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THE IMPERIAL BRICK MACHINE.

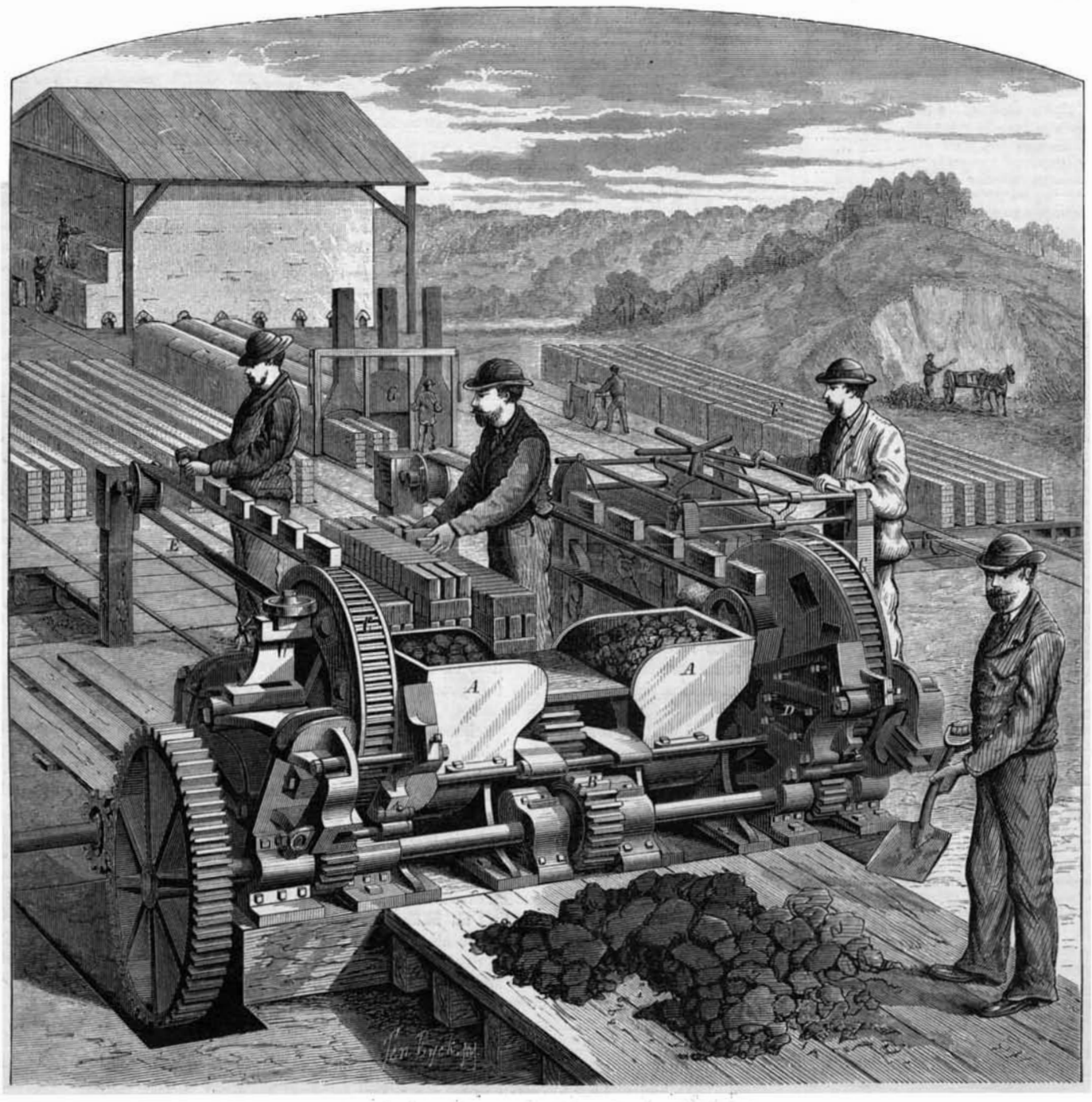
The brick machine illustrated in the annexed engraving belongs to that class which comprises all those in which the clay is first mixed in a pugmill and therefrom pressed into moulds disposed on a rotating mould-carrying disk. In this class there are two varieties, first, machines in which the pugmill is vertical and the mould disk horizontal; second, those in which the above relative positions are reversed. A glance at the engraving will show that the present apparatus is of the last mentioned variety. It uses clay taken directly from the natural bed, over which, just before entering the machine, sufficient water is thrown to cause it to be properly tempered while being ground and mixed. Another important feature of the apparatus, as here illustrated, is that it is double—two machines in one—which produce a proportionately greater quantity of bricks.

The clay is thrown into the two hoppers, A, and descends into the horizontal mixing cylinders below. Of these there are two, and through both passes a 6½ inch wrought iron shaft, actuated by the gearing shown at B. In each cylinder and on the shaft are steel cutters, and also screws, the latter adjusted in relatively reverse directions, so that the clay is thus forced out of the outer ends of both cylinders at once; and at the same time the thrust due to the resistance in working the clay is sustained wholly by the shaft, which becomes subjected simply to a compression. This last is an important advantage, as the thrust being removed from bearings or any other neighboring portions, durability is gained, friction diminished, and consequently less power is required to drive the machine.

The tempered clay on being forced outward by the screws enters the moulds, which are formed in the inner faces of the rotating mould carriers, C. As these revolve, a stationary knife at D removes any excess of material. Ten of these moulds are contained in each carrier or wheel, and each mould has a movable bottom with a roller that travels on an eccentric track beneath it. This, as the wheel turns, gives a series of pressures to the brick. An opening is left before the last pressure to allow any surplus clay to escape, so that when the brick comes to the cam that pushes it out upon the endless belt, E, it is perfectly formed.

With the double machine two of these belts are of course employed and a man stationed at each removes the bricks as fast as formed and places them on hacks, planks capable of holding five hundred bricks each. Each belt is about 10 feet in length, and is capable of holding 11 bricks. The capacity of the double machine is claimed to be from fifty to sixty thousand bricks per ten hours—for the single machine, where but one mixing cylinder and mould carrier is employed, half that aggregate. In connection with the above described apparatus, a truck is employed for transporting the brick to the drying yard. The construction of this is shown at F. It runs on four wheels, and is brought over a loaded hack plank. By means of a crank and simple mechanism the latter with its load is lifted, and suitable tracks being provided, the truck can be moved off by one man to any desired point, where the hack is deposited. He then takes a hack plank of dried brick to the setter (in the same way) under the kiln shed, deposits it, and returns to the machine in plenty of time to get a new load. By this means, we are informed, one man can move 25,000 green brick from the machine to the yard, and take therefrom 25,000 dry brick to the setter in one day. The other hands required are two men to shovel in clay, and two to remove and hack the brick.

Another brick-making improvement, devised by the manufacturers of these machines, is the drying oven shown at G. This is simply a long brick chamber, into which in winter time the hacks of green bricks are placed to be dried. A fire is ignited at one end of the chamber, and the heat passes through and escapes at the chimney at the other end. This admits of the bricks being expeditiously dried, and saves their exposure to the weather. We have seen this machine in operation at the brickyard of the company below named. It produces excellent bricks with remarkable rapidity. Patented January 11, 1876, by Mr. E. R. & W. E. Gard. Other patents now pending. For further particulars address the Imperial Brick Machine Company, Croton Landing, New York.



GARD'S IMPERIAL BRICK MACHINE.

THE English arctic exploring vessel Pandora is to under take another expedition next Spring, and an attempt to reach the pole by way of the Spitzbergen, instead of by the Smith's Sound, route will be made.

Properties of the Human Gastric Juice.

The *Press and Circular* says M. Charles Ricket has been experimenting upon the patient on whom Professor Verneuil recently performed the operation of gastrotomy. According to his researches the acidity of the gastric juice is equivalent to 1·7 grammes of hydrochloric acid to 1,000 grammes of fluid. This acidity increases a little at the end of digestion. Wine and alcohol also increases it, but cane sugar diminishes it. It tends to return to its normal acidity after the introduction of acid or alkaline matters. The mean duration of digestion is from three to four and a half hours, and the food does not pass gradually out of the stomach, but in masses. According to four analyses, after a modification of Schmidt's method, free hydrochloric acid exists in the gastric juice; and altogether this secretion appears to consist of one part of lactic acid to nine parts of hydrochloric acid, the former of which is free in the gastric juice. The nature, therefore, of the free acid in the stomach seems almost solved, and it may be said that in every 1,000 grammes of the juice there are 1·53 grains of hydrochloric acid and 0·43 of lactic acid.

Medical Uses of the Tupelo.

The root of the tupelo tree, indigenous to the United States, is being used with success, so says the *Medical and Surgical Reporter*, by various obstetricians, for dilating the *os uteri*. It is said to be superior for this purpose to seatangle, as its power of absorption is greater; it is as light as a cork, and its fibre is fine-grained, capable of being made very smooth, and therefore easily introduced.

The Compass Plant.

It is well known to botanists that the western plant growing on the open prairies, and known as *Silphium laciniatum*, has the remarkable property of turning many of its leaves nearly north and south, and hence the name "compass plant." It is also called "rosin-weed," from its copious resinous juice. In order to determine to what extent this alleged polarity exists, C.E. Bessey, of Ames, Iowa, has made a large number of accurate observations, which he reports in a late number of the *American Naturalist*. Out of 93 observations, 54 were found which pointed more or less east of north, and 39 more or less west. Of the 54 which pointed eastwardly, 18 were within 5° of north; 8 more within 10°; 7 more within 15°; 5 more within 20°, and 3 more within 25°; leaving only 14 leaves which diverged more than 25° from due north. Of the 39 which pointed to the west of north, 9 were within 5°, 5 more within 10°, 3 more within 15°, 7 more within 25°, and 7 more within 35°; leaving only 8 which diverged more than 35° from due north. Its polarity is fully established.

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(Illustrated articles are marked with an asterisk.)

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ARRESTED DEVELOPMENT.

The interest excited by Von Chauvin's recent observations upon the axolotl seems to be somewhat in excess of the actual novelty or importance of their results. The axolotl is not the only creature whose development has been rapidly carried forward from a stage, permanently low in the natural state, to another and higher one, in consequence of human interference. Nor, as we noticed the other day, were that lady's specimens of the axolotl the first to undergo, under observation, the, to them, abnormal transformation into fully developed *amblystoma*. Besides, we are strongly inclined to suspect that, so far from determining or compelling the evolution of the two which survived her treatment, the German lady's attention to her pets was the reverse of helpful. Had they been let alone, it is quite possible that the fatalities would have been fewer and the progressive development of the survivors not less remarkable.

For the benefit of those unfamiliar with the creatures in question, we will note here that the transformation alluded to corresponds to that of the water-breathing tadpole into the land inhabiting and air-breathing frog. Seventy years ago Cuvier suggested that all siredons (like the axolotl) might in reality be larval salamanders, that is, the tadpole stage of higher batrachians. The observations of Dumèril upon numerous specimens of axolotl, bred in the Natural Historical Museum at Paris, proved the old suspicion to be substantially true, at least in one instance. In its natural habitat—the Lake of Mexico, and neighboring mountain lakes—the axolotl is, so far as known, always an inhabitant of the water. The specimens transported to Paris remained unchanged; but some of their offspring passed on to a higher stage of development, developing lungs in place of branchia, and becoming perfect *amblystoma*, hitherto regarded as belonging to a distinct family. Why all did not complete the same course of development was a mystery to Dumèril (whose observations were published in *Comptes Rendus*, 1865 and 1867); but a possible explanation was suggested by observations made soon after by Professor Marsh and other American students, upon several allied species of siredons from the elevated lakes of the Far West. Professor Marsh's observations were published in the *American Journal of Science* for November, 1868.

That distinguished observer had seen Professor Dumèril's account of the remarkable metamorphosis of the second generation of the axolotl (*siredon Mexicanus*) in Paris; and, during his next summer's excursion to the Rocky Mountains, took pains to secure a number of specimens of *siredon lichenoides*, Baird, from Lake Como, Wyoming Territory. At the same time a number were secured by Professor Eustis, of Harvard. The two lots were brought to New York together and here divided, part going to New Haven with Professor Marsh, the rest to Cambridge, to be observed by Professors Wyman and Eustis. Professor Marsh's specimens made the passage to New Haven without apparent inconvenience, either from the long journey or their transference to fresh water, the water of Lake Como being brackish. They fed readily upon worms and insects, and occasionally came to the surface and inhaled air. More rarely an exhalation occurred, usually under water. On being removed from their native element they showed the same distress as fishes under similar circumstances, although in a much less degree.

The first indications of any change were observed in one of the smaller specimens; and the metamorphosis apparently began during the journey, which lasted about a week. The animal first became spotted and of a darker hue. Then the broad thin membrane along the back, and above and below the tail, was gradually absorbed; the external branchia followed more slowly; the dark spots increased in number; and the animal came more frequently to the surface for air. By the time the swimming and water-breathing appendages were absorbed, and the openings on the neck closed up, the head had undergone marked changes in shape; the eyes had become more convex and prominent; the body had largely decreased in bulk; the thin external skin was shed, and the secretion of mucus from the surface sensibly diminished. At the same time the animal showed an increasing desire to leave the water, often remaining for some time with its nostrils above the surface, and occasionally made violent struggles to escape. Aided by a heavy rain at night it at last succeeded, and thus put an end to further observation, just at a time when it had lost the generic characters of siredon and become a true *amblystoma*.

A few days later, several other specimens of various sizes began to show signs of transformation. Two were placed in a glass jar, and left in a strong light, and five others were left in a cooler place in the shade. At the end of three weeks the first two had completed the metamorphosis. The others changed less rapidly, or not at all, three completing the metamorphosis in about six weeks, while two showed little or no change, remaining typical siredons. In those that were transformed, a succession of warm days hastened the process remarkably, while it was all but arrested by a series of cooler days. Of the specific changes which the specimens underwent in structure, dentition, habits, etc., in passing from the siredon to the amblystoma state, full information may be found in Professor Marsh's paper.

At the time his specimens were under observation, the specimens taken to Cambridge were being studied by Professors Wyman and Eustis. Only one of the latter was transformed, and change occurred much less speedily than those in New Haven. Two, kept by Professor Eustis, escaped during a rain storm, and six days after one was found still alive, though shrivelled up and the branchia partially gone. On being placed in water, it refused food and died. The lateness of the season probably prevented the transformation of the others.

In the next number of the *American Journal of Science*, Professor Silliman contributed a note describing a colony of *amblystoma* in the possession of a person at Cheyenne. The proprietor assured him that when they were received from Lake Como, a few weeks before, they were all in the "fish" state; that they began to change soon after, and in about three weeks were all completely developed into salamanders. That this change ever occurs in Lake Como, there is, so far as we are aware, no evidence. In this connection, Professor Marsh remarks that, in the elevated region where Lake Como is situated (7,000 feet above the sea), although the weather in summer is quite warm, the nights are always cool, and the changes of temperature often sudden and very great; hence the metamorphosis, if it began, would probably proceed slowly and be liable to suspension during its various stages. That the animal breeds in the siredon state, like the axolotl, he is quite ready to believe; and he remarks that it is probable that after reproduction the power of complete development would be lost. Here is, perhaps, the explanation of the persistence in the siredon state of the majority of the specimens of axolotl observed by Dumèril and Von Chauvin.

A legitimate inference from all the facts would seem to be that the siredons of the elevated lakes of Mexico and the United States are *amblystoma*, whose complete development has been arrested by increasing elevation and consequent climatic change, at a period relatively so recent that they have not entirely lost their ancestral capacity for becoming fully developed under favorable conditions. The transference of reproduction to the larval state is not an insuperable objection to this inference, since, as Professor Marsh observes, the near approximation in many batrachians of the periods of reproduction and metamorphosis, and the effects (especially upon the latter) of even slight differences of physical conditions, are known to produce remarkable variations in the same species, as well as other results, until recently quite unexpected.

It is well known, for example, that our common large bullfrog (*rana pipens*) may remain in the larval or tadpole state, in the colder parts of New England, for many times the normal period; and Professor Wyman once kept the transformation of such tadpoles under arrest for a number of years, the experiment being thwarted at last by an accident, which emptied his tank and killed his specimens. This line of investigation is worth the attention of some of our younger naturalists. It is quite possible that, by a skillful use of light and temperature, the tadpole stage in the bullfrog may be continued until after the reproductive faculty has been developed, and the natural history of siredons paralleled by art.

PROFESSOR TYNDALL ON THE PHENOMENA OF HUMAN LIFE.

Professor Tyndall has recently delivered before the Midland Institute at Birmingham, England, one of those characteristic addresses of his which seems to us likely to excite discussion as widespread as that aroused by his famous prayer gauge proposal and the great Belfast speech. The idea that there is no necessity for invoking the supernatural to account for the ordinary phenomena of human life has already been repeatedly foreshadowed in Professor Tyndall's writings. Nor has he been at all alone in that view, as it is virtually the same as is held by the majority of scientific reasoners of the present time. But in this late address, (which, owing to its length, we cannot publish in these columns, and therefore refer the readers to the pages of the SCIENTIFIC AMERICAN SUPPLEMENT, current issue, where it is printed in full) he crystallizes, so to speak, that opinion and the arguments on which it rests into a compact mass of logical reasoning. With all that clearness, precision, and beauty of language which have rendered him almost without a peer as a public lecturer, he places before us a chain of argument, or rather causes his hearers to forge the links themselves, he only acting as guide, and thus enables them to reach for themselves a logical conclusion.

Just as in the opening of a musical work, a suggestion is given of the themes afterwards to be wrought out, so in his introductory sentences, by which the audience is placed in good humor with themselves and the lecturer, Professor Tyndall manages to shadow forth an instance of absence of free will. Half humorously he deplores the hard fate of modern scientific men, who like himself are drawn from their quiet laboratories and forced into publicity which is not conducive to the exercise of their best powers. Unlike Joule and Darwin, who are not dragged from their seclusion and made presidents of associations, he himself is a special sufferer, but social duties are paramount to his will. With this much preamble he launches into a splendid account of that great theory of modern science, the doctrine of the conservation of energy. "There is nothing gratuitous in physical nature," he says, "no expenditure without equivalent gain, no gain without equivalent expenditure. With inexorable constancy the one accompanies the other, leaving no nook or crevice between them for spontaneity to mingle with the pure and necessary play of natural force. Has this uniformity of nature ever been broken? The reply is, 'Not to the knowledge of natural science.'" Then follows a wealth of illustration to show the universal application of the great law, and through this, step by step, the hearer is led to the

question of the energy of the human machine. Joule's statement is quoted, that unless we abandon the physiological axiom that "the animal body cannot create heat out of nothing, we are driven to the conclusion that it is the total heat within and without that ought to be regarded as the real calorific effect of the oxidation within the body." A man weighing 150 pounds consumes, we are told, in lifting his own body to a height of 8 feet, the heat of a grain of carbon. Jumping from this height, the heat is restored. The muscles of a laborer whose weight is 150 pounds weigh 64 pounds. When dried they are reduced to 15 pounds. Were the oxidation corresponding to a day laborer's ordinary work exerted on the muscles alone, they would be wholly consumed in 80 days. It is but a step further on to ask what enables the production of bodily motions, and to enquire whether it is the action of the will. The answer is that the will is mediate, not direct. The nerves controlled by the brain pull, as it were, the trigger, but the gunpowder which they ignite is stored up in the muscles. "We all know the effect produced on a nervous organization by a slight sound which causes affright. An aerial wave, the energy of which would not reach the minute fraction of that necessary to raise the thousandth of a grain through the thousandth of an inch, can throw the whole human frame into powerful mechanical spasm, followed by violent respiration and palpitation."

