and secured upon the window casing without the aid of nails or screws. Brackets carrying adjustable slides to which the curtain fixtures may be conveniently attached are adjustably fixed in the top inner portion of the window

frame by means of clamping plates which are brought into firm engagement with the inner faces of the window frame through cross rods connected by a sleeve, the rods and sleeve having a right hand interior thread at one end and a left hand thread at the other end and the ends of the sleeve sliding within an outer tube.

MUSICAL INSTRUMENT.—Francisco Barrientos, San Juan Bautista, Mexico. This invention relates to instruments played with a pick, and is designed to enable the performer to readily play in octaves, producing sounds as if he were playing two instruments. For this purpose a special construction of the instrument is provided, in which a raised stop is arranged on its body laterally of the strings to arrest the pick, the pick being double, and the performer striking the strings with it both above and below the bridge.

VEHICLE AXLE SPINDLE AND BOX.—John A. Rumrill, Salina, Kans. The axle spindle, according to this invention, has a socketed stub end and a grooved journal bearing, while the box has hollow bearings spaced by an annular chamber, the improvement rendering the box and axle spindle easy to lubricate, and also affording means for storing a supply of lubricant which automatically feeds itself while it lasts.

FARRIER'S KNIFE.—Francis M. Me Cartea, San Juan, Cal. This knife has at one end of its handle a curved knife blade secured in its socket by a thumb screw, the blade having at its end a mud scraper and a hook or pick for cleaning out the seam on the bottom of the horse's hoof, while at the other end of the handle are pivoted a bleeding knife and a searching tool. In the handle are also chambers to receive two combination tools, one consisting of a mud spoon, a lance, and a sounder or probe, and the other constituting a hoof pick, a needle and tweezers.

SUCTION DREDGE.—James H. Bacon, Wilmington, N. C. This dredge has an open bottom suction box in which swing oppositely arranged connected cutters that are automatically actuated on dragging the box along the bottom of a waterway. The box is flushed by valves in its sides actuated from the deck of the dredge, and adjustable stops limit the swinging motion of the cutters.

APPLYING PAINTS OR VARNISHES.—Howard C. Cleaver, London, England. This inventor has devised an apparatus to facilitate the application of oil paint, flatting paint and varnish with greater rapidity, uniformity, smoothness and lightness than is possible with a brush, the paint or varnish being atomized and projected in fine spray by an air blast through an exit orifice, where it is met by a blast directed across the orifice. By this means the paint or varnish is laid so lightly that a second coat may be applied as soon as the previous one becomes tacky, quickly giving a smooth surface without brush marks and dispensing with rubbing down.

WHEAT STEAMER, HRATER, ETC.—William H. Reitz, Somerset, Pa. This is a device for use with flour mills, regulating also the feed of the