ture and rub outwards toward the edges to dispel all air and paste. Be very careful not to get paste on the back of the print. Keep it damp with a sponge until the rubbing is finished, being careful not to break the surface of the paper. When perfectly dry, lay on a heavy coat of castor oil and it will soon become transparent. If too much oil, rub off the surplus with a cloth. Allow it to stand a day or two, when it may be colored.

IMPROVED APPARATUS FOR TESTING BANK CHECKS.

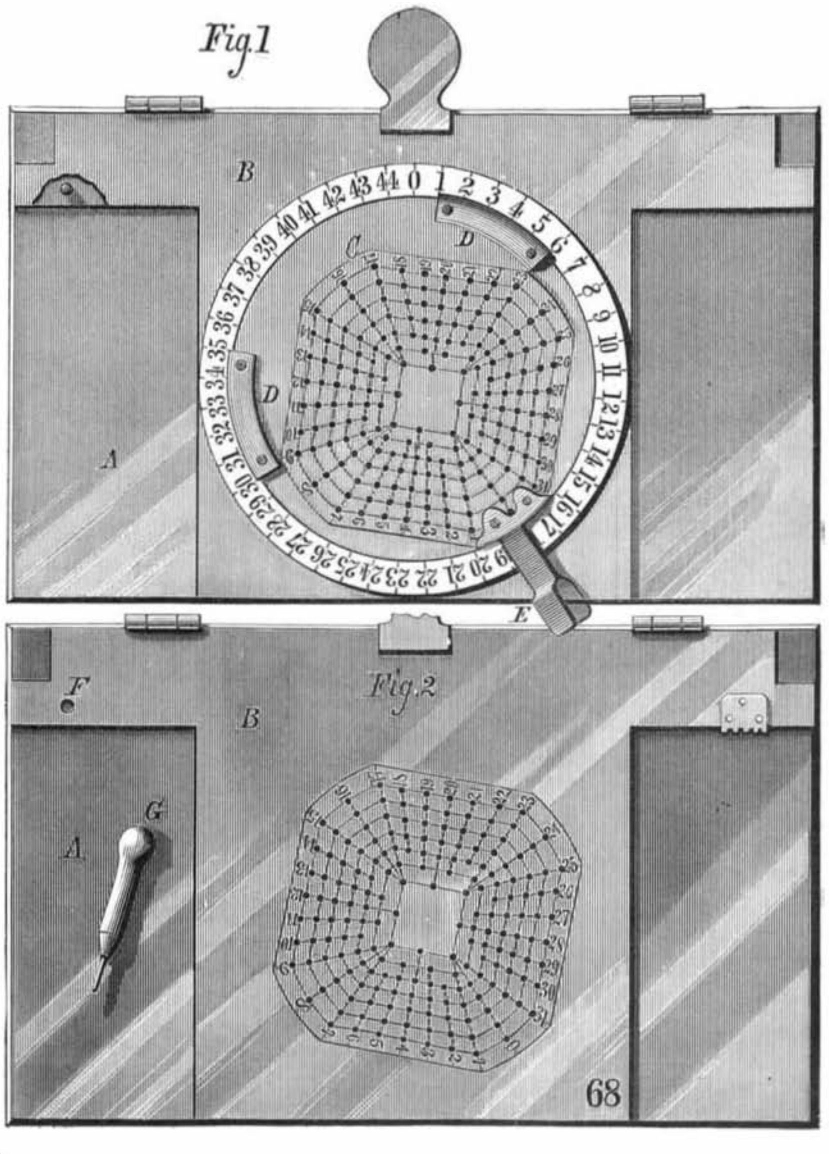
The device herewith illustrated is intended as a safeguard for bank checks, which will enable any alteration or raising of the figures of the same to be at once discovered. Certain perforations are made in the paper which, by their position, indicate the true amount, but it is impossible for any one to make these perforations at the right places, unless he possesses the depositor's peculiar combination, while the presence of a perforation in the wrong place immediately discredits the check.

