upper shaft carrying a sprocket wheel, from which a chain belt passes downward to one of the cone pulleys on the main driving shaft, the saddle being adjustable by a screw at the top, whereby the tension of the belt may be adjusted as desired. Ranging vertically on the front face of the main post is fixed a metal guide plate, on which slides up and down a pawl-carrying head, on a central pin of which head is fitted the lower end of a pitman rod, the upper end of the rod being connected to the outer end of a lever fulcrumed to a suitable support on the windmill tower, and connected with the vertically movable pump rod, driven directly from the windmill in any ordinary or approved way, of which the details are not shown. The pawl-carrying head is shown in Fig. 2, the pawls being pivoted to diagonally opposite parts of the head in such way that they have a solid bearing when they alternately engage the belt to drive it as the head reciprocates. Each pawl has a projection at its pivoted end, a spring connecting the projections of both pawls, and acting normally to throw the free ends of the pawls into engagement with the cross bars of the link belt. Each pawl is also provided with a face recess in which is fixed a pin that enters a slot at one end of a metal link, the springs holding the pawl pins at the outer ends of the link slots, so that when one of the pawls engages one side of the link belt, the other pawl will be disengaged from the other side of the belt, each pawl alternately coming into engagement as the pitman moves up and down, thereby imparting continuous rotary motion to the driving shaft. The speed of the latter may be regulated by setting the pin which connects the pitman with the lever operated by the pump rod at a greater or less distance in or out from the fulcrum of the lever.

The Perfected Phonograph.

The improvements in the phonograph have now been carried to such a degree of perfection that the instrument is practically ready for general introduction. Undoubtedly means will be hit upon from time to time to enhance the value and efficiency of the phonograph, but it stands to-day, in our opinion, far more practical and complete than was the type writer when first brought out and placed on the market. Back of all the tall talk and exaggeration on the subject, for which the daily press is chiefly responsible—certainly not those who are introducing it—is a machine of admirable performance, whose utility is so wide and various that it is hard to determine just which work will give it the largest fields of employment. And then, too, aside from the practical use, is the wonder—for wonder it is—that not only can the human voice be registered, but it can be duplicated in countless electrotypes. We may be wrong, but not greatly, in believing that this century will be memorable above others because it is that which first preserved articulate speech for after time. All poetry, of every age, is full of the yearning, one of the deepest in human nature, for the voice whose gentle greeting could be heard no more, and yet this tender sentiment will be gratified, and each elusive tone and accent now has conferred on it a perpetuity that is not an attribute of even the graven stone or brass.—*Electrical World.*

A Good Word for Leghorns.

There is no better fun in the world than keeping chickens. From Boston—and all fads originate there, says a contemporary—the hen fever is sure to spread over the South and West. If you catch it, pay attention to these few simple rules: Buy Leghorn hens—no others lay as well as these Italian fowls—and feed them liberally with a variety of grains. Give them all the scraps from the table in a hot mess each morning, with plenty of red pepper and burnt bones. Keep their quarters clean and well ventilated, and be sure that they are warm in winter. Water they should have in plenty. Herein lies the essence of all poultry wisdom. Act upon it, and you will have—with twenty hens and a couple of roosters—enough fresh eggs to supply your household all the year round. And, after all, what delicacy is there that equals an egg taken warm from the nest and popped into boiling water for one's breakfast?

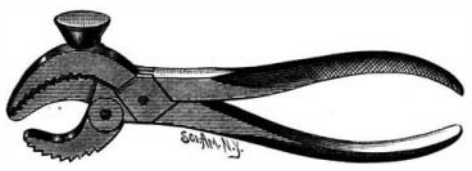
THE Thursday's lecture on April 19, on "Public Health in India," was delivered at the Parkes Museum, London, by the Hon. Mr. Justice Cunningham, who spoke as the representative of an association which has for some years past made the public health in India its especial care. The lecturer stated that the annual death roll in India was probably nearer seven or eight millions than five, which was the official return for the year 1885. The following statement shows how largely the death rate is contributed to by diseases which we here recognize as preventable:

TOTAL DEATHS IN 1885.

Cholera	385,928
Small-pox	80,630
Fevers	3,396,239
Bowel complaints	293,638
Injuries	83,262
Other causes	937,903
Total	5,177,600

AN IMPROVED LASTING TOOL.

