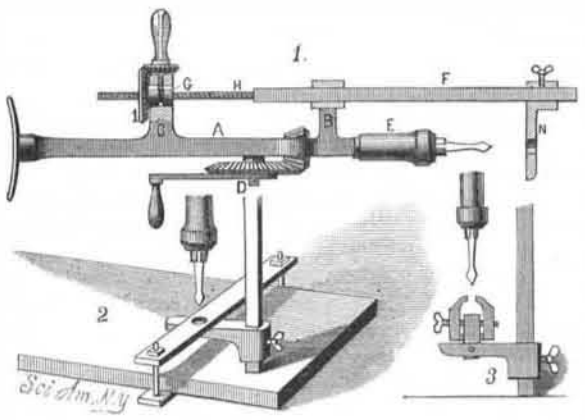
IMPROVED BREAST DRILL.

The drill stock, A, is provided with arms, C B, on the side opposite the crank gear, D, which drives the spindle of the chuck. A strong bar, F, slides in one arm, and its upper end, which is screw threaded, fits in a feed nut, G, in the other arm. On one end of the nut is a toothed wheel that gears with a beveled pinion attached to a thumb bit fitted on a stud projecting from the end of the bracket; by turning the thumb bit the bar can be drawn along the drill chuck, E. The lower end of the bar carries a bracket, N, that serves for a work table, the work being placed on it and forced against the drill by the feed nut, which is turned by the left hand of the operator, who turns the crank gear with the right hand.

When the piece of work is large and heavy, the drill may



HARDISTY'S IMPROVED BREAST DRILL.

be clamped to it by bars, as clearly shown in Fig. 2, or a vise may be secured to the bracket, N, as in Fig. 3, for holding the work by that means. This bracket is fitted to the bar with a binding screw so as to be shifted according to the size of the piece to be drilled. The baris fitted parallel to the stock, so that the bore will be true when the work is placed squarely on the face of the bracket.

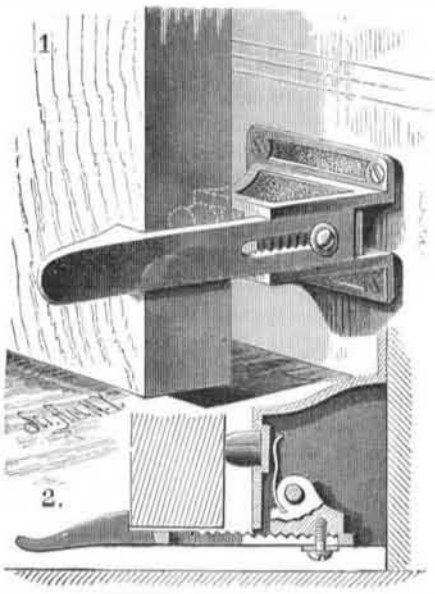
This invention has been patented by Mr. J. F. Hardisty, of St. Joseph, Mo.

New Bone Bleaching Process.

Various chemicals have been used for the purpose of bleaching bones, such as sulphurous acid, chloride of lime, and latterly peroxide of hydrogen; but according to experiments made at the Bavarian Museum of Arts, a very simple and effective method has been discovered, which is said to impart to bones thus treated almost the same appearance as ivory. After digesting the bones with ether or benzine, to remove the fat, they are thoroughly dried and immersed in a solution of phosphorous acid in water containing 1 per cent of phosphoric anhydride. After a few hours they are removed from the solution, washed in water, and dried, when they will appear as indicated above.

NOVEL DOOR CHECK.

The door catch herewith shown automatically engages with the door to hold it open, and can be readily released by a slight pressure with the foot. An ornamental box or case is secured at its back to the base board of the room in such a position that the device will come within range of either the bottom or upright edge of the door. A hook catch, having its rear portion serrated so as to engage with a carrier similarly constructed—shown in the sectional



RALL'S DOOR CHECK.

drawing, Fig. 2—projects from the casing. The catch and carrier are held in engagement by a screw passing through a slot, in the shank of the catch, to provide for the adjustment of the catch to suit doors of different thicknesses. A spring keeps the catch in contact with the door. Projecting from the front of the case is a stop made of some elastic substance which prevents the knob of the door from striking the wall.

This invention has been patented by Messrs. L., G. and E. Rall, and additional particulars may be obtained from M. Lehmann and Rall Bros., of Glasgow, Mo.

