AMATEUR MECHANICS.

METAL TURNING.

In selecting a lathe an amateur may exercise more or less taste, and he may be governed somewhat by the length of his purse; the same is true in the matter of chucks; but when he comes to the selection or making of turning tools he must conform to fundamental principles; he must profit as far as possible by the experience of others, and will, after all, find enough to be learned by practice.

Tools of almost every description may be purchased at reasonable prices, but the practice of making one's own tools cannot be too strongly recommended. It affords a way out of many an emergency, and where time is not too valuable, a saving will be realized. A few bars of fine tool steel, a hammer, and a small anvil, are all that are required, aside from fire and water. The steel should be heated to a low red, and shaped with as little hammering as possible; it may then be allowed to cool slowly, when it may be filed or ground to give it the required form. It may now be hardened by heating it to a cherry red and plunging it straight down into clean cool (not too cold) water. It should then be polished on two of its sides, when the temper may be drawn in the flame of an alcohol lamp or Bunsen gas burner; or, if these are not convenient a heated bar of iron may be used instead, the tool being placed in contact with it until the required color appears. This for tools to be used in turning steel, iron, and brass may be a straw color. For turning wood it may be softer. The main point to be observed in tempering a tool is to have it as hard as possible without danger of its being broken while in use. By a little experiment the amateur will be able to suit the temper of his tools to the work in hand.

In the engraving accompanying the present article a number of hand turning tools are shown, also a few tools for the slide rest. These tools are familiar to machinists and may be well known to many amateurs; but we give them for the benefit of those who are unacquainted with them and for the sake of completeness in this series of articles.

Fig. 1 is the ordinary diamond tool, made from a square bar of steel ground diagonally so as to give it two similar cutting edges. This tool is perhaps more generally useful than any of the others. The manner of using it is shown in Fig. 23; it is placed on the tool rest and dexterously moved on the rest as a pivot, causing the point to travel in a circular path along the metal in the lathe. Of course only a small distance is traveled over before the tool is moved along on the rest. After a little experience it will be found that by exercising care a good job in plain turning may be done with the tool.

Fig. 2 shows a sharp V shaped tool which will be found useful for many purposes. Fig. 3 is a V shaped tool for finishing screw threads. Figs. 4 and 5 are round-nosed tools for concave surfaces; Fig. 6, a square tool for turning convex and plane surfaces. The tool shown in Fig. 7 should be made right and left; it is useful in turning brass, ivory, hard wood, etc. Fig. 8 is a separating tool; Fig. 9 is an inside tool, which should be made both right and left, and its point may be either round, V shaped or square. Fig. 24 shows the manner of holding an inside tool. Fig. 10 is a tool for making curved undercuts. Fig. 11 is a representative of a large class of tools for duplicating a given form.