A special form of pinchers for shoemakers and saddlers, which will not tear or disarrange the thinnest insole, is illustrated herewith, and has been patented by Mr. Joseph R. Jacques, of Hancock, Mich. On the under side of the lower jaw of the tool are ears, between which is pivoted a lip that is curved upwardly and forwardly, to contact, in use, with the lower jaw, the under surface of the lip being corrugated to prevent slipping when the lip is utilized as a fulcrum in using the tool. The lip thus forms a rocking fulcrum for the tool, and when not employed falls down out of the way. Differing from a rigid lip, which would be liable to slip and draw the inner sole from the upper, the pivoted lip remains stationary when in use, and



JACQUES' LASTING TOOL.

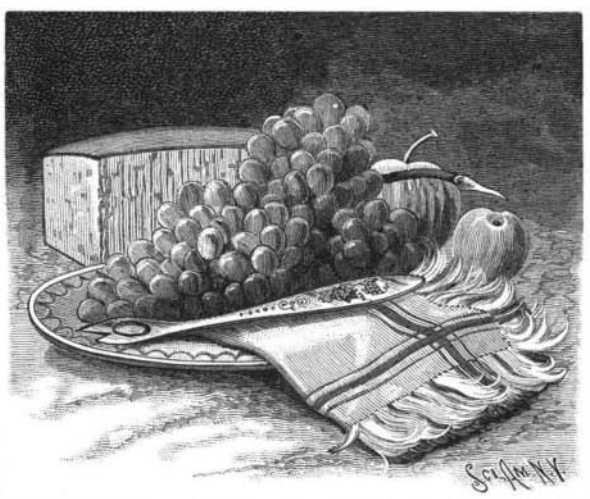
facilitates drawing the leather quickly in the direction of the middle of the last. Upon the outer surface of the upper jaw is a projection adapted for use as a hammer.

Projection of a Globule of Liquid in the Spheroidal State.

Instead of heating the globule in a metallic capsule, polished so as to give perfect reflection, Professor P. Colardeau recommends, in Buguet's *Journal de Physique*, the use of the ever brilliant surface of mercury as the mirror. The mercury is placed in a porcelain capsule, and the whole is heated on a water bath to a temperature of 212° Fah. Next a drop of ether is allowed to fall upon the mercury, and from any source of light a beam is directed upon it by means of a prism arranged for total reflection. The reflected beam of light is caused to fall upon and pass through a convex lens or regular objective, and thus there is produced upon the screen a sharply defined image of the drop. The mercury retains its heat long enough for convenient observation of the projection of the phenomenon.—*Rivista Scientifico-Industriale.*

IMPROVED UTENSIL FOR EXTRACTING GRAPE SEEDS.

A simple and serviceable implement for extracting the seeds from grapes before eating them, and which may be made in quite ornamental patterns, is shown in the accompanying illustration, and has been patented by Sarah E. Toucey, of New York City (P. O. box 2425). It has a flat pick, with a sharpened point on its end in line with the handle, a cavity in its top face, and a cutting blade projecting laterally from the pick, its point forking out therefrom a short distance within the point of the pick. The top of the grape can, with this utensil, be quickly sliced off by the cutting blade, so as to uncover the grape seeds, when, by



TOUCEY'S GRAPE SEED EXTRACTOR.

introducing the flat pointed pick beneath them, they can be readily received in the cavity and removed without injuring the edible part of the grape.

PEROXIDE of hydrogen, according to Dr. Love, of St. Louis, is a most valuable agent in the treatment of diphtheria, ozæna, and in all cases of cancerous ulceration and of suppuration or necrosis. He employs it in a solution containing 0·5 to 3 per cent, using most frequently, however, a strength of one per cent, diluting the commercial "ten volume" peroxide with two or three times its volume of water. Of its value in clearing away and effectually deodorizing the decomposing exudate in cases of diphtheria he speaks in the most emphatic terms, and he regards the remedy also as one of great usefulness in scarlet fever, whooping cough, and other specific diseases.

On the Detection and Estimation of Magenta in Orchil and Cudbear.

BY CHRISTOPHER RAWSON, F.I.C., F.C.S.