Thus far—and we have given but the barest outline of the argument—nothing has been advanced which rises to any other level than that of plain scientific truths which no one can hesitate to accept. But now comes the question: What causes the nerves to act and liberate this gigantic power? Who or what is it that sends and receives massages through the bodily organism? The query is answered thus: "You picture the muscles as hearkening to the commands sent through the motor nerves; you picture the sensor nerves as the vehicles of incoming intelligence; are you not bound to supplement this mechanism by the assumption of an entity which uses it? Are you not forced by your own exposition into the hypothesis of a free human soul?" Henceforward the whole drift of the address changes—persuasion and abstract argument replace scientific deduction; but the speaker has proved us necessitarians by necessity, and then, lest the dilemma afflict us, goes on to show that the belief is by no means such a dreadful one.

Are the brain, and the moral and intellectual processes known to be associated with the brain, subject to the laws we find paramount in physical nature? This is the final problem. Science has led us into the domain of metaphysics, and we have been prepared for the affirmative response. The phenomena of heredity, of how much we owe to the transmitted influences of the past, how closely we are bound up in a chain of events—evolution, whence we cannot escape—all are adduced to prove that we are not masters of the circumstances in which our motives and wishes originate, and "if finally our motives and wishes determine our actions, in what sense can these actions be said to be the result of free will?" "There is," says Professor Tyndall, in his closing sentences, "on all hands a growing repugnance to invoke the supernatural in accounting for the phenomena of human life; and thoughtful minds, finding no trace of evidence in favor of any other origin, are driven to seek in the interaction of social forces the genesis and development of man's moral nature. If they succeed in the search—and I think they are sure to succeed—social duty would be raised to a higher level of significance, and the deepening sense of social duty would, it is to be hoped, lessen, if not obliterate, the strife and heart burnings which now beset and disguise our social life."

THE AMERICAN RAILWAY SYSTEM.—MAINTENANCE OF WAY.

In presenting some facts illustrative of the progress in railway management in this country, we take data from the Pennsylvania Company, that great organization, by virtue not only of the unparalleled extent of its lines, but by the rare administrative ability by which they are controlled, preeminently deserving to take first rank as an example. In no other similar organization are the principles of engineering, construction, maintenance, and management carried to higher standards, and we doubt if any other road can show so thorough a system in all its departments. In each of these, for example, certain standards are decided upon as a result of long experience, and these become the inflexible and governing law, whether it be a mechanical measurement or a matter of policy, and subordinates are rigidly held thereto, no departure being permitted. A somewhat amusing illustration of this occurred recently, when a friend, traveling on their line on a pass issued to him as the company's guest, because of an informality therein, and having insufficient funds to buy a ticket, had presented to him by the conductor the alternative of getting off the train or depositing his watch as security. Being a sensible man he appreciated the situation, surrendered his time-piece, and continued his journey, receiving his property back in due time with a polite explanation from the company's office. The conductor had no discretion in the matter, and courteously maintained the regulation for such case made and provided. This inflexibility might appear to defeat progress in certain departments, but to prevent this tendency, the company maintains a corps for the express purpose of conducting experiment, and any practical improvement reported by it, is put to the working test, and, if demonstrated to have real value, is adopted, but is not, prior to its adoption, allowed to affect any of the railway company's operations in the slightest degree.

A recent article furnished some interesting facts relative to the running of their trains under the block system, and it is proposed herein to explain the method by which their magnificent roadway is maintained in such superior condition. To begin with the official organization of the company is such as to secure with a proper distribution of labor and responsibility the greatest possible efficiency.

The entire line is divided into three grand divisions, severally known as the New Jersey, the Pennsylvania, and the Philadelphia and Erie. Over the whole there presides, independent of the Board of Direction, one general manager and two engineers, one of the latter having charge of bridges and buildings, the other of maintenance of way. Each division is under a general superintendent, and being divided into sections of about 100 miles each, called sub-divisions, for each of which there is a division superintendent. These subdivisions are again divided, say into three parts, over each of which is a supervisor. Under him are sub-division foremen, having 2½ miles of track each to work and keep in order. The number of men allowed to these foremen is determined by the peculiarities of the locality, more men being necessary for difficult sections, as in the mountain regions or wherever the trackway is exposed to exceptional danger.

The important relation of the condition of a road way to its carrying capacity, and the economical management of the traffic over it, was so evident that it was determined to develop the highest possible standard of excellence in this department. The various engineers, superintendents supervisors, and other practical men, met in consultation to decide what various items were essential to the production of a perfect road. Suggestions were made and discussed fully, after which short sections were ordered, constructed according to the plans agreed on, and when ready these were inspected and criticised by the same officers, some modifications suggested, and still further improvements developed. This sample track was as nearly ideal in every particular as it could be made, as to solidity, evenness, drainage, joints, ties, etc., while the surface was finished with all the care and accuracy of that of a drive in Central Park.

When completed to the satisfaction of all, the sub-division foremen and others were referred to it as the standard, and notified that it was expected that the entire line would be brought to a like condition. To encourage a healthful emulation among the subordinates, it was suggested (by Mr. Cassatt, Vice-President) that premiums should be offered for excellence of trackway, namely, $100 to the supervisor whose section should rank highest, and $50 to each foreman whose piece should approach most nearly to the standard. The method employed to determine these awards is both thorough and impartial. About the first of November the various engineers, superintendents, and others go over the entire line in a special car from east to west at a speed of forty-five miles an hour, to test severely the riding qualities of the road. Then the party make the return trip at ten miles an hour in a gondola car, as it is called, which is placed in front of the engine and has seats arranged in tiers, so that all have an unobstructed view of the track. Each person is provided with a printed table, the horizontal rulings of which represent the different 2½ mile sections, with the names of their respective foremen at the left side and the perpendicular rulings representing the different items, specified by name, which are to be examined and criticised. Under these latter rulings each inspector enters a number from 1 to 10 to express his estimate of the quality of each part of the work; 10 is the symbol of perfection, and is never employed, on the principle that the ideal is never quite reached; in fact 8 is rarely used.

The total of each foreman's number is extended to the right, and his average obtained by dividing the sum by 11, that being the number of ratings on the table. Each member of the inspecting party makes his own figures independently, and they are subsequently aggregated and a grand average struck to determine which of the men are entitled to the prizes. It should be remarked, however, that as not all the eleven items that go to make up the perfect roadway are of equal importance, discrimination is made in favor of the foreman whose track is in the highest mechanical condition in the essential points, these features very properly outweighing mere superficial appearance.

When the awards are made, printed announcement is given, and the effect has proved most healthful. The prize money is of course in itself very acceptable, but the prestige is still more valued, as the man is put in the line of promotion, and his work attracts much attention from his fellows, who are guided by its excellence in the next competition.

It is by this system that the Pennsylvania Railroad Company, having first constructed its roadway upon the most thorough principles, not only maintains its excellent condition but constantly improves it. No thoughtful traveler in passing over it can fail to be struck with its solidity and fine appearance, it being in fact a great macadamized way. If he is really observant he will see that its condition is an explanation of the safety and comfort of the great travel over it. Those familiar with the freedom from dust, secured by the stone ballasting used on the entire line in Pennsylvania, will be pleased to learn that the road between New York and Philadelphia is to be finished in the same way, the work now being in progress.

NOTES OF PATENT OFFICE DECISIONS.

In Gordon's case, just decided by the Acting Commissioner of Patents, the trade mark sought to be registered was described as a narrow strip of leaf tobacco placed as a wrapper around the mouth piece of a cigarette.

It was held by the Examiner of Trade Marks that the above matter claimed, as a trade mark, was a functional part of the cigarette and was consumed with it; that, in fact, it entered into the mechanical structure of the article itself, and therefore was not an arbitrary symbol or a lawful trade mark.

It will do, however, to carry this doctrine to the extreme of saying that nothing can be regarded as a proper trade mark which is so intimately connected with an article as to be consumed with it; for if that were the rule, a mark upon a cake of soap, a symbol in the sole of a shoe, and many other forms of devices which might be mentioned, and which are undoubtedly excellent trade marks, would lose their character and value as such from the mere fact that the use or consumption of the article would also result in the destruction of the mark.

A distinction must be made in these cases, between the material, which is essential in the structure of the article, and unessential matter placed thereon or incorporated therein, for the mere purpose of distinguishing the origin or ownership of the article.

Thus the box, barrel, or wrapper containing merchandise, whatever its form, cannot, *per se*, be the trade mark; but a name, symbol, figure, letter, form, or device, cut, stamped, cast, impressed, or engraved thereon, or in some other manner attached thereto, or connected with the article itself, may be a proper trade mark. The trade mark need not be inseparably connected with the package, as when blown into glass, but it must have the *independent and sole* quality of distinguishing the goods as being of a particular manufacture, or as belonging to a particular party. There could be, therefore, no legitimate objection to the trade mark sought to be registered by Gordon, on the mere ground that it was connected so intimately with the article to which it was attached as to necessitate its consumption with that of the article itself.

But there was a serious objection to the registration on the ground that it did not perform the *sole* office of a trade mark. No one has a right to appropriate to his own use, as a trade mark, a device which, from the nature of the use to which it is put, others may adopt and employ for the same purpose. Now, in this case, the leaf of tobacco which was wrapped around the mouthpiece or end of the cigarette, answered a practical, and, perhaps, a very useful purpose. Being composed of tobacco, it was an addition to the material of the cigarette, strengthened the wrapper, and was probably more agreeable to the taste than the paper of a cigarette. The useful properties of the article, therefore, seemed to be the predominant ones, while the function the wrapper performed as a trade mark was merely incidental. Perhaps a trade mark would have been granted had Gordon applied merely for a silk band attached to the cigarette, or a colored piece of paper, or similar device connected therewith, since, in such instance, the device would perform no mechanical function, or answer any other purpose than that of a trade mark.

The intent of the trade mark law being to afford protection to symbols, and not to inventions or mechanical devices, the question whether Gordon had introduced an improvement in the manufacture of cigarettes was immaterial. If he had introduced an improvement, and was entitled to protection thereon, it could be by a patent only. In the absence of any patent, other manufacturers of cigarettes could not be prevented from using the like useful device.

The Acting Commissioner of Patents, therefore, while overruling the decision of the Examiner of Trade Marks, that a trade mark, which is so intimately connected with an article as to be consumed with it, cannot be registered, yet affirms the decision of the latter officer, that the strip of tobacco leaf served more a mechanical than a distinctive purpose. He therefore denies it registration as a trade mark.

THE WOODEN PAVEMENTS OF CHICAGO.

The *Engineering News* severely criticises the present wooden pavements of Chicago, and declares they are a standing disgrace to everybody concerned in them. That the foundation of the paved streets is not only filled with earth hauled from adjacent excavations, but with all the rubbish, bricks, stones, manure, and kitchen slops that can be obtained in the neighborhood. Nothing is excluded from the fillings. The material is carelessly dumped, and there is no sufficient puddling, ramming or rolling. The solidification of the accumulated mass is anything but uniform. Upon this foundation, so unfavorable to permanence, the pavement is laid. As a consequence it soon shows settlement in places, and solidity is the general exception. There are some hundreds of miles of wood pavement in Chicago, but the *News* declares that there is scarcely a dozen miles fit to travel on, and this pavement has been laid only from three to five years. A Committee of the City Council have the subject in hand, and are earnestly seeking to improve the condition of things and determine what kind of pavement can be best adopted to replace these defective paved streets.

THE publication of the illustrated article on "Graphic Phonetics," to which reference was made last week, has been unavoidably deferred. It will appear at an early day.

THE WREN GAS WORKS.

We illustrate herewith an improved system of manufacturing illuminating gas from crude petroleum, which is cheaper and of higher candle power than ordinary coal gas, and in the production of which apparatus which is both simple and easily managed is employed. Tests made in our presence showed that a 6 foot burner, consuming Brooklyn city gas, gave less light than either a 1-foot or $1\frac{2}{10}$-foot burner using the petroleum gas, pressures being the same in both instances.

The common objection to oil gas is that it does not come to the consumer in the shape of permanent gas. That is, the hydrocarbon is not fully gasified, but is rather in a semi-vaporous state; consequently the gas leaves a deposit in the pipes, and smokes when burned. In the present system this difficulty is claimed to be obviated by the construction of the retort used, which is divided by longitudinal partitions into chambers. The oil entering one of these is vaporized, and the vapor then passes through the retort from end to end four times in traversing the compartments. As a large sized retort enters six feet into the fire, it will be seen that the gas traverses 24 feet of heating surface, and in doing so it changes from vapor into a permanent gas.

The engravings given herewith exhibit plainly the arrangement of the apparatus. Fig. 1 shows the construction suitable for fixed works. Fig. 2 represents a portable arrangement. The crude petroleum is held in the receptacle, A, Fig. 2, and thence passes, by the pipe shown, into the inverted siphon, B, which communicates with one of the chambers of the retort which is imbedded in the furnace. It will be noticed that this construction effectually prevents any danger of explosion of the retort, because as soon as the stand pipe chokes, the pressure in the retort meets the entering oil and stops the inflow—the oil running over the funnel of the siphon. Consequently no more oil can get in and no more gas can be made until the excessive pressure is relieved. The stand pipe conducts the gas to an ordinary washing vat, C, and thence it goes to the receiver.

We are informed that such an apparatus as is exhibited in Fig. 1, the retort being 6 feet in the fire, 13 inches high, and 17 inches wide outside, will produce as much as ten large 9 feet gas retorts, or 40,000 cubic feet of gas per day of 24 hours. A No. 2 retort and bench complete, size 5 feet, 6x4 feet, and height 6 feet, is claimed to make the equivalent of 25,000 feet of coal gas per day, or sufficient to supply a village of from six to eight thousand inhabitants, the works being run continuously day and night. If more gas is required two or more retorts can be placed in the same bench, the labor and fuel used being no greater. To produce petroleum gas the equivalent in illuminating power of 25,000 feet of gas, using the single retort, the manufacturer states that 300 lbs. of coal will be consumed in the 24 hours' continuous run. So that the cost of making the gas will stand as follows:

50 gallons of petroleum, at 6 cents	$3.00
¼ ton of coal at $8 per ton	2.00
Labor	4.00
Total	$9.00

This averages 36 cents per 1,000 feet of 80 candle gas. Actual practice has shown that over 4,000 feet of gas of the above candle power can be made from one barrel of crude petroleum which, even at the high rate of 10 cents per gallon, brings the cost of the gas to $7 for 4,000 feet. "This," says one user of the system, "gives a better light than $70 worth of coal gas at $3 per 1,000 feet."

We are further informed that the gas is unaffected by temperature, and that it retains all its properties over an indefinite period. It has been stored in a cylinder for four years, and at the end of that period it was found to have left no deposit and not to be impaired in its illuminating properties. It is well adapted for enriching coal gas of 11 candle or other low power. One part of petroleum gas to 5 parts coal gas makes a 17 candle light; 4 parts a 21½ candle light, and to 3 parts a 30 candle light. It is also suitable for heating purposes, and especially so for iron and steel working, owing to its freedom from sulphur.

The system is in use in Ashtabula, Ohio, where it supplies the town, the gas holder containing the equivalent of 50,000 feet of coal gas. Also in Shelbyville, Ind., Morris, Ill., and elsewhere, where its employment, we are informed, has proved uniformly successful.

Fig. 2.

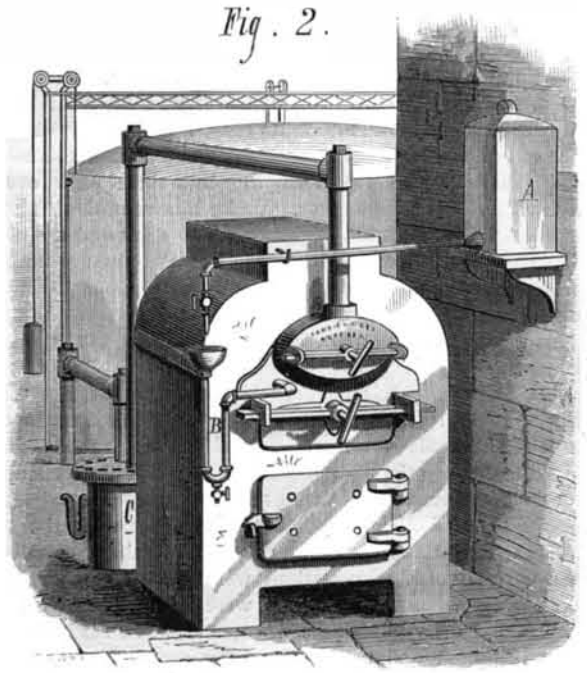


Fig. 2.—THE WREN PORTABLE GAS WORKS.

For further information address Dr. W. C. Wren, Wren's Gas Works, corner of Jay and Water streets, Brooklyn, N. Y.

Analysis of Petroleum.

Anything in relation to petroleum is presumed to be interesting at the present time, and for this reason it may not be out of place to notice that the chemical constituents of rock oil are carbon and hydrogen, generally ninety parts carbon and ten parts hydrogen, by weight. The proportions form about an equal bulk, carbon being heavy while hydrogen is light and volatile. Originally, they both existed as gases, and by their union they form protocarburet of hydrogen, which, being condensed, forms naphtha, or light volatile oil; and after the escape of a portion of hydrogen, the product is petroleum. By a further escape of hydrogen, the product becomes more solid, as bitumen, pitch, or asphaltum, the higher stages of condensation being cannel, bituminous and anthracite coal. The diamond is the purest state of solidified carbon, and is probably a crystalization of carbonic acid gas, unadulterated with hydrogen. Coal oil is artificially produced by converging coal into gas, adding a proper equivalent of hydrogen and then condensing the gas. Iron, sulphuric acid, and water, when placed in contact, give off hydrogen gas. Burning charcoal gives off carbonic acid gas. Mix these gases in proper proportion, subject them to heat under confinement, then allow the heated gas to escape through water, and the condensation will produce carbon oil on the surface of the water, but it will cost about ten dollars a gallon, even if you get through without an explosion.—*Osceola Reveille.*

Columbia Water Works.

The Columbia, Ohio, water works, which are upon the Holly system, have now been in operation about seven years. Since they were built, the city has abandoned the use of their entire force of steam engines, and the losses by fire have been decreased from an average, previous to the introduction of the water supply, of 65-100 of one per cent to 9-100 of one per cent upon the total tax valuation, while since 1870 the valuation of taxable property has increased, in round numbers, from $16,000,000 to $27,000,000 in 1876. The average daily amount of water now being pumped is about 1,600,000 gallons, the machinery with which the works are supplied being capable of furnishing 10,000,000 gallons daily for domestic use or 7,000,000 gallons under fire pressure. There are now in use in the city upwards of 600 improved water meters, from the Eagle Meter Co., of Brooklyn, L. I., which are recommended by the engineer in his report as giving better satisfaction than any meter yet tested. Since their introduction three years ago, the consumption has but slightly increased, notwithstanding the growth of the city. There are about 45 miles of cast iron pipe laid, in connection with the works, which was furnished by H. R. Smith & Co., of Columbus, to the credit of which establishment it may be said that not a single length has thus far been obliged to be taken up from any faultiness of the pipe.

