Twenty-four hours' absence, without notice, will be sufficient cause for assigning others to positions thus made vacant.

The advantages of this system of time keeping are manifold. Before, the time was kept by the foreman, and there was no way of checking in case of dispute; now each man keeps his own time, subject to the approval of the foreman. Formerly the office had to keep an open account with each man; now the balances are made up each day. Heretofore there was no satisfactory method of getting at the actual cost of each piece of work; now it can be obtained without trouble. There was some objection by the men to the system at first, but after the adjustment of a few details, such as allowing them to take the company's time for filling out the blanks, all readily acquiesced in the new order of things, and matters are now running smoothly all around.

## DECISIONS RELATING TO PATENTS.

### United States Circuit Court.—Eastern District of Pennsylvania.

SEWING MACHINE COMPANY *vs.* FRAME.—PATENT CUTTING AND TRIMMING ATTACHMENT FOR SEWING MACHINES.

Butler, J.:

A change made in an old device which, though simple, is effective, and produces a new and useful result, held to involve the exercise of invention.

The correction of a patent by means of a reissue where invalid or inoperative for want of a full and clear description of the invention is proper.

Where there is a doubt as to whether the description in a patent will be misunderstood, the judgment of the Patent Office as to the necessity of a reissue is entitled to great weight.

A structural difference in form and size does not avoid infringement if the same work is done by substantially the same means.

The manner of using it does not characterize a machine. This is effected by its structure and capabilities.

## Carbonated Beverages.

The Board of Health of Brooklyn, N. Y., having found that water from some of the many badly contaminated wells of that city was being used in the making of carbonated water for the supply of soda fountains, siphons, etc., an inquiry has been set on foot relative to the possible danger to health from this source in New York city. As the firm of John Matthews supplies over three thousand such fountains in New York regularly, they anticipated such inquiry by inviting Dr. Edson, of the New York Health Board, to make a thorough inspection of their large establishment, not only to examine the water used, but also the processes and materials employed in making sirups, and the construction of their fountains and sirup holders, to prove that there was no possibility of metallic poisoning in the use of their apparatus. All the water they use is the city Croton, but this is thoroughly filtered in a large double apparatus by passing it through sand, charcoal, and gravel. The firm expended some $8,000 in putting down a well some 800 feet, but the water obtained therefrom was so impregnated with iron and sulphur as to be unavailable, and the well was filled up without ever being used. The sirup holders in their soda fountains are of glass, and the fountains themselves are of steel, but have a complete water and gas tight lining of pure block tin, put in by a process originated by the house. The firm use none of the old style copper fountains, which, in connection with the soda water as well as the faucets for the sirups, have undoubtedly caused a great deal of mineral poisoning. They annually receive and cut up many tons of such material for use as old copper, substituting therefor their own improved apparatus. The brass and copper fixtures they are thus receiving daily and consigning to the waste heap almost invariably have large deposits of verdigris, especially about the discharge openings of the multiple cocks for sirup holders. Could some of the old soda water drinkers see the condition of the inside of these fountains and their fixtures, the fine finish and the silver plating on their outsides would not much diminish their alarm. A representative of the SCIENTIFIC AMERICAN, who saw the proof of what is here stated, also drew half a glass of what looked like pure soda water from a copper fountain received only a few hours previous, when the application of a simple reagent for copper instantly turned it to a dark red. The last glass drawn before this had presumably been drunk by some customer. The amount of metallic poisoning it is possible in this way to inflict upon the public is not a pleasant subject to contemplate.

Pure carbonated waters are certainly cheap enough, and there should be no excuse for dealers who neglect to furnish themselves with apparatus by which such beverages can be furnished with a certainty that they will be non-poisonous.

## Petroleum Springs in India.

The Government of India have received reports of the preliminary examination of the oil bearing strata which exist in the neighborhood of Sibi. The professional reports are of a character so decidedly encouraging that the Government have determined to procure from England the necessary machinery for boring operations. These will begin next winter, and will be conducted on an extensive scale. If the results justify the sanguine hopes entertained, the discovery will be one of no trifling importance.

