farmers to destroy the fundamental basis of the patent system is ungrateful, if it is not also suicidal.

"But," the agricultural classes may argue, "grant that the patent system has been of great use in helping us to gain our present commanding position, we do not need it any longer; we have paid roundly for the benefits received; and may now do away with it, as one removes the scaffolding from around a completed house. It has served its purpose, well or ill; from this time forward it must be more an inconvenience than a benefit. Let it go."

Could not the same have been said as truly last year, two years ago, or five years ago? And has not the cost of production been reduced, or the scope of production increased, by inventions made since then?

A correspondent engaged in developing the transportation of Western products to Eastern markets in refrigerator cars, thus points out some facts bearing upon this question:

"Within your recollection and mine, butter made in the West did not command as good a price in Boston and New York markets as when made in the immediate vicinity of New York, or as Vermont butter in Boston. In the year 1878–79 a Western maker of creamery butter took the prize in New York at the national dairy fair for creamery butter. The next season the same party said to me: 'It is of little use for me or my neighbor to make the superior quality of butter, or to gather our eggs in summer, for we find it impossible to place them in good order in Eastern markets and command the price their quality should give us.'

"Referring to the fact that last year and the year before one-fifth of the butter that left Chicago for Eastern markets was carried in our cars, although we had only the Boston outlet for them at that time, you can see that the obstacle which had hindered Western butter makers from securing a good price for their article was largely overcome. This is specially apparent from the fact that our heaviest shipments were in the hottest months, and that in the wholesale markets at Boston this same Western butter was commanding a better price than Vermont butter from one to two cents per pound. The agent for this particular creamery said to me in Boston last week: 'Our fine grades of Western butter are sold ahead, and prices are very firm for such goods,' thirty-nine cents being the wholesale price that day.

"In view of these facts, have the patents which we have introduced for refrigerator cars done anything for the Western farmers? The butter that took the prize at the last international dairy fair in New York had been made the previous June, and kept in one of our cold storage houses for six or eight months. Eight years ago, the state of the art would have made this thing impossible. There have been, from parties not thoroughly posted in the matter, some severe attacks upon dealers in large cities who have bought, during the season when the market was overstocked with butter, eggs and such articles, and placed them in cold storage houses at the distributing points to be sold during the winter when it was impossible to get fresh made stock. I saw some eggs candled from cold storage houses in Boston, where they had been for nearly nine months, and to the case of forty-nine dozen one-half dozen to the case were all that were thrown out, and a portion of these were cracked from handling. This would make the percentage of shrinkage very small indeed. The eggs were selling for twenty-seven cents per dozen. How much could the farmer have realized from these eggs, if he had been obliged to sell them when gathered, with no chances for storage?

"The *Western Rural* might say that the middleman made this profit between the spring and fall market; but that is only the superficial view. The farmer has the same opportunity to hire storage in any of the large cities that the commission merchant has, and the same opportunity to get full price for his eggs, in the winter, and he does secure an advantage when he makes his sale at a proportionally higher price for his eggs from the fact that they can be stored until they become somewhat scarce. The newspapers have had considerable to say about shipments of dressed beef from the West, and you were kind enough to say in a recent article that our cars have had something to do with that business. An owner in the largest herd of cattle in the West tells me that the loss from cripples now made in shipping in stock cars would pay the freight from the extreme West to market on the hides, tallow, and bones of the whole shipment, if the shipments were to be made dressed. In this way it looks to us as if we had brought the market for Western products very near to the door of the farmer and producer.

"These things would not have been done without some object for parties to introduce improved refrigeration."

The influence of improved transportation in bringing the market nearer and nearer the farmer's door is shown not alone in connection with minor products. In 1878 the difference between the average price of wheat throughout Iowa and in New York is given by a Western writer as a fraction over 65 cents a bushel. By 1880 this difference had been reduced to a fraction under 40 cents. On a crop of 33,000,000 bushels and more, the difference meant something over eight million dollars to the profit of Iowa farmers. The benefits received by other farmers in the far West were proportionally great, and this is only one of the advantages reaped by the farming interests in recent years by virtue of improvements brought about mainly through the agency of the patent system.