The invention includes two separate devices—one to be in the possession of each depositor, the other to be kept by the bank. The first is represented in Fig. 2, the second in Fig. 1. Both have metal base plates, A, to which are hinged other plates, B. The plate, B, in Fig. 2, has inscribed upon it just seven concentric polygons, which are intersected by thirty-one radial lines. At each of the points of intersection (except at those on the innermost polygon, where they are spaced further apart) apertures are made. The radial lines are numbered as shown at their outer ends. These numbers are called combination numbers. The apparatus used by the bank is represented in Fig. 1. In the outer plate, B, is a circular hole around which numbers are marked. Within the circle is placed a loose polygonal plate, C, marked off and perforated in precisely the same way as the outer plate of the depositor's apparatus. This plate is held in position by lugs, D, and is provided with a handle or extension piece. E.

The mode of using the device is as follows: On the depositor's portion, Fig. 2, is inscribed the number 68. This gives 18 as the index number of that particular apparatus, 50 being taken as the starting point. We will suppose that the index being 18, the depositor's combination number is 22, and the amount of his check $1,225. After filling out the check, he places it on his plate, A, beneath the plate, B, Fig. 2. A pin at F, in the lower plate, then perforates the check, and enters a hole in the upper plate. Beginning with the units of the sum to be marked 5, is added to the combination number. The total of 27 is now found on the edge of the polygon, and through the hole in the outside polygonal line opposite that number a hole is pierced by the pin shown at G. The figure in the ten's place or 2 is next added to the combination number, and the pin is forced through the hole in the second polygonal line opposite the number 24, and so on, the hundreds being marked through the third polygonal line, the thousands through the fourth, and so on to the tens of thousands. The hundreds of thousands and the millions are marked in the two inner polygonal lines

When a check is received at the bank the index and combination numbers of the depositor are noted. The plate, C, is then adjusted to bring the zero point opposite the depositor's index number on the surrounding circle, the handle, E, furnishing a convenient means of doing this. The check is then placed so that the pin, G, on the plate B, Fig. 1, corresponding in position to the similar pin in Fig. 2, enters the hole in the check made by the latter. The perforating pin, F, is then used in the same manner as already described. The check in being removed from the apparatus is examined, and if no new punctures have been made it is genuine; but if new holes have been formed, then there is proof of the raising or forging of the check.

Patented through the Scientific American Patent Agency August 21, 1877. For further particulars address F. and A. D. Grafelmann, Middle Village, Queens county, L. I.



APPARATUS FOR TESTING BANK CHECKS.

American Machinery in New South Wales.

Messrs. J. A. Fay & Co., the well known manufacturers of woodworking machinery, of Cincinnati, Ohio, inform us that the Metropolitan Exhibition of New South Wales, to which they contributed quite largely, proved remarkably profitable and satisfactory to them. They received four medals in competition with other American and the English manufacturers. We have taken occasion before this to direct the attention of our readers to the extensive demand for improved American machinery in Australia, and Messrs. Fay & Co.'s statement goes further to show the ready appreciation which our industrial products there encounter.

CEMENT UPON IRON OR STONE.—A cement made of glycerin and litharge hardens rapidly, and makes a durable cement upon iron or stone. It is insoluble and is not attacked by acids.

WALKER BROTHERS' IMPROVED SCROLL SAW.

Workers in wood are generally aware that while the band saw is excellently suited for outside work, it is not so for inside cutting or perforated work. The jig saw, on the other

hand, is adapted to both, and for the latter variety especially, owing to the facility with which its blade can be detached or unhooked and passed through the holes made in the piece to be sawed. On its capabilities in this particular are based the claims of superior economy usually advanced for the jig or scroll saw

A new machine of this description is represented in the accompanying illustration. It is designed for general use on medium or fine work in hard or soft wood. It is durably constructed, and is provided with convenient means for the adjustment of all its parts.

As the straining device for the blade is one of the most important features in the construction of the scroll saw, special attention may be directed to the ingenious arrangement herein embodied. The object is to produce an even tension on the blade at all points of the stroke, and to enable the strain to be varied at pleasure. Springs, L, links, D, and lever, M, are attached to a casting that may be moved up or down the standard, B, for blades of different lengths. More or less strain may be imparted by turning the hand nut, I, so moving the lower spring, L. As the lever, M, travels on its upward or downward stroke, it throws the supports of the limbs, D D, forward and backward; in this way the lever tension of the blade is maintained. The links, D, are attached to the ends of the springs and lever so as to roll on their points of contact or bearing surfaces, thus reducing friction of the working parts. The upper and lower fastenings for the saw blade are made to fit any thickness, and the blade can be quickly changed for perforated work without raising and lowering the upper slides or hold down, F. The lower slides, P, have a parallel adjustment, and are set up for wear by simply turning one screw, P, at the sides of each slide.