## WIREWORMS AND SKIPJACKS.

In turning up the soil round garden plants we sometimes find a stiffish, elongate, shiny, yellowish-brown, worm-like thing, about the thickness of a stout pin, and about three-quarters of an inch in length. Under the impression that any living creature found in garden soil is an intruder that should be summarily disposed of, we may proceed to endeavor to put these ideas into practice, only, however, to find that this is not quite so easy a matter as it seemed; the thing is so stiff and tough, that even a good hard squeeze seems to make but little impression on it. This tough, worm-like thing is a wireworm (Fig. 1), and so dire a foe is

Fig. 1.—WIREWORM, MAGNIFIED.

it to vegetation that we are perfectly justified in making all efforts to dispatch it. On examining it more closely, we find that it is not truly cylindrical, like a piece of wire, but somewhat flattened beneath, and that it is made up of a series of thirteen segments, placed in line, one behind the other. The first of these is the head, and the next three carry six short legs, one on each side of each segment, with which the creature crawls along, trailing the remainder of its body after it. The head is black, and is furnished with a pair of stout, transversely moving jaws, and a pair of short antennæ.

Wireworms are the larvæ of various kinds of beetles, called "skipjacks" or "click-beetles," from a peculiar habit of springing up into the air, and, at the same time, producing a sharp clicking sound. Skipjacks are narrow, elongate insects, with short legs and hard integuments (Fig. 2). The

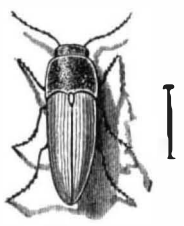

Fig. 2.—CLICK BEETLE (*Agriotes obscurus*).

head is small and often much sunk into the thorax, and carries a pair of long, distinctly jointed antennæ; the thorax is of large size, and, roughly speaking, more or less quadrangular in outline, and convex above and beneath. The elytra or wing cases cover the body, and conceal a pair of ample membranous wings. Each is somewhat triangular in shape, and they form when closed a strongly arched, shield-shaped surface; they are usually marked longitudinally with parallel grooves or furrows, and covered more or less densely with short hairs. The under surface also is strongly convex, and the legs are short, and capable, like the antennæ, of being folded close up to the body. When thus compactly folded up, the insect may easily be mistaken for a piece of stick or earth. When surprised or alarmed, it will thus feign death, relaxing its hold of what it may have been clinging to, and falling to the ground, as often as not, on its back.

Now usually, when a beetle gets into such a position, it frantically waves its legs about till one of them by chance strikes the ground; then, seizing any irregularities of surface with the sharp claws at the end of its feet, and assisting itself with the end of its shanks it levers itself over sideways. But, owing to the convexity of its back and the shortness of its legs, a skipjack is unable to use this method, unless there happen to be close to it some objects of sufficient height to be reached by its waving legs; failing this, however, it would be, were it not for a remarkable contrivance, as helpless as a turtle in a similar position, and would stand a good chance of being doomed to continue its unavailing struggles, at the mercy of any passing foe, till exhaustion ended its woes by death.

The contrivance is as follows: The hinder edge of the thorax is produced in the middle underneath into a long, curved, blunt spine, which is received into a little pit at the base of the body. The thorax is loosely articulated to the abdomen, and can be freely moved up and down, like the lid of a box on its hinge. When on its back, therefore, the skipjack arches its body by bending its thorax backward, and so balances itself on the two extremities of its body; this movement releases from its hollow the spine above referred to. Having stretched itself to the utmost in this attitude, the insect suddenly and forcibly resumes its former supine position—a movement which has the effect of causing it to rebound from the ground and shoot upward into the air to the height of several inches, at the same time bringing the spine back into its sheath with a sharp clicking sound. On returning to the ground, the insect generally manages to land itself right side up; if not successful the first time, however, it renews the attempt, and continues skipping till the desired result is obtained.

About sixty species of skipjacks belong to the British fauna, and three or four of them, brownish insects belonging to the genera *Athous* and *Agriotes*, are exceedingly common; the latter genus furnishes the most destructive wireworms. In their larval existence they are subterrancean in habits, living for several years a little below the surface, and spending their time in devouring the roots and underground stems of plants, and thus, of course, doing much more harm than can be measured by the amount of matter actually devoured. In the winter they retire to a greater depth, descending farther and farther as the frost increases, and pausing in their depredations only in the coldest weather. They devour all kinds of agricultural produce, destroying both root, grain, and fodder crops. Carrying on the ravages as they do in the complete obscurity of subterranean life, they are rarely detected when at work, and the first evidence that the fatal work has been done is seen in the apparently causeless withering of the plants.