Properties of Brass.

The most important properties of brass compared with copper are the following: The color of brass is much brighter, and more approaching to that of gold; it is more fusible than copper, less subject to rust and to be acted upon by the vast variety of substances which corrode copper with so much ease; and it is equally malleable when cold, and more extensible than either copper or iron, and hence is well fitted for fine wire. Brass, however, is only malleable when cold. Hammering is found to give a magnetic quality to brass, and this circumstance makes it necessary to employ unhammered brass for compass boxes and similar apparatus.

The expansion of brass has been very accurately determined, as this metal is most commonly used for mathematical and astronomical instruments, where the utmost precision is required. Mr. Smeaton found that 12 inches in length of cast brass, at 32°, expanded by 180° of heat (or the interval from freezing to boiling water) 0·0225 part of an inch.

Brass wire under the same circumstances expanded 232 parts; an alloy of 16 of brass with 1 of tin expanded 229 parts. The expansion of hammered copper is only 204 such parts, but that of zinc is 253, so that brass holds a middle place in this respect between its two component metals.

Most of the zinc readily burns off from brass when kept melted in a strong heat with free access of air. When the heat is equal to that of melted copper, the zinc takes fire and slowly burns away. At last, little else but copper remains, but still united with a small portion of zinc, which no further continuance of the fire will entirely separate.

Some kinds of very fine brass are said not to be made by cementation, but by a more speedy and direct union of copper and zinc, care being taken to prevent the access of air to the materials while in fusion. Very fine brass may also be made by mixing together the oxides of copper and zinc and reducing them with a carbonaceous flux. Sage gives the following experiment to this purpose: Mix together 50 grains of the oxide of copper, remaining after the distillation of verdigris (which is very pure), with 100 grains of lapis calaminaris, 400 grains of black flux, and 30 grains of charcoal powder; melt the mixture in a crucible till the blue flame is seen no longer round the lid of the crucible, and when cold a fine button of brass is found beneath the scoria, weighing a sixth more than the copper alone, obtainable from its oxide in the same way, but without the calamine. This brass has a very fine color, like gold.

On this experiment M. Sage observes that there appears to be a point of mutual saturation between the two metals, which is when the copper retains one-sixth of zinc, and this portion it will retain however long it is heated, provided the surface of the melted metal be covered to protect the zinc from the action of the air; but if the brass contains a greater proportion of zinc, precisely this excess will escape, even in covered vessels, and will burn when it comes out to the air.

The same chemist also observes that the color is the finest at the above proportion. These experiments seem to require further confirmation, but we may reckon that to be the most perfect brass which is composed of about 14·28 per cent of zinc and 85·72 of copper, and which is not liable to any alteration in its constituent parts by successive or long continued fusions, provided the access of air be prevented.

Analysis shows a vast variety in the proportions of the different species of brass used in commerce. In general the extremes of the highest and lowest proportions of zinc are from 12 to 25 per cent of the brass. Even with so much as 25 per cent of zinc, brass, if well manufactured, is perfectly malleable, though zinc itself scarcely yields to the hammer. M. Dize analyzed a specimen of remarkably fine brass made at Geneva, for the purpose of escapement wheels and the nicer parts of watch making, the perfect bars of which bear a very high price. This metal unites great beauty of color to a very superior degree of ductility. It was found to consist of 75 of copper with 25 of zinc, and probably, too, the copper was Swedish, or some of the finer sorts. The common brass of Paris seems to contain about 13 per cent of zinc, the English probably more.

Brass is applicable to an infinite variety of purposes, is easily wrought by casting and hammering, and by the lathe, its wire is eminently useful, and it takes a high and very beautiful polish. The appearance of brass is given to other metals, by washing them with a yellow lacquer or varnish, a substitution often very much to the detriment of the manufactured article.—*Glassware Reporter.*

A Preventive of Stopped Ascension Pipes.

The manager of the gas works at Deventer, Holland, has adopted, for preventing stoppages in his ascension pipes, an exceedingly simple arrangement, which is described in the *Organe Industriel de l'Eclairage.* The system consists in the insertion in the mouthpiece end of the retort, immediately after charging, of a sheet of iron fitting the retort as closely as possible. This piece of sheet iron has in the middle a hole equal in area to the ascension pipe. The tarry vapors, heavy oils, and carbon dust are for the greater part arrested by this plate, and are thereby prevented from rising a few feet higher, and condensing on the interior surface of the ascension pipe. The office of the plate is simply to arrest as far as possible the matters that in the ordinary way settle at the lower end of the ascension pipe.