A small rotary blower, O, attached to the frame under the table and driven by a pulley on the balance wheel shaft, forces a blast of air against the sawdust as it comes from the blade, keeping the slides free from dust, preventing absorption of the oil in the lower slide and guides, and preventing the noise and heat so common in slides when running loose and dry. A rubber tube, not shown in the engraving, is attached to the blower and conducts the air above, keeping the sawdust from the working lines of the sawyer.

The table is made of wood or iron, as preferred, and the filling around the saw blade may be of wood or of hardened steel. The latter is kept in place and adjusted by the screws, R, in front of the table. The hold down, F, and the slides, G, may be adjusted independent of each other for thickness of stuff or length of blade, and the back and side guide, H, removed, when not in use, for long or narrow blades. The lower slides, P, may also be set up for wear and kept parallel without trouble and loss of time. The saw is started and stopped by the foot of the operator on the rod and brake, N, and the belt shifter, K—another important improvement—may be set for the belt in any direction. All the parts are well made and fitted, and guaranteed in every respect. The pulleys are 6 inches diameter by 3 inches face, and should make from 900 to 1,050 revolutions per minute. Patented May 27, 1873. For further information address the manufacturers, Messrs. Walker Bros., 73 and 75 Laurel street, Philadelphia, Pa.

Egg Raising.

The egg traffic of this country has risen to an importance which few comprehend. The aggregate transactions in New York city alone must amount to fully $8,000,000 per annum, and in the United States to $18,000,000. A single firm in that line of business east handled $1,000,000 worth of eggs during the year. In Cincinnati, too, the traffic must be proportionally large. In truth, the great gallinaceous tribe of our country barnyard contributes in no small degree to human subsistence, eggs being rich in nutritive properties, equal to one half their entire weight. Goose, duck, hen, pullet, and partridge eggs are the principal kinds produced in America. We have nothing, however, like what we are told used to be found in Madagascar, or have been found there, the gigantic woa egg, measuring thirteen and a half inches in extreme length, and holding eight and a half quarts. One of these birds, with a single effort, might supply a modern boarding house with omelettes for a day.

The perishable nature of eggs has naturally detracted from their value as a standard article of diet. The peculiar excellence of eggs depends upon their freshness. But lately the process of crystalizing has been resorted to, and by this process the natural egg is converted into a vitreous substance of a delicate amber tint, in which form it is reduced seven eighths in bulk compared with barreled eggs, and retains its properties for years unimpaired in any climate. This is indeed an achievement of science and mechanical ingenuity, and has a most important bearing on the question of cheaper food, by preventing waste, equalizing prices throughout the year, and regulating consumption. In this form eggs may be transported without injury, either to the equator or the poles, and at any time can be restored to their original condition simply by adding the water which has been artificially taken away. The chief egg-desiccating companies are in St. Louis and New York. No salts or other extraneous matters are introduced in the process of crystalizing, the product being simply a consolidated mixture of the yolk and albumen. Immense quantities of eggs are preserved in the spring of the year by liming. Thus treated they are good for every purpose except boiling. It is a common trick for some dealers to palm off eggs so treated as fresh, so that imposition is easily practised. In the desiccating process, however, the difference becomes apparent, as from four to five more limed eggs are required to make a pound of eggs crystalized than when the fresh eggs are used, and eggs in the least taintedwill not crystalize at all.

Some of the most experienced egg dealers declare that there is no profit in raising poultry to compare with producing eggs. A single hen will lay from twelve to fifteen dozen eggs per annum, selling at an average of thirteen cents per dozen, and the birds thus occupied can be housed and fed for less than fifty cents for the whole period. In the East the price per dozen is much higher. Here we buy them by the dozen. Step into an eastern produce or grocery establishment, and they sell so many eggs for a quarter of a dollar. There is no reason why the crystalizing process should not become quite general, and egg production stimulated as never before, and the food supply receive large accessions from this source. The already great and increasing consumption of eggs in England and France shows growing appreciation of this form of food compared with any other. It is thought the annual sales in the United States alone must aggregate nearly $20,000,000. In Lima, Peru, eggs sell at one dollar per dozen, equal to four dollars per pound crystalized. It is thought that this new process of preserving for utilization the industry of our hens and pullets may be very acceptable as well as beneficial in a business and domestic point of view.—*Cincinnati Commercial.*

An American Surgeon in England.

