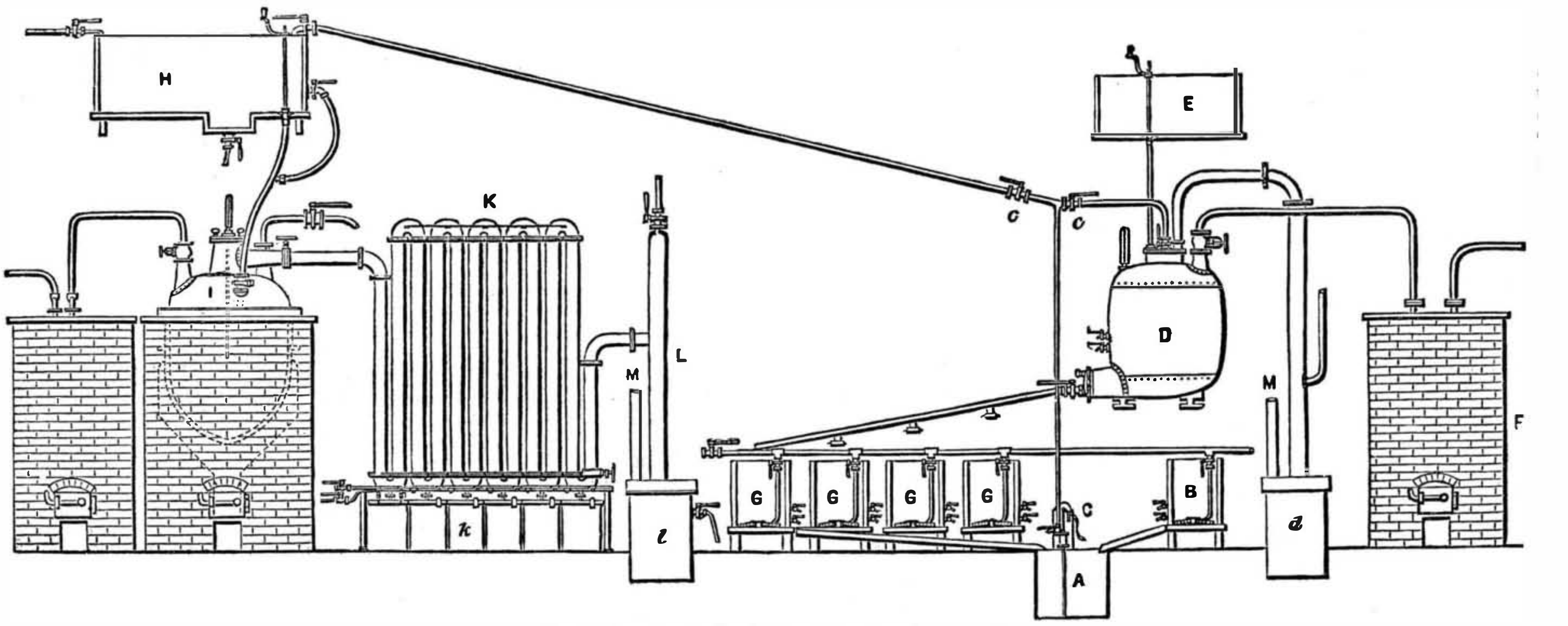
DISTILLING STEARIN.

As an appropriate supplement to our recent article on the oil resources of Africa, in which we described the immense yield of palm and other oils which might be obtained from sources on that continent now unutilized, we give herewith an engraving of a new apparatus for extracting the stearin from oil, by a new process. Stearin is now extensively used for making candles, and it is extracted from grease of all kinds. Hitherto a costly process of saponification has been employed, which the present device (for the illustration of which we are indebted to the *British Trade Journal*) obviates.



NEW STEARIN-DISTILLING APPARATUS.