Fruit Bread.

Mr. Campbell Morfit, of Baltimore, Md., has recently patented a new method of preserving the juice of lemons, currants, oranges, and other fruits. He mixes the juice, with or without sugar, with any kind of cooked meal, makes the mass into cakes and bakes them. These cakes are afterwards ground up and used to make a very palatable fruit farina. The fruit juices are said to retain their original flavor and character indefinitely, and thus the fruit bread may become a valuable and convenient addition to the daily ration of sailors, and soldiers in the field.

The Utilizations of Slag.

The principal utilizations of blast furnace slag, nearly all of which, with the exception of the employment of the material as road metal, have come into use within the past four years, are summed up in a valuable paper recently read by Mr. Charles Wood before the Iron and Steel Institute.

Slag sand is employed for making concrete, building blocks, mortar, and cement. The cement is composed of slag sand with common lime and iron oxides, and its strength is said to be little inferior to that of Portland cement, while its price is not one fourth. Slag sand, with about 10 per cent of common slaked lime, makes a good mortar. Concrete is either made from slag sand or slag shingle. The latter is well suited for covering roads and foot paths. Slag wool, produced by the impact of a steam jet with a stream of molten slag, is used for covering steam boilers, steam pipes, ice houses, and cisterns, as a protection against fire, and as a filter for chemicals. Paving blocks and building bricks are made by pulverizing the solid slag and then pressing the bricks in a press.

A remarkable property of the bricks is that nails can be driven into them without causing their splitting. The bricks harden with age. Glass is produced of an impure quality by Mr. Bashley Britten's process, the molten slag being taken in a ladle from the blast furnace and poured into a Siemens furnace, where soda and silica are added according to the quality of the slag used.

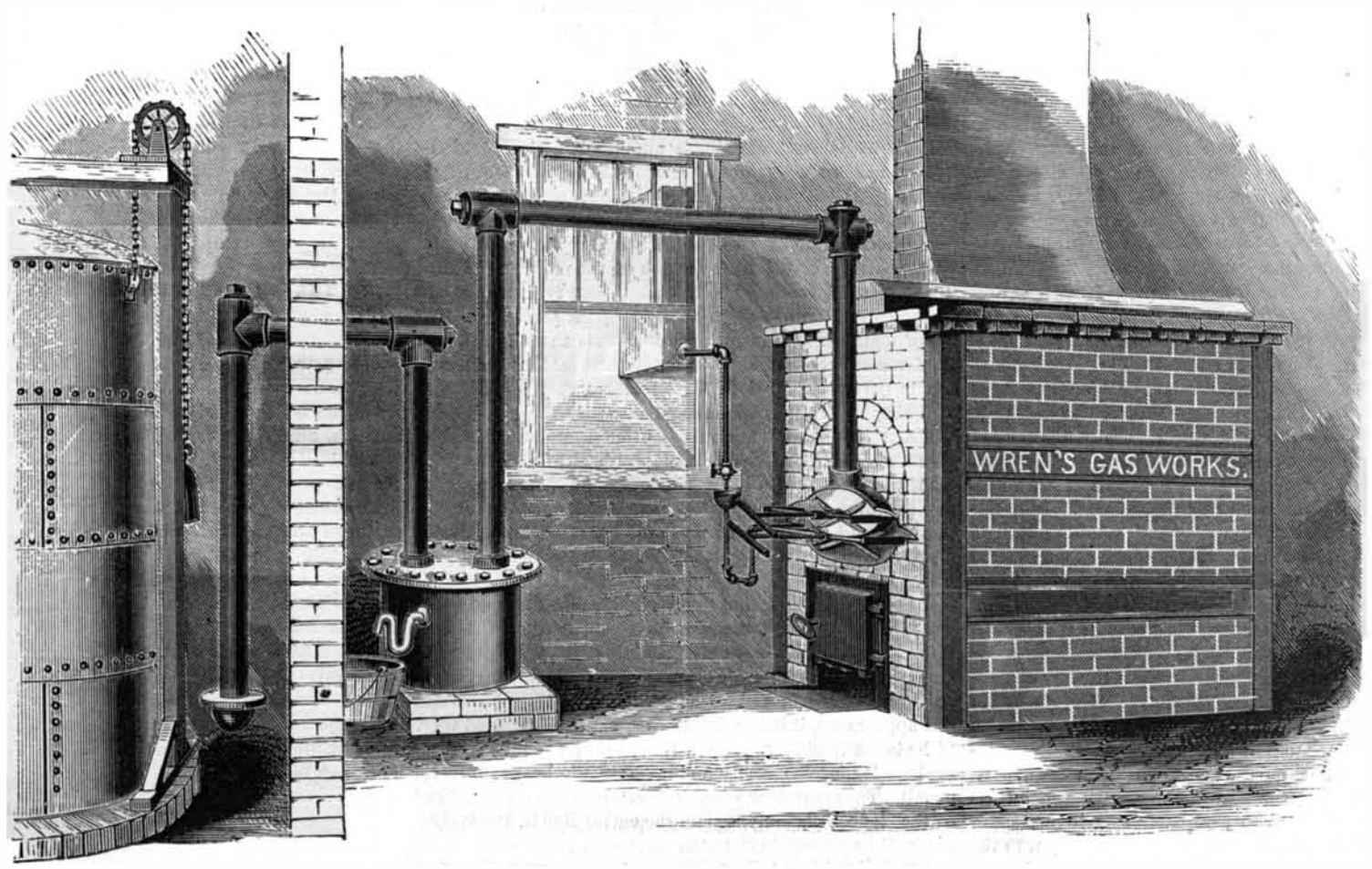


Fig. 1.—THE WREN GAS WORKS.

NEW STANDARD GRINDING MILL.

The annexed engravings represent a new standard heavy 20 inch mill, manufactured by Mr. Edward Harrison, of New Haven, Conn., with which is combined a pedestal and temporary dressing frame, on which the stones may be dressed. The mill is thus rendered complete, and despite its high power is portable, requiring nothing to be built for it to rest upon. It is claimed that the grinding surface of this mill, at 1,400 turns per minute, is equal to three quarters more than an old style 48 inch run at 175 revolutions per minute. The grinding capacity per hour is from 14 to 75 bushels and the weight 1,250 lbs. Fig. 2 shows the pedestal and case made in one casting, with a dressing frame bolted on and the burrs turned out upon it for dressing. The frame is made in two parts which are fastened one on each side of the case by tap bolts, the operation requiring but a few minutes.

This mill, in common with others of different sizes, which we shall illustrate in subsequent issues, is constructed in accordance with the principles, the demonstration of which the manufacturer states to be the result of his fifty years' experience in mill building. Mr. Harrisen believes that no process of milling can be perfect without the use of burr stones, and that such furnish the only proper grinding surface; that the stones should not be large and heavy, or horizontally superposed, or run at low velocity, but that on the contrary they should be light, hung vertically face to face, and driven at high speeds. In the former case there is mashing and over-grinding, in the latter there is neither, while high speed produces the necessary grinding surfaces.

In the present new machine, we are informed that the entire construction is of iron and steel except the burr stones. The runner stone is held as firmly to the spindle as a lathe head. All the bearings in which it runs are unusually long, which render it impossible for the spindle to get out of line. The faces of the burrs are protected from injury during the passage of hard or foreign substances through the mill by means of a very heavy safety spring and step, against which the end of the spindle always rests. The mill may be used for any kind of grinding, from wheat to quartz, and either wet or dry. It is hardly necessary to point out that for machines of this type a wide field of usefulness exists in this country. The heaviest tax paid by the consumer for cereals is that due to transportation, and when grain is cheap and transportation high, enormous quantities of the former are wasted because it does not pay to send it over long distances to be converted into flour and meal. The economy and portability of these mills renders such transportation practically unnecessary. Any farmer possessing a small farm steam engine—and no farmer working even a moderate sized farm should be without this most valuable adjunct—can with a Harrison mill grind his own grain and that of his neighbors, and thus secure a double profit. Horse power may be used to drive some of the smaller sized mills, which show a capacity equal to the old style 48-in. mills.

For further information address the manufacturer, Mr. Edward Harrison, 135 Howard avenue, New Haven, Conn.

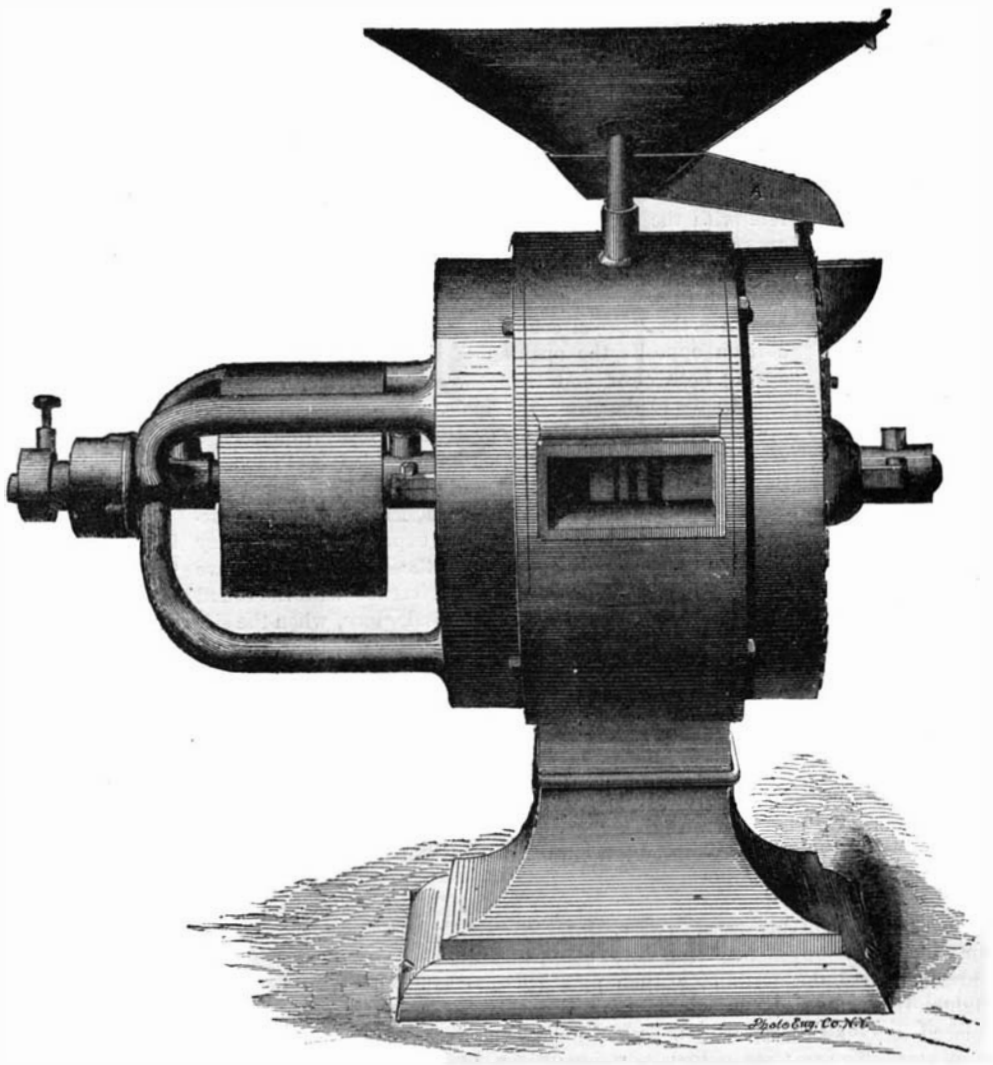


Fig. 1.—HARRISON'S NEW STANDARD GRINDING MILL.

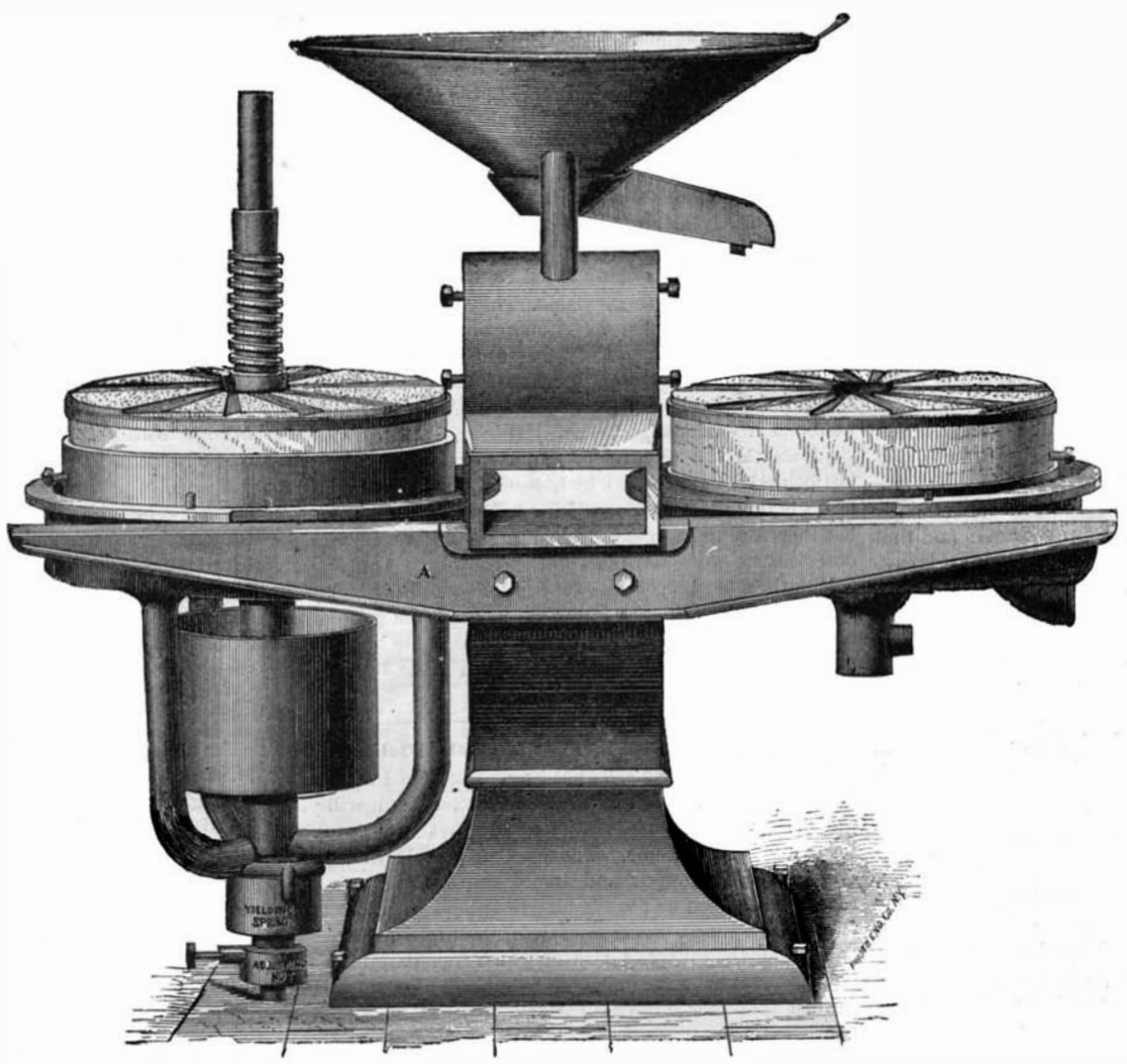


Fig. 2.—GRINDING MILL WITH COMBINED PEDESTAL AND DRESSING FRAME.

Petroleum in California.

It is now an established fact that we have oil in Ventura county in paying quantities. Out of the crude material a fluid can be made better than Pennsylvania oil—because, while it produces as clear a light, it is a safer oil, the poorest of it being non-explosive. It will pay to refine the light dark oil, and very well to refine the light green. Our advantages are not alone in the superiority of our oil, nor in the accessibility of our territory. One of the chief advantages, often overlooked by even our most sanguine oil prospectors, is in the proximity of our oil territory to the sea, and another is in the ease with which the refined oil can be placed on board vessels bound for foreign ports. A vessel at the end of the oil wharf, to be put at the foot of California street, can be loaded with ease from the refineries, which will extend from the wharf eastward to the corporate limits. Our pipe line will convey every gallon to the barrels in the holds of the vessels, thus saving all the immense expense of hauling and storing in hazardous places the oil barrels awaiting shipment. The nearness of the oil springs, facing as they do the great ocean, the highway of nations, and the facilities offered in loading the oil, are advantages not possessed by our Eastern producers, and will be greatly appreciated by them when they come to look at the field. Undoubtedly, with extensive and properly supplied refineries, we could now ship oil to the foreign markets cheaper than it is done from New York and Philadelphia. All the advantages are greatly in our favor, giving margins for profit in every direction.—*Ventura (Cal.) Signal.*

Lake Tahoe Lumber Operations.

A writer in *Appleton's Journal* says the lumber interest and the lumbermen sustain Glenbrook, Cal., and all the neighboring settlements. They are seen nearly everywhere in that beautiful region, which, once clothed from head to foot in pines, is being denuded to supply the Comstock mines with fuel for their hoisting apparatus and supports for their excavations. Penetrating a pine forest to its heart we find an industrious gang of vandals blasting trees out of beds upon which a tangle of roots seems to have fastened for eternity; and standing upon the foot hills we hear the sibilant grind of the sawmills, the crash of axes, and the dull reverberations of the blast. Following one of many devious wagon roads—one out of use, for instance—a curious litter of chips and shavings represents a forest sacrificed; following another road still in use, we discover the lumbermen at work carrying the havoc further.

On one side of Lake Tahoe a steam railway several miles long is used exclusively in the transportation of logs to the shore; the logs are towed across the water in immense rafts to Glenbrook, where they pass through the sawmills; and thence another steam railway, also used exclusively in the lumber service, extends to the summit of the divide. Down the eastern slope of the mountains, leading to the Carson river, flumes 20 and 30 miles long are carried over valleys and ravines on high trestle work bridges, and the wood is floated through them over another stage of its journey toward the mines.

"One morning as I was riding through Truckee cañon, a great wave and a cloud of spray leaped from the river into the air some distance in front of me. I went a few paces further, when, by the merest chance, my eye caught what was intended to be a sign—the lid of a baking powder box tacked to a pine stump, and inscribed with dubious letters: 'Look out for the logs!' In which direction the logs were to be looked for was not intimated, and I paused in uncertainty as to whether security depended on my standing still or advancing. Suddenly my mule shied round, and a tremendous pine log, 80 or 100 feet long, and about five feet in diameter, shot down the almost perpendicular wall of the cañon into the river, raising another wave and an avalanche of spray.

"This was to me a new phase of the lumber industry. A wide,, strong, V-shaped trough, bound with ribbons of iron which had been worn to silvery brightness by the friction, was laid down the precipice; and out of sight on the plateau above, some men were felling the trees, which they conveyed to the river in the expeditious manner aforesaid."