Dr. Sayre seems, from all accounts, to be having quite an ovation among our British cousins; and probably no American surgeon ever before received such marked attention on their part. The *Lancet* for July 14 announces his arrival in London, and offers him a cordial greeting, and, in the issue for July 21, gives an extended account of the principal points insisted on by Dr. Sayre "in his forcible expositions of pathology, diagnosis, and treatment of spinal curvature." All the late numbers of the *British Medical Journal* contain references to his visit. That of July 14, in speaking of his demonstration at University College Hospital, gives the details of his method of treatment of Pott's disease and lateral curvature, and those for July 21 and July 28 contain reports of his demonstrations at St. Bartholomew's and Guy's Hospitals respectively.

His first demonstration of his method in London was at University College Hospital, by invitation of the surgical staff, before an immense audience.

Tuesday, July 17, he delivered a clinical lecture at St. Bartholomew's Hospital, at the invitation of Mr. Callender, and the same week he also appeared at the London Hospital. Wednesday, July 25, he visited Guy's Hospital, by invitation of Mr. Durham, and "put up" two cases of Pott's disease and one of lateral curvature, before a large number of the profession. The first of the cases of Pott's disease was the daughter of Dr. Gooding, of Cheltenham, and the second a child of eleven, who had never stood, and the worst case, Dr Sayre said, which he had ever seen. In less than half an hour he had the satisfaction of making her walk, which, of course, created the greatest enthusiasm among the audience. On the day following, he "put up" four cases at the Royal Orthopædic Hospital, of which he had previously had photographs taken.

Dr. Sayre then made a visit to Birmingham, at the request of the branch of the British Medical Association located there, and, by invitation of Mr. West, senior surgeon, gave a demonstration in the amphitheatre of the Queen's Hospital, which was crowded to its utmost capacity. He lectured for one hour, during the course of which the plaster jacket was applied to two cases of Pott's disease, and one of lateral curvature, and at its conclusion, Mr. West made a fine address, and moved a "hearty welcome and thanks to the great American surgeon." The sequel is thus described by an eye witness: "Mr. Furnieux Jordan seconded the motion with such a glowing tribute, and in such fervid eloquence, that Dr. Sayre became completely overcome. He spoke of the millions of human sufferers, heretofore tortured by rack and screw, and even then left miserable and misshapen, which would now be made easy and comfortable, and restored to perfect health and perfect form. He thanked God that the days of the hunchback had passed away, and that the instruments of torture would never again be resorted to. At the conclusion of his remarks there was not a dry eye in the house, and there probably never was such a scene in any medical meeting before. Tears of gratitude got the better of Dr. Sayre's ability to speak, and he broke down completely in his first attempt to respond. In a few minutes, however he sufficiently recovered himself to express his appreciation of the sentiments just uttered, and shortly afterward so electrified the audience with his enthusiasm that one would have thought the roof would go off the amphitheatre."

On the 6th of August, Dr. Sayre was to go to Manchester to be present, as a delegate from the United States, at the annual meeting of the British Medical Association; after which he expected to devote himself for a time to the preparation of a work on the treatment of spinal disease, which will be immediately put in press by Messrs. Smith, Elder & Co., of London. During his stay in England he has been the recipient of much generous hospitality. Among the pleasantest of the entertainments which he has attended were a delightful breakfast, attended by all the principal men of the place, which Mr. West gave him at Birmingham, and a magnificent dinner in the Royal Hall of St. Bartholomew's Hospital, at which there were nearly four hundred guests present.

Rennet and its Preparation.