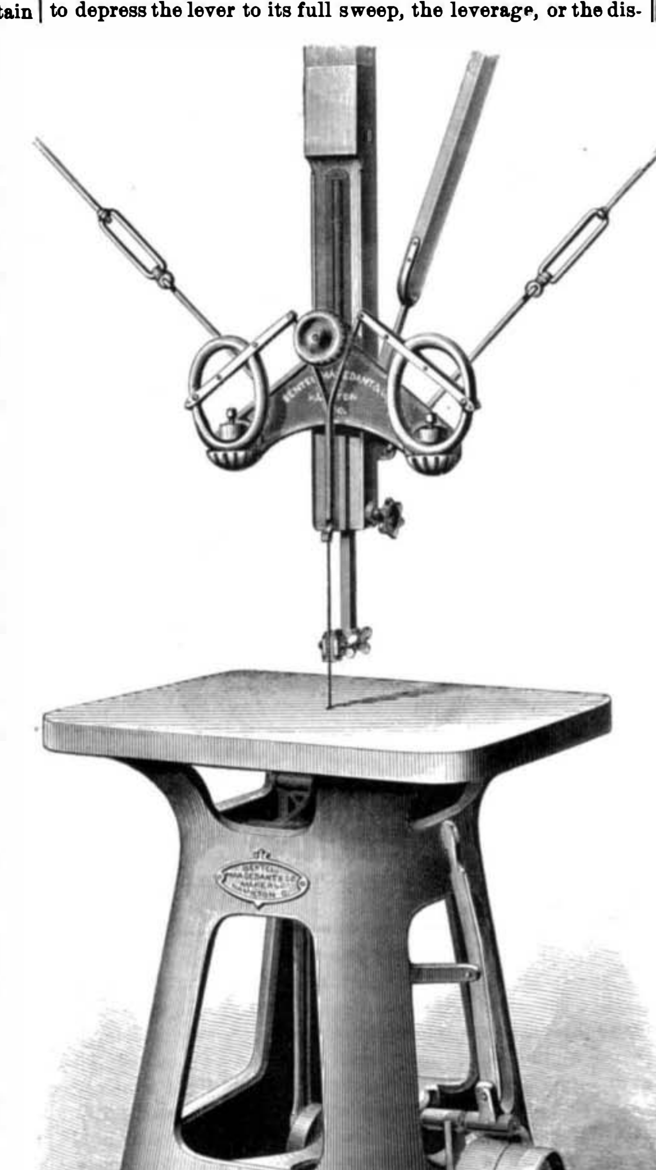
The palm oil or tallow, or both combined in certain proportions, are melted in a tank, A, by means of steam; the material is then pumped into a copper vessel, B, to which is connected a steam pipe whereby it is boiled up for a certain period, the steam being superheated in the superheater, F. Sulphuric acid is then run into the acidifier, D, from E, when the process of acidification is perfected. The material is next discharged into an open vat, G, and boiled with free steam for a few hours and allowed to settle; it is then drawn off into a tank below, and pumped into a large open tank, H, lined with lead, which is placed at a sufficient elevation above the still, I, to allow it to run by gravity; this tank has a coil inside which is charged with steam in order to keep the contents in a liquid state. By means of a suitable valve, the material finds its way into the still, which is heated externally by fire to about 240° Fah., while superheated steam is let into the interior. The process of distillation now commences, the temperature being regulated according to the quality of the material that is being operated upon. The vapors pass over to the refrigerator or cooler, K, which consists of a series of vertical copper pipes connected at top and bottom with gun metal bends, the bottom bends having outlets to which are attached spiral copper coils placed in a circular tank, *k*. These tanks are fitted with pipes for the admission of steam and cold water. The product is collected in pails from the outlets or mouths of the copper coils, the greater part being fit for making candles without resorting to the process of passing it through hydraulic presses. L is the essence tank, and M a pipe for conveying gas to be burnt in the flue. That part which is not fit for making candles direct from the still is pressed and redistilled.

As the result of distilling tallow, from every 100 lbs. subjected to this process, 78 to 80 lbs. of stearin are obtained; three fourths of this, or about 60 lbs., is ready for making stearin candles without further treatment; the remaining fourth, namely, 20 lbs., after being submitted to pressing and re-distillation, yields about three fourths of stearin and one fourth of oil, the whole producing only 5 lbs. of the latter. It has been mentioned that 78 lbs. is the product by distillation, but in addition to this there is an amount of material called pitch. This is a hard black substance if it be allowed to get cold, but provision is made for passing it into an iron vessel from the still before it becomes hard. It is operated upon at a great heat in this iron vessel, and the product is similar to that from the distilling process. The pitch, after having undergone the operation in the iron vessel, is a commercial article used in many trades, and is well suited for coating iron in lieu of black japan, an article of a somewhat costly character.