It is fortunate that creatures so destructive have natural enemies Among the most important of these is the mole, which devours the larvæ with avidity. It is aided in its praiseworthy efforts by several kinds of birds, such as rooks and lapwings. A variety of artificial remedies have been proposed for checking the spread of the mischief, such as the application of liquid manure, which has the twofold effect of strengthening the plants that have not been irreparably injured, and driving away or killing the wireworms; paring off a thin coating of the soil, which will contain most of the insects, and then burning it; embedding in the soil at short distances apart slices of carrot and turnip to serve as traps, and then examining them and destroying the wireworms every other day. The latter method has been found serviceable in hop grounds, as many as 150 wireworms having been trapped close to a single hop hill. It should be remembered in this connection that the abundance of many agricultural pests is due in great measure to man himself. We greatly increase the supply of suitable food for these creatures, and in other ways make the surroundings more and more favorable to their existence, and we need not wonder, therefore, that the inevitable result follows, and that the additional task devolves upon us of devising means to counteract the excessive development we have ourselves unintentionally occasioned.—*Knowledge.*

## Banknote Paper.

The banknote paper on which American legal tender, national banknote currency, and government bonds are printed is made entirely at Dalton, Mass.

If you should happen to stop at the paper mill, with proper introduction and credentials, you may perhaps be allowed to handle a sheet of the crisp paper, where, as the wet, grayish pulp is pressed between heavy iron cylinders, bits of blue and red silk are scattered over its face and silken ribs laid on its surface. You may go beyond into the counting room, where each sheet as it comes from the drying room is carefully examined and counted and then returned to the paper cutter to be divided into smaller sheets. If you trace this paper still further, you will find that from the cutter's hands it passes again into the counting room, and is separated into little packages containing 1,000 sheets each, the amount recorded in a register, and then packed in bundles and stored in fire and burglar proof vaults to await shipment to the United States treasury.

From the pulp room to the vault the precious paper is watched and guarded as carefully as though each sheet was an ounce of gold. Its manufacture is one of the greatest secrets connected with the government's money making. From the vaults of the paper mill at Dalton to the guarded store rooms of the treasury at Washington is a journey of several hundred miles. In the capacious vaults of the treasury building, among gold, silver, copper, and nickel coins, bullion, paper currency, and official records, you will find thousands of packages of the banknote paper made at Dalton. It comes in little iron safes, such as are used by the Adams Express Company, and each package and every sheet is carefully counted before the manufacturer and express company are relieved of further responsibility. The paper that arrives to-day may lie in the treasury store room for years, or it may be sent to the Bureau of Engraving and Printing to-morrow, to return in the course of a month's time a legal tender or bank note.—*Geyer's Stationer*

## A Scientist's Cheerful Workshop.

A biography of Louis Pasteur, just completed by his son-in-law, gives the following description of the surroundings of the great French investigator at his daily work: All the animals in the laboratory, from the little white mice hiding under a bundle of cotton wool to the dogs barking furiously from their iron railed kennels, are doomed to death. These inhabitants of the place, which are marched out day after day to be subjected to operations or other experiments, share the space with still more ghastly objects. From all parts of France hampers arrive containing fowls which have died of cholera or some other disease. Here is an enormous basket bound with straw; it contains the body of a pig which has died of fever. A fragment of a lung, forwarded in a tin box, is from a cow which died of pneumonia. Other goods are still more precious. Since Pasteur two years ago went to Pauillac to await the arrival of a boat which brought yellow fever patients, he receives now and then from far-off countries a bottle of black vomit. Tubes of blood are lying about; and plates containing drops of blood may be seen everywhere on the work tables. In special stores bottle-like bladders are ranged. The prick of a pin into one of these bladders would bring death to any man. Inclosed in glass prisons millions and millions of microbes live and multiply.

