we surrender—at least we mean before *our mouth is closed* like a backwoodsman's bear-skin powder pouch, to enter our solemn protest.

Do these reformers expect us to believe that a man appears best when his face is so disguised that one would as soon hunt for a mouth at the back side of his head as the front? For one we can't see it. What are we coming to? We have no suitable implements with which to feed ourselves in the event of this fashion becoming "the law of the land." But, hold! Yes, the thought has just occurred to us—we saw in the SCIENTIFIC AMERICAN a wood cut representing a spoon for this very purpose. The "bowl" and handle are formed in the ordinary fashion, and a strap of the same material passes over the top forming a sort of funnel. We could name several objections to this new invention, but we have a plan of our own much to be preferred to the patent *hair* spoon—and for one, when "worse comes to worse," we mean to adopt it—and as we do not intend to apply for a patent, all others are at liberty to make the most of our suggestions. These implements, like most improvements, are "cheap, simple and not liable to get out of repair," and now, presuming that the reader is fully prepared for the announcement, we say—for the more solid, nutrimental aliments the patent Sausage Stuffer is just the thing—and for those who indulge in whisky, lager, coffee, tea, buttermilk, &c., the instrument most resembling, but not te hnically styled, a squirt gun, would seem perfectly adapted. What say you, Messrs. *Hall* and *Munn?*

[We copy the above from the Tunkhannock, Pa., *Republican*. We think the suggestion a good one. Let it be tried by all means.—EDS.

### Blockade Runners Captured in 1864.

We have a copy of the Report of the Secretary of the Navy for the year 1864, which contains among other things a list of the vessels captured in attempting to elude the blockade in 1864. The total number caught or destroyed is eighty-eight. Of these seventy-eight were captured by merchant built steamers employed on blockade duty by the navy, leaving *only ten* captured by naval vessels proper. Of these ten two were caught in a sound or inlet where there was no escape, one by the *Sassacus*, and one by the *Sonoma*. Two others were taken, one by the *Kanawha* and others, and one by the *Matabassets* and others; but how many and what vessels were "the others" is not stated. One was caught by the *Minnesota*, a frigate of the old navy, and one by the *Pequot*, built by Mr. Wright not on the navy plans. Four out of the eighty-eight were caught by the new navy in the open sea and when the vessels were unaided in the capture; and only six in the open sea whether with or without aid.

We look in vain for the *Eutaw* and other fast naval vessels; their names do not appear; although when the *Eutaw* went into the blockade we were told that she would be heard from. What is the reason of this undeniable fact? Is it true that our naval vessels lack speed? What other explanation can be given?

### Rag Boiler Explosion.

Wednesday, Dec. 21st, a boiler used for steeping rags exploded in a large paper mill in Troy, N. Y. The explosion was so violent that it blew down and destroyed a large brick building filled with machinery, breaking timbers a foot square into splinters, and doing damage to the amount of at least $40,000.

As rags are steeped under a pressure of 60 lbs. or more to the square inch, the explosion is no stranger than the explosion of any steam engine boiler. It doubtless resulted from imperfect construction or careless management. A small part of the $40,000 loss would have paid for a good boiler and would have hired a competent man to take care of it.

### Big Oil Stories.

Oil wells have done big things in their day. The Phillips well has flowed two thousand barrels per day; Empire well three thousand; Sherman well fifteen hundred; Noble well fifteen hundred; Caldwell well eight hundred; Maple Shade one thousand; Jersey well five hundred; Coquette well fifteen hundred; Reed well one thousand."

We copy the above from an exchange, and would like to believe that the statements are all true; but our courage fails us just at the point of believing.

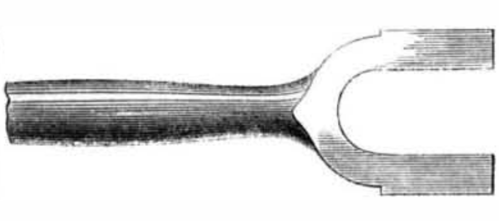
## TURNING TOOLS.

PART FOURTH.