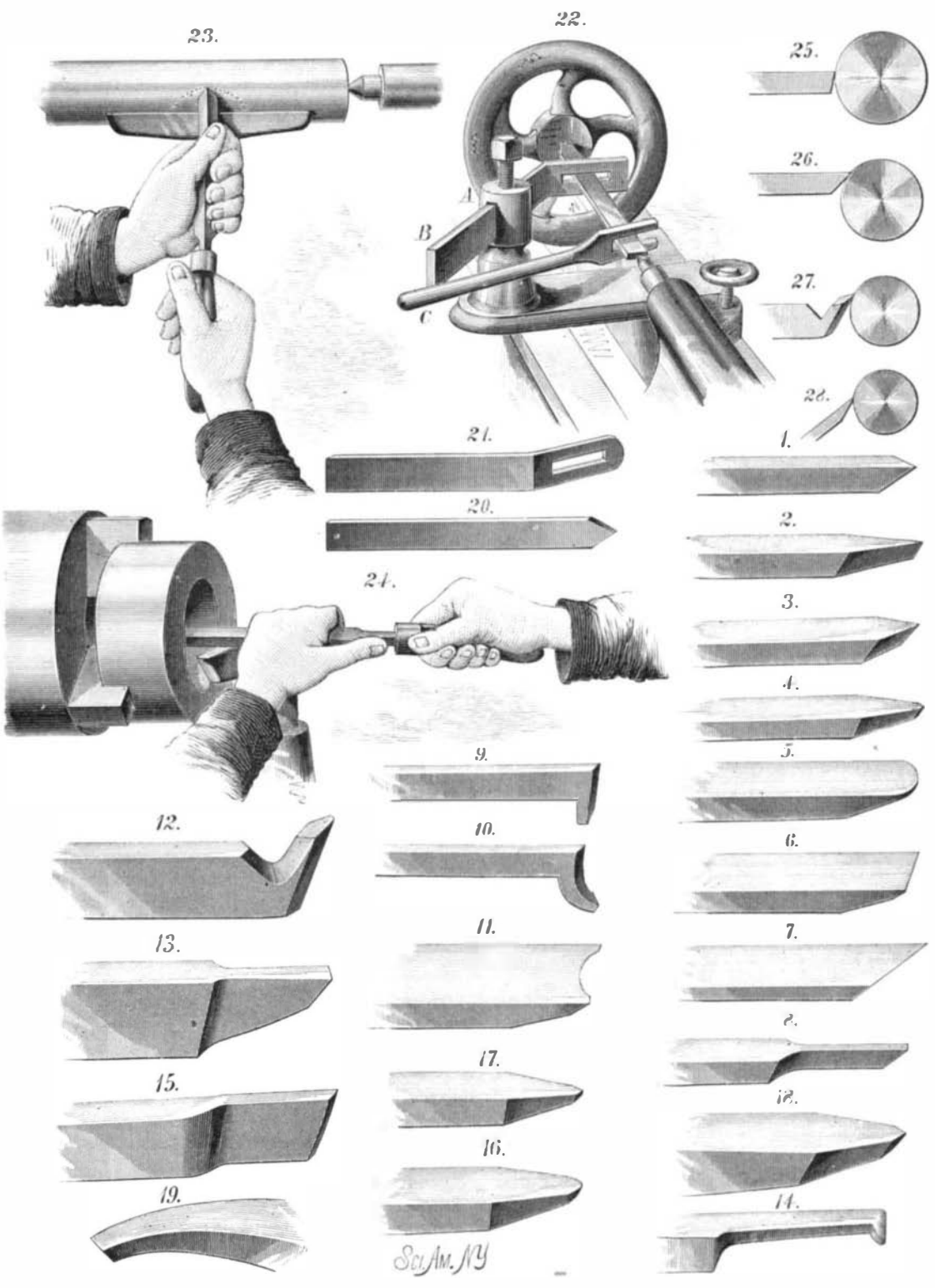
These figures represent a series of tools which may be varied infinitely to adapt them to different purposes. The user, if he is wide awake, is not long in discovering what angle to give the cutting edge, what shape to give the point, and what position to give the tool in relation to the work to be done.

Having had experience with hand tools it requires only a little practice and observation to apply the same principles to slide rest tools.

A few examples of this class of tools are given. Fig. 12 is the ordinary diamond pointed tool, which should be made right and left. The cutting edge may have a more or less acute angle, according to the work to be done, and the inclined or front end of the tool may be slightly squared or rounded, according to the work. Fig. 13 is a separating tool, which is a little wider at the cutting edge than anywhere else, so that it will clear itself as it is forced into the work.

For brass this tool should be beveled downward slightly. By giving the point the form shown in Fig. 3 it will be adapted to screw cutting.

Fig. 14 shows an inside tool for the slide rest, its point may be modified according to the work to be done. Fig. 15 is a side tool for squaring the ends of shafts; Figs. 16, 17, 18, and 19 represent tools for brass; Fig. 16 is a round nosed tool for brass, Fig. 17 a V-shaped tool, Fig. 18 a screw thread tool, and Fig. 19 a side tool. In boring, whether the object is cored or not, it is desirable, where the hole is not too large, to take out the first cut with a drill. The drill for the purpose is shown in Fig. 20, the drill holder in Fig. 21, and the manner of using in Fig. 22. The drill holder, B, is held by a mortised post placed in the rest support. The slot of the drill holder is placed exactly opposite the tail center and made secure. The drill, which is flat, is drilled to receive the tail center, and it is kept from turning by the holder, and is kept from lateral movement and chattering by a wrench, C, which is turned so as to bind the drill in the slot of the holder.



TURNING TOOLS.