Is there any farmer so ignorant as to suppose that an end has been reached in improvements of this nature? or that the improvements will go on in the absence of all inducements in the way of protection and profit to inventors?

SERIOUS HURTS THAT FAIL TO KILL.

A short time ago a shoemaker of Astoria, N. Y., shot himself twice with a heavy pistol, once in the ear and once in the mouth. He was brought to the Roosevelt Hospital, in this city, where it was discovered that the first ball glanced from the skull. The other is thought to be somewhere in the head, perhaps in the brain. Speedy death was expected; but the next day the patient walked away from the hospital, saying that he was sorry for the attempt on his life, but appeared to be in no immediate danger of dying.

With this case as a text, a writer in a morning paper reviews a large number of more or less marvelous cases of recovery from grievous hurts, showing that serious injuries to the main organs of the body are not always followed by death. Men persist in living, not only with bullets in their brain, holes in their stomach, dislocated vertebræ, and wounds in the heart, but even with open wounds clear through the body. During the civil war, General H. A. Barnum, of Brooklyn, received in battle a wound which still remains an open passage through the body. For years the treatment of this wound has been simply to wear in it a roll of prepared lint, which is renewed daily. The suppuration of the wound is constant though variable.

General Shields, of Missouri, had a similar wound extending through his body, and open in front and behind. His wound, it is said, was received in the Mexican war, and he wore, not lint, but a silk handkerchief in it. This he could draw directly through his body.

ALCOHOL SUGAR AND PAPER PULP FROM WOOD.

Braconnot's process, as described in an Austrian paper, consists in mixing sawdust carefully with an equal weight of sulphuric acid, not allowing the mixture to get hot; and after a while diluting the paste mass with water and heating to boiling. When decomposition is complete, the acid is neutralized with carbonate of lime, and the glucose thus obtained is fermented in the usual manner by adding yeast to it. Owing to the large amount of sulphuric acid required, the results hitherto obtained do not favor its introduction on a large scale. But, on the other hand, the manufacture of spirits may perhaps be profitably combined with paper making.

Very satisfactory results were obtained by Bochet and Machard by treating wood shavings with hydrochloric acid under pressure. They treated 4,000 pounds of wood with 8,000 pounds of water containing 800 pounds of hydrochloric acid for ten or twelve hours in wooden vats, the mass being kept boiling by live steam. The hot acid dissolves off the incrusting material from the wood, which is thereby converted into a dry mass that is easily converted into paper after being washed with water. The acid liquid contains from 20 to 22 per cent of grape sugar to 100 parts of the dry wood. The liquid is then saturated with chalk, and fermented at 24° to 25° C. (75° to 77° Fahr.). One cubic meter of pine wood weighing 435 to 440 kilos is said to yield 780 to 790 liter per cent of alcohol (equal to 39 or 40 liters of 50 per cent spirits), which is worthy of consideration.

CONDENSED WHEY.—A NEW INDUSTRY AND A NEW FOOD PRODUCT.*

BY PROF. ALEXANDER MUELLER.

Whey, which is a by-product in the manufacture of cheese, contains about an equal quantity of milk, sugar, and albumen, as well as a considerable quantity of salts and particles of caseine and butter fat that have escaped being made into cheese. Only a very small percentage of all the whey produced in Germany is utilized directly for human nutriment, either as drink or as an addition to food and pastry, nor is much used for making milk-sugar. The greatest part of it is fed to animals—hogs, calves, cows, and even horses—at least among country cheese makers. Where large cheese factories are situated in cities, a considerable quantity runs off in the gutters and sewers!

The value of whey for feeding cattle and hogs is scarcely higher as an average than half a cent per gallon; its value as human food, on the other hand, is at least six times as high. This disproportion between supply and demand has frequently attracted the attention of milk producers and economists generally, without, as yet, however, having met with any satisfactory solution.