### Trees for Shelter and Ornamentation.

Besides the value and importance of forest trees in many other ways, there is the shelter, beauty, and richness manifested in endless variety; and no landscape would please the taste of the man of culture and refinement without having in its composition trees of some kind. It is quite possible, and not at all uncommon, to have too many trees in the landscape, and where their distribution is in the form of lines, rows, and single trees, it is quite easy to see how the whole district may be made to assume the general appearance of a vast, irregular wood or plantation. General mixing, like general distribution of trees, is a subject which requires more attention than is generally given to it. What should be aimed at is definiteness and well defined features in all its aspects, without formality or stiffness. The trees should not be so distributed as to present an irregular, undefined, and incomprehensible mixture, either of species mixed together or in the distribution and arrangement of the trees upon the ground.

One thing that often leads to disfiguration of the landscape is the manner and form in which the planting is originally done. The great mistake here consists in not calculating to what height and proportion the trees would attain when mature and full grown. In planting shrubs or trees which bear cropping and keeping in subjection, there is little hazard or likelihood of going wrong, because in such cases the means of cure are kept in hand. If the shrub rises too high it can be headed back, and if too broad it can be reduced to the desired circumference. With medium sized trees, as the hawthorn, laburnum, mountain ash, and small leaved maple, a similar mode of treatment may be applied without prejudice.

Where the fields are small, and the whole domain of circumscribed and limited extent, the whole arrangement of distribution of the trees should be in proportion. Where the villa garden and pleasure ground are all comprised within a small area, it is often, under such circumstances, found necessary to plant medium instead of primary forest trees. By doing this the same effect is produced as by large trees in an extensive domain. Attention should also be paid to the distance the trees are planted from the garden walls, to the dwelling, or to any other object with which they might interfere when grown up.

The north and east sides of a house and premises should always be well planted, so as to afford the greatest amount of shelter, and the west and south sides left open to the sun. This in all planting, all authorities agree, should be adhered to, and the cases are extremely rare and exceptional where the rule should be departed from. The kinds or species of trees to plant have entirely to be regulated by circumstances; for the soil, situation, altitude, and climate so vary in different places that what would be suitable in one place would not at all do in another. As a general rule, in planting a new place or reorganizing an old one, it will be economy to employ a competent landscape gardener to lay out the grounds, establish the grade, and select and plant the trees and shrubbery. Much of the disappointment in country homes results from the mistakes made by the inexperienced owners in directing their improvements, and in this connection we think we may confer a favor to some of our readers needing the counsel or active services of an experienced landscape gardener by giving the address of Mr. O. C. Bullard, who resides at 123 Macon Street, Brooklyn, N. Y.

Mr. Bullard had charge of the tree planting in Prospect Park during the entire period of its construction, and his knowledge of the varieties of forest and ornamental trees is probably not surpassed by any one in this vicinity. The laying out of the grounds of Rev. Henry Ward Beecher's homestead, at Peekskill-on-the-Hudson, and the planting on his place of probably the greatest variety of ornamental trees to be found in any private grounds in the country, was the work of Mr. Bullard.

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OVER $750,000 was paid last year as duty on patent medicines in England.

### SHANKS' COMPOUND ENGINE FOR SMALL VESSELS.

In the compound engine represented herewith in perspective, the use of connecting rods and guides is done away with, and a return has been made to the old arrangement of a circular eccentric sliding in a frame connected with the piston rods. This engine has been specially devised for small craft, and is provided with a surface condenser and a reversing mechanism. It may be seen from a simple inspection of the figure that such a type of motor is well adapted for use upon small vessels, since it is capable of developing a great power while occupying but little space. All its parts, in fact, are grouped in a very ingenious manner, and in such a way as not to interfere with ease of access to them. The cylinders, which are quite close to one another, are connected by strong iron castings, which also carry the bearings of the driving shaft. After the steam has once operated at a high pressure, it enters the large cylinder without passing through an intermediate reservoir.

Fig. 2. Fig. 3.