The relative position of the tool and work is shown in Figs. 25, 26, 27, and 28; Fig. 25 shows the position for brass; Fig. 26 for iron and steel; Fig. 27 the relative position of the engine rest tool and its work; and Fig. 28 the position of the tool for soft metal and wood.

In all of these cases the point of the tool is above the center of the work. In the matter of the adjustment of the tool, as well as in all other operations referred to, experiment is recommended as the best means of gaining valuable knowledge in the matter of turning metals. M.

The Cost of Electric Lighting in Paris.

The report of M. Cernesson to the Municipal Council of Paris, relative to the experiments that have there been made in electric lighting, gives the first authoritative statement of the cost of lighting by the Jablochkoff system. Inasmuch as the figures given by M. Cernesson are accepted as correct, not only by the corps of city engineers and the engineers of the Paris gas company, but also by the engineers of the Paris Electric Light Company, they can be safely received as not far out of the way. Three sources of expense are involved in electric lighting: the power, the dynamo-machine, and the lamp.

The engines employed in the Paris experiments were each of 20 horse power, driving Gramme generators. Each engine was found capable of running 16 Jablochkoff candles; or, in other words, each candle required for its successful operation a force equivalent to 1·25 horse power. Four engines and Gramme generators were necessary to the illumination of the Avenue de l'Opéra. The unit of illuminating power adopted was the light produced by a Carcel lamp consuming 42 grammes of pure oil per hour. It was first ascertained that 10 gas burners, each using 140 liters of gas per hour, are equivalent to 11 Carcel lamps, while a single Jablochkoff candle is equal to 30 Carcels. But, as it was found necessary to the diffusion of the latter to shade it with an opaline globe, its illuminating power was, practically, considerably below this standard, being equal to only 18 or 20 Carcels when the horizontal rays were tested, and to only 10 or 12 when the oblique were under examination—a very meager result, indeed, when compared with the actual light generated. The ultimate comparative result arrived at was that one Jablochkoff candle is practically equal to 11 gas jets of the ordinary caliber used for street illumination. But a comparison of the figures of cost showed that the amount of gas used might be so increased as to give an equivalent light without incurring a fully equivalent expense.

When a burner consuming 200 liters of gas per hour was used, it required only 7 to equal 1 electric candle. Electricians hope to diminish the waste consequent upon the use of opaline globes, and M. Clemandot's invention (that of using two globes, the one fitting loosely into the other, and filling the space between the surfaces with powdered glass) has favorably impressed the scientific men of Paris. The particles of the thin layer of powdered glass appear to exercise a wonderfully diffusive influence without materially reducing the illuminating power. The cost per hour of running the 62 candles used upon the Avenue de l'Opéra is thus stated by Levy, a competent engineer:

	Francs.
Motive force.....	3·20
Coal	6·64
Oil for lubrication.....	1·23
Cost of superintendence	3·20
Sixty-two candles.....	31·00
Total.....	45·27

A calculation upon this basis shows the cost per hour of running one Jablochkoff candle to be 73 centimes (about 14 1-3 cents). The electricians count upon a considerable reduction in the amount of motive force and the cost of candles—enough, at least, to bring the cost per hour down to 60 centimes (about 11·8 cents). But even upon this basis, the economical advantage rests manifestly with gas. In effect, then, while a Jablochkoff candle is equivalent to 11 gas burners of the Paris standard, these 11 gas burners cost only a little over 23 centimes per hour—something less than 5 cents. At the present figures, therefore, the relative expense of electric light to that of gas, illuminating powers being equal, is as 73 to 23, and were the cost reduced to the limit urged by electric engineers as possible under existing circumstances, the proportion would still stand as 60 to 23, a very wide margin to be overcome. M. Cernesson's report further compares the questions of relative convenience, liability to get out of order, etc. Each electric lamp (*foyer*) being supplied with four candles, each

burning 100 minutes, the whole provision has to be renewed every seven hours, while with gas no such renewal is necessary. He finds that from May 30 to October 10 there were 60 extinctions in all on the Avenue de l'Opéra, lasting from merely a minute or two to 15, 30, 35, and even 45 minutes.

Correspondence.

Chemistry at Columbia College, New York.