The chief difficulty lies in the great dilution of nutriment in the whey, and the consequent tendency to sour or putrefy. The first step toward a better utilization of whey must be taken in the direction of concentration. As in the case of most other kinds of food, concentration will improve its keeping qualities.

It is a fact that the small dairymen of Norway have been wont, from time immemorial, to boil down the greater part of their whey, sweet as well as sour, more or less, to a "mesost" or "prim," sometimes alone, sometimes with the addition of buttermilk, or even of cream. The boiling down in open vessels over an open fire of course demands the most painful attention to prevent burning, which would spoil the taste of the whole lot, and make it uneatable, for us at least. Then, too, the consumption of coal is so great as to make the product unreasonably costly. The use of a water or steam bath would overcome the former of these objections, but not the latter. A solution of the problem must be sought in the use of a vacuum apparatus, which, assuming the operations to be conducted on a large scale, guarantees at once the cheapest and best preparation.

After many fruitless attempts, an opportunity was afforded me last autumn, at the Cismar condensed milk factory in Eastern Holstein, to evaporate whey in a vacuum. But before the experiment had been made there, the firm of Heckmann, in Berlin, kindly placed at my disposal a suitable vacuum apparatus with an arrangement to prevent foaming over, and all its attachments and service. I first made use of it last January. Part of the whey was evaporated until it just began to crystallize when cold; another part to a stiff dough, which in a few days hardened to a solid cake.

In both cases, but especially in the latter case, a very permanent product was obtained, which could be kept for months in pure dry air without spoiling or moulding. Whey condensed *in vacuo* is better for making milk-sugar than any other preparation.

For daily use in the household it is capable of the greatest variety of uses for food and drink, the most important of which, it seems to me, is in making different kinds of pastry, for which purpose its milk-sugar and milk salts especially fit it, and this is the easiest way to utilize them in nourishing and sustaining large classes of the people. C. Becker made experiments on baking with whey concentrated on a water bath, while Bolle used a portion of the whey extracts obtained by me in Heckmann's factory here. These bakery experiments were so satisfactory that Bolle decided to have a vacuum apparatus set up in his own place, and to offer his whey to the Berlin public in the form of bread or cake.

In the course of the following winter and spring Bolle put up the necessary apparatus, and having secured regularity in working the process, he began the regular manufacture of whey-rye bread, and of two kinds of wheat bread, one a fine article in rolls, made of the best wheat flour, with the addition of milk, butter, eggs, etc., the other plain bread in round loaves for daily use, without the addition of the more expensive ingredients. The public seems to have a taste for this new form of bread, and the example is worthy of imitation in other places.

By careful treatment of the whey, and if the bakery were properly conducted, I have not the slightest doubt that all large cheese factories which are situated in towns could make a profitable use of their now worthless whey by evaporating and baking it, and at the same time contribute to the sustenance of the people.

Besides this, cooks and housekeepers would soon learn to use extract of whey in the preparation of their daily food, both to improve the flavor and render it more digestible.

The fear that there will soon be too much whey-extract made and offered to the public is met by the idea that the larger cheese factories will, in time, cease to make use of thin or skimmed milk, but to sell it as condensed skimmed milk, as this would be more profitable than condensing the whey.—*Chemiker Zeitung.*

* Read before the fifty-fifth meeting of German Naturalists, etc., in Eisenach, in 1882.

Facts about Stoves.