IMPROVED SCROLL OR RECIPROCATING SAW.

In the accompanying engraving is represented a new scroll saw, manufactured by the well known firm of Bentel, Margedant & Co., of Hamilton, Ohio. So far as the general construction of the machine extends, beyond strength and uniform excellence of work there are no special features of novelty which would attract attention. The table and stand are very heavy and are cast in a single piece; or a wooden table may be attached, if preferred. There are the usual crank wheel, pitman, and slide to communicate motive power to the saw, the pin of the slide having a hollow chamber which carries the lubricator. The slide is of steel and the guide slides are adjustable.

The novel and important point of the apparatus is, however, in the straining device for the saw, which is both simple and effective. It consists of two springs, two levers, and a connecting belt. The springs are each formed of a round steel bar, which is flattened on the ends and bent to an oval in such a manner that the extremities, while nearly meeting, allow a lever to be inserted between them. By depressing this lever one end of the spring acts as a movable fulcrum, while the other end presses with a force of about 820 lbs. on a point almost opposite the fulcrum. In order to compensate for the extra power which, it would appear, would be required to depress the lever to its full sweep, the leverage, or the distance between the ends of the spring, is proportionately reduced, so that the strain is thus equalized.



BENTEL, MARGEDANT & CO.'S SCROLL SAW.

This device, the manufacturers state, may be adjusted so as to show an actual loss of strain; and as a matter of curiosity they inform us that they have one such apparatus in their possession that loses 3 lbs. during six inches travel or depression.

By raising or lowering the plate which carries the device, and by turning the springs toward or from the center, an increase or reduction of strain is obtained. The saw can be run at a very high speed; and as the two spring levers can be depressed 13 inches, the length of the stroke can be increased in such case to 10 inches, the saw having ordinarily 5 inches stroke.

The further advantages claimed are that the saw runs easier, with less jar, noise, and vibration than does any blade strained by springs, and that the simplicity of the device enables it to be easily manufactured, and reduces its wear and need of repairs.

Patented November 30, 1875. For further information address the manufacturers as above.

Pneumatic Dredging.

Dredging has been a disagreeable necessity ever since docks and canals came into use, and up to quite recent times no improvement upon the ordinary elevator seems to have been thought of. Randolph, of Glasgow, tried, some years ago, to pump up mud along with water, much as M. Bazin later has done, but we have not heard that either got beyond the experimental stage. Still more recently a new dredging plant has been designed by Mr. F. E. Duckham—already well known for his hydraulic devices—for the Millwall Dock Company, who are very well satisfied with it, inasmuch as a saving is effected by its use amounting to about $10,000 a year. The working of this system of pneumatic dredging was exhibited to a party of engineers and others interested in the subject, and met with unanimous approval.

The vessel employed is a screw steamer of about 300 tuns burthen, 113 feet long, of 27 feet beam, 12 feet deep under deck, and drawing 8 feet of water when laden. She is driven by a neat compound engine of 25 nominal horse power, having 15 and 30 inch cylinders and 15 inches stroke, and 2 high pressure boilers loaded to 65 lbs. These, as well as the entire plant, reflect great credit on the makers, Messrs. Rait and Lindsay, of Glasgow. The dredger steamed round from the Clyde to the Thames, and behaved admirably. The screw is disconnecting, so that the whole power of the engines can be applied to the air pump, which forms an important part of the apparatus. This is double acting, and able to work up to a pressure of 60 lbs., though 10 lbs. is the usual working pressure. A water chamber round the cylinder, fed by a circulating pump, keeps the air cool. The dredge proper is of the usual elevator kind, fitted in a well in the center of the vessel, on the line of the keel, and adapted to traverse towards the bow, so as to excavate in advance of the vessel if needed. A couple of steam winches aid in raising and lowering the bucket ladder and varying the position of the dredger while at work.