With a roughing tool and a finishing tool any one can turn out good work with a little experience, and observation will supply from day to day much more instruction than we could impart in a page of this journal. In complicated work, or in places where ordinary tools cannot be used, it may be of some benefit to our readers to bear in mind what follows.

The forked end of a connecting rod is a difficult thing to turn nicely. It is not troublesome to roughhew it, to make plunges at it with a round-nosed tool, to make chatters in it, or leave it in such a state that it will take a finisher three or four days to file it up. But to turn the various corners neatly, to leave the edges sharp, and the outline without ridges, is a nice piece of work, and on no other job can the turner show his ability better.

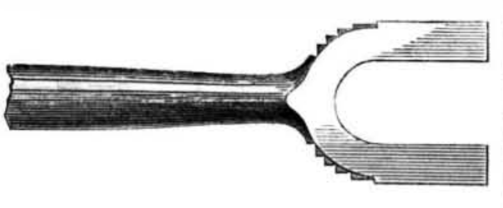
This is the piece of work spoken of, and although it is quite simple in its appearance, it is very trouble-



some. It is flat on the face toward the reader, and unless the finishing and roughing tools are set at the proper angles, and well secured, they catch under the advancing edge and break off or jump in. Every mechanic knows what mortification it is to have a tool act thus; for when the surface has been finely finished elsewhere one unlucky mischance by catching may spoil the whole,

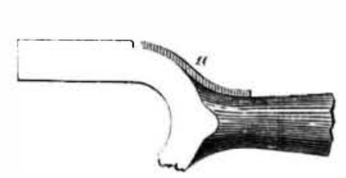
As the rod comes from the forge it is rough, and in heavy rods for marine engines, such as we now speak of, especially so. If it is troublesome to turn the rod it is bad to forge it, and the blacksmiths generally leave an abundance of metal.

After the rod is laid out with the curves expressed on the drawing, and properly centered, the turner takes a square-nosed tool and runs in nearly to the lines all round, as in this diagram.



This roughs out to the outline neat and clean, and develops the shape perfectly. It is handier than any other method, because the workman knows exactly what he is doing. Instead of skipping about, taking off a lump here and a chip there, he goes steadily on to the end, and never makes one turn of the feed-screw handle without some advancement.

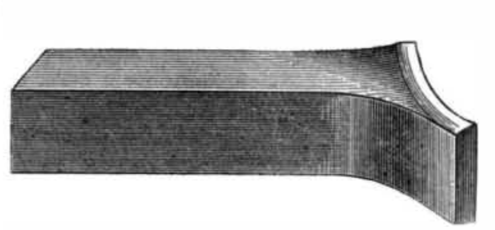
A square-nosed tool is better than any other for this purpose, because the edge, or corner, takes hold fairly and firmly, while the round nose, although it conforms to the curve better, is continually working or crowding off. When the tool has to be worked down a distance by hand, as in this diagram, it is




better to put in an ordinary roughing tool, with the feed in, and start at *a*, and cut it right down at once to the center punch marks denoting the outlines. In this way the lathe does much more work, for no man can feed as regularly and steadily, or as effectively, as the lathe itself can.

When the outline is once developed, and the ridges cut off by a bent side tool, the outline of the curves will present a surface consisting of a series of smooth-faced angles without a rough cut, a "dig," or a chatter upon them. After this it is an easy thing to cut off the tops of these angles, and make one fair and beautiful sweep of the whole outline. The surface will shine as bright as the face of a mirror, and be as true as a pair of dividers can lay it out. We know this because we have tried it.

The final finish can be well given by a tool con-



structed as shown in Fig 22, and the reverse curve as in this cut (Fig. 23). It must be borne in mind

that these tools have but little cut, or rake below, for the circle they cut on is very large and short, circumferentially, and a raking edge will jump in, while one too straight will push off. The linear length of the tool, or distance along the line of cut, should not be great, for the liability to spring is very greatly increased thereby. From two to three inches, and even less, ought to be sufficient for rods of ordinary marine beam engines.

## Correspondence

### A Well-expressed Compliment.

MESSRS. EDITORS:—Inclosed find $3 for the SCIENTIFIC AMERICAN for one year, commencing January, 1865. A journal that combines so much that is artistic and beautiful with so much that is valuable and instructive I wish every success. I appreciate harmony in every thing, and I love to associate external beauty with richness of soul.