In the manufacture of stoves the patterns cut a very important figure in the column of expenses. The wood and iron patterns cost about the same; and the total cost of a wood and an iron pattern for a stove of any one size is about $1,000. Sometimes they cost a good deal less, and sometimes more. One manufacturer in this city, says *The Age of Steel*, published at St. Louis, has a set of patterns for a stove of three sizes which cost him $6,000. The "life" of a pattern used to be longer than it is now. Twenty-five years ago a certain style or make would last about ten or fifteen years before it became obsolete; now styles change more frequently, and the life of a pattern is, accordingly, much shorter. The desire of customers for stoves of new styles and bright and fancy finish has necessitated a greater expenditure for patterns larger stocks of them, and a more profuse use of nickel plate. The result of all this has been disastrous to large profits. A quarter of a century ago, sixty and seventy per cent profits were as easily realized by the manufacturer as thirty and thirty five per cent are now. Then a comparatively small number of patterns would answer for the largest establishment; now several hundred are required.

Stoves turned out by Western works are heavier by some fifty pounds than Eastern stoves, owing to their having larger flues and thicker plates. Flues are made large in the Western stove on account of the general use of bituminous coal in the West. A small flue would soon choke up, and the stove would be unserviceable. In the East, anthracite coal is largely used, for which reason the flues are made small. The advantage claimed by Western stove manufacturers in making thicker plates is that the percentage of those spoiled in the mould is not so large as when the plates are made thin. Thus, of each day's total melt of iron in a Western stove foundry, about fifty-five or sixty per cent is saved in good plates, the remainder, in the shape of defective plates, sprues, gates, etc., going back to the furnace to be remelted. In the East, fifty-two per cent saved is considered a high average. The result is, Western stove makers save more time and more iron in the furnace and the mould than Eastern manufacturers. Stoves made in the East for the Western trade are called "staddles" from the fact that the flues are made with a view to burning either anthracite or bituminous coal in the stoves.

ELECTRIC lights have been largely introduced in the government establishments at Yokohama, Japan.

Arrowroot Manufacture in Queensland.

The machinery used for the manufacture of arrowroot is simple in the extreme, and is chiefly manufactured on the place, the shafts, pulleys, and engine work being, of course, foundry-made. The first process shown was the roots being tipped, by two boys, into a long trough, through the length of which a shaft slowly revolved, and by means of wooden projecting pegs the dirty roots were stirred up, and so cleaned, there being a constant stream of water running through the trough. These revolving pegs have a screw pitch, so that the roots are gradually moved toward the far end of the trough, where they are caught up by a sort of bucket pump, which elevates them some 12 feet, and drops them regularly into a hopper. As they fall to the bottom of this, they meet the grater, which is a drum of perforated galvanized iron, driven at great velocity. A small stream of water pours into this all the time, and the roots are quickly grated up into a brown colored pulp. This mass of fiber and pulp falls into a cylinder of perforated iron, about 9 feet long and 2 feet in diameter; through the length of this runs an axle, on which are two beaters, like the drum of a thrashing machine; these smash up the fibrous pulp, exposing it to the action of the water, so as to enable all the starch and fine pulp to be washed out and squeezed through the perforations of the cylinder, while from the one end is discharged a constant stream of the dirty looking fibrous refuse. The finer pulp, as squeezed through the perforations of this cylinder, is received in a precisely similar one below; here, again, the mass, now only pulp, is beaten up; but the perforations around this second drum being very small, only the starch and dirty looking water passes through, the pulp being again discharged from the cloaca at the end. The stream of water and starch pouring from these cylinders is received in troughing, extending for 100 feet around the shed, and, as it runs along, the starch, being heavier than the water, all sinks to the bottom, and the water runs away. So far the work goes on automatically, no one but the two boys throwing in the roots troubling themselves about it. But toward the end of the day the stream of water is stopped, and the arrowroot starch scraped up out of the trough, where it has accumulated in a layer some inches in thickness, and is placed in large vats and tubs, all ranged in regular rows. Before being put into these tubs, it is passed through fine muslin sieves, and at the same time another stream of water is turned on. These fine sieves effectually clear it of any foreign matter, and it settles by the morning at the bottom of the vats, clean and white as snow. The water is drained from it, and the starch put into a centrifugal machine similar to what is used for sugar; this soon forces out the surplus water, but perfect dryness is essential to its keeping qualities, so it is now carried to the drying room, which is some 60 feet long by 12 feet wide. Round the whole length of this runs a flue, heated by a special furnace, and over this are shelves of galvanized wire-netting; on this netting is placed calico, and on this is spread out the starch. In this hot-house the moisture is quickly evaporated, and the arrowroot becomes crisp and grain-like. On fine days it is spread out in the sun on similar wire stages. All operations are now finished, and the flour is stowed away in bins in the storehouse, and there made up into the packets usually seen in the shops.—*Queenslander.*

Soda in Commercial Potash.