FOLDING STEP LADDER.

The invention shown in the annexed cut was recently patented by Mr. George A. Sommer, of 265 Greene Avenue, Brooklyn, N. Y. The side boards, steps, landing, and standard are of the usual form, except that the side bars of the latter are pivoted to the side boards near the landing. To the upper ends of these bars are pivoted the ends of side rails, whose lower ends are pivoted to links joined to the side boards near their lower ends. When the standard is closed against

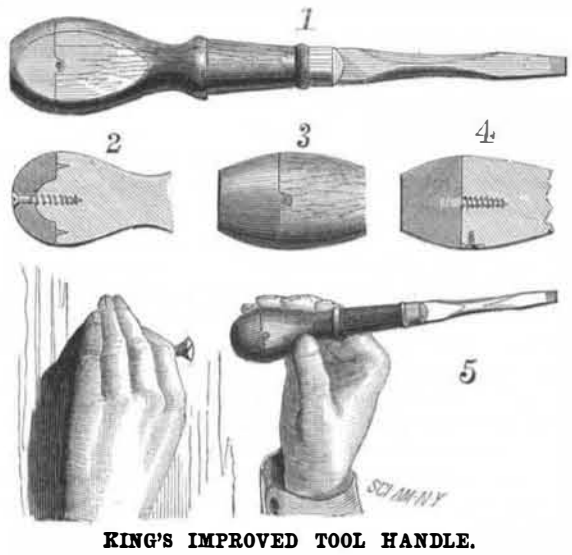
SOMMER'S FOLDING STEP LADDER.

the back of the ladder, the rails are folded down along the side boards; when the lower part of the standard is moved away from the ladder, the rails are extended along the front so as to assist a person to ascend and descend the ladder. The rear edges of the side boards are provided with notched braces that prevent the standard from being swung out too far and that hold the ladder in open position for use. The braces come into position automatically, requiring no attention on the part of the one using the ladder.

AN IMPROVED TOOL HANDLE.

The annexed engravings show a useful improvement that can be applied to the handles of many kinds of tools, and for which letters patent were recently granted to Mr. John A. King, of 2,015 Chestnut Street, St. Louis, Mo. The wooden portion of the handle is provided with a metal cap secured in position in any suitable manner. In the construction shown in Fig. 2, the cap has a recess for receiving a projection on the wooden portion of the handle; it is held on by a screw, and is steadied by pins entering the wood. In Figs. 3 and 4 the screw is made a part of the cap, and turning is prevented by a thin lug on the cap entering a recess in the wood, and being held in place by a screw. The handle may be made with flattened sides as shown in Fig. 1, or with a globular end as in Fig. 5, the form being governed by the work to be done with the tool.

This plan not only increases the durability of the tool by strengthening that part which is subjected to rough usage, but permits the tool to be used for purposes for which it would not otherwise be adapted. In ordinary work the starting of a screw takes time; the change from the screw driver to the hammer and back again having to be gone through with before the turning is begun. In this case all the time consumed is in the turning of the tool end for end, as indicated in Fig. 5. The metal cap perfectly protects the wooden handle.



KING'S IMPROVED TOOL HANDLE.

The various applications of this improvement will be readily perceived by those who have felt the want of such a device.

SALTING WALKS.—The best way, says a correspondent, to apply salt to paths, to destroy weeds, is as follows: Boil the salt in water, 1 pound to 1 gallon, and apply the mixture boiling hot with a watering pot that has a spreading rose; this will keep weeds and worms away for two or three years. Put 1 pound to the square yard the first year; afterward a weaker solution may be applied when required.

Flexible Photographic Plates.

Photographers, both amateur and professional, have long wanted some thoroughly efficient substitute for glass as a support for dry plate films, and a few attempts have been made to supply the want with more or less of success. The following method has been recently patented in this country on behalf of Messrs. Fickeissen and Becker, of Villingen, Baden. The plates or surfaces can be prepared from paper, cloth, or other suitable fabric or material, but by preference from white paper containing very little size and not much grain. This paper is first extended on a frame or other arrangement, according to the size of the plate or surface which is desired. After it is dry the surface is covered in any convenient manner with a fine varnish or composition, such as copal varnish, for the purpose of rendering the fabric transparent; it is then dried, and after it is quite dry the surface is rendered smooth by the application of powdered pumice stone or other suitable material, or it may be smoothed by suitable machinery.