The manufacture of cheese depends upon the peculiar property possessed by casein of being curdled by acids. On the addition of an acid to milk, the casein, or cheesy portion, which constitutes three fourths of the nitrogenous matter present, is separated from the liquid, and this separation of milk into curds and whey is the first step in cheese making. Curd may be formed either by the addition of an acid, or by the juice of certain plants, or, as is the universal practice in this country, by the use of rennet, which is prepared from the fourth stomach of the young calf. Its peculiar action in coagulating the casein of milk is due to the presence in this stomach of minute cells contained in the gastric juice, and the process is one of fermentation, rapidly effected by minute microscopic bodies, of which the liquid composing the steepings of rennets is full. Over one thousand of them have been counted in one five hundredth part of a drop taken from a gallon of water in which a single rennet had been soaked; hence at this rate a good rennet would contain two hundred thousand millions of them. It is claimed that this active agency in rennet may be multiplied and carried from one lot to another of milk, the same as leaven in bread making, and hence rennet is really a true yeast.

It is only the fourth, or true digesting stomach of the calf, from which rennet can be prepared out of the inner lining or mucous membrane. They are usually in their best condition when the calf is from five to ten days old, but do not vary materially in strength while the young animal lives entirely on milk. As soon as the calves begin to live on solid food the strengths of their stomachs as rennets grow feeble. The calf should be perfectly healthy, must have suckled the cow four or five days, and to within a short time of killing. If it has been without food for any length of time the stomach becomes inflamed and congested with blood, and especially so if the calf has been driven or carried much of a distance, since then it is of no value for rennet. The stomach should be taken out and well cleaned at once after the calf is killed, by careful wiping with a moist cloth or sponge, or by rinsing, but in no case should water be poured upon it. As soon as cold, let it be lightly salted and left to dry on a dish for a day or two, then stretched on a hook or crooked stick, and hung up to dry in a place where the temperature is moderately warm. The Bavarian method is to blow up the rennet like a bladder, and tie one end to keep out air, first putting on it a little salt at the place were tied; the skins, being thus made very thin, will dry rapidly and keep well; sometimes they are suspended in paper bags.

Rennets lose their strength if kept too warm, but they are much improved by alternate freezing and thawing if kept open to dry air; they should not be allowed to gather dampness, since their strength will evaporate if thus exposed. Their quality improves by at least one year's age and they part with the strong odor so common to green rennets. This prepared stomach or rennet, when steeped in water, produces a decoction which possesses the power of thickening milk or of decomposing it and separating the casein from the liquid or whey. The most convenient way to prepare the rennet for use is to place the stomach in a stone or earthen jar containing a brine sufficiently strong to prevent it from tainting, with not exceeding two quarts of cold water: allow the whole to stand for five days; then strain and put it into bottles; or the rennet may be soaked over night in warm water, and next morning the infusion may be poured into the milk.

In from fifteen to sixty minutes the milk becomes coagulated, the casein separating in a thick mass. The rennet possesses the chemical property of producing lactic acid, by acting upon the sugar in the milk; the acid unites with the soda in the milk, which holds the casein in solution, when the casein separates, forming the curd. Showing the wonderful power of this agency, by taking a single ounce of this membrane or rennet thoroughly washed and dried, and placing it into eighteen hundred ounces of milk, heated to 120° F., complete coagulation of the whole quantity will shortly follow. Remove the rennet from the curd, again wash, dry and weigh it, and it will be found to have lost but one seventeenth part of its weight. Thus it may be proved that one part of the active matter of the stomach may coagulate about thirty thousand parts of milk.

It would be seen from these facts that but a small comparatively small amount of rennet would be required by our cheese factories; but such is not the case. The desire to hurry cheese off to market in ten or twenty days from the hoop requires far more of the rennet than is absolutely necessary in the more moderate operations of private dairies in former days. The home supply from the millions of calves which are slaughtered in this country is wholly inadequate to meet the demand for rennets, hence they are largely imported from Europe. It is to be hoped that the enterprising chemists and investigators of the age will discover some method of extracting the active agent in rennet, and in a state of absolute purity and fredom from objectionable animal matter, with a degree of uniformity in strength as well as concentrated form. While American cheese making has made wonderful progress during the past twenty years, their yet remains a wide field for careful study and intelligent progress.

To Find the Contents of Boilers.