Hoping that prosperity may ever be your portion, I am, yours very truly, WM. H STEVENS.

Fredonia, Dec. 18, 1864.

### Influence of Colored Light on Sorghum Molasses.

MESSRS. EDITORS:—I take the following extracts from my memoranda:

Four cylindrical glass tubes, each of $1\frac{1}{2}$ ounce capacity, and respectively of blue, red, green and yellow color, were filled three-fourths full with sorghum molasses, of a clear wine color, closed with cork stoppers, and exposed to the rays of the sun. After two months' exposure, the appearance was as follows:—The molasses in the red tube was covered with a moldy scum; that in the yellow tube had a flaky sediment; the molasses in the blue glass tub kept perfectly clear, and the peculiar taste of the sorghum was considerably diminished; the molasses in the green glass tube was similar to that in the blue, but not quite so perfect. The cork stoppers were removed; the scum in the yellow and sediment in the red tubes were also removed; the four tubes afterward covered with paper, to prevent the dust from falling into them, and exposed for two months longer to atmosphere and sun. A moldy scum appeared again in the yellow tube, a sediment in the red, while those of blue and green color remained clear as before. This experiment shows that molasses will keep best under the influence of blue color. The sorghum molasses contains a good portion of gum, also likely pectin.

The process of Prof. Goessling's patent, spoken of in Vol. XI., No. 25, consists, as I understand, mainly of a method adopted by Robert Philips, of Germany, published in No. 9, *Oeconomical News*, for the year 1843; also in Vol. I of Dr. Ludwig Gall's practical communications to the agricultural profession, page 408, year 1855. The process is, 1st, Extracting the starch from the corn in the usual way; 2d, Converting the starch by diastase or malt into glucose; 3d, In another vessel converting starch into starch sugar, by aid of sulphuric acid. When sugar is formed in this way the glucose sirup is added to that boiling with sulphuric acid, to produce a more complete conversion of dextrine into grape sugar. The action of malt or diastase on starch will stop when 30 per cent of sugar is formed.—*Comptes Rendus*, December, 1861, Vol. III., page 1,217; A. Payen.

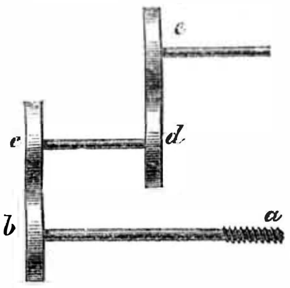
According to T. Musculus (*Comptes Rendus*, 1861,) only $33\frac{1}{3}$ per cent of sugar is formed by the action of the diastase. T. A. Hoffmann.

### Change Gears for Lathes.

Messrs. Editors:—I noticed in your issue of the 10th inst., a method of calculating the change gear of lathes, by Chas. E. Albro, of New York city. Your editorial hint to careful mechanics, at the end of the article, was well timed. Most machinists' lathes, with simple gearing, will cut just double the number of threads to the inch with the gearing mentioned in the examples of Mr. Albro.

I think Mr. Albro has overlooked the fact that most machinists' lathes, with simple gearing, are furnished with an auxiliary spindle called the change gear spindle or stud, which is generally, though not always, geared to move at half the speed of the main spindle of the lathe head. To obtain a correct solution of the problem it is necessary to take the movement of this auxiliary spindle in relation to that of the main spindle into the calculation; for instance, if, as in the case of Mr. Albro, 12 threads to the inch are wanted, and the change gear spindle moves at half the speed of the main spindle, it will only make 6 revolutions while the main spindle makes 12; consequently it must be 6 and not 12 which we multiply in order to get the correct relative proportion, or number of teeth, of the two gears required.

Example:—




Let $a$=the number of threads to the inch on the lead or feed screw; $b$=the number of teeth on the screw wheel; $c$=the number of teeth on the loose wheel of the stud spindle; $d$=the number of teeth on the fast wheel of the stud spindle; $e$=the number of teeth on the main spindle gear. Then the number of threads to the inch, which any change will cut is equal to $\frac{a\times b}{c\div(d\div e)}$ or $\frac{b}{c}(a\times\frac{d}{e})$.