But the distinguishing feature of this dredger is the mode of disposing of the spoil when brought up. Instead of being tipped into open barges or hoppers, it falls through a hopper on deck, into a couple of tanks, one on each side of the well, each 50 feet long by 9 feet 6 inches wide, and having a total capacity of 240 cubic yards. Iron pipes, 15 inches in diameter, one from the bottom of each tank, rise towards the deck, and unite with a breeches junction into one huge discharge pipe of 20 inches diameter, which is led to the side of the ship, and there ends in a large leather hose, with which connection may be made with a similar pipe onshore. This, at Millwall, is carried on underground—crossing roads, railways and wharfs—for 130 yards, finally coming out into a field, where the spoil is discharged. When the tanks are full, the holes on deck are closed with air tight doors, and the vessel made fast to the discharge pipe as described. Then air is pumped into the tanks from below—and, contrary to our anticipation, at no time during the discharge did the index mark more than 9 lbs. pressure—and the spoil rushes through until the tanks are empty. The tanks can be filled in from two to three hours; it rarely takes more than half an hour to empty them, and they were emptied in twenty-two minutes. Allowing 20 yards for matter which adheres to the sides of the tanks, this is at the rate of 10 cubic yards per minute. It might be supposed that stones, bricks, etc., would hardly pass through these pipes, but we saw some as large as a man's head rushing out of the outfall, and we were informed that much heavier--notably a 20-inch furnace bar, weighing 25 pounds—had been successfully carried through. As to expense, we were told that, even on the intermittent system of work necessary in docks, ten cargoes weekly could be dredged, equal to 2,200 cubic yards. The weekly bill for labor amounts to $66.75; for coal, $ 15; and allowing $100, or 10 per cent, for maintenance, the cost of this would be $184.25, or 8·04 cents per cubic yard. This, we need hardly say, contrasts very favorably with the usual price of 10d. (20 cents) or 1s. (24 cents) per cubic yard; and of itself it proves that Mr. Duckham's invention deserves the attention of all who are interested in what is at best an unprofitable labor.—*Iron.*

Correspondence.

How Strikes are Originated.

To the Editor of the Scientific American:

What is your opinion of a person who advertises for a first class tool maker, and, when his advertisement is answered by a number of skilled workmen, selects the best one, as far as he can judge, and then offers him two dollars and fifty cents a day for his services? This, as the reporters say, "is no fancy sketch," but a stern reality, and happened very recently in this city. Indeed, I learn that a certain powerful corporation, a short distance from this city, will only give this miserable pittance to the men employed in their tool room. Now a tool maker, in the correct sense, is a person who is capable of doing the very finest work, as well as the heavier kinds, in metal. Theoretically, there exists no limit, either way, to the size of tools that may be demanded for various kinds of work. They may be as large as a house or as small as a fine needle; and the skilled tool maker is able to produce either of them, each one perfect in its way, from immense templates used in drilling heavy engine parts down to the marvelous combinations of jewels and hardened steel used in watch factories. He must be able to do a job at the forge that would put many a blacksmith to the blush; he must be very familiar with the working of steel, besides being a competent worker of sheet metals, and have a thorough understanding of solders; he must be able to do a good job in pattern-making and other woodworking; he must have a correct knowledge of drawing and a decent smattering of foundery work: in fine there is nothing, I might almost say, that can be constructed from any known materials on the face of the globe but the first class tool maker is supposed to be, and in fact must be, able to construct. And all this for two dollars and fifty cents *per diem!*

"But," says the fortunate one to whom this offer is made, "I can do any kind of tool-making: I can make gages for you so perfect that the slightest variation in temperature between the parts will make a perceptible difference in their fitting. You surely cannot expect me to work for such wages as you offer!" "Well, sir, you can take my offer or not, as you see fit," answers the advertiser; "I can get plenty of tool makers at that price." This brings me to the main point, one which I have long and earnestly pondered upon. The employers say that the tendency of strikes is to compel the good workman to carry the poor workman on his shoulders; and yet, if they can hire the veriest fool that ever undertook to finish a V thread with a three cornered file (and I have seen this attempted) who chooses to call himself a tool maker, for two dollars and fifty cents a day, they will not give more to the competent workman.

I do not believe in strikes; I never was connected with any but once, and then I saved my employers and fellow workmen each a serious loss by my action in the matter; but as long as there is such a state of affairs as now exists, just so long will the strike disease be either epidemic or sporadic.

The only remedy is, in my opinion, to have the trades legally recognized so far as to have a complete and perfect registry kept of all men who pretend to be skilled workmen, with a rating placed opposite each man's name; and let each have a certificate in his possession, showing his rate in the register. A mixed board, composed of employers and employees, could from time to time fix the ratings and a schedule of wages therefor. The workman's certificate would be his recommendation, and he would get paid according to his ability and skill.