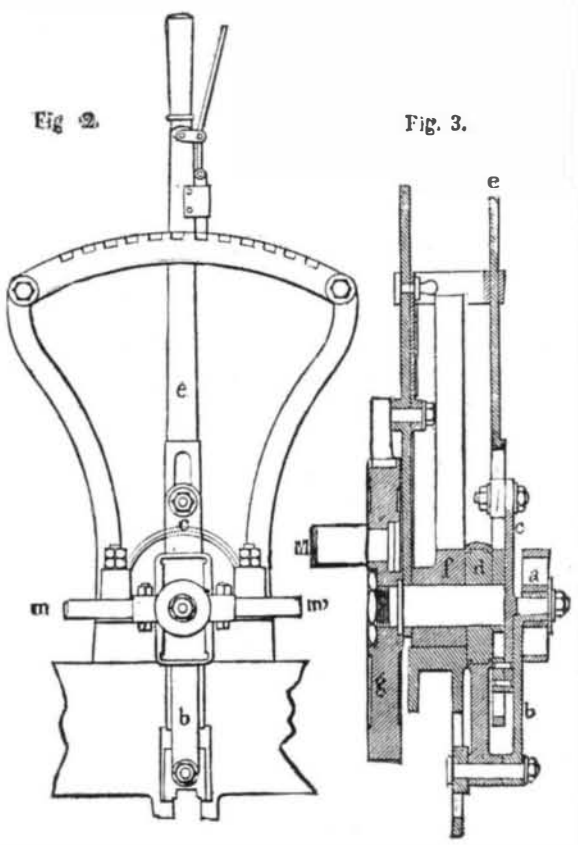


Fig. 2.—REVERSING GEAR.