Let $y$ represent the number of threads to the inch wanted, then—$\frac{c}{a}(y\div\frac{d}{e})=b$ and $\frac{a\times b}{y\div(d\div e)}=c$

Let $m$ represent any number used as a multiplier, then—

$$m\,(y\div\frac{d}{e})=b$$

and—

$$m\times a=c$$

All that is necessary to calculate for fractions of threads is to convert vulgar into decimal fractions, and multiply in the same manner as you would for whole numbers. For compound gearing different equations are necessary, as the intermediate gearing has to be taken into the calculation also.

A. Buckham.

Newark, N. J., December 10, 1864.

[We understand Mr. Albro's rule to refer to lathes with simple gearing only, that is *one* intermediate between the spindle and lead screw; in which case the intermediate is of no importance. Modern lathes are made as Mr. Buckham states, but there are many old-fashioned lathes for common work that have but three wheels—one on the spindle, one intermediate, and one on the lead screw.—Eds.

### Advantage of Deep Raceways.

Messrs. Editors:—I believe that the advantage of having raceways of considerable depth is not universally understood. Messrs. A. C. Seeley & Co., of Danbury, Conn., have a discharge raceway ninety rods long, from their water wheel to the river, eight eet deep, and ten feet wide on the bottom, and level. They use a Reynolds Water Wheel which takes 168 inches of water under 7 feet head, and the discharge raceway fills just 12 inches deep with water, when the wheel is in operation. In the winter season, experience has shown that it was a great advantage to have the raceway deep, as it kept clear of ice even in very severe weather. A. T. P.

### HOW MILK IS CONDENSED.

In our last volume we published an article on Condensed Milk which gave some interesting general particulars. We find in the *Daily Tribune* some additional facts which are also interesting; we repeat for the benefit of our readers.

We will start from the platform where the cans are received from the farmer, and take the reader step by step through the whole process.

If the cans "pass muster," they are immediately emptied through a fine cloth or strainer into the receiving vat, which holds a thousand quarts. From that the milk flows through a pipe, and is drawn into brass pails which hold fifty quarts each. These stand in a flat tub capable of holding fifteen pails at once, which is filled with water that is heated by a coil of steam pipe. Here the milk is heated to 190°-195°, and in this first process of the work of condensing lies the whole secret of success. This was the discovery of Mr. Borden. He was not the originator of condensed milk. It had been thought of and processes patented before the date of his patent, but all had failed, because the albumen of the milk, if boiled in open kettles, burnt upon the bottom, and if *in vacuo*, coated the pipes and vessels, preventing perfect condensation, and, if heated too high, giving an unpleasant odor to the condensed milk. When thus cooked upon the inside of the condenser, the albumen became an insoluble cement, which required great labor to remove, and which, if not removed, would spoil the next charge.

In this water bath, in these open pails, the albumen is coagulated, without separation from the watery portion of the milk, and a little portion that adheres to the pail is almost instantly removed by placing the pail bottom upward over a steam jet, instantly followed by a strong water jet, in the same way that the farmers' cans are so perfectly cleansed. Until this plan was adopted, the work of cleaning off the coagulated albumen was very laborious. Now it is almost instantaneous.

This first process requires but a few minutes, and two men stand ready to hook a tackle to the pails as fast as the contents reach the proper temperature, and hoist them out of the bath and empty them through a fine brass wire gauze sieve into what is termed a "steam well." This is a copper vessel shaped like an egg, standing on end, with about one-fourth of the upper end cut off. This holds about seven hundred and fifty quarts—six and a quarter barrels. This well is made with a steam jacket over the lower end, so that the milk, which is already heated almost to the boiling point, is soon brought to that degree, and is then ready to go to the condenser.