Various methods have been proposed from time to time for detecting the presence of magenta in orchil and cudbear. But on account of the difficulty hitherto experienced in completely separating orsein from salts of rosaniline, there are few, if any, published methods which are sufficiently delicate to detect very minute quantities of magenta in these coloring matters. H. Crossley* precipitates the magenta by ammonia, and E. Knecht† makes use of caustic soda for the same purpose, but since rosaniline is appreciably soluble in alkalies, a small quantity of magenta would be entirely overlooked by the employment of either of these methods. Liebmann and Studer‡ saturate a solution of the orchil or cudbear with sulphurous anhydride, and after filtering, add either acetone or aldehyd, when, if magenta be present, the color of the liquid changes from red to violet. They state that by this reaction $\frac{1}{10}$ per cent of magenta in cudbear can be detected. In making use of this process, on account of the cudbear which remained in solution after saturating the liquid with sulphurous anhydride, I have been unable to detect such a small quantity.

The method which I have to propose is based upon the complete precipitation of the coloring matter of orchil and cudbear in an aqueous and alcoholic solution by basic acetate of lead, followed by an excess of ammonia. Magenta, under the same conditions, remains in solution.

From 1 to 2 grammes of cudbear (or an equivalent amount of orchil liquor) are boiled with 50 c. c. of alcohol, and afterward diluted with 100 c. c. of water; 15 to 20 c. c. of a strong solution of basic acetate of lead (sp. gr. 1·25) are then added, followed, after stirring, by a similar quantity of strong ammonia. The mixture is filtered, and if the amount of magenta present is to be *estimated*, the precipitate is washed with a solution containing 1 part of ammonia, 5 parts of alcohol, and 10 parts of water; otherwise the washing may be neglected. With pure cudbear the filtrate is quite colorless; if magenta be present it is either colorless or pink, according to the amount of ammonia present in the solution. The liquid is then acidulated with acetic acid, when the presence or absence of magenta is at once made apparent; in the case of pure cudbear or orchil the solution remains colorless, whereas, if a salt of rosaniline be present, the well known color of magenta is immediately developed. If further proof be wanting, a small piece of worsted yarn may be dyed in the solution and afterward tested in the usual way with such reagents as hydrochloric acid, caustic soda, and a mixture of hydrochloric acid and stannous chloride.

By means of this method I have been able to detect with certainty 1 part of magenta in 100,000 parts of cudbear.

For determining the *amount* of magenta present, I make use of a colorimetric process. A standard solution of pure magenta is prepared so as to contain $\frac{1}{100}$ milligramme per c. c. It is acidulated with acetic acid in order that it may be under the same conditions as the solution to be tested. The latter is made up to a known bulk, say 250 c. c. (or, if magenta present be very small, concentrated to 100 c. c. and the whole taken for estimation), and an aliquot part run into a Nessler tube and diluted to 100 c. c. The standard solution of magenta is then run from a burette into a second cylinder in such quantity that the depth of color is equal to that in the first, as in the case of Nesslerizing ammonia. The amount of magenta present in the sample of cudbear or orchil under examination can be then readily calculated. In place of Nessler tubes the colorimeter or Lovibond's tintometer might be used with advantage.

It will no doubt be apparent from what I have already stated that this method is capable of detecting very much smaller quantities of magenta than the manufacturer of cudbear would ever think of using for the purpose of adulteration. But as the amount present can, at the time, be easily and readily estimated, there is little danger of genuine cudbear which may have become accidentally contaminated with a trace of magenta being pronounced sophisticated.

In a valuable paper on the "Detection of adulterations in orchil and cudbear," F. Breiul§ employs basic acetate of lead for detecting magenta and other basic coal tar colors. Some time previous to the publication of that paper, however, I tried the same reagent at the suggestion of my friend Dr. E. Knecht, but a considerable amount of cudbear still remained in solution, and it was only by adding an excess of ammonia or soda that it was completely precipitated.—*Chemical News.*

THE Bank of England is the most extensive banking institution in the world. It employs over 1,000 clerks, and its buildings cover 8 acres.

* *Journal of the Society of Dyers and Colorists*, vol. ii., p. 23.

† *Ibid.*, vol. ii., p. 58.

‡ *Journal of the Society of Chemical Industry*, vol. v., p. 237.

§ *Mitth. d. Techn. Gewerbemuseums in Wien*, 1887, 37.