The English Channel Tunnel.

Operations connected with the submarine tunnel have already been commenced on the other side of the Channel, several pits having been sunk to a depth of about 110 yards. At the same time the French and English committees have definitely drawn up the conditions of working for the route. The property of the tunnel is to be divided in half by the length: that is to say, each company is to possess half of the line, reckoning the distance from coast to coast at low tide. Each company will cover the expenses of its portion. The general work of excavation will be done, on the one

hand, by the Great Northern of France, and on the other by the Chatham and South-Eastern companies, the two latter having each a direct route from London to Dover. All the materials of the French and English lines will pass through the tunnel in order to prevent unnecessary expenses and delay of transhipment, as in England and in France railway companies use each other's line, and goods can pass from one line to another without changing vans. It is understood that an arrangement will be established for a similar exchange of lines between all the English and continental railway companies when the tunnel is completed. The tunnel will belong to its founders. At the expiration of thirty years the government will be able to take possession of the tunnel upon certain conditions.—*Mining Journal.*

THE MEETING OF THE ACADEMY OF SCIENCES.

The semi-annual meeting of the National Academy of Sciences was recently held at Columbia College in this city. Professor Joseph Henry presided. Abstracts of the papers read are given below.

Professor Stephen Alexander in a paper entitled

LAWS OF EXTREME DISTANCES IN THE SOLAR SYSTEM

in which he showed the relations of various members of the solar system and the curious proportions existing between them, the whole indicating that in their organization they have obeyed the rule of law. The ratios of the planetary distances for example he pointed out as follows: Neptune to Uranus $\frac{2}{3}$; Uranus to Saturn $\frac{1}{2}$; Saturn to Jupiter $\frac{1}{2}$; Jupiter to Asteroid $\frac{1}{3}$; Asteroid to Mars $\frac{2}{3}$; Mars to Earth $\frac{2}{3}$; Earth to Venus $\frac{2}{3}$; and Venus to Mercury $\frac{1}{2}$, and then he showed that the difference between the distances according to law and in fact were small, not exceeding in any of the preceding instances ·078. Tables of relations for the systems of Jupiter and Uranus were given which also showed remarkable approximations of theory to fact.

VELOCITY OF VIBRATIONS IN EARTH.

General H. L. Abbot gave an account of his series of experiments to test the rate at which tremors from explosions are transmitted through the earth. He stated that for one mile through drift formation, a severe shock gives a velocity of about 8,500 feet per second. The rate for the great Hallett's Point (Hell Gate) explosion was about 8,300 feet per second for the first eight miles and about 5,300 feet per second for the first thirteen miles. These estimates enormously exceed those reported by Mr. Mallet some years ago to the Royal Society, the highest velocities obtained by him being not over a third of the lowest and a fifth of the highest noted by General Abbot.

Professor O. N. Rood presented two essays on the study of color, in which he described a means of determining the effects of a given mixture of colors by means of superposed diagrams, and also a method of comparing the relative brightness of colors.

Professor Alexander propounded the ingenious theory that the inner satellite of Mars is an asteroid which has traveled so near to the orbit of the planet as to be drawn and held within the sphere of the latter's attraction. Investigations of the orbits of several of the asteroids apparently confirm this view.

Professor Elias Loomis read a paper on the

ORIGIN OF STORMS

based upon data obtained by the United States Signal Service. He stated that our great storms begin in the neighborhood of the Rocky Mountains and that no example is found of any considerable storm arising on the Pacific Coast, south of Oregon. At the outset there is generally an area of several hundred miles diameter, through which the barometer stands at mean. On opposite sides of this area, generally east and west, at a distance of 1,000 miles apart, are areas of high barometer. The atmosphere in these side areas begins to move toward the central area. The currents thus established are deflected toward the right by the earth's rotation; and a diminished pressure results over the central area, when the inflow increases and comes from all sides. The area of low pressure assumes an oval form, but if the winds are very violent, it may be more nearly circular. With rotation a centrifugal force is developed which increases the depression, and within the latter there is an upward movement of the atmosphere which carries large amounts of vapor, which on cooling condenses as rain. The heat liberated by condensation increases the rarefaction of the area; and thus rain increases the force of the storm, though never originating it. The upward motion within the storm area takes place chiefly on the east side, so that the depression at the center is constantly transferred toward the east, unless however there is a great precipitation of vapor on the west side of the area, in which case the storm is held stationary or even moved westward.

Professor Joseph Henry summarized the results obtained by the Lighthouse Board to determine the utmost efficiency of

FOG SIGNALS.

These are (1.) Loud sounds spread rapidly from the mouth of a trumpet, and fill the whole horizon at the distance of a few miles. A parabolic reflector only holds the sound in the direction of its axis for a mile or two; at three or four miles the sound is heard as well behind as in front of the reflector. (2.) Sound is heard further when moving with the wind near the surface than when moving against it; but there are exceptions to this rule, and before a change of wind the sound is heard further in opposition than in the same direction as the surface wind. The exceptions are referred to the effect of an upper wind prevailing in a contrary direction. (3.) It is established that neither fog, snow, nor rain interferes with the transmission of loud sounds. (4.) A sound may become inaudible over a certain space and be heard again beyond it. This occurs when the wind blows against the direction from which the sound is moving; and is referred to the tilting of the front of the sound wave so that it passes over the head of the observer, and afterward descends. It is not due to a special condition of the atmosphere in a circumscribed locality by which the sound is absorbed, since there is no such effect when the sound is transmitted in an opposite direction—that is, with the wind. (5.) Independently of the wind, however, the air does not on all occasions transmit sound with equal facility. If intervening air be heated above or cooled below the general temperature, there will be refractions and reflections, which interfere with the progress of sound. (6.) "Sound shadows" are sometimes produced by projecting portions of land, or other obstacles. In these shadows the sound is temporarily diminished, or lost to the observer. (7.) The phenomenon known as the "ocean echo," is a return of sound from the horizon opposite the opening of the trumpet, and occurs during both clear and foggy weather, and with various winds. Its explanation is difficult.

The remainder of Professor Henry's essay described a very interesting series of experiments tried in Penobscot Bay, at a locality where the sound of a loud fog signal suddenly became inaudible for a considerable space, and beyond that was heard again. The experiments were very satisfactory in proving many of the propositions above enunciated, especially that the interference with the sound was due to the opposition of the wind, since, when the signal was carried on the vessel going outward, there was no such interruption to hearing the sounds on the shore.

Professor Alexander Agassiz read a very important essay on

THE DEVELOPMENT OF THE FLOUNDER,

which fish, in early youth, has one eye on each side of the head, like other bony fishes. After three or four months, both eyes are found on one side. Professor Agassiz reaches the curious conclusion that the eye slides around instead of going through.

The notion has been that this fish has its eyes both on one side, because its facilities for securing food are thereby increased. But why should not this process have, by natural selection, resulted in a fish that, when hatched, has both eyes on the same side? We do not find this peculiarity in fossil flounders, and no flounders have yet been found later than the tertiary formation. It is not true that all flounders are destitute of swimming bladders. There are other fishes as flat as a flounder, but with eyes on both sides of the frontal bone.

The sides of the flounder in the young are identical as to color. The color is due to the pigment cells, of which there are three kinds, red, black, and yellow. By contraction of these cells the different colors are produced. Now, if a flounder is left in a vessel with a gray ground it becomes gray; if on a black ground, black; if on a red ground, red. This power of changing color is, however, lost on the side where the eye is absent. The inference is that the nervous system, being affected by a change of color through the eye, originates the change of color in the fish, by means of appropriate contraction of the pigment cells. But when light was continuously admitted to the under side of the vessel holding the young fish, before its eye had gone to the other side, the process of development and the removal of the eye to the other side went on just as before. There was a great deal yet to be learned before this series of facts could be explained.

NEW ASTRONOMICAL THEORIES.

Professor Alexander brought forward a variety of evidence tending to indicate some envelope like an atmosphere for the moon, the hypothesis being based on the bright band seen around the moon during eclipses. This, the speaker thought, could best be accounted for by supposing an atmosphere to the moon, a thin remnant of ancient nebulosity, comparable to that which accompanies the earth and gives rise to the appearance of the aurora. Professor Alexander also propounded a curious geometrical theory, showing that the shadows thrown by celestial objects are retrograde, being left behind by the time which light takes to travel. The effect is that these shadows lean backward, and allowance has therefore to be made for a resulting difference between observations on occultations and on eclipses. Applying the calculations to observations on Jupiter's satellites the following is the result: There is a difference of ten seconds of actual time between all such observations made by means of occultations and those which have been made by means of eclipses.

A New Discovery of Potash Fields.

A deposit of potash salts has been discovered near Stassfurth, Germany, which is said to be so vast that it will yield these salts in sufficient quantity to supply the entire world for many years to come. The uses of potash salts in the arts are very numerous and important, and to obtain them recourse has been had to washing of sheep's wool, the liquor from which cane sugar is crystalized, and to sea water. The entire bed, the immense size of which was determined by borings made with the diamond drill, lies within the triangle formed by the three towns of Magdeburg, Halle, and Nordhausen, and is supposed to be due to the evaporation of an inland sea. The company, which is soon to begin working the mines, has obtained a concession of about 8 square miles.

Mechanical Stoking.

The *English Mechanic* gives the following summary of the various inventions for mechanical firing of furnaces, now in use in England.

It has been generally admitted that the theoretically correct manner of feeding fuel to the fire is to supply *upwards* through the bottom of the furnace from below. It is on this principle that the "Frisbie Feeder" and Mr. Holroyd Smith's "Helix" stoker are constructed; the latter giving a continuous supply of fuel, and therefore more correct in method than the former, whose supply is intermittent. This arrangement causes the smoke and gases, when passing upwards through the incandescent coal, to be thoroughly consumed. Another method is to supply fuel from a hopper to the front of the bars, which rotate slowly backwards, and the desired combustion is the result. Such is the construction of Regan's stoker, which has been very successful as regards economy, both in the quantity and quality of the fuel used, only small coal being burnt.

Another contrivance, applicable principally to marine boilers, has recently been patented by Mr. Regan, and this is known as the "jogglebar furnace." It allows of the agitation of the bars by means of a lever, so as to be free them from clinkers, and to keep the space between the bars clear for the passage of air. The bars are placed transversely, and nothing is easier than their removal and replacement when necessary.

Another method is that of the Henderson stoker, which provides that, as the crushed coal falls from the hopper, it is caught on the vanes of horizontal or vertical fans, and thrown by them over the fire in such a manner that an even distribution can also be made, as mentioned above, by means of a peculiar motion imparted to the bars. The rocking or other motions are produced by means of gearing, eccentrics, etc., driven either by shafting from the main engine or by a small supplementary one. At the same time the bars are either rocked up and down, or from side to side, revolve over spindles, or rotate backwards from the front *en masse* by means of horizontal shafts. In Dillwyn Smith's stoker there are two grates placed crosswise in the same fire, and these are so arranged that the gases given off by the coal on the first grate are burnt, with perfect combustion, on the second. It is unfortunately impossible to speak with any certainty on the comparative merits of the various stokers in use, as no competitive trial has been made. Some inventors assert that the saving effected by their stokers is as high as 30 per cent. Of course such may have been the case where they have been erected, but it only proves that where such an immense percentage is claimed there must previously have been a shameful waste of material. By the use of mechanical stokers hard labor is, of course, almost entirely dispensed with, the filling of the hopper and the raking out of the ashes constituting the only manual work. Sometimes, however, even the filling of the hopper is performed by mechanical means. Such is the case at the General Post Office, where four of Vickers' stokers are at work. They use only small coal, which is lifted by an automatic arrangement, driven by an engine of a small horse power. The coal is then delivered into a trough about twenty yards in length, in which works a helical screw. The fuel is thus forced forward and dropped in measured quantities into the hoppers. At the Royal Mint mechanical stoking on the Juckes' principle has been in active operation for many years. Mechanical stokers can be used with equal benefit on board ship, where an even fire can be kept up in spite of heavy seas, with the additional advantage of a comparatively cool temperature of stokehole. Thus far all the objections advanced against hand stoking have been overcome by these useful labor-saving and money-saving machines; and though the price of some of them occasionally appears rather high, they invariably repay their cost in a short time.

Solar Radiation and Sun Spots.

In an essay on the above subject in *Nature*, Mr. S. A. Hill, of Allahabad, India, considers it to be possible that the excess of tropical and oceanic rainfall in maximum sun spot years may be caused by precipitation near the place of evaporation, owing to the diminished force of the trade winds and anti-trades at those periods, and that if the winter rainfall of Europe and America were examined it might show an excess in minimum sun spot years, derived from vapor brought by an unusually strong upper current from region of great evaporation in the South Atlantic. The registers of nearly twenty years show that the winter rainfall of India, north of the tropic, is probably subject to such a periodic variation, and if this surmise be verified in the future the author thinks, it may prove of the greatest economic importance.

AT a recent meeting of the French Academy of Sciences, M. Duplessis called attention to the infection of grain through the agency of floods in water courses. A case was noted of a field of rye which became partially infected with smut, owing to a river having overflowed its banks and covered a field further up stream, which was already infected. The flood had been the means of communicating the disease or fungus.

THE bakers and pastry cooks of Paris have been forbidden to burn in their ovens wood which has been painted or impregnated with any metallic salt, as it is believed that the articles of food may be rendered deleterious through the agency of the same.

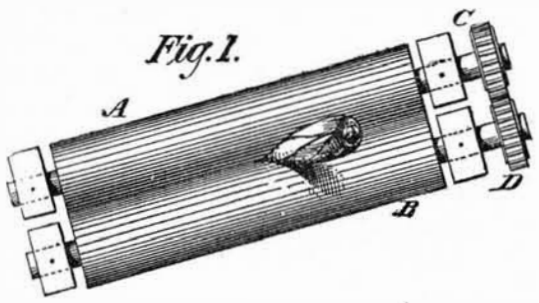
[From a Correspondent of the Scientific American.]

SOME INVENTIONS FOR HUSKING CORN.

The production of a machine to successfully husk corn has of late years engaged the attention of many mechanics. Numerous devices have been made and patented, but none of them has thus far been adopted by the corn raiser. Many of the earlier machines were intended to first strip the ears from the stalk and then strip the husk from the ears. It is the latter operation which has so far baffled the efforts of inventors.

The first method tried was that of providing two revolving inclined rollers, made of an iron rod covered with a rubber tube. The rolls were kept in contact by springs acting upon the journal boxes, which were made to slide. The ears of corn were fed in at one end of the apparatus, and traversed by gravity along the two rollers, as shown in Fig. 1. The rollers, A B, are revolved by the gear wheels, C and D. E represents an ear of corn sliding down between them. The action of the rolls was designed to strip the husk, by friction, from the cob, the ears passing down the rollers and falling at the end. The husk was to be carried through the rollers and fall beneath. This simple device

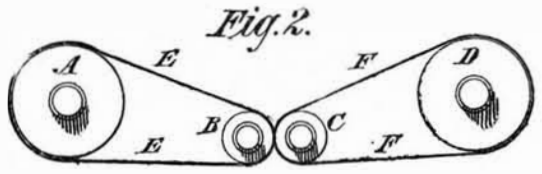
Fig. 1.



would husk dry corn fed into it in small quantities, say, one ear at a time, providing that the husk was dry and somewhat ragged or loose upon the ear. It would husk small sized ears much more readily and perfectly than the larger sized ones. Its defects were that the rubber rollers elongated, and the silk lapped around the ends.

Another inventor used the device shown in Fig. 2, in which A B are one pair and C D another pair of rollers. E E and F F are endless bands, made of sheets of rubber pass-

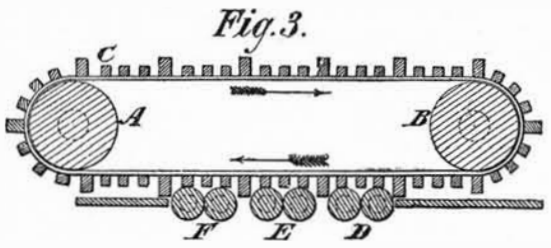
Fig. 2.



ing over their respective pairs of rollers, of which B and C were the ones driven. This is the representative of numerous devices, the fault of which is that when several ears of corn fall upon the rollers together, the top ones are apt to ride without coming into contact with the rollers, and therefore pass out unhusked. This defect is incident to all machines of this class, in which gravity alone is depended upon to feed the unhusked corn through the rollers.

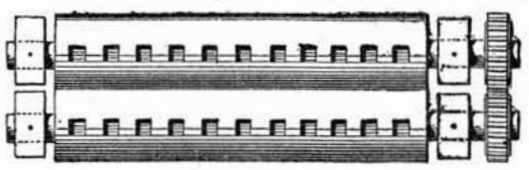
The next step was to give the corn a positive feed by means of an apron. This is shown in Fig. 3, in which A and B are two revolving drums around which passes a leather belt at each end. Fastened to the two belts were strips or slats

Fig. 3.



of wood, C, every fourth one being higher than the others, being designed to take hold of the corn and carry it to the rollers. It was found that the short slats would press the ears of corn to the rollers and leave them there, the high slats carrying them off after the husks were removed. A difficulty was found, that to use such a feed, the corn requires to pass across and not along the rollers, and thus necessitating the use of at least three pairs of rollers, as shown at D, E, and F. Rubber rollers were first used, but being found deficient, eccentric rollers were substituted, the object being to induce friction upon the husk by reason of the eccentricity of the rollers. Next, rollers were made composed of small disks of wood, supposing that the end grain of the wood would afford a sufficient grip upon the husk without catching hold of the silk. These rollers were found defective in husking capacity, and a resort was made to iron rollers, the first of which were made with isolated cavities about half an inch wide by three quarters of an inch long, as shown in Fig. 4. The edges of these slots were intended to catch hold of the husk and carry it between the rollers. There were two rows of the slots in each roller, and the rollers were so geared together that the slots of each would simultaneously grip the husk on each side of the ear. After the slot edges had thus gripped the husk and carried it down between the rollers, it was intended to have the plain part of the roller behind the row of slots strip the husk from the ear. These rollers were found to husk some corn well

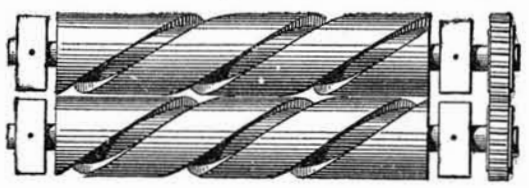
Fig. 4.



enough, but they were not adapted to husk in sufficiently large quantities, nor to husk various sizes and kinds of corn.