The first boiling in the open kettle appears to be another of the requisites in the preparation for the final operation, as it gets rid of something in the milk that tends to make it foam in the boiler; and if there is any defect in the condition of the milk, it is exhibited here in this open kettle, and the deposit of albumen that takes place during the first boiling is easily seen and cleared off between the changes. There are two of these steam wells, with their accompanying water baths and receiving platforms. From these the milk is taken by what is generally termed suction, through tinned iron pipes, to the floor above where there are three condensers, or vacuum pans. These in form are somewhat like the steam well, the egg shape being complete—being four or five feet diameter, and holding one thousand quarts. In the upper part on one side, there is a window, through which strong sunlight, or lamplight, is reflected to the bottom, and opposite this there is an eye-glass, through which all the movements of the milk are seen, and by that means the boiling is regulated. There is also a manhole, through which a man enters after each charge is withdrawn, and scrubs the copper bright enough to almost see his face in it. The lid of the manhole being screwed on, the pan is to ready commence receiving a charge. The first operation is to start a powerful double-action air-pump, which exhausts the air in the vacuum pan until the gage shows twenty to twenty-five inches.

The cock in the pipe connected with the steam well is now opened, and the milk rushes up to fill the vacuum. This pipe, by the by, is inserted into the milk from the top, and does not extend quite to the bottom, so that if any sedimentary matter has accumulated there from the boiling, it is not taken up to the condenser. As soon as the first charge is drawn up, more milk is prepared ready in the well for the next demand. The steam is now let on, heating the coil of pipe inside, and the steam jacket outside of the condenser, the pumps being kept in continual operation, and the milk closely observed by the intelligent Yankee girl (one of the "mudsills"), who has charge of the pan, and prides herself in keeping it and all around as neat as she does her person, and all are faultless. In a few minutes she observes the thermometer indicate 190° and that the milk *in vacuo* is boiling rapidly. In open air at this elevation it would require 210°, and could not have eighty per cent of the water it contained removed, as is the case in the condenser.

As the boiling goes on, the milk continues to flow in, until 3,200 quarts have been taken up. Then the cock of the supply pipe is closed, and from this time the most watchful care of the attendant is required to keep the heat regular, and the pumps working perfectly. The pumps stand upon the lower floor, where a stream of cold water flows upon the air chamber, and condenses the steam vapor drawn from the boiling milk into water, which is discharged into a stream constantly flowing through the building. This condensed vapor constantly emits that peculiar odor that we perceive in milk warm from the cow, or during the operation of boiling, and which contains the germ of putrefaction. When the charge of 3,200 quarts shows by the gage that it has been reduced to 800 quarts, it is ready for the final operation of purification. The steam is shut off, and its place filled with cold water, the effect of which is to condense the vapor in the air-tight pan, and thus diminish the pressure. This increases evaporation, and the effect is to throw off all the remaining odor, through the discharge of the pumps. This often has such a fetid, sickening smell, that it pervades the atmosphere all around, and affords one of the most convincing proofs of the value of the process that discharges such a substance from our daily food.

From the time the milk is received from the wagons until it is finished in the condenser, about three and a half hours are required for all the operations. It is then drawn into ordinary milk cans, and these are placed in an ice bath in the lower room, and require an hour and a half to become perfectly cold. It is now ready for shipment to the city. In summer time it is kept icy cold by means of an "ice core," that is a tin tube filled with ice, inserted in the cans, occupying about one-fourth of the space. Ordinarily, the milk drawn from the cows night and morning is condensed during the day and shipped at night, and delivered to city customers the next morning at thirty-two cents a quart.

It is a very curious fact that although only four quarts are condensed to one, when pure water is added to reduce the article again to milk, it is invariably found that it requires four quarts of water, and that the milk is then better than what is really pure milk, as drawn from the cows, and far better than much that is sold as pure milk.

The Pneumatic Loom.—Mr. T. Page, C. E., reports on a new system of weaving by compressed air in the pneumatic loom. The improvement will affect the working of nearly 500,000 power-looms, the labor of more than 775,000 persons and the manufacture of about 1,200,000,000 lbs. of cotton alone. The principle upon which the new loom acts is that of discharging a jet of compressed air from the valves of the shuttle-box, upon the end of the shuttle, at each pick or stroke, and thus substituting for the imperfect motion of the "picker" the pneumatic principle, simply applied. The working velocities will be in proportion of 240 strokes by the new machine per minute, to 180 strokes of the old in the same time. This improvement applied to the whole of the power-looms of the United Kingdom would represent a total increase of 1,400,000,000 yards over the produce of the same number of machines.