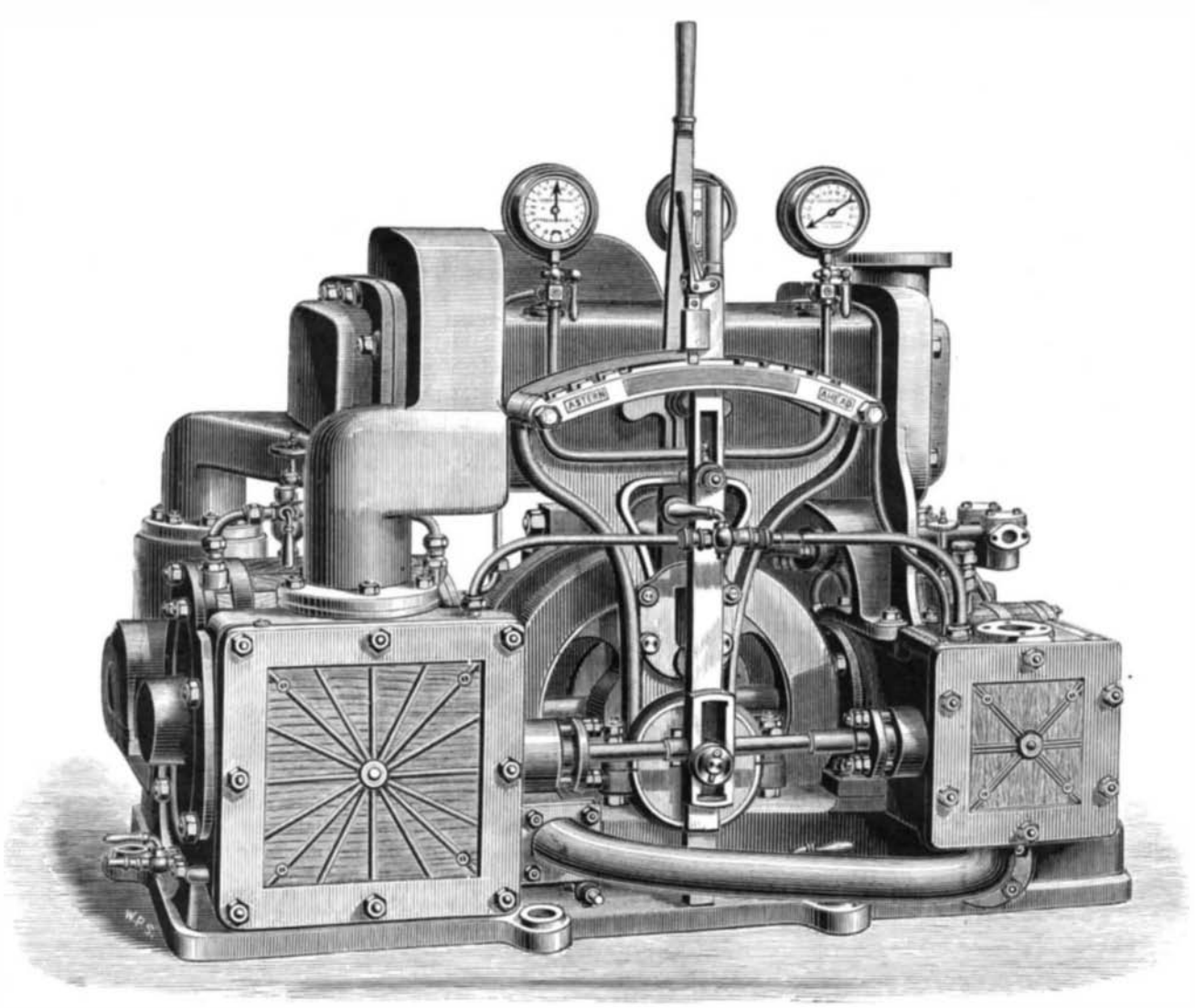

Fig. 1.—SHANKS' COMPOUND ENGINE.

The reversing gear is particularly interesting, and for this reason we devote to it two detailed figures, one of which, in section, shows how the different parts are mounted. The two rods, *m m'*, of the distributing valve are situated in a line with one another and are connected with a small vertical frame. Upon this guide there moves a slide, *a*, whose oblique changes in direction bring about a motion of the slide-valves. To effect this, the slide is connected with a flat bar, *c*, which is capable of moving to and fro upon the reversing lever, *e*. In this latter there are slots which serve to guide the motions of the piece, *c*, by means of nuts placed on each side of the axis of rotation. The latter is simply screwed into a plate, *g*, carrying a crank pin, M. Finally, a second flat bar, *b*, embracing at one of its extremities the slide, *a*, is jointed at the other with the rod of an eccentric, *d*. The axis of this assemblage is prolonged behind in such a way as to enter a fixed guide contained in the frame, *f*. The figure represents the reversing lever held at the stop notch in the toothed sector.

It is now easy to understand that the eccentric, *d*, causes the bar, *b*, to move to and fro along the lever, *e*, and according to a certain angle with the direction, *m m'*. Consequently the slide valves move at each stroke a distance equal to the horizontal projection comprised between the extreme points occupied by the slide, *a*, in its movement.

Messrs. Shanks & Son are likewise building after the same plan a series of reversible engines of all dimensions, of from six up to a thirty nominal horse power. The high pressure cylinders of the largest and smallest models have a diameter of 26 and 15 centimeters respectively, while the dimensions of the bore of the expansion cylinder vary between 56 and 33 centimeters.—*Revue Industrielle.*

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### Repairing the Mail Sacks.

According to Mr. H. G. Pearson, Postmaster of this city, the Government spends about $50,000 a year for the repair of mail pouches; there are about 100,000 mail bags in use, and about 10,000 new ones are bought yearly. The weakest point in the mail sack is where it closes and opens. In closing the bag the staples are pushed through the slots, and project an inch or more. When the bag is thrown about, the staples soon bend and often break. It looks strange that this little item should cost the Government so much money, and it seems as if our inventors ought to invent a new mail bag and obviate the objection referred to in the old one.

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### A Suggestion to Chemists.

The low price crude coal oil sells for at present—about 63 cents a barrel, something like 20 cents a barrel, it is said, below the cost of producing it—suggests to the *Independent Record*, a newspaper devoted to oil, paint, drugs, chemicals, etc., that coal oil may be manufactured into a great variety of useful articles which our chemists have not discovered its use for yet.

This favored article, in the crude state, is worth say 60 or 70 cents per barrel. Refined, it brings five or six times that amount. Under proper and skillful treatment it yields products of greatly increased value. The *Record* counsels the discouraged men of oil to devote more time and money to the various by-products of petroleum, and less to the producing of crude and the making of refined. Bring to your assistance the chemist and the laboratory, and create from cheap oil that which it contains.

A pound of raw iron is worth a penny or two. A pound of watch springs is another thing, and the mill of the maker of raw or cheap iron may be closed and his men hungry, while the dealer in fine steel and specialties in iron is unconcerned, and his wares in constant demand. Cheap oil offers a better return to the maker of any of the scores of petroleum's products than does crude oil at one dollar a barrel. There are specialties in the way of lubricants, petroleum jellies, paraffine wax, dyes, etc., which must enjoy a constant demand irrespective of the condition of the market for crude or refined. In the making of these will be found an employment for capital which must lift the manufacturer far above the realm occupied by the mere producer or refiner.