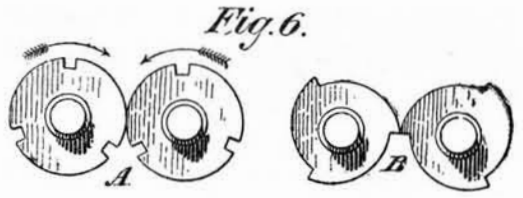
The next invention was to make the rollers with a spiral groove, as shown in Fig. 5. This was found to be an improvement upon large ears of corn, but was found deficient in husking when the husk was damp or not held close upon

Fig. 5.



the ear. The grooves were then changed in shape, the back edge being eased off, as shown in Fig. 6, in which A represents an end view of the rollers of Fig. 5, and B an end view of the grooves as changed. By this change keener husking edges were obtained, but the liability to shell the corn from the cob was increased, the edges of the grooves being so

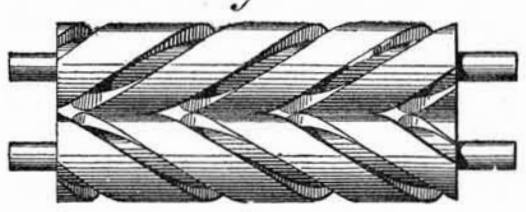
Fig. 6.



prominent as to shell a large proportion from some ears while other ears could be passed through the machine several times in succession without ever being husked.

Another inventor conceived the idea further, and made more husking edge, but with the former style of groove. His first idea was to make iron rollers as represented in Fig. 5, but with right and left hand grooves, as shown in Fig. 7. The object being that the edges of the grooves would grip the husk simultaneously on opposite sides of the ear. This plan was abandoned because of its inadaptability to

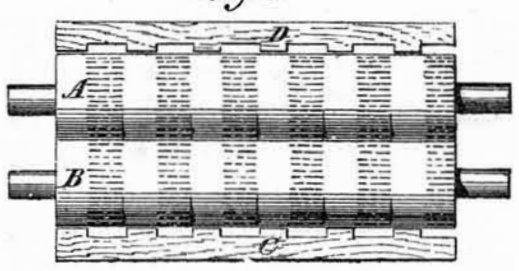
Fig. 7.



husk ears of varying sizes. The amount of twist suitable for small ears being inadequate for large ones, and *vice versa*.

Another inventor conceived the idea of giving a large and continuous amount of husking edge by roughing the surface of the rollers, but in that a new difficulty was encountered, as the silk and husk clung to and wound around the rollers, thus increasing their diameter in places and throwing them apart. To remedy this defect, plain spaces were left, and a scraping attachment was added as shown in Fig. 8, in which

Fig. 8.

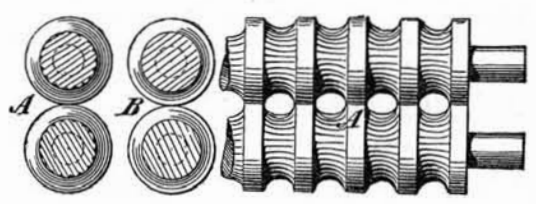


A and B are the rollers, and C and D are the scrapers. It was found that the silk and damp husk, as cleaned from the plain spaces, would lap around and clog the roughened parts, and the device was abandoned.

During all these experiments it was found that ears of corn that would pass over rollers several successive times, without being husked, would be denuded very readily if the husk was jagged by some sharp instrument like a knife, even though the jagging were performed upon one small spot upon the ear only; and the next experiment was to attach to the slats of wood which formed the feed apron, as shown in Fig. 3, a series of sheet iron strips serrated at the edge similar to a saw, but it was found that these edges would sometimes take hold of the ears and drag them unhusked through the machine.

Another inventor achieved considerable success by making a roller with a deep spiral groove, and placing at the bottom of this groove a row of small cylindrical projections which were intended to loosen the husk so that the groove edge would remove it. Another effort was made with the rubber rollers, by giving to the surface of the rollers a series of raised rubber projections intended to firmly grasp the husk and drag it off, but this was found to not equal the expectations formed of it. One more effort is worthy of note. This was to pass the stalks of corn, butt end first, through two pairs of rollers, such as shown in Fig. 9, in which there is shown at A a pair of rollers containing a series of grooves, each groove being provided with a series of husking edges of a form made in the same way as shown in Fig. 6, at B. Behind these rollers was another plain pair, as shown in the end view of Fig. 9, at B, the idea being to pass the corn stalks, butt end first, through the revolving grooved rollers, which would carry the stalk through to the

Fig. 9.



rollers, B, which were made to revolve somewhat faster than those shown at A, so that when an ear of corn met the grooves, the two pairs of rollers, A and B, would pull it violently and firmly against the grooves, the edges of which would cut off just so much of the end of the ear as would detach the husk therefrom; but only a partial success, however, was by this method obtained.

A New Glacial Period in Progress.

A Swedish paper states that in the Bay of Komenok, near Koma, in Greenland, fossil and very characteristic remains of palm and other trees have been discovered lately, which tend to show that in these parts formerly a rich vegetation must have existed. But the ice period of geologists arrived, and, as a consequence of the decreasing temperature, this fine vegetation was covered with ice and snow. This sinking in the temperature, which moved in a southerly direction, as can be proved by geological data, that is, the discovery of fossil plants of certain species, seems to be going on in our days also. During the last few years the ice has increased far towards the south; thus between Greenland and the Arctic Sea colossal masses of ice have been accumulated. On European coasts we now frequently find ice in latitudes where it never existed before during the summer months, and the cold reigning upon the Scandinavian peninsula this summer results from the masses of ice which are floating in the region where the Gulf Stream bends towards the British coasts. This is a repetition, says *Nature*, of the observations made in the cold summer of 1865. The unaccustomed vicinity of these masses of ice has rendered the climate of Iceland so cold that corn no longer ripens there, and the Icelanders, in fear of a coming famine and icy climate, begin to find new homes in North America.

Petroleum for Removing Scale in Boilers.

Petroleum has recently been successfully employed for the removal and prevention of scale in steam boilers, also for the removal of deposits from water pipes where the water contains large quantities of lime. It has the effect of penetrating and rotting the scale, causing it to become porous and disengage itself from the surface to which it is attached. It is a very simple remedy and can be used in small quantities without any difficulty whatever, say about a quart every week for a twenty-five horse power boiler, and in quantities more or less, according to the size of the boilers. It may be introduced in the feed water or through the safety valve, or in any way most convenient for that purpose; but to be effective it must be pure. The heavy oil used for lubricating purposes in cold situations is the most efficient, as the refined oil of this description is of no use, as it is soon expelled by the heat.—*Oil, Paint and Drug Reporter.*

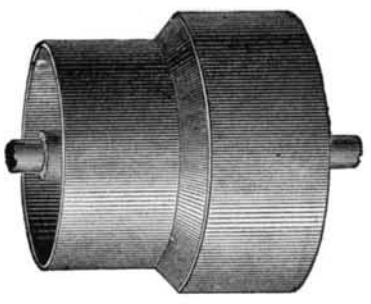
Progress of the Western Union Telegraph Company.

On the first day of July, 1877, there was in operation 76,955 miles of line, 194,323 miles of wire. and 7,500 offices. There are in use on the lines of the company, 10,306 sets of instruments for reading by sound, 9 printing instruments, 1,639 recording instruments, 220 repeaters, 183 duplex instruments, 113 quadruplex instruments, 98,558 cups of main battery, and 21,996 cups of local battery. The number of messages transmitted during the year ending June 30, 1877, was 21,158,941, being an increase of 2,429,374, or 12·9 per cent. This includes press reports *sent*, reduced to messages on the basis of 30 words to each message. The average tolls upon each message for the year were 43·6 cents, average cost 29·8 cents, and average profit 13·8 cents.

STREIT'S NEW BEVEL FLANGE LOOSE PULLEYS.

The chief difficulty encountered in the use of tight and loose pulleys, is that of keeping the loose pulley properly lubricated when the machine is at rest, and, consequently, while the loose pulley is revolving upon its shaft. The combined influences of the pressure of the belt, produced by its tension, and the centrifugal force from the revolution of the pulley, tend to force out and throw off the lubricating substance, leaving the shaft and bearing of the pulley exposed to all the effects of friction, which is increased in a ratio corresponding to an increased velocity of the pulley. By a departure from the usual line of invention, it is now claimed that these objectionable features have been overcome in a remarkable degree by the use of a loose pulley having a smaller radius than its accompanying tight pulley, the belt being conveyed from the loose pulley to the tight pulley by means of an incline, which is shown in the accompanying illustration.

The principle involved in this device consists in relieving the loose pulley from the effects of the tension of the belt. The belt, when upon the tight pulley, has a tension requisite for driving the machine, but when moved to the loose pulley, the lesser diameter of which reduces the distance between the outer peripheries of the driving pulley and loose pulley, practically lengthening the belt and reducing the friction on the bearing of the loose pulley to that resulting from the belt alone.



These pulleys, we are informed, were subjected to a thoroughly practical test at the recent Centennial Exposition at Philadelphia, where the results obtained were such as to insure the success of the device, which has since been demonstrated in evidence received of their continuing to grow in favor with those having them in use.

A patent for this improvement—"The combination of a tight pulley, a loose pulley of lesser diameter, and a means, in the nature of an incline, for guiding the belt upward from the smaller to the larger pulley"—was granted to J. A. Fay & Co., September 25, 1877; and they are placed upon all counter-shafts constructed by the above-named firm, and from whom any further desired information can be obtained by addressing J. A. Fay & Co., Cincinnati, O.

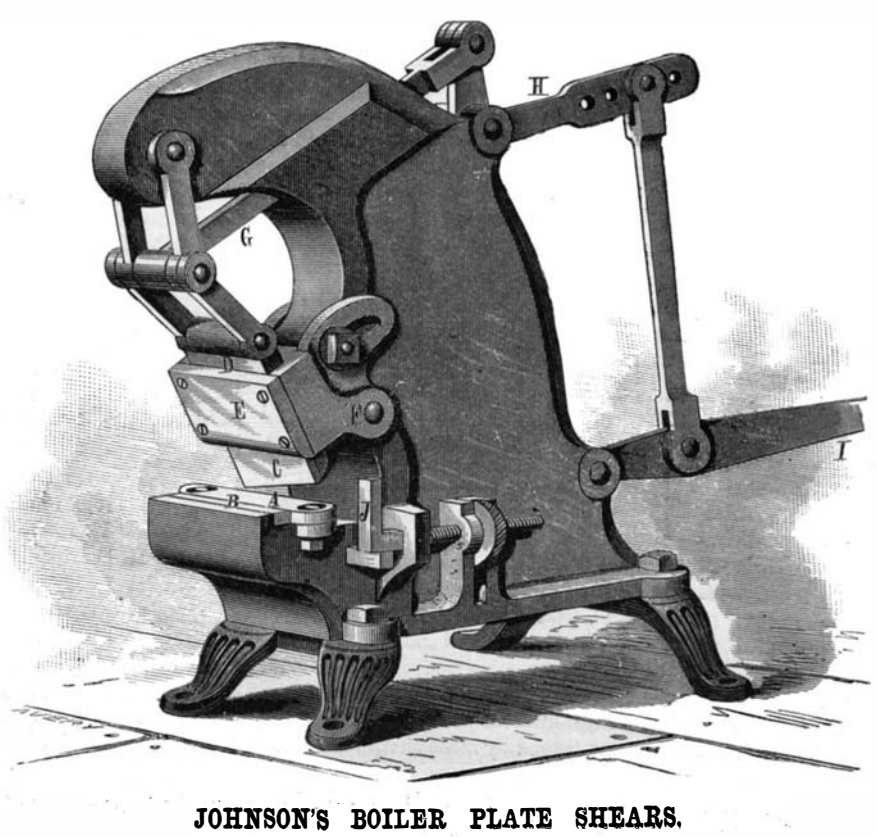
How to Kill Entomological Specimens.

A correspondent says the method of killing entomological specimens, by putting them in a glass cylinder closed at one end, and then inserting a wad of tow saturated with ether on closing the other end of the cylinder, is very good, but when putting the insect, especially butterflies, in the tube, it flutters its wings, and so loosens some of the colors. A better way is to put a small drop of chloroform on the insect's head as soon as it is caught, and the effect is that it instantaneously dies. Not even a relaxation of the muscles being perceptible.

JOHNSON'S IMPROVED BOILER PLATE SHEARS.

The improved boiler plate shearing machine herewith illustrated is claimed to be solidly constructed, not liable to become out of order, and to be capable of being expeditiously changed to give any desired bevel upon different thicknesses of plate. A is the stationary blade attached by bolts passing through lugs formed upon the side edges of the bed plate. It is held against outward pressure by a wedge, B, driven between its outer edge and a flange formed on that of the bed plate. The movable plate, C, is bolted to a holder, D, which works in a guide socket, E, which is pivoted to the standard at F. Lugs having curved slots are formed upon said guide socket, and through these slots pass bolts, so that by adjusting the latter the sockets may be placed to give any desired bevel to the cut. To the upper corners of the holder are pivoted bars, which in turn are pivoted to another pair of bars, and these last to the end of the standard. At the point of meeting of the pairs of bars is pivoted a connecting bar, G, which passes back through the standard and is connected to the short arm of the bell crank lever, H, which is pivoted to the standard, as shown. To the long arm of this lever is adjustably connected a connecting rod, which communicates with the operating lever, I. At J is a guide, which can be adjusted by the hand nut shown, and which serves to keep the plate parallel with the blade while being cut.

Patented through the Scientific American Patent Agency, May 15, 1877. For further information address the inventors, Messrs, J. W. & R. Johnson, Ferrysburg, Ottawa county, Mich.



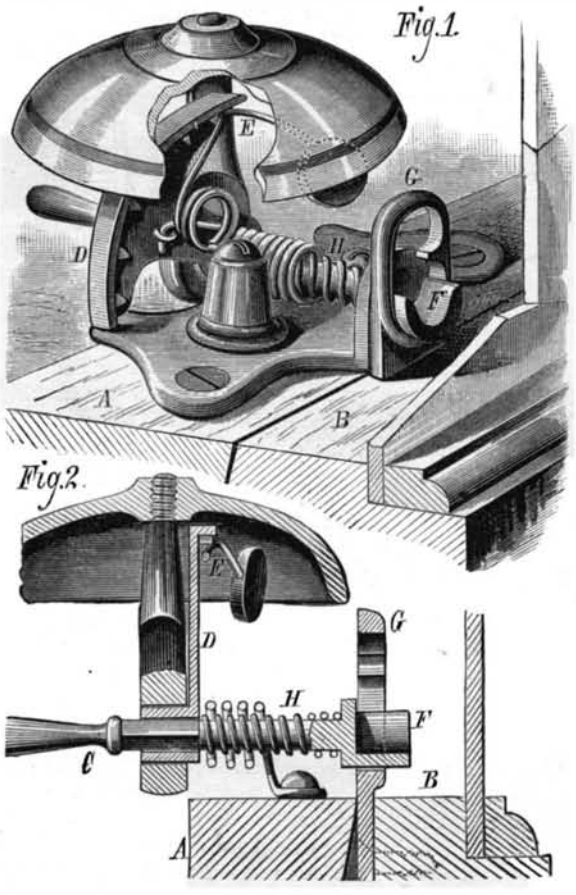
JOHNSON'S BOILER PLATE SHEARS.

IMPROVED BURGLAR ALARM WINDOW FASTENING.

The annexed engraving represents an improved fastener and burglar alarm particularly applicable to securing windows, shutters, and other similar devices, which is so constructed that in case of any one attempting to raise or lower the lower or upper sash without first releasing a bolt, a bell is sounded and an alarm given. Fig. 1 is a perspective and Fig. 2, a sectional view.

A represents the top bar of the lower sash, and B, the bottom bar of an upper sash, of a window.

To the bar, A, is affixed the main framing of the device by means of screws. On the frame is a standard, which supports the bell shown.



C represents a bolt, which is supported in bearings in such manner that it is capable of a to-and-fro as well as a revolving motion. Upon the bolt, C, is mounted a semicircular disk, D, which is provided with a circumferential rim, and a series of serrations or projections, adapted to engage with and operate the arm of the gong hammer, said arm being formed on the end of a spring coil, which is mounted on a standard, forming part of the main framing, C.

The bolt, C, at one end is provided with a handle, and at its opposite end with a semicircular locking piece, F, which, when the bolt is thrown, passes into a recess, in a plate, G, carried by the bar, B.

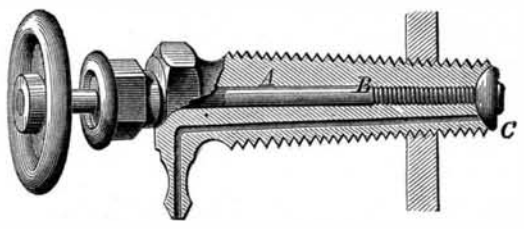
A projection is formed on one side of the recess, the object of which is that, in the event of either of the sashes of a window being attempted to be raised or lowered without the bolt being withdrawn, the projection will immediately come in contact with the semicircular locking piece, and cause the same to make a partial revolution, and in so doing cause the disk, E, to also revolve, thereby operating the arm and ringing the gong each time a serration or projection passes said arm.

The bolt is kept forward in a locking position (when not otherwise held by the handle) by means of a spring, H. Around this spring is also arranged a second spring, adapted to bring the bolt and disk back to their normal position when they have been revolved.

Patented August 21, 1877. For further particulars relative to purchase of patent rights address the inventor, Mr. George Saurbrey, 195 East Livingston avenue, Columbus, Ohio.

BORDEN'S IMPROVED GAUGE COCK.

The object of this invention is to provide a gauge cock that will not allow of the escape of hot water or steam if it should be broken off outside of the boiler shell. In the engraving, A is the body of the gauge cock, which is bored longitudinally through its center, and threaded internally to receive the spindle, B, upon which a thread is cut that fits the internal threads of the body, A. The inner end of the body is concaved to receive the convex valve, C, which is attached to the end of the threaded portion of the spindle, B. The outer end of the spindle, B, is provided with a hand wheel, and is surrounded by a stuffing box at the outer end of the body. A passage runs lengthwise through the body, A, the inner end of which terminates at the annular



groove cut in the valve seat, and is closed by the valve, C, and its outer end terminates in a nozzle. The body, A, is threaded externally and screwed into the boiler in the usual way. The internal thread of the body, A, and the thread of the spindle, B, extend from the valve and valve seat outward beyond the boiler shell, so that if the gage cock should by accident become broken outside of the boiler shell the valve would be undisturbed, and the accidents that usually follow the breaking of gage cocks entirely avoided. The valve of the cock is opened or closed by turning the screw by means of the hand wheel.

This invention was patented through the Scientific American Patent Agency, June 19, 1877, by Mr. Henry L. Borden, of Elgin, Ill.

Is There a Resisting Medium in Space?

Mr. C. B. Warring, of Croton-on-the-Hudson, has written to the *Tribune*, suggesting that the rapid motion of one of the newly discovered moons of Mars may be explained without impugning the nebular hypothesis, by the supposition that there is a resisting medium in space. If at the time this moon was left behind by the shrinking nebula of Mars, its distance from the center of that nebula was comparable with that of our moon from the earth, and it was afterward drawn nearer to the planet because of the check occasioned by a resisting medium, its time of revolution would be shortened as it approached the planet. On the other hand, the revolution of the planet itself would be little affected by the resisting medium; but to whatever degree it was affected, its speed of rotation would be decreased, and hence the difference between the times of the planet's rotation and the satellite's revolution would become greater. Mr. Warring regards the discovery of the swift moving satellite as evidence in favor of the presence of a resisting medium in space. He suggests as problems not less difficult of solution, the questions why the eighth satellite of Saturn is 12° or 14° out of the plane of the other satellites and the rings of the planet; and why our moon is 18½° nearer the ecliptic than the plane of the earth's equator.