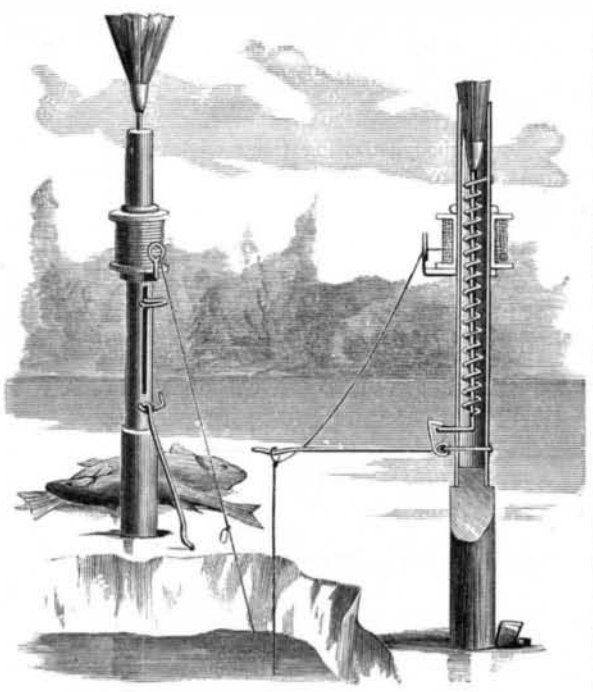
A Belgian chemist gives the following method for detecting the presence of soda in samples of carbonate of potash. It is based on the fact that chloride of sodium is much less soluble than chloride of potassium in strong hydrochloric acid. A solution of the potash to be tested is prepared, the potash being dissolved in ten times its weight of water. One ounce of this solution is saturated with diluted hydrochloric acid, and then evaporated until it is dry. The residue, which is a fine powder, is introduced in a bottle of 10 oz., hydrochloric acid of 1·189 specific gravity, which has been previously saturated with chloride of sodium, being then added. The mixture is well shaken, then left to settle, and after five or six hours, all the chloride of sodium will have settled to the bottom while the chloride of potassium will be in solution. The whole is now filtered through asbestos, and the deposit is washed with hydrochloric acid saturated with chloride of sodium. It is then dried at 150° C., weighed, and will consist entirely of chloride of sodium, an accurate result being obtained if the operation has been carefully executed.—*Weekly Drug News.*

A PLANER has been constructed at Pittsburg capable of planing a piece of iron or other metal ten feet wide, ten feet high, twenty-four feet long, and so arranged that four cutting tools may operate on the work at one time, two being on the crosshead and one on each upright.

WHITCOMB'S FISHING APPARATUS.

This apparatus is designed to be set after the fashion of a trap for fishing through holes made in the ice in winter, so that when a fish bites at the hook a signal will be automatically displayed.