This process of smoothing may be repeated, if necessary, two or three times until the surface or plate is smooth or transparent. The surface so prepared is then covered on one or both sides with a solution of gelatine, isinglass, or other substance possessing similar properties, and allowed to dry. The surface so prepared may, if desired, be further treated with a preparation of ox gall from which the fatty matter has been extracted by acetate of alumina or similar acting agents, which will precipitate the fat of the gall, the resulting preparation being then passed through a filter, whereby a clear solution will be obtained with which the plate or surface may be covered, so as to secure the safe reception of the emulsion for photographic or other use. Instead of ox gall, any similarly acting substance or material may be used.

The plates or sheets prepared as above may be used with great advantage in reproducing photographs from nature in lines or stipples for calico and other printing, as the stipples or lines can be printed first on the material before it is made transparent. Any photographic design or drawing can be put on the transparent surface in the usual way, and by using the film as a negative or positive in photographing from nature or from a drawing, half tones will be reproduced in lines and stipples available for any kind of printing. As these plates or sheets are waterproof, they can also be used as surfaces upon which can be printed or produced all kinds of ornamental and useful work.

Porpoise Fishing on the Atlantic Coast.

The *Public Ledger* states the result of the first effort this season to entrap porpoises off the coast of North Carolina. It resulted in the capture of 75 fat porpoises, which were taken to Philadelphia to be "*tried out.*" The estimated weight of the catch is 45,000 pounds, from which Capt. John A. Cook, superintendent of the company, roughly calculates will be procured 1,000 gallons of oil, 3,750 pounds of leather, and 15 tons of phosphate. The hide will make a leather pronounced equal to the best French calf skin, and the oil is said to be superior to sperm oil. Leather from this source has been made in small quantities for some years in England and Germany; it is fine and strong, and makes the best shoe laces.

The fishing, it is said, will be continued, but as the weather is getting warm it is probable that the next catch will be "tried out" at an establishment on the coast. It is intended to fish in Chesapeake Bay, and about June 1 operations will commence at Cape May, and continue during the summer. The net used is something like what is known as a "fyke" net, and is, with the wings, a mile long. The bag into which the fish are inveigled is 60 feet wide, 24 feet deep, and 120 feet long. The 75 fish were caught in two hauls, the first bringing in 39, both hauls being made in one day.

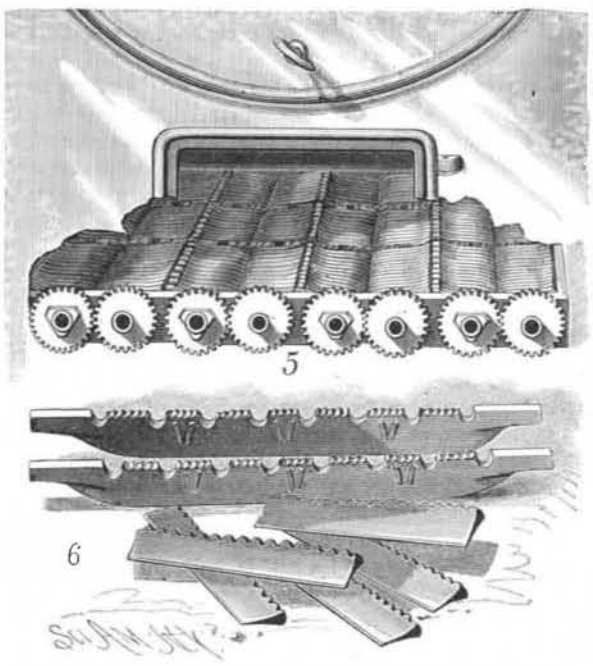
Water from Eucalyptus Roots.

In many parts of Australia, where water is scarce, the natives formerly procured it from the roots of the eucalyptus and a few other trees. The tree most preferred throws out numerous lateral roots, which lie at a depth of from six to twelve inches below the surface.