To the Editor of the Scientific American :

The SCIENTIFIC AMERICAN is in general conducted in a spirit of so commendable fairness that I have observed with some surprise an article in your number for January 11, referring to this institution in a tone which seemed to indicate rather a purpose to disparage than a desire to convey information. The writer says:

"At a time when the value of natural and physical science as a source of mental discipline is beginning to be acknowledged, and science itself to be respected and honored here as elsewhere, it is somewhat remarkable to see one of our oldest colleges abolish the study of chemistry in her regular course. Yet this is what Columbia College has really done. True, the name of chemistry still appears in her list of studies, but it is studied no longer. It is but an outward pretense, a sham, an empty name, a skeleton without flesh, a shell without contents."

Now, whatever might be the facts of the case, there can be no mistaking the animus which inspires language like this. But the fact is that the opportunities afforded to the undergraduate students of Columbia College for pursuing the study of chemistry were never, since the foundation of the institution, so ample as they are at present. We have thought it judicious, as many other colleges have done, to make the extent to which the subject of chemistry is studied dependent, in some degree, upon the option of the student; but the obligatory portion of our chemical course is larger than that of Harvard, where optional supplementary instruction is provided in several different forms; and equal to that of Yale or Williams, where no optional instruction on this subject is given. Our sophomore class attend weekly lectures in elementary general chemistry throughout the year. Deducting the time given to vacations and examinations, the academic year contains about thirty working weeks. At Harvard University the freshman class attend twenty exercises in chemistry, and this is all that the obligatory course embraces in that institution. At Yale College chemistry is studied during one term of the junior year, out of two that the year embraces; and at Williams, during one term out of three—the number of exercises per week not being stated in the catalogue.

During the senior year at Columbia a course of theoretic chemistry is open to the student, of three exercises per week throughout the year.

As to the further strictures of the article in question, they are hardly worth attention. A writer who regards spectroscopic analysis and the mechanical properties of bodies as essential parts of elementary chemistry would do well to understand what he is talking about before he returns to the subject.

I am, sir, respectfully, etc.,

F. A. P. BARNARD,
President of Columbia College.

Columbia College, February 19, 1879.

Fall of a Meteor in Michigan.

To the Editor of the Scientific American :

This morning at 2 (?) I saw a most magnificent spectacle. The world (E. N. E.) was on fire. There was a pyramid of red light, 60° at the base and 30° high. It lasted 6 or 8 seconds, too long to be an electric phenomenon. Was it a meteoric stone? Where did it fall? Possibly into Lake Michigan, 70 or 80 miles away. If it was an aerolite it must have been the most magnificent one ever (?) seen.

(REV.) WM. M. RICHARDS.

Princeton, Green Lake county, Wis., Jan. 28, 1879.

The phenomenon observed by our correspondent was, without doubt, the meteor which (according to the *Herald*, of Traverse City, Mich.) was seen passing over that region about the hour named. It is described as an immense fire ball, which lighted up the country as bright as noonday. A night watchman at Traverse City says that he saw it explode, and that it flew into minute pieces like star dust. The one thing that all agree upon is the explosion. This was heard with equal clearness and with like effect at Mayfield, 13 miles south of Traverse City, and at Williamsburg, 12 miles east. The effect was of an earthquake shock. The houses were shaken, windows shook, and dishes rattled upon the shelves. A swaying motion seemed to be given to the buildings, as of an upheaval and settling back. If the meteor had not been seen it would have been thought an earthquake shock. Mr. R. S. Bassett, who has a fishing shanty within a few rods of Fouch's dock, at the head of Carp Lake, seven miles northwest of Traverse City, was awake and saw the flash, and was almost immediately deafened by the report of the explosion. The next morning a large hole, 50 feet or more in diameter, was discovered in the ice about 600 feet from shore. The ice was solid in this spot the day before. For a long distance around the surface was cracked and broken, and the ice around the hole itself, being 12 or 15 inches in thickness, had the appearance of being driven down. The water at this spot is only 8 or 10 feet deep and the bottom of the lake is soft and muddy.

SOME NEW POINTS IN THE DIAGNOSIS AND PROGNOSIS OF TYPHOID FEVER.