A round tube, forming the body of the apparatus, is mounted on a stick, which serves as a standard. On the outside of the tube there is a spool, to hold the fish line. The lower end of this spool bears on a stop, and the spool is kept in place on the upper side by an elastic clasp, which can be moved up and down on the tube, and set to bear



NOVEL FISHING APPARATUS.

against the end of the spool with sufficient friction to prevent the spool from turning easily. Inside the tube is a rod the upper end of which is furnished with pompon, flag, or other suitable device as a signal, which comes down into the tube when the device is set, as seen in the sectional view, but which shoots up into sight when the device is sprung, as seen in the perspective view. This rod is impelled upward by a spring, one end of which is attached to the tube, the other end being attached to the rod. The rod is bent out laterally at the lower end, projecting through a vertical slot, made in the wall of the tube, forming a tappet for receiving a tripping lever, which is pivoted to the outside of the tube, with its outer end, when the device is set, projecting laterally for connection with the fish line. A loop is tied at a convenient point in the line, and hung upon the outer end of the tripping lever, and drops down into the water, with a hook suitably baited hanging from it.

When a fish takes hold of the hook, the hook of the tripping lever is detached from the lateral projection of the rod, which, being thus freed, flies up and displays the pompon at the top. This is the invention of Mr. M. H. Whitcomb, of Holyoke, Mass.

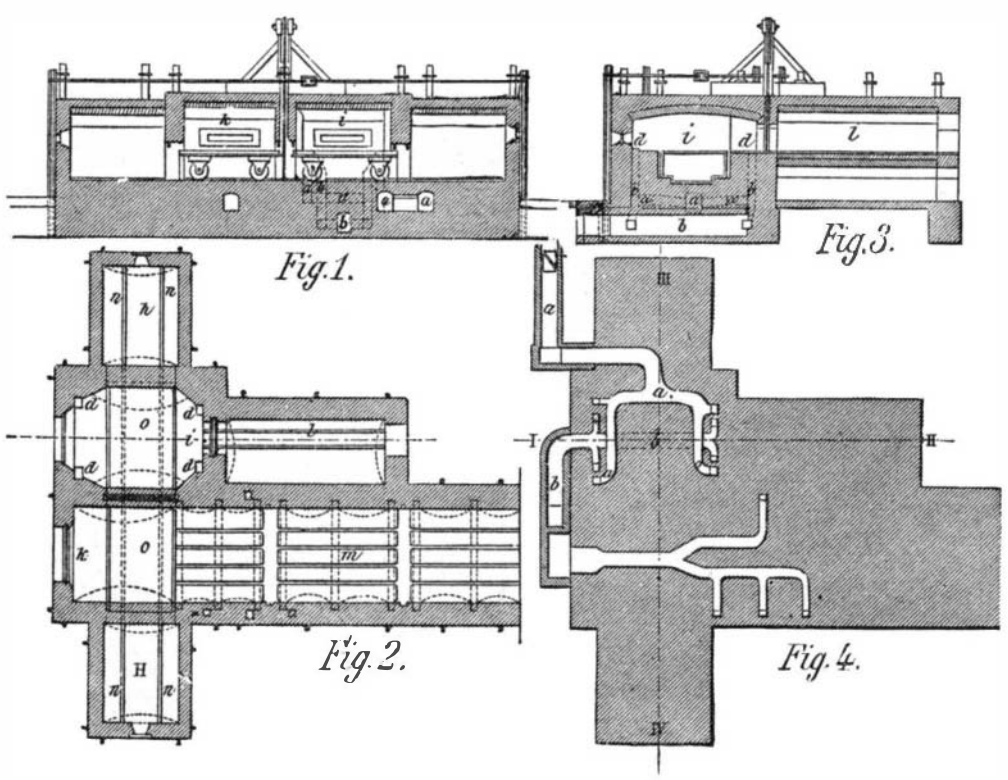
THE FASTEST ATLANTIC STEAMER AFLOAT.—The steamer Alaska left New York on the 19th of October last, and arrived in Queenstown in the surprisingly short time of 6 days 21 hours and 46 minutes. Her log showed as follows: 10, 380, 389, 381, 388, 401, 403, and 436 knots, or a total of 2,788 knots.

Birds.