According to a writer in the *Proc. Linn. Soc.* of New South Wales (vol. viii., 1883), the native having ascertained, by means of prodding with a pointed stick or spear, the position of some of the roots, "removes the superincumbent soil with his wooden shovel for twenty or thirty feet, and cutting the root off at each end lifts it out of the trench and cuts it up into lengths of about eighteen inches or two feet, knocks off the bark, and stands the several portions on end in some receptacle to contain the water. . . . As soon as these pieces are placed on end, the water commences to drip, and when the whole of the root or roots are cut up and placed on end, the native, beginning at the first placed, puts the end in his mouth and by a vigorous puff expels the remaining water. . . . The water is beautifully clear, cool, and free from any unpleasant taste or smell."—*J. F. J., Amer. Nat.*

IMPROVED FURNACE GRATE.

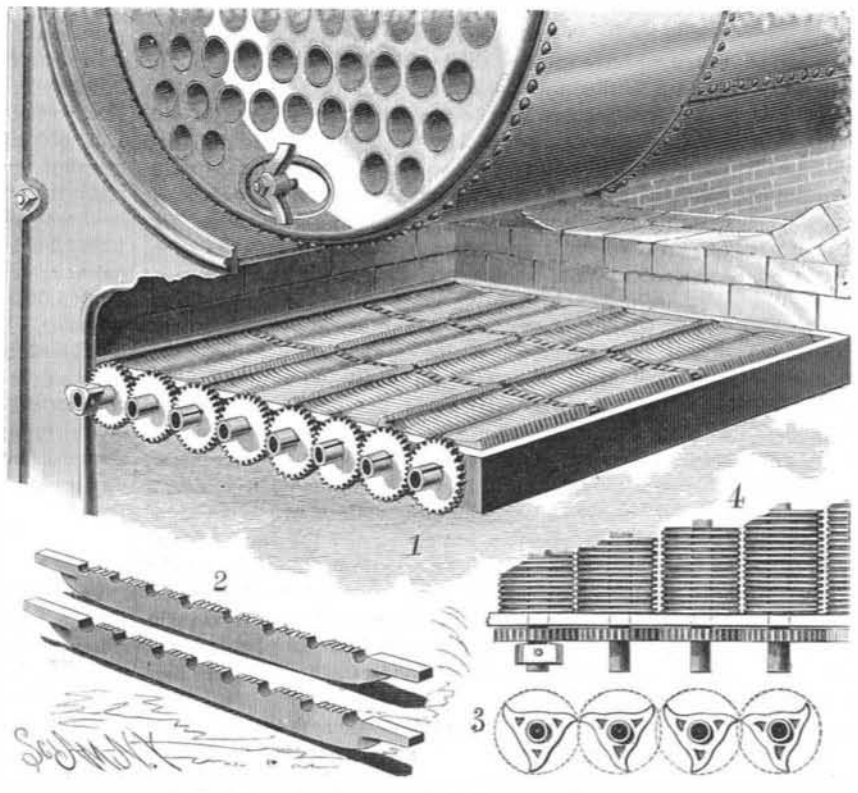
The accompanying illustrations represent a new and effective method of removing the refuse—ashes, clinkers, slate, and all foreign and incombustible matter—from the fire chambers under boilers, forges, furnaces, etc. This invention has been patented by Col. J. A. Price, of Scranton, Pa., and is a direct result of an intimate acquaintance with the problem in all its aspects, and of long continued study of the mechanical details. The grate insures complete combustion by reason of an absolutely clean fire bed, and reduces



PRICE'S IMPROVED FURNACE GRATE.

the waste arising from unconsumed fuel to a minimum, beside saving both time and labor in cleaning.

The grate consists of tubular shafts connected by gearing, and having mounted thereon a series of cutting fire arms or bars which operate in pairs when the grate is constructed as shown in Fig. 5, and together when made as in Fig. 1. The action is positive, and any foreign substance lying upon the grate is cut up and discharged. The cutting arms are slipped upon the tube, which is either ribbed or grooved to meet a corresponding groove or rib in the cutting arm, thus fastening all into a rigid mass capable of making a cut of any length up to ten or twelve feet. Fig. 2 represents cross bars, whose ends rest upon the sides, which serve as carriers. Fig. 6 shows the form of cross bars used when the cutting arms are arranged in pairs; the same figure shows the dividing bars, which divide each pair of arms and which are supported by lugs upon the sides of the cross bars. Fig. 3 is a vertical cross section, and Fig. 4 a plan view of the grate. The shoulder on the cutting arm constitutes the



PRICE'S IMPROVED FURNACE GRATE.

spacing of the bars, which may be larger for coarse and finer for small fuel, and so on down to culm, or coal waste.