Substitute for Tea and Coffee.

In an official report by Mr. O'Conor on the general condition and economic progress of Brazil, he states that the cultivation and preparation of sterva-maté, which is largely exported from the province of Paraná to the neighboring countries of Uruguay, Paraguay, and the Argentine Confederation, has not yet become an article of commerce for European markets, and this will be regretted by those who have experienced what a capital substitute it is for either tea or coffee. In its nature more fortifying and alimentary, and far more wholesome, it can be bought at a price so moderate that it would easily be within the means of the poorest inhabitants of Ireland or Scotland; and it is said there can be no doubt that if it were once known it would be extensively used in place of the far more expensive and sometimes adulterated beverages of tea and coffee. A small sum has been appropriated by the Minister of Agriculture, with a view to make this excellent plant

known in Europe, and it is sincerely hoped that the experiment will be productive of beneficial results.—*London Grocer.*

What They Say About Us in India.

Campbell, the poet, in his poem on "The Last Man," has written verses which have attractions for most men, more or less. The Bible tells us the history of the first man, and unsatisfied curiosity peers forward, and wants to know the situation and position of the last man.

Almost numberless have been the speculations on this topic. The raciest of them which we have seen is that which we give elsewhere from the SCIENTIFIC AMERICAN, and to all of our readers who can enjoy genuine humor, based on good scientific knowledge, we commend the perusal of this very clever skit. *En passant,* we may say that for good sound scientific knowledge, clear cut and luminous engravings, combined with ability and liveliness in general conduct, the SCIENTIFIC AMERICAN has no peer. It is *sui generis.* There are English journals which give more scientific matter, but there is none which has such decided characteristics as those that make this publication peculiarly unique. One is sure to know from it the latest results of science put in the most attractive form, realizing, indeed, Tennyson's line:

"The fairy tales of science and the long results of time."

—*Madras Times.*

Ventilation of Soil Pipes.

At a recent meeting of the New York Board of Health it was resolved that soil pipes in tenement houses and vaults, when within twenty feet of any dwelling, should be carefully ventilated by pipes to be laid as the Board directs. After November 1, violations of this resolution will be prosecuted civilly and criminally.

ARCHER FISHES.

The chelmons are a species of fish indigenous to the Indian Ocean. They are divided by naturalists into two varieties, distinguished respectively by the short and long nose or snout, and by the disposition of the very beautiful colors which their bodies exhibit. The short-nosed chelmon has a greenish hue over its body; the fins are green with blue reflections. A black spot surrounded by a pearly white circle appears on the dorsal fin, and on the body itself are bands of blue and mother-of-pearl. The long-nosed chelmon, which is represented in Fig. 1, is of a citron yellow color. There is a large black spot beside the forehead, the front of which is azure blue. The eye is of a bright rose tint; and on the anal fin is a circular spot of black bordered with white.

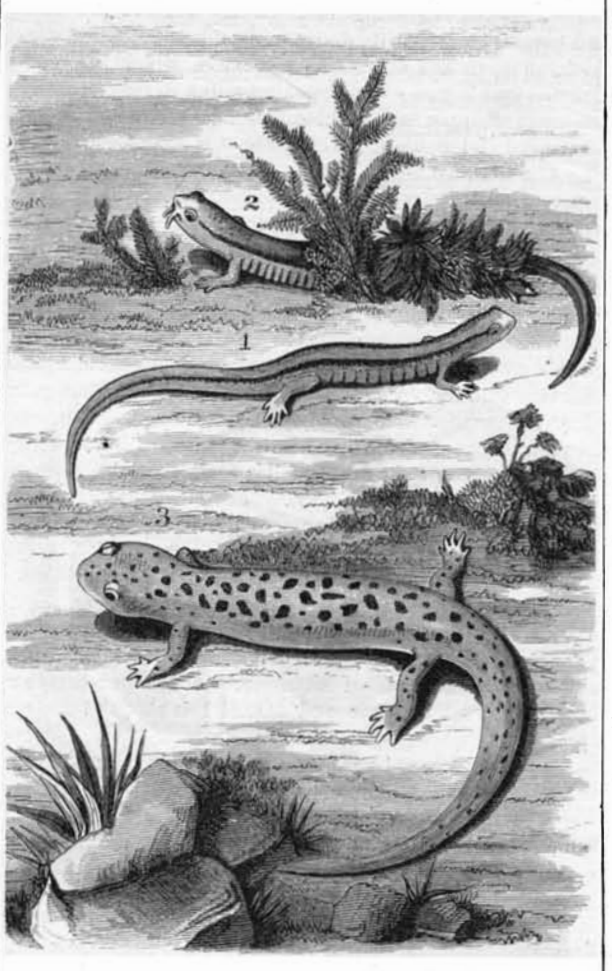
This fish has a singular way of obtaining its food, which has earned for it the name of archer fish or fish pump. It frequents the mouths of rivers, and especially shallow places, in search of the insects which exist on the marine plants, the stalks of which rise a little above the surface of the water. As soon as the fish spies its prey, it approaches cautiously as near as possible, and then, raising its snout above the surface, squirts out a fine stream of water with considerable force and unerring aim. The jet is often projected over a distance of 6 feet. The insect struck is stunned and falls into the water, and there is easily captured by the chelmon.

The representation of another group of archer fishes, and to which this name is more specifically applied, is depicted in Fig. 2. The body is elongated, the line of the back being nearly straight, while the belly is strongly curved. The color is olive brown, or yellow, marked with large oblong spots or bands. Although the mouth of this fish is of entirely different formation from that of the chelmon, it takes its prey in precisely similar manner. The Chinese keep the fish in tanks in their dwellings, as pets, feeding them by presenting the insect on the end of a straw, from which the fish knocks it off by ejecting his water jet.

THE RED AND THE TWO-LINED SALAMANDER.

BY C. FEW SEISS.

You may, perhaps, have seen in some brook or spring, a bright red, lizard-like animal, either lying motionless at the



bottom, or wriggling beneath a stone at your approach, to escape observation. This is the red salamander, Fig. 3, *spelerpes ruber,* Daudin. The whole superior surface of this animal, in life, is vermilion red, thickly spotted with black, the spots smallest on the head and tail, and disappearing half way down the sides of the body. A few small spots on the under jaw and the legs. Beneath, spotless orange-red. The eyes are prominent, with a golden yellow iris; a dusky spot before and behind the pupil; pupil oval and black. The dark spots on the iris give it a linear appearance. It varies in size; I have seen it from 3½ to 6 inches in length.

Although so bright and pretty during life, a few hours' immersion in alcohol changes its bright vermilion color to a dirty white. It seems nonsensical to label a uniform soiled white, black-spotted animal, the *s. ruber.* Dr. Holbrook says "it is a land animal, and is found under rocks, fallen and decaying trees, etc." This is not the case with the red salamander in Pennsylvania and New Jersey, for I have never seen it captured out of the water. The finest specimen I ever saw was in a spring of cold water, and as the time was the middle of summer, it is not probable it had gone there only to deposit spawn. It can, however, remain out of water for a long time; specimens in our aquarium often remained upon floating objects for several successive hours. It is quite possible it could live in extremely moist situations for months at a time.

The food of the red salamander consists of insects and small earth-worms. In the aquarium it is showy and interesting, but as it is an air-breathing animal, it should be furnished with the means of quitting the water when it is so desired.

Another animal belonging to the same genus as the preceding, and frequently met with in Pennsylvania, is the two lined salamander, Fig. 1, *spelerpes bilineatus,* Green. It is a terrestrial species, but frequents only moist places, and most generally in close proximity to a stream of water or spring.

Occasionally during the breeding season two barbels or cirri appear upon the upper jaw of the male, between the nostrils and the lip. Green's *salamandra cirrigera* appears to be a male of this species thus adorned (see Fig. 2). The use of these barbels is unknown, but they seem to be simply ornamentations, to show, perhaps, when the possessor pays his addresses to the females, that "the sign of man is now upon his chin!"

The young or larva of this, as with other species, are provided with gills, and breathe water only. When the gills disappear it becomes a perfect salamander, and respiration is performed with lungs. The young *bilineatus* resembles the adult in color, but the colors are less bright, and the lines less distinct. In mature animals the color is brownish yellow above, with a black line on each side beginning behind the eye, extending along the flanks, and lost near the end of the tail. Beneath, bright yellow. It is a small species, rarely exceeding three inches in length. In activity, it far surpasses the red salamander, and you will learn, as I have, "you must be quick with your hand if you wish to catch a *bilineatus.*"

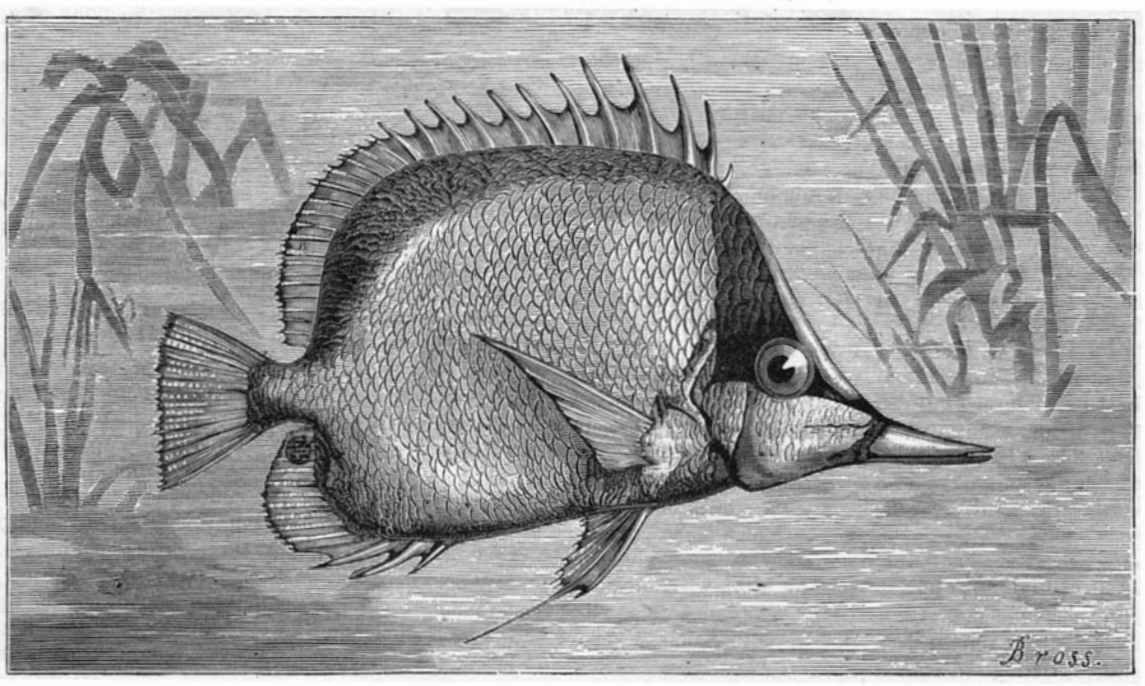


Fig. 1.—THE LONG-NOSED CHELMON.

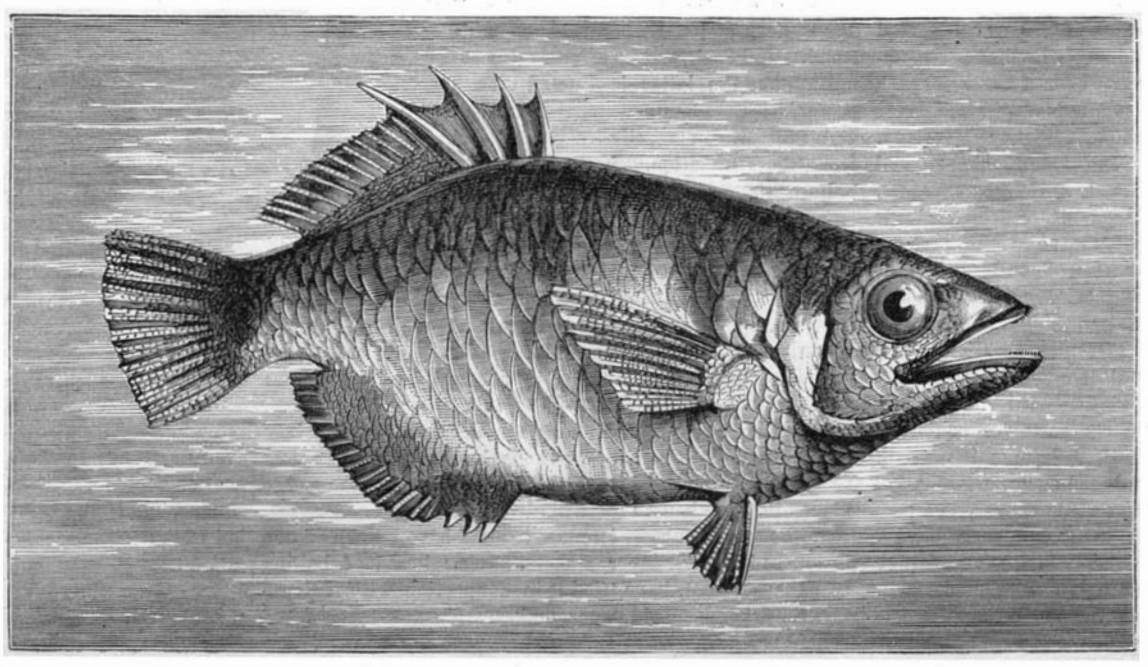


Fig. 2.—THE ARCHER FISH.

Pheasants Poisoned by Shot.

A short time ago the keepers on Sir H Tufton's estate at Ashford, England, noticed a singular mortality among the pheasants. The cause was not immediately discovered, but it was eventually found out that the birds swallowed the splinters from spent bullets lying about on the ground at the range of the local volunteers, which was close at hand. The lead did not produce immediate death, but caused lead poisoning, to which the birds by slow degrees succumbed. Other even more remarkable instances than the above have occurred with pheasants and grouse swallowing shot picked up in the coverts that have been shot, and among the heather, in mistake either for seed or gravel.

Last year a considerable number of pheasants died in one gentleman's preserve alone in Lancashire from this cause, and there is every probability that many of both pheasants and grouse casually found dead from some unknown cause owe their death to picking up pellets in this manner.

How Tomatoes are Canned.

The large consumption of canned goods in this country, and the market which is opening for them in Europe, the great variety of farm products which the factories demand, and the near home market which they make for perishable fruits and vegetables, render this industry a matter of interest to all intelligent farmers. Besides meats and fish preserved by this method, nearly all the more common and perishable fruits and vegetables are canned and made available for food during the whole year. A canning factory is one of the most useful and economical institutions that can be established in an agricultural community. The process of preserving is now so well understood, and the work is so thoroughly done that the goods will keep for years, and can be sent on long sea voyages to all climates and to the remotest countries. There is hardly any limit to the demand for these goods, so that a factory will make a good home market for nearly all fruits and vegetables that cannot be disposed of in the fresh condition. It is a complete remedy for any glut in the local markets; for when the hucksters or middlemen cease to pay living prices, the factory takes the overplus. The packing companies are one important factor in the solution of the question of a cheap food supply for the million. An almost inconceivable amount of wholesome food is gathered and marketed at cheap rates that would otherwise be lost. In many ways this industry stimulates the production of fruits and vegetables in districts remote from large markets. It gathers up the fragments, so that nothing is lost.

Mr. W. Clift, of Mystic Bridge, Conn., writing to the *Country Gentleman*, says: Your readers will be interested in a description of the canning process as carried on by the Dudley Packing Company at their factory, established in this place the present season. The capital called for in a factory that will use up a thousand bushels of tomatoes a day is about $15,000. The company began with tomatoes, because the demand for them is very large, and they can be grown in quantity on short notice. Seeds were distributed during the winter and spring, and the farmers pledged themselves to cultivate at least 115 acres of tomatoes, and the price was fixed at 30 cents a bushel. It was regarded as an experiment, many of the farmers doubting whether the crop would pay at that price. The company engaged to take all that they would raise. Both parties have kept their engagements, and not only has the factory consumed all the tomatoes produced in this vicinity, but large quantities have been brought from New Jersey by steamer and rail for packing here. The yield on good land, well cultivated, has reached in some cases 400 bushels to the acre, which plays fairly for a rather bulky crop.

The company furnish crates, holding just a bushel, open at the top, and furnished with projecting posts at the corners, so that they can be packed one crate on the top of another without damaging the fruit. The payments are in cash on delivery of the goods. The first operation in the canning process is the scalding of the fruit to loosen the skin. The scalding tank is six feet long, three feet wide and two deep, and stands upon the platform, outside of the building, near the door. This tank is filled with water, and kept near the boiling point by steam. A sieve of iron wire fits into the top of the tank, and receives two bushels of tomatoes for a charge. A jet of steam is turned into the water, and the tomatoes remain in it a half minute, when they are raised by the sieve, which turns on a hinge, and are dropped into two boxes at the lower end of the tank. Two men manage the scalding tank, and a boy distributes the fruit among the peelers within.

Thirty-six women and girls attend to this department. They are arranged at the sides of troughs, elevated sufficiently for convenient handling, each workman having a pail and a box for the deposit of the skins and refuse; each tomato is peeled and cleaned of all decay and green around the stem. The price paid for this work is 3½ cents a pail, and the day's work is from 30 to 40 pails to each operative, according to her skill and activity. The pails are carried by boys to the steamer, which is upon an elevated platform, and discharges into the hopper for packing. The overseer of the steamer carefully examines each pailful, as it is spread out, for any neglect among the peelers, and removes the unripe portion if any is found. She also gives a check for each pailful, which the boy returns to the operative, and these checks are the certificates of the amount of labor performed.

From the steamer the tomatoes fall into a hopper, and then into the stuffer, which is a cylinder worked by a treadle. The cans used here are quarts and gallons, of which a large stock is kept on hand in the loft above the packing room. The cans are passed down to the packer by a trough, which is kept constantly full. The filling is done through a hole about an inch and a half in diameter in the top of each can. This hole is placed over the end of the stuffer, and with a slight pressure of the foot upon the treadle, the packer fills his can, and nearly excludes all air and water. The next step in the process is regulating the cans for soldering. Some of the cans are a little too full, and some do not contain quite enough. This work is done by two girls. A boy fits the caps over the holes, and puts seven cans upon a tray, and delivers them to the solderers. This is done by boys at the Gulden's patent capping machine, which is exceedingly ingenious, and saves a great deal of labor. The can to be capped is put upon the platform of the machine. The soldering iron, a semi-circular piece of iron, adjusted to the size of the cap, is immediately lowered upon the edge of the cap, which the workman turns with one hand, while he holds the strip of solder in the other. A stream of gas made from naphtha is thrown from the burner upon the soldering iron, which melts the solder and seals the can as fast as it can be turned upon the platform. Two cans are sealed every minute, when everything is ready. A boy will seal from 700 to 1,000 cans in a day, and the pay is 7 cents per 100. This work was formerly done by men at a cost of $7 or $8 a day, consuming twice as much solder, and this is a good illustration of labor-saving machinery.