To find the contents of cylinder boilers multiply the area of the head in inches by the length in inches and divide the product by ·1728; the quotient will be the number of cubic feet of water the boiler will contain. Example: Diameter of head, 36 inches; area of head 1017·87 inches; length of boiler, 20 feet or 240 inches. Now multiply 1017·87 by 240 and the product will be 24,428,380; divide this by ·1728 and the result will be 141·37 cubic feet, which will be the contents of the shell.

In flue boilers, multiply area of the head in inches by the length of the shell in inches; multiply the combined area of the flues in inches by their length in inches, subtract this product from the first and divide the remainder by ·1728; the quotient will be the number of cubic feet of water the boiler will contain.

Proper Speed of Circular Saws.

Nine thousand feet per minute, that is nearly two miles per minute, for the rim of a circular saw to travel, may be laid down as a rule. For example: A saw 12 inches in diameter, 3 feet around the rim, 3,000 revolutions; 24 inches in diameter, or 6 feet around the rim, 1,500 revolutions; 3 feet in diameter, or 9 feet around the rim, 1,000 revolutions; 4 feet in diameter, or 12 feet around the rim, 750 revolutions; 5 feet in diameter, or 15 feet around the rim, 600 revolutions. The rim of the saw will run a little faster than this reckoning, on account of the circumference being more than three times as large as the diameter. Shingle and some other saws, either riveted to a cast iron collar or very thick at the center and thin at the rim, may be run with safety at a greater speed.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

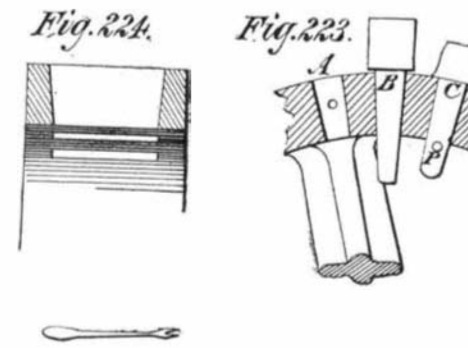
NEW SERIES—No. XX III.

COGGING.

The term cogging is applied by pattern makers and wheelwrights to the process of furnishing wooden teeth to iron wheels, in the rim face of which are cast mortises to receive the wooden cogs. The term cog is applied to the piece of wood out of which the tooth is formed. This includes the shank fitting into the mortise together with the tooth projecting from the face of the wheel. The term tooth denotes the part forming the tooth independently of the part fitting into the mortise.

The object of using cogged wheels is to avoid the jar and noise incidental to the use of large cast gear wheels, which it is found impracticable to cast true. If the wheel is cast from a wooden pattern, this pattern is liable to warp. Furthermore, the rapping of the pattern in the mould tends somewhat to destroy the truth of the mould. Even if these elements of error are eliminated in making the mould by using a moulding machine, the unequal shrinkage of the casting induces untruth. After a gear wheel is cast, the face is then be turned true. While in the lathe a circle may be made for the bottom of the teeth, and another for the

Fig. 224. Fig. 223.



pitch line. Other circles may be made as are deemed neces sary ase guids for adjusting the instruments used to form the outlines of the teeth. The wheel may be marked off as carefully as can be, and the teeth after marking may be chipped and filed to the lines; but it is not found in ordinary practice that by any such means a degree of truth sufficient to avoid jar and noise is attainable. This is especially the case with large wheels, and cogging is resorted to. It is usual to cog the large wheel of a pair that run together, and to make the wood teeth thicker across the pitch line than the iron one. If two cast wheels are made to run together, there is usually given a certain amount of clearance between the spaces and the teeth, whereas, when a cogged wheel is employed, this clearance is dispensed with, and back lash is avoided. The woods generally used for cogging are hornbeam, hickory, button wood or sycamore, maple, and locust. The blocks for the cogs should be cut out and kept so as to thoroughly season before being used. There should, when there is likely to be a demand for them, always be kept a spare set of cogs, so that they will be ready for use, well seasoned and less liable to shrink and thus come loose in the mortises.

When the cast wheel arrives from the foundry it is taken to the machine shop, bored and turned across the face. The mortises receive a little attention, burrs and sprue fins are removed, the rough places levelled, etc. If it should be found that any of the mortises are "blind," that is, stopped by the arms of the wheel, as shown at A, Fig. 223, a cir-