I should like to see a full and free discussion of this subject in the columns of the mechanic's friend, the SCIENTIFIC AMERICAN. D.

Harlem, N. Y.

A New Test for Boracic Acid.

To the Editor of the Scientific American:

While working with nickel and cobalt in connection with glycerin, a very unexpected result was obtained. A borax bead containing both nickel and cobalt was immersed while hot into glycerin; the bead, then heated gently before the blowpipe, gave at first a faint green coloration, then carbonized, giving off acrolein in abundance. The experiment was repeated, using only a cobalt bead, then a nickel bead; in both cases the result was a beautiful green flame. Thinking it very singular that such difficultly reducible metals as nickel and cobalt should give a coloration, the experiment was repeated, using only a borax bead and without the aid of the blowpipe

By gently heating the bead (after it was immersed in glycerin) in a Bunsen burner and then withdrawing, the glycerin caught fire and burned, first with a faint blue, then with a strong soda flame; finally the entire flame assumed a deep green color. Various other borates were then tried, with perfectly satisfactory results. A number of minerals containing boracic acid were next tested, and the result was satisfactory. In such minerals as tourmaline, where the test could hardly be expected to hold good, the green flame of the boracic acid was distinctly visible.

The following is the best mode of procedure: Finely powder the substance in an agate mortar: fill an elongated platinum loop with glycerin, introduce this into the fine powder, and gently heat in a Bunsen burner until the glycerin catches fire. If only a minute trace of boracic acid is present, it will be best seen by holding a piece of white paper as a background, and carefully watching just as the flame goes out.

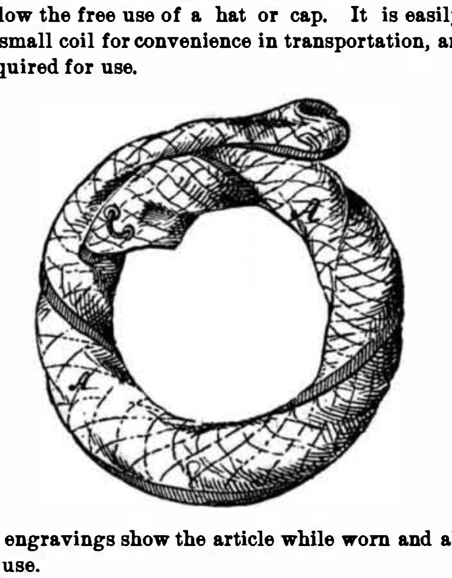
M. W. ILES.

School of Mines, Columbia College, New York city.

IMPROVED HEAD MUFF.

Mr. Heimann Fürst, of Williamsburgh, N. Y., has recently patented an improved neck, ear, and throat protector,

which, when applied to the head of a man or boy, will protect and cover the back of the neck, the ears, and the throat, and allow the free use of a hat or cap. It is easily folded into a small coil for convenience in transportation, and when not required for use.



The engravings show the article while worn and also when not in use.

The Moon.

Professor Soule recently lectured on this subject before the San Francisco School of Mechanic Arts. He said that, in using the immense telescopes of modern times, one is surprised at the exceedingly small area that can be examined at one time, and by the great diminution of light which appears to take place. A careful survey of the surface fills one with astonishment that the placid, silvery moon should be changed in a ragged, gray, wrinkled, and pockmarked heavenly body.