The cans pass immediately from the solder to the cooking apparatus. The cooking tank is six feet long, three wide, and four deep, furnished with an elevator having a capacity of 112 gallon cans. The sealed cans are lowered into the tank, and cooked by steam for two hours. There are four of these cooking tanks. The cans are partially cooled after cooking, and vented by making a pinhole to let out any air within, and are immediately sealed again. They are then removed to the platform outside of the building, to complete the cooling. After this comes a thorough examination of every can, for any defect in the soldering which admits air. The smallest hole would spoil the contents of the can in a few days. Any leakage of air is indicated by the bulging of the head of the can. If it is perfectly tight, there is a slight depression of the head. The cleaning of the outside of the cans, and labeling, completes the work. The goods are then boxed and sent to Acker, Merrall & Condit, and to Park & Tilford, wholesale grocers of New York, who take all the tomatoes manufactured by this company. They are mostly consumed in the city and its vicinity.

The cases are made of half-inch pine, with inch heads, and come in shooks from Michigan, and are put together here. The cost of labor and material is about 15 cents a case.

Besides the canned goods, catsup is manufactured from the skins and the refuse that is rejected from the hopper. The whole mass first passes through a mill, which separates the pulp from the skins. From the vat of the mill the pulp is pumped upstairs into a reservoir. When a sufficient quantity has accumulated, it is drawn from the reservoir into the cooking tank, and cooked three hours. It is then drawn off into barrels, and allowed to ferment one week. The pulp settles at the bottom, free from impurities, and the water at the top is poured off, and the barrel filled again with the tomato pulp. It is then returned to the cooking tank and heated; the spices are added, and the catsup is barreled and sent to market, where it is bottled, labeled and sent to the retailers. Charles Gulden of New York takes all the catsup made by this company, at 15 cents a gallon.

Apples will follow tomatoes in due order, and have already begun to come in from the neighboring farms in limited quantity. These are packed in gallon cans, and are designed for pies and sauce in family use. There is a large demand for canned apples in the European markets, and it is not improbable that they will supersede the shipment of apples in barrels, which are greatly exposed to decay and loss, both on the voyage and after arrival. The canned goods are a safe article for shipment, and, if necessary, can wait a long time for market and consumption, without damage.

The large piles of apples in the store-house, the streets about the factory crowded with teams waiting to unload, the platforms filled with tomato crates, the busy crowd inside the factory, and the daily shipment of canned goods, look like the revival of business in this community.

Applications of Steam Power.

BY JAMES BINX.

It seems to me that something more might be profitably said during this season of extreme drought, when many are adding, and others are thinking of adding, steam engines to their plant of machinery. Many owners who partially rely upon steam power to run their mills, and who are not advantageously situated for fuel and freight, and who have not perhaps applied their steam power in as economical a manner as possible, count the cost of so applying it, and solemnly shake their heads when anything is said upon their having soon to apply it altogether. But for all that, I believe the day is near at hand when a steam mill, well located as to freights and fuel, will be a better investment than a water mill, unless the latter is situated on a never failing water power, with moderate water rent and freights.

A mill, to run wholly by steam, should be so designed from the foundation. Such a mill does not need rotary boilers. The boiling should be done in tubs with the exhaust steam from the main steam engine. The engine should be of ample size, economical in the use of steam, and one as little affected by back pressure as possible.

In boiling bleach tubs by exhaust steam there will be back pressure, and it will amount to from ten to eighteen pounds, according to the depth of the bleach tub. Many have fitted up mills without taking this into account, and have been grievously disappointed with the result.

Steam engines running under a boiler pressure of sixty pounds and losing fifteen pounds by back pressure lose twenty-five per cent of their effective power. A steam gauge placed in the exhaust pipe will always tell the tale.

While on this subject let me say that I have known of two instances in which paper makers, having heard of boiling by exhaust steam, have tried it in connection with their rotaries. I knew an old paper maker in Connecticut, of excellent reputation as a paper maker, but with a poor education, who make this blunder. He owned a mill which was extremely short of water. He bought a large engine and put it in. He had the exhaust piped to his rotary, and only found his mistake when back pressure shut his engine down. The same man, when the engine was put in, had her speeded ten revolutions faster than the water wheel; and, of course, as the head of water went down (the revolutions of the wheel consequently falling off), the steam engine had all the work to do and carry the water wheel besides. This gentleman told me he was disappointed in his engine, and did not see but what he did just about as well without it, and will tell me to-day that it is not to be thought of as a motor for a paper mill.

Within the past year a Jersey firm concluded to utilize the exhaust from a steam engine they had put in to run the machine. Instead of using it for drying their paper, as they might have profitably done, they piped it to the rotary, and found out their mistake when the Connecticut man did—that is, when the engine stopped from back pressure. Comment is unnecessary. These men lacked knowledge. In the latter case they gained it, in the former I am afraid they never will.

I once ran a mill in which the machine was driven by a steam engine. There was no speed shaft on the machine, and the owners ran her on low grades of bleached papers, in weight anything from box lining to card middles. The engine would not drive the machine over sixty feet, nor less than forty, and the engine had to be slowed down until she ran unsteadily to make the latter speed. We pretended to dry by exhaust steam; the driers were also piped for live steam. When on card middles the engine ran so slow she would not exhaust steam enough to dry, and we had to use some live steam. The engine ran so unsteadily we let her exhaust into the open air, thinking we could get a slower steady speed, and dried by live steam. We could not then make steam enough in the boiler to keep us running in that manner, and the owners were obliged to do what I recommended at first—put in a speed shaft for the machine. When this was done the steam engine ran a regular speed, and we could run the machine anywhere from ten to one hundred feet. The exhaust would dry anything we made, and we had exhaust steam to spare, and did run our feed water, after leaving the exhaust pump, twelve feet in the exhaust pipe, heating it so hot that the hand could not be borne on the feed water pipe between the engine and boiler, and our steam troubles vanished.

In a mill running wholly by steam, the boiling of stock and drying of paper can be done for but a trifle more of expense than if the engines exhausted into the open air, and if the owner attempts to substitute live steam he will immediately (if able to make steam enough) find the amount of his loss in his fuel account.

Mills running partially by steam and part by water, where the water wheel and engine are attached or drive the same line of shaft, should have the wheel at or near one end of the shaft and the steam engine at the other end. The couplings on the shaft should be faced. Then, as the water in the steam fell off or gained, these couplings could be fastened or unfastened, adding rag engines to the steam engine, or detaching therefrom, as the capacity of the stream demanded. I know of some mills where steam has been added, that the water wheel cannot be detached from the main line, and sometimes when there is not even water enough to drive the wheel, the wheel gates are shut, and the engine is obliged to carry it also.

Steam engines coupled on to water wheels seldom work well together. A large machine shop and foundry in Ansonia, Conn., formerly had a 600 horse power engine, which they tried to run conjointly with a water wheel. After numerous breakages they gave up the attempt, and ran them separately. This concern has turned out some of the best mechanics in the country. If both motors were speeded alike, and the head of water constant, it seems to me they ought to work, but it is evidently a safer, surer mode of working to have them separate. You then know what each is doing.

The connecting pipes between the boiler and engine should be of ample size; it is better to err on the large side. Steam engines should be located as near the boiler as possible, for reasons obvious to any one.

There are many inventions that are urged on paper manufacturers and others as economizers of steam. I once worked for a wealthy manufacturer in the Western States, who was a great economist in his own estimation, and who bought everything that came along that promised to lessen running expenses. He invested in a patent boiler setting that was to save a certain per cent, a feed water heater and lime extractor ditto, a boiler and pipe composition covering ditto, super-heater ditto, water-trap ditto. Coming to figure them up one day he found to his astonishment that his economy had run ahead of his arithmetic. He was saving 133 per cent. There is no doubt that many of these are great helps, but the inventors' claims can usually be discounted fifty per cent without doing them injustice, and often more. It has been frequently demonstrated that the average gain of the best feed water heaters cannot be over ten per cent, and that for non-condensing engines. For condensing engines, which take their feed water from the hot well, it cannot be over five per cent.—*Paper Trade Journal.*

ZINC WHITEWASH.—Mix oxide of zinc with common size and apply to the ceiling with a brush. Then apply a wash of chloride of zinc, which will form a smooth, shining surface.

Japanese Process of Varnishing.

In 1873 Professor Rein, of Marburg, was sent by the Prussian Minister of Finance and Commerce to Japan, to study those branches of industry in which that people excel, and thoroughly examine processes of manufacture. Upon his return he gave a course of instruction in varnishing, or japanning, to an employee of Messre. Beuttenmueller & Co., from whose report to the Baden Minister of Commerce we abstract the following:

The course of lessons given by Dr. Rein lasted 9 hours a day for 6 days. Dr. Rein filled up the intervals, while waiting for the work to dry, with theoretical instructions about the plants from which the varnishes are prepared, the method of preparing the different qualities, etc.

Japanese varnish is obtained from a tree, *rhus vernicifera.* This varnish tree, which is called *urishi naki* by the Japanese, reaches a height of 33 feet; and at the age of 40 years, the trunk is 40 inches in circumference, grows very slowly, about 13 inches per year in height. The wood is strong and heavy, has few branches, consequently very little foliage, and the tree is not very pleasing to the eye. The fruit resembles grapes, and grows in thick spikes on the branches. In October the fruit is ripe, and is collected in November to obtain from it a vegetable wax, known as Japanese wax. The tree is best propagated from the root shoots. It reaches its greatest perfection at its 18th year, and then produces the largest yield of lac or varnish. This is obtained by slitting the bark in a horizontal direction, and may be performed at any time between April and October; later in the year the lac is very thick and viscid, so that its collection is attended with much greater difficulty. The lac tapper carries his own peculiar bow-shaped knife, made for this purpose, with which he cuts a 2 millimeter ($\frac{8}{100}$ inch) cut in the trunk of the tree in a horizontal direction, and then draws the point of the knife through the cut again, to remove any chips formed by the first cut. This cut is made low down; on the opposite side of the trunk 15 or 20 cm. (6 or 8 inches) farther up, a second cut is made, then on this side again, and so on until the trunk has 6 or 10 such cuts. After he has cut 10 or 15 trees, he returns to the first tree and collects the sap oozing from the cuts, which sap is light gray, and thick; but by exposure to the air, it at once turns dark brown and afterwards quite black. The crude lac is called *ki-urushi.*

The tree is hacked in this way for 60 to 80 days, until it dies; it is then cut down, the wood chopped up and put in hot water, which extracts the last remnant of the sap. From the tree when cut down, ¼ liter at most of sap is obtained, and this forms the poorest kind of lac. The value of 100 lac trees is about $30 to $40.

The lac is purified in the following manner: It is first filtered through cotton stuff, ground on a paint stone like ordinary paints, mixed with water, and the water evaporated again by warming. The finer sorts are bleached in shallow dishes in the sun. The best kind is called *nashyi-urushi,* the poorer kind *henki-urushi,* the unbleached *jeshime-urushi.* The black varnish, *roiro-urushi,* is made from the crude lac, *ki-urushi.* There are about 20 different kinds in market, of which the above named are most used. The cost in Japan is: *Nashyi-urushi,* $4.77 per lb.; *jeshime-urushi,* $1.65 per lb.; *roiro-urushi,* $3.70 per lb. The Japanese varnishes are as often adulterated in trade as wine in Germany (or milk with us)?

The operation of varnishing is conducted totally different from what it is in Europe. The Japanese apply their varnishes mostly to woodwork, less frequently to copper and unglazed stoneware and porcelain. When applied directly to tinware, the japan does not stick. The varnishes, when applied, are generally brilliant black, dark colored, impure vermilion, or impure dark green, or dark gray. Pure light colors and white cannot be produced with Japan varnish.

The Japanese varnishers prepare their woodenware with the utmost care, the surfaces are smoothed and the chinks filled with cement. The ground coat is a mixture of jeshime-urushi with paste; upon this is laid Japanese paper, rubbed smooth with a brush, and dried. Afterwards several very thin coats of the same varnish, now and then well dried, and, after every coat, polished with Japanese carbon.

The drying is performed in a moist atmosphere. For this purpose they take a box that will shut tightly, put the articles to be dried in it, close the box and wet it on all sides with water. After 24 hours one coat is dried. If the articles are to be black, it is now given a coat of black varnish, roiro-urushi, but if it is to be gray or gray-brown, jeshime-urushi is used instead, and if it is to be red, the latter varnish is mixed with vermilion. The appearances of gold and pearl are obtained by mixing real gold dust, or mother of pearl dust, with the varnish, whereby a beautiful effect is produced. It is then dried, rubbed down, and polished; and if there are gold, tortoiseshell, or mother of pearl decorations, another coat of azure varnish, nashyi-urushi, is applied. Dr. Rein communicated other methods of japanning, the introduction, of which, in this place, would lead us too far.

In applying their varnishes, the Japanese use broad brushes, the bristles of which are very stiff, and inserted in wood, just as the graphite is in our lead pencils. After long use the bristles get worn short, and the wood is cut away as in sharpening a pencil, exposing more of the bristles. A very fine piece of work receives 18 coats; these never fade with time but rather improve, bear a high heat, and are totally unaffected by acids, spirits, and the like.

The Japanese method is not likely to be introduced into Europe or this country, because of the want of the natural material, which, when imported from there, becomes extremely costly; and the process is indirect and tedious, and, with the high price of wages, would be impracticable.

The Great Wall of China.

The Great Wall of China was measured in many places by Mr. Unthank, an American engineer, lately engaged on a survey for a Chinese railway. His measurements give the height at eighteen feet, and a width on top of fifteen feet. Every few hundred yards there is a tower twenty-four feet square, and from twenty to twenty-five feet high. The foundation of the wall is of solid granite. Mr. Unthank brought with him a brick from the wall, which is supposed to have been made two hundred years before the time of Christ. In building this immense stone fence to keep out the Tartars, the builders never attempted to avoid mountains or chasms to save expense. For 1,300 miles the wall goes over plain and mountain, and every foot of the foundation is in solid granite, and the rest of the structure solid masonry. In some places the wall is built smooth up against the bank, or canons, or precipices, where there is a sheer descent of 1,000 feet. Small streams are arched over, but on the larger streams the wall runs to the water's edge, and a tower is built on each side. On the top of the wall there are breastworks, or defences, facing in and out, so the defending forces can pass from one tower to another without being exposed to any enemy from either side. To calculate the time of building, or cost of this wall, is beyond human skill. So far as the magnitude of the work is concerned, it surpasses everything in ancient or modern times of which there is any trace. The Pyramids of Egypt are nothing compared to it.—*London News.*

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MILLER'S PAINT STAFF.

Jacob Austine, Huntsville, O.—This is an improved form of miller's paint staff, or device for applying a color in a true plane to the face of a millstone to detect and locate the high places when the stone is "in wind," or has uneven places, and then permit the same to be trued up. It consists in a staff made in the form of an equilateral triangle, the advantages being partly in the facility and accuracy of construction (the same measurement of bar serving for all three sides), but more especially in the corrections of its results, the equilateral triangle being best adapted to the circular area of a millstone.

IMPROVED CAR WHEEL.

William Y. Cruikshank, Shamokin, Pa., assignor to John Cruikshank, of same place.—This invention consists of an oil chamber arranged in the hub of the car wheel, and connected by radial holes to an annular recess in bore of wheel or groove of axle. Ribs or elevations of the oil chamber arrest the oil, and feed it to the supply holes to lubricate the bearings, and pass the surplus back again to the oil chamber. The centrifugal force distributes the oil during the running or revolving of the wheel by the aid of the outer elevations around the outer surface of the oil chamber, while the side elevations conduct the oil and cause it to flow through the holes to the axles. When the wheel ceases to revolve the oil above the axle is guided along the ribs to the holes, and along or around the axle or shaft in the recess or groove back to the holes below the axle, and thence into the oil chamber again, saving thus all the oil which is not used actually in lubricating the axle or shaft. Sufficient oil adheres to the axle to run the wheel in either direction and lubricate the bearings.

IMPROVED DRY WOOD GRINDER FOR PAPER-PULP.

Isaac W. Bowers and David A. Curtis, Petersburg, Mich.—This invention relates to an improved machine for making dry pulp from dry wood in a cheap and simple manner, which pulp has the advantage of being readily shipped, not liable to freeze, and being converted with less labor into paper. The invention consists of a machine for grinding up the wood by exposing it to the action of a cylinder covered with a grinding surface of glue, ground flint, quartz, and emery, and conveying the pulp by a hopper and an endless revolving belt to a reciprocating screen. The wood pulp produced by a dry process with this machine is, in many respects, superior to that obtained by the wet processes hitherto in use, as it does not mold or freeze, and may be more conveniently shipped. The machine is cheaper and simpler in construction than those used in wet processes, and may be run without skilled workmen. A number of machines may be arranged side by side, according to the quantities of pulp to be manufactured.

IMPROVED AUTOMATIC CYLINDER COCK.

Joseph M. Graham, Bloomfield, assignor to himself and George Elliott Bedford, Ind.—This invention relates to cocks for discharging the water of condensation from engine cylinders, and it consists in the arrangement at each end of the cylinder, of cups of sufficient capacity to contain water accumulating during one stroke, and in small valves placed in the said cups that open upward and are connected with a lever which is held by a spring, so that the valves are both open when the pressure is removed, but admits of the valves being alternately closed by the steam pressure as it acts in the cylinder. As steam is admitted to the cylinder it closes one of the valves while the other remains open, and when steam is admitted to the opposite end of the cylinder, the valve which before was open is closed by steam pressure, and by virtue of the connection of the two valves with the lever, the valve which was closed is now opened, permitting the escape of the water from the cavity. The valves are automatic in their action, and the water escapes when the pressure is removed, so that the noise of escaping steam common to other devices for relieving engine cylinders of water is by this improvement entirely avoided, and the valves need no attention.

IMPROVED TREADLE MOTION.

Henry B. Barber and Clark J. Barber, Scott, N. Y.—The object of this invention is to furnish an improved treadle motion for sewing machines, lathes, and other like machines, by which the working of the machines is facilitated and produced with less effort of the foot; and the invention consists of the combination of the swinging treadle with a pitman of inverted V-shape, which is pivoted to the toe of the treadle and the supporting rod of the same, and at the apex or upper end of the crank rod of the flywheel. The elbow formed between the pitman and crank transmits the power in more effective manner to the flywheel, requiring less effort to run the machine, and rendering thereby the working of the same less fatiguing and trying.

IMPROVED FREIGHT CHUTE.

William C. Crompton, New York city, James Nicol, Newark, and Richard Hawley, Jr., Jersey City, N.J.—The object of this invention is to furnish a chute for lowering cheese and other freight in loading vessels, in warehouses, and in other places, in such a way that it will not be injured, and which shall be simple in construction and convenient and reliable in use. To the sides of the chute are attached guide bars which project inward and incline downward. The guide bars are made elastic, or have spiral or other springs placed between them and the sides of the chute, so that they may yield to allow the articles to pass, while at the same time they offer sufficient resistance to said articles to check or retard their descent, and prevent their acquiring too great a velocity and momentum.

IMPROVED ACCOMMODATING PULLEY FOR CABLES USED IN PROPELLING CARS, ETC.