Professor Ewart last week gave an account of the structure of birds. After explaining the main features of difference between the flying and the running birds at present existing, he went on to say that the running birds of the Tertiary period had a much wider distribution than the same class had now. Among the flying forms there were a number which could not fly; and the flightlessness was always accompanied with modifications of the limbs and the sternum, and those modifications so mimicked the form of those structures in the running birds that some zoologists believed that all the running birds were only modified flying birds. In the Eocene beds was found the remarkable odontopteryx, which had peculiar bony projections, not true teeth, along both jaws. The chalk beds showed a great abundance of flying reptiles, and while those beds were being deposited there were a large number of aquatic birds, some of which were highly specialized, closely resembling our flying birds, while others more resembled our running birds. The ichthyornis of the chalk period had true teeth, and the vertebræ were like those of fish. The hesperornis, a running bird, had merely rudimentary wings, while the posterior limbs were enormously developed. It had well-developed teeth, which, however, instead of growing from sockets, were set in a narrow continuous groove, as in some of the extinct saurians. The brain was like that of a lizard, and the vertebræ like those of ordinary birds. The rocks of the Jurassic period presented enormous flying reptiles, along with remains of birds allied to ostriches, but which had teeth and fish-like vertebræ. The archæopteryx seemed to have had a more or less complete covering of feathers, and it had true teeth and fish-like vertebræ. It was an exceedingly generalized form, closely resembling some of the American Jurassic dinosaurs. Apparently some of the smaller dinosaurs were arboreal in habit, and probably differed from archæopteryx in that they had no feathers. It might be inferred that archæopteryx was descended from a still more primitive creature, which, besides being the ancestor of archæopteryx and the birds, was also the ancestor of the dinosaurian reptiles.

HIRSCH'S CONTINUOUS FURNACE FOR FLATTENING WINDOW GLASS.

In Hirsch's furnace for flattening window glass, shown in Figs 1, 2, 3, and 4, the operation is rendered continuous by the addition of the two chambers, *h* and H, at the sides of the flattening furnace, *i*, and annealing furnace, *k*, and by employing the channel, *n*, and the stones, *o* and O. The flattening of the cylinders coming from the heating channel, *l*, takes place on the stone, *o*, while the flattened sheets are raised from the stone, O, of the annealing furnace, *k*, and conducted into the annealing channel, *m*. The stone, O, is then pushed into the chamber, H, while the stone, *o*, passes into the annealing furnace, *k*, to deliver its sheet into the channel, *m*. The two stones are afterward pushed back, *o* to *h*, and O to *i*; and then the operation begins again. The work can likewise be regulated in such a way that the stone, *o*, shall pass into the chamber, *h*, after flattening, while the stone O, shall serve for flattening in furnace *i*, to pass from thence into chamber, H; the stone, *o*, being afterward pushed from *h* to *k*, where its sheet is discharged into the channel, *m*, and this stone being then brought into the furnace, *i*, while O passes from H to *k*.



HIRSCH'S CONTINUOUS FURNACE FOR FLATTENING WINDOW GLASS.

The gas and air conduits, *a* and *b*, debouch in the four angles, *d*, of the flattening furnace, *i*, so that the air and gas combine and burn in those places. After the cylinders have been brought into the flattening furnace the ingress of air through the conduits, *b*, is shut off, so that the complete oxidation of the flame ceases; but as soon as the sheet of glass has passed into the annealing furnace, the air is allowed to enter again, so that the desired temperature may be obtained.

Poisoning from Red Stockings.

Dr. J. Woodland writes to the *Lancet* that, having had his attention directed to several cases of great irritation of the feet and legs, causing small pustules to arise and the skin to subsequently exfoliate, and suspicion being fastened upon red stockings which the patients wore, he carefully analyzed them. He found a tin salt which is used as a mordant in fixing the dye. He succeeded in obtaining as much as 22·3 grains of this metal in the form of the dioxide, and as each time the articles are washed the tin salt is rendered more easily soluble, the acid excretions from the feet attack the tin oxide, thus forming an irritating fluid.

IN the ten years from 1870 to 1880 the value of the silk production of the United States rose from $12,210,662 to $34,410,463.