The tubular shafts are open at each end, and the natural passage of the cold air from the outside to the high temperature of the inside, into which they discharge under the burning surface, serves to preserve them from the action of the fire; they are further protected by the cutting arms slipped upon them. These tubes can be converted into water bars by the use of socket joints without interfering with the action of the grate in the least. A simple lever turns one pair or all, or an adjustable clutch can be arranged to connect with some moving part of the engine, thereby doing away with the labor of the engineer or fireman. The fire can be effectively cleaned without opening the door; steam will not run down during the operation, and the boilers will not suffer in consequence of the expansion and contraction caused by the frequent opening of the doors. This fact will be appreciated by locomotive engineers. A light or thin fire bed, free from clinker bridging, can always be maintained. Culm, coal waste, or dust can be taken direct from the deposit and used, no preparation being needed.

What the Elevator Has Done.

The marvelous advance in the construction of business and residence dwellings in New York and other large capitals of the world is clearly due to the use of the elevator. The substitution of steam for human strength in lifting people from the ground to the upper floors of structures has radically changed not only the appearance of the streets, but our methods of living and doing business. Fifteen years ago these great business and apartment edifices were unknown. The possibilities of the elevator were only then beginning to be understood. But what a change has occurred in our leading business streets! Without the elevator we would have been deprived of every striking structure in New York. There would have been no Equitable, Mutual Life, Mills, Western Union, Temple Court, Morse, Field, Boreel, or Tribune building, and then there are literally hundreds of apartment houses which would not have been erected had it not been for this very simple means of "getting up stairs."

Of course high buildings have their disadvantages. They imperil human life, if not incombustible. They exclude light and air from neighboring houses, and then they are manifestly out of place on narrow streets. But notwithstanding these drawbacks, the building of these great establishments will be continued. The average builder and householder is opposed to them, and cordially seconds the bill now before the Legislature to put a stop to their construction. They are, however, so comfortable, convenient, and profitable that no law can stand, even if enacted, limiting their height. New York is designed to become a city of monster buildings, and no legislation will avail against the inevitable.

The public, however, has a right to demand that these high structures shall be fireproof, and that there shall be ground or courts about them, so that they cannot interfere with neighboring property. The rule should be, at least 40 per cent of vacant space wherever a high building is erected. The limit now demanded by law is too small. Life and property should be protected, but beyond that there should be no interference with capitalists who wish to invest in this latest outcome of business and domestic architecture.—*Real Estate Record.*

How to Prevent an Epidemic of Small Pox.

The metropolis is again threatened with an epidemic of small pox. The disease, which broke out some weeks ago in the northeastern district, is now prevalent in Hackney and one or two adjoining parishes, and the number of cases under treatment in the Asylum Board Hospitals has risen from 150 in the middle of March to 273 on April 7. The frequent occurrence of outbreaks of small pox in London, and the great expense entailed by treating and isolating the cases in hospitals, make us ask the question: Can an epidemic of small pox be prevented? It is a well known fact that a very large proportion (75 per cent being the average) of those nowadays attacked with small pox have been vaccinated in infancy, but that after a time the protection against small pox afforded by vaccination seems to die out.

We have before us statistics of 17,756 cases of vaccinated small pox cases of all ages, treated in the London hospitals from 1871 to 1881. Of these 15,903, or 90 per cent, were over 10 years of age, while only 10 per cent were under 10 years. This shows in a sufficiently definite manner that, of the vaccinated population, children under 10 years are very little liable to small pox, and that the incidence of small pox is in those who have passed the age of childhood, and are entering on or have reached adult life. To afford protection against small pox to adults in the same measure as we now do to children by vaccination in infancy, is clearly the only effective means (apart from isolation in hospital or at home) of preventing epidemics of small pox; and, to effect this, a second vaccination should be performed soon before or at the age of puberty. We have frequently instanced the experience of small pox hospitals, where the staff there employed are revaccinated, to show the complete immunity from small pox enjoyed after revaccination by those engaged in nursing the sick. If the public would protect itself against small pox in the same way that officials of small pox hospitals do, this loathsome and dangerous disease would never assume the proportions we have been accustomed to see during the past fifteen years. To prevent an epidemic of small pox, we unhesitatingly say that the only effective measure is revaccination. —*British Medical Journal.*