On turning to the brighter portions, we find everywhere mountains, volcanoes, crevasses, and precipices of vast hight or depth. It seems to be a picture of desolation, enthroned upon a pedestal of ashes. Those mountainous parts reflect a brilliant light on account of their volcanic nature, the rocks being often smooth and polished, and their jagged surfaces giving them power to catch and throw light in every direction. The southwestern portion is especially volcanic in its appearance. On close examination, however, we find long ranges of mountains exhibiting no signs of volcanic action, but in many respects similar to the Sierras, much steeper on one side than the other, and apparently formed by similar forces, though as a rule the volcanic element prevails. Many of these mountains are of immense size; thus Clavius is 120 miles in diameter, and has an area of 12,000 square miles, and turrets on its walls shooting to an altitude of 16,000 feet. We next notice the frequent occurrence of ringed mountains, not more than 10 to 15 miles in diameter, and almost perfectly circular in form. They are found alone upon the level country, or in groups, and even upon the ridges of the walled plain. There are also craters and pits, which differ chiefly from the others in their smaller dimensions. There is also another prominent feature which has puzzled astronomers, even in the present day. From many of the ringed mountains, notably from Tycho, Copernicus, and Kepler, are radiations, extending in some cases hundreds of miles, which at the full of the moon glisten with a remarkable brightness. They shine as brilliantly under the oblique as under the vertical rays of the sun—a fact yet unexplained; they pass over the tops and through the craters of volcanoes, and through the valleys in an uninterrupted course. Of the many theories concerning them, perhaps the most reasonable is that they are veins of matter ejected from below during some great volcanic or earthquake disturbances, and in many respects they resemble our own trap dykes and seines.

Since the time of Galileo, astronomers have painfully, patiently, and perseveringly mapped every detail of the moon's surface, until we have lunar topographical charts more accurately constructed than any hitherto constructed of the earth's surface. Photography has recently aided largely in this work.

By careful experiments, it has been proven that the light of the full moon is only $\frac{1}{600000}$ part of that of the sun, and that she gives only one sixth as much light as would a pure white disk; therefore she is nearer black than white. An equal sized globe of fire brick or clay thrown into the orbit of the moon would furnish us with light as bright as our own luminary.

As early as 1700, efforts were made to ascertain if any heat came from the moon, her rays being concentrated by means of a lens upon the bulb of a thermometer, with no effect, however; and other and later trials with improved apparatus gave the same result, or in some cases indicated that the moon was shedding negative heat, or cold. It was only after the invention of the thermopile that evidences of lunar heat were discovered. The amount was excessively small, however. Lord Rosse, with the aid of his three-foot reflecting telescope and Thompson's galvanometer, show that little, if any, of this heat comes from the interior of the moon, or, in other words, that the body of the luminary would be cold but from the heat absorbed from the sun. This borrowed heat has been shown to raise the exterior temperature of our satellite to at least 50° Fah. As the sun's heat and light cease to fall upon her surface and are lost for 15 days at a time; and the remaining heat being radiated into space, the alterations of temperature must be something startling, and the changes in the physical features of the body produced by the enormous expansions and contractions of her outer substance must be great and very destructive.

Intelligence and Labor.

The old delusion that education is unfavorable to labor has almost passed away. We no longer argue that the more a man thinks, the less he is inclined to work, nor fear that the material interests of our country will suffer through intellectual cultivation. We acknowledge that a well educated man may work as well as his neighbor who can hardly sign his name; and we even go a step further, and admit that a certain amount of education is necessary to secure the best kind of labor. Yet we are still far from appreciating the full effect of mental progress upon industrial employments, or estimating the vast debt which the latter owe to the former.

Intellectual culture, so far from unfitting men and women for exertion, actually excites them to it. Ignorance is the chief cause of indolence, and they are rarely separated. Savage tribes know but little of the benefits that industry can secure, and, having scarcely a motive beyond that of appeasing hunger, are proportionately idle. Educate them—show them the superiority of a house to a wigwam, and of a comfortable dress to a blanket—and the industry which can secure these benefits immediately begins to expand. Each fresh accession of civilized life demands a fresh accession of labor; and in proportion as the results of industry become more and more apparent, industry itself will more and more develop.

Education benefits industry, not alone by exciting and increasing it. It has an equally direct and powerful influence upon it in raising and improving its quality. How is the soil made most productive? Not by an unthinking routine of drudgery upon it, but rather by a knowledge of its nature and requirements; a study of the laws which govern vegetation; a thoughtful consideration of the relations which subsist between human needs and the powers of agriculture to supply them. The success of manufactures is due almost wholly to the busy thoughts that are ever planning improvements; making new inventions; constructing machinery; combining and regulating labor, and adapting all the various means within reach to the highest and most productive ends. Commerce, too, owes its very existence to the same source. The more forethought, judgment, discretion, and knowledge the merchant possesses, the more certain we may be of his ultimate success.

The same is true of those occupations which we are accustomed to consider wholly manual. The mechanic or laborer who thinks out the meaning of his work, who enters into its spirit, who devises improved plans for its execution, and