At a recent clinic held at the Pennsylvania Hospital in Philadelphia, Professor I. M. Da Costa developed some very novel and interesting points in connection with the diagnosis and prognosis of typhoid fever. The case under consideration was that of a sailor, who had enjoyed good health until four days before his admission to the wards, when he was attacked with chilliness, fever, headache, and nausea. His bowels were loose and his nose bled profusely. Upon admission the man's face was singularly flushed and he complained of severe pain in his back. His temperature was 104½°, his pulse 92, and his respirations 24 to the minute.

Careful physical examination of the lungs failed to find cause for the heavy flush on the face. Examination of the urine revealed the presence in it of granular hyaline casts and of bladder epithelium.

The patient remained in the same condition with regular morning remissions and evening exacerbations in the fever process. There were a few bronchial râles in the lungs.

On the day after admission profuse epistaxis supervened, and pathognomonic rose colored spots appeared on the abdomen, which grew swollen and tympanitic. The tongue was characteristic, dry, cracked, reddish in spots, and varnished in appearance. The case was undoubtedly one of typhoid fever.

As the disease progressed the face still continued to be flushed, the first sound of the heart grew very feeble, and the throbbing of the carotid arteries at the root of the neck was very marked.

In calling attention to these three symptoms, together with the presence of albumen in the urine so early in the course of the disease, the lecturer was led to remark that the case was a very unusual one.

Speaking first of the albuminuria, which was noticed on the fifth day of the disease, he said that early albuminuria was never present in typhoid fever unless the case was a very grave one; that albumen did not as a general thing appear in the urine until the third week of the disease.

So too with regard to the alteration in the first sound of the heart, which is not usually altered until late in the course of the disease. "When the first sound of the heart is affected early in the course of the disease it becomes a warning."

The flushed face, Dr. Da Costa also considered of unusual significance. When this symptom occurred in typhoid fever, which was but rarely, it always made him suspicious, especially when it was associated with great throbbing of the vessels at the root of the neck. When he noticed this coincidence of symptoms he was in the habit of roughly diagnosticating the case at once as one of typhoid fever before making any further examination. That the present case was without doubt one of much gravity, and that on the strength of the above portentous symptoms he should order the amount of stimulus administered to the patient to be immediately increased.

SAML. M. MILLER.

Weekly Pay Days.

The Springfield *Republican* is vigorously urging upon the New England manufacturers the policy and propriety of substituting weekly for monthly payments of wages to employes. It has been consulting some of the large manufacturing establishments upon the subject, and from the information published we learn that in New England monthly payments are the rule rather than the exception. It is different with us. Of course it is necessary everywhere for great corporations like railroad and steamship lines, which traverse great spaces, and the employes of which are often weeks absent from the place where the payrolls are adjusted, to pay their hands at wider intervals than a week, but with this exception, and excepting also domestic service and farm labor, which are usually hired and compensated by the month, nearly all other wages service in this latitude, and especially that employed in shop and factory, is paid by the week. This is the general rule and practice, and to it there are but few exceptions besides those noted.

The *Republican* observes that those New England employers who have tried the weekly system are not disposed to go back from it, but those who have not tried it see great obstacles to its introduction. They contend that weekly payments require increased clerical force and greater working capital, and that they will encourage an increase in drunkenness among the hands. As the *Republican* truly says: "This conclusion is on the old paternal principle that the laborer cannot safely be trusted with his hire. It is alleged to be a great kindness in the corporation to detain his wages even for a month, although when the fatal pay day comes it is followed by a debauch. If the pay were given oftener, would not the laborer become schooled to a keener sense of responsibility for his own welfare and gradually learn more thrift? If it is wrong to trust him with a week's wages at a time, it must be four times worse to place in his hands a whole month's. There is only one system of labor which is entirely consistent with this theory of the superior intelligence and beneficence of employers, and that is slavery."

Positions of the sort here described, deliberately assumed by the great employers in Massachusetts, go far to teach outsiders that the alleged "undue influences" exerted by corporations upon their workmen to prevent Butler's election may not be without foundation. To refrain from paying weekly wages because it requires an increase of working capital raises another nice question, not simply of propriety, but of morality. General Walker, in his book on wages, shows that one of the greatest hardships of labor is the enormous amount of credit exacted from the working classes by capital. This compels them in their turn to seek credit for the necessaries of life and involves them in continual loss. A manufacturing corporation which pays its hands by the month practically borrows the wages of its hands during three weeks. By what right does it do so? A newspaper which seeks to controvert the Springfield *Republican's* position says that the credit consideration is an important one. If a pay roll comes to $20,000 a month, the corporation or manufacturer gets practically a loan of $5,000 for three weeks, $10,000 for two weeks, and $15,000 for a week, and thinks that this is worth considering in these hard times. To which the *Republican* replies in the following unanswerable way: "Exactly, but whom does this credit belong to? Does it not belong to the employes whose wages are withheld for this time? Is it not 'worth considering in these hard times' in behalf of the man to whom it does belong rather than in behalf of him to whom it does not? Especially when the man to whom it does belong suffers greatly in his position as a buyer in the market for the very lack of that cash which is affording but a very trivial advantage to the employer? As a matter of fact the less a business concern runs in debt to its help, the better is its credit with other people."—*Baltimore Sun.*

California Honey.

The report that California strained honey has been largely adulterated with glucose, and accordingly condemned in English markets, naturally causes some unpleasant feeling among the bee keepers of the Pacific coast. A producer, writing to the *Pacific Rural Press*, offers the following test for detecting adulteration:

"Take a quantity of honey and add one part water, dissolving the honey thoroughly by stirring. Then add alcohol of 80° until a turbidness is formed which does not disappear on shaking. If glucose sirup is present in the honey, soon a heavy deposit of a gummy, milky mass, will form, while with pure honey there will be only a very slight milky appearance observed."

The same writer says that California honey taken in May generally candies in a few days after it is extracted. Later in the season, when the air is less humid, the honey gathered is white, very thick and heavy, weighing 12 to 12¼ lbs. per gallon of 231 cubic inches, and does not candy so readily, as some samples have been kept three years without any symptom of change. A different class of pasturage comes on in August and continues through the fall months, the air becomes more humid as the rainy season approaches, and the honey gathered is thinner, has more color and candies very soon, differing from April and May honey in flavor. In the Atlantic States all honey made through the entire season, candies upon the approach of winter; and a large dealer in Cincinnati says all good honey becomes candied during the winter in that climate.

The San Francisco dealers rule that candied honey is reduced in value from one to three cents a pound; yet of samples of California honey sent to France, complaint was made that it was not candied, as no other could be readily sold there. The magnitude of the California honey trade may be judged from the circumstance that over 300 tons of extracted honey was produced last year in Ventura county alone. A large part of this crop was shipped direct to Liverpool for the English market. Of this shipment the writer above quoted says:

"Knowing our honey to be pure and good, and knowing the character of the shipping merchants who are transacting our business, we have an abiding faith that our product will be allowed to fairly compete in these markets with like product from other parts of the civilized world. We wait with patience the results. We have the climate, the pasturage is abundant, our bee keepers are energetic, industrious, and economical men; are determined to push our products into all the markets of the world; and we warn all men who are engaged in the production of honey elsewhere, that if they cannot produce large quantities of the article that is first-class, and do not put it up in an attractive form, more so than we do, they had better stand aside and admit 'that the survival of the fittest' is a fixed fact."

Masson's Process for Deodorizing Petroleum.

Into a vessel containing 225 lbs. of petroleum are separately introduced, by means of a long funnel, 2 ozs. each of sulphuric and nitric acid, and 1·1 lb. of stronger alcohol are carefully poured upon the surface of the petroleum. The alcohol gradually sinks to the bottom, and when coming into contact with the acids, heat is developed and some effervescence takes place, but not in proportion to the quantity of the liquids. Ethereal products of a very agreeable odor are formed, and the substances thus treated acquire an analogous odor, at the same time becoming yellowish in color. The operation lasts about an hour, after which the liquids are thoroughly agitated for some minutes with water, and, after resting for 8 or 10 hours, the purified petroleum is drawn off. The lower stratum, which is a mixture of the acids, water, and alcohol, may be used in deodorizing the heavy oils of petroleum by agitating them well for 20 minutes, and, after 12 hours' washing the oil with milk of lime, to remove the acids. Petroleum thus purified may be used in pharmacy for many purposes. All the tinctures for external use may be prepared with it, like the tincture of arnica, alkanet, and camphor, and may also be used for dissolving ether and chloroform, like alcohol; and, combined with fats or glycerine, it promises to be of great utility in the treatment of skin diseases, etc.