Orlando H. Jadwin, Brooklyn, N. Y.—The object of this invention is to provide on effective means for the propulsion of cars, boats, or other bodies, and it consists, first, in the manner of connecting and disconnecting the car from the travelling cable; and, second, in the manner of supporting the cable on accommodating pulleys which allow a knot, swivel, or other bulky obstruction to ride over with ease. The connection between the car and traveling cable is so made that the cable is not pinched, but simply has its tension increased, so that neither car nor cable receives any sudden jar, as the motion of the cable slipping through imparts the motion gradually until the car has attained nearly the same speed as the cable, at which time the tension is made sufficiently tight to prevent slipping between the friction and tension rollers.

IMPROVED APPARATUS FOR OPERATING PUMPS.

John A. Hurley and Daniel J. Hurley, Oil City, Pa.—This invention relates to an improved pumping apparatus for oil and artesian wells, and consists of a rock beam operated by the pitman of an engine, and connected by ball joints with the ends of a cable or rope, passing over guide pulleys, and being attached by an adjusting device on the pump rod. The rock beam is connected at the lower end with the pitman of a steam or other engine, by which oscillating motion is imparted to the rock beam, which, by the cable and adjuster, gives vertical reciprocating motion to the pump rod, so as to work the well by a simple and reliable apparatus.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED PANTOGRAPH.

Elijah Ware, Omaha, Neb.—The object of this invention is to provide a simple and inexpensive pantograph which may be adapted to large or small work, as may be required; and it consists of a pantograph of rectangular form, made of four bars, so placed as to assume a parallelogram. To one end of this parallelogram are pivoted, or attached by means of screws, three supplementary bars, two of which continue the parallelogram form of the instrument, while the third bar makes the end piece. These last named bars are used for copying, enlarging, or reducing large work. The size of the copy is varied by shifting the last named end bar toward or away from the pivot of the instrument, and by moving the bar so as to change the position of the pencil or tracing point. When the instrument is used for smaller work the bars are disconnected, and it is used as a common pantograph.

IMPROVED POCKET RIFLE.

Marcus L. McCord, Nashville, Ill.—The object of this invention is to furnish an improved sight for pistols and other firearms, which shall be so constructed that it may be readily extended to the rearward to give a longer range to the sight and greater accuracy of aim. To the rear end of the barrel, or to a projection or support attached to the barrel, is hinged the end of a bar in such a way that the bar may be turned back into a position parallel with its former position. This bar, when turned back, rests upon a support attached to the stock, and which enters a guide socket formed in the bar. The bar is made of such a length that when turned down upon the barrel its forward end may abut against the forward sight, and may be secured in place by a spring catch attached to the bar, and which engages with the recessed rear side of the said sight. The rear sight, when the bar has been turned down upon the barrel, enters a transverse groove in the barrel. The bar may be pivoted to the rear end of the barrel, so that it may be swung around from one position to the other; or it may be slid into a dovetail groove in the upper side of the barrel.

IMPROVED COMPOSITION FOR DRESSING COTTON YARNS.

William H. Perkins, Fall River, Mass.—The dressing consists of unslacked lime, sal soda, soap, and water, and is prepared in the following manner and proportions: Two and one half pounds of unslacked lime, two and one half pounds of sal soda, one ounce of common soap, and one gallon of boiling water, which are thoroughly stirred together until the parts are mixed. Five gallons of salt water are then added, and the whole left standing for twenty-four hours, when the compound is ready for use. It is applied in the same manner as other dressing, but is considerably cheaper. It imparts a bright and glossy finish to the fabrics dressed therewith, and stands unchangeable in any weather or atmosphere.

IMPROVED HOSE COUPLING.

Frederick Stewart, St. Louis, Mo., assignor to himself and Oscar F. Scudder, of same place.—This invention relates to an improved hose coupling that is tightly connected with the hose ends, so as to resist a considerable pressure on the coupling parts with less liability to blow out or disconnect the hose ends, as the connection of coupling and hose will be drawn tighter the greater the pressure exerted thereon. The interior sleeve of the coupling is made with a slight taper. The hose end is placed in position on the same, and rigidly secured thereon by a diagonally split and tapering band, having a screw thread cut on the outside, and by an outer sleeve, with corresponding taper, having an interior screw thread. The screwing up of the outer sleeve on the split band closes the latter, and clamps the same and the hose tightly on the inner sleeve. The clamping or wedge connection of the inner sleeve, split band, and outer sleeve with the intermediate hose end produces a tight fastening of the hose, that gets tighter the greater the pressure, so as to remove any liability to blow out by the pressure of the water on the coupling.

IMPROVED BED PAN.

Clark S. Merriman, New York city.—In this invention the ordinary bed pan is used, to one side of which an air cushion is attached. The air space in the annular part is separate from that in the cushion. When the device is used it is placed under the body, and one or both parts are inflated, as may be required. The cover is then placed in position with the pocket in the cavity of the bed pan. After use the cover may be removed and cleansed and replaced; or two may be used in alternation. The advantages claimed for this improvement are that the body is supported in an elevated position, so that the excrements, when ejected, will not flow down the back. It is more comfortable to use, and is easily cleaned.

IMPROVED COMBINED CANE AND UMBRELLA.

Thomas F. Darcy, New York city.—This invention consists in a combined umbrella and cane, formed of the ribs, the handle, the stretchers,

the runner, and the tubes and cap, constructed and arranged to operate in connnection with each other. When the umbrella is extended, and it is desired to adjust it for use as a cane, the handle is drawn down through the tube until the collar reaches, and is secured to, the lower end of the tube. As the handle is being drawn it slides down through the runner until the stationary ferrule strikes the said runner. The stretchers are then pressed upward by the end of the tube, which closes or folds the umbrella upward, and the whole umbrella passes downinto said tube. Another tube is then drawn upward and locked, and the cap is secured to its upper end, and the device is ready for use as a cane.

IMPROVED REMOVABLE TOP FOR SHOWCASES.

Thomas H. B. Parks, Arkadelphia, Ark.—This invention is a detachable front or cover designed for application to boxes containing goods. For example, when a grocer receives a box of crackers, raisins, or other articles whose contents he wishes to display, and at the same time to protect them from dust, also from thieves, and yet render them accessible for the purpose of removal of a portion to supply customers, the top of the box may be removed and the detachable front or cover applied to the same. In such case the box may be turned on its side, so as to better display the goods. By use of this improvement the dealer avoids the necessity of placing the goods in separate boxes for the purpose of exposing yet protecting the goods. In practice the dealer will keep on hand a number of the detachable box fronts or covers, and will transfer them from one set of boxes to another as occasion requires.

IMPROVED MEDICINAL COMPOUND.

Mary Catharine Peden, Caverna, Ky.—The object of this invention is to furnish an improved medical compoundfor purifying the blood and effectually curing scrofulous diseases. The inventor says: In preparing this compound I take burdock root, one and a half ounces; poke root, one and a half ounces; sarsaparilla root, one and a half ounces; and sulphur, one ounce. To these ingredients I add proof whisky, one pint, and allow it to stand twelve hours. I then add such a quantity of water that there will be one pint of the mixture when drawn off. The compound is then allowed to stand in a cool place for one week, when it is drawn off and bottled, and is ready for use and market.

IMPROVED STOPPER FASTENER.

John L. Stewart, Ellicott City, Md.—This is an improved form of bottle stopper, more particularly designed for bottles for holding aerated liquids, such as beer, ale, soda water, etc., but applicable to other uses. It belongs to that class of stoppers in which a yoke made of bent wire is screwed about the neck of the bottle to receive a swinging bail, which bail carries a rubber stopper that is forcibly pressed against or into the mouth of the bottle. The improvement consists of a tilting cam provided with a thumb piece and combined with the bail, the rubber stopper, and the support to which said cam is pivoted, whereby the fastening is made more secure, and the manipulation of the stopper is facilitated by permitting the same to be removed or applied with ease and rapidity.

IMPROVED STAKE HOLDER FOR PLATFORM CARS.

Owen Miner Avery, Pensacola, Fla.—This invention relates to an improved socket and stanchion for railway platform cars. The object of the invention is to obviate the difficulty usually encountered in removing the stanchion from the sockets when the car is to be unloaded. As ordinarily constructed, the stanchions have to be lifted vertically from their sockets, and when the car is loaded with lumber or other similar freight the lateral pressure exerted by the same against the stanchion jams the latter in the socket so that they can be removed only with difficulty. This invention consists in pivoting the stanchions in such a manner that they may be quickly turned laterally to a horizontal position and then down, or entirely detached if desired, and yet be locked in a rigid vertical position while upon the route.

IMPROVED COMBINED COFFEE ROASTER AND COOLER.

Joseph B. Underwood, Fayetteville, N. C.—This is an improved device for carrying out the method of roasting coffee for which letters patent were granted the same inventor May 16, 1876, by which method the volatile products that arise from the coffee being roasted are utilized by being conveyed to a closed communicating chamber for cooling the coffee, where said flavoring and aromatic exhalations, which are being given off from the roasting coffee, and restored to the hot roasted coffee as it is cooled, the method serving to preserve the roasted coffee and render it less susceptible to the managing influences of the atmosphere, and at the same time preserving the full strength of the flavor and obviating loss in weight. The means consist generally in a revolving roasting cylinder arranged in combination with a revolving cooling and condensing cylinder, and so connected as to admit of the transfer of the generated volatile products of the first to the latter without condensation in transit, and finally of the transfer of the entire charge of roasted coffee from the roasting chamber to the cooling chamber. The improvement also consists in other details of secondary importance.

IMPROVED ANIMAL TRAP.

John Crawford, Vanlue, O.—This invention coverscertain improvements in animal traps of that form in which a cage or box is allowed to drop upon the animal enticed by a bait beneath the same. The improvement consists in a central axially-turning rod having notches formed in the same which are adapted to support a cage or box moving upon vertical guides until said central rod is turned axially by the animal in removing the bait from an arm attached to the same, when the notches will be removed from the catch on the cage and the latter allowed to drop bodily upon its guides over the animal.

IMPROVED VENTILATING BARREL FOR SHIPPING FRUITS, VEGETABLES, ETC.

William Crowell, Dennis, Mass.—The object of this invention is to provide, for the packing and shipment of fruits, vegetables, and other articles of perishable nature, an improved barrel or other package that is sufficiently ventilated at the center to prevent the decaying of the articles; and the invention consists of a barrel, box, or other package having a grooved center piece or partition for admitting air, and a sectional removable head, secured by a conical nut, binding on the head sections and turning on the threaded end of the center piece. As the decay of the articles commences generally in the center of the barrel, on account of the lack of air, this objectionable feature of the packing of fruits, vegetables, and other articles is prevented by the use of this ventilating center piece, post, or partition. By unscrewing the nut the head sections may be readily detached, and the contents of the barrel removed, and *vice versa*.

IMPROVED HORSESHOE ATTACHMENT.

George W. Price, Lakeland, assignor to himself and William H. Sanford, Hauppauge, N. Y.—The object of this invention is to provide calks for horseshoes that may be attached and detached at pleasure, and also to provide a device for preventing balling. An ordinary horseshoe is attached to the horse's hoof in the usual way. The calks, that are fitted to the horseshoe just in front of the usual heel calks, are each provided with an inwardly projecting arm, at the end of which a nut is formed. They are also provided with a lip that engages the edge of the horseshoe. The calks of the attachment, being longer and sharper than the calks of an ordinary horseshoe, prevent slipping, and by means of a plate balling is entirely prevented.

IMPROVED WEIGHING ATTACHMENT FOR HAND TRUCKS.

Daniel A. Beam, Newark, N. J.—This invention consists in the combination of scale levers and scale beam with an ordinary two-wheeled hand truck having an axle fitted in slotted bearings of the truck frame, so as to enable the latter to have a vertical motion relatively to the axle when weight is applied. The invention is mainly designed for use where an approximation to the weight of several packages is required, when it would be impossible to weigh each package accurately upon regular scales.

NEW AGRICULTURAL INVENTIONS.

IMPROVED MILK PAIL.

William Heuermann, Sedalia, Mo.—This invention has relation to strainers for buckets, and the nature of the invention consists in combining, with the pouring spout of a bucket, a removable strainer, a hinged retaining cap, and a hinged cover. From the hood of the pail springs a pouring spout, near the end of which is formed a ring, forming a seat for a strainer. This strainer is preferably composed of gauze wire, suitably secured to a ring, and when it is adjusted on its seat is retained in position by means of a shoulder formed on a hinged cap. This cap forms the nozzle of the pouring spout, and its reduced end has a cover hinged to it, which cover will automatically open when the bucket is tilted, and close when it is set upright. The strainer can be quickly removed when it is necessary to clean it, and it can be quickly replaced.

IMPROVED FENCE.

Nelson B. Gunn and Timothy Gunn, Elwood, Ind.—This invention relates to rail or worm fences, and the object is to afford greater strength and security to the fence at the angles thereof by rigidly tying the crossed ends of the rails together with wire or its equivalent, held under strong tension by means of a wedge. Instead of using posts or stakes at the points of the crossing of the ends of the rails, the rails of each section are firmly bound together by means of a strong wire loop, which may encompass all of the rails or only a few of them. A single band or loop will in all ordinary cases be found sufficient, although two loops may be used and arranged closed to the points where the rails cross each other.

IMPROVED STUMP PULLER.

Henry M. Stitzer, Cochranton, Pa.—This invention relates to an improved device for pulling stumps, rocks, and other bodies in simple and effective manner, by making use of another stump or fixed body, close to the one to be pulled; and it consists of a single or double beam, attached at one end by a chain to a stump or other object, and of a draft link, connected by a chain to another stump and pivoted to a hand lever, combined with pivoted pawls and wedge links, of peculiar construction, that work the link forward on the beam by the rocking of the lever. These links being loosely arranged, also, they turn upon their recessed seats in the pawls in their progression along the plain bars, so that in advancing alternately along the bar to take a new hold they slip freely over the same; but when strained in the opposite direction, in exercising the draft, they turn and cramp against and bind with the bars, and thus give a purchase for the draft strain.

IMPROVED CATTLE-WATERING DEVICE.

William H. Hayes, Salisbury, Mo.—This invention has reference to an improved device for watering stock in stock cars or yards, in a superior and automatic manner from a common tank, without waste; and the invention consists of a bucket hung to a fulcrumed and weighted lever, with curved end, that is pressed by the weight of the water in the bucket against the hose, connecting tank, and bucket, so as to cut off the water supply and re-establish the same when the bucket is getting empty. The raising of the bucket takes off the pressure from the hose, and re-establishes the supply of water from the tank, until the weight of the water in the bucket overcomes again the balance weight and cuts off the supply. In this manner a continuous and automatic water supply for stock in cars and yards is obtained.

IMPROVED SULKY AND GANG PLOW.

John H. Goodwin and David Woodard, Lamar Station, Mo.—This invention relates to improvements in gang plows, and consists mainly of an axle with swinging plow beams that are raised or lowered by a pulley frame, chains, and lever to the required depth. The pulleyframe is jointed. to admit the raising of the plow beams into upright position after work, The plow beams are retained in position by curved metallic brace pieces, that are hinged to the axle in front of and above the turning points of the plow beams, and seated in notches of the same, according to the higher or lower position of the beams. The pulley frame is made of two sections, of which the lower stationary part is secured, at suitable inclination, to the axle, while the upper section is pivoted, by its fork-shaped ends, thereto, in such a manner as to rest on a supporting extension or bearing of the lower part when the plows are dropped for work. After use, the plows are raised and thrown, with the upper section of the pulley frame, into nearly vertical position on the axis, so that the gang plow may be carried to and from the field with great facility. The shape of the plow beams produces a light draft, and the ready adjustment or entire raising of the same a gangplow of convenient construction and use. The plow may also be used as a sulky plow by using one plow only, taking off the others, the plow being thus a gang or sulky plow, as desired.

IMPROVED GATE.

John W. Harvey, Farley, Iowa.—This invention relates to gates which, when opened, will close by their own gravity; and the nature of the invention consists mainly in a foot plate for a swinging gate post having a convex bottom and crossed slots through it, in combination with studs on a post driven into the ground, which studs enter the said slots and keep the gate in proper position. A lever is pivoted to the post and connected to the gate by a pin and slot, so that a person can raise the gate bodily with very little exertion. This allows the gate to be opened and shut over snow drifts.

IMPROVED BEEHIVE.

Isham B. Burroughs, Tuscaloosa, Ala.—The object of this invention is to furnish improved beehives, which shall be simple in construction and convenient in use, enabling all the operations necessary in taking care of bees to be easily and conveniently performed, and thoroughly protecting the bees from moth. A drawer in the lower part of this hive is divided into compartments, in which are formed holes to allow the millers to pass through. With this construction the moths enter a forward dark compartment of the drawer, see a little light entering through the holes in the partition, and pass through said holes into the inner compartment of said drawer, where they lay their eggs, and from which they cannot find their way out.

IMPROVED WHEEL PLOW.

Stephen M. Harris, Forest Grove, Oregon.—The object of this invention is to furnish an improved plow, which shall be so constructed that either wheel may be raised and lowered, as required; which will turn under and thoroughly cover stubble; which will clear itself of vines and weeds, and may be readily thrown out of the ground when desired. Upon the outer arms of the crank axles revolve the wheels, which are unequal in size, the furrow wheel being the larger. Spring pawls are placed in such positions as to engage with the teeth of ratchet wheels, and thus hold the wheels securely in any position into which they may be adjusted. The plowed land end of the cross bar has a slotted crosshead formed upon it, to receive a bolt which passes through the slot of a bar, so that the said bar can be inclined forward or rearward, to adjust the cutter to take or leave land, as may be required. To the furrow end of the roller is attached a flange, which projects over the edge of the furrow, so as to bend down the projecting weeds and stubble into said furrow, and thus insure their being fully covered.

IMPROVED CENTRIFUGAL MACHINE FOR CREAMING MILK.

Wilhelm C. L. Lefeldt and Carl G. O. Lentsch, Schoeningen, Germany.—This invention consists of a revolving cylinder or drum, provided with a fixed or detachable top flange or ring and with radial detachable partitions. The drum is inclosed by a guard casing or jacket, and revolved at uniform speed, being slowly started and stopped by means of a weighted idler bearing on the driving belt. The spindle revolves in a cushioned bearing of radial arms of the safety jacket and in a base step. The cream is separated from the milk by centrifugal force, and drawn off after the drum has been slowly brought to rest by taking off the idler from the driving belt. The apparatus is operated as follows: The milk is placed, in fresh state, in the drum, and the drum then gradually set in motion by pressing the idler first lightly against the driving belt until the maximum velocity is obtained. The milk is allowed to revolve with the drum for about twenty minutes, during which time the separation of the cream from the blue milk is obtained by the greater specific gravity of the latter, which is thrown up along the wall and against the top flange, while the lighter cream collects nearer to the center. The success of the operation depends now on the stopping of the machine in such a manner that this separation of the milk and cream is kept up, so that they may be separately drawn off. This is accomplished by stopping the drum slowly without jerks, which is obtained by raising the weighted arm of the elbow lever, so that the idler clears the belt and takesoff the tension of the same. This causes the revolving the drum and spindle by their own *vis viva*, and the gradual decrease of the speed of the same until they assume a state of rest. After a few minutes of rest the cream may be skimmed off, the partition walls being first carefully taken out for facilitating taking out of the cream. The cream may be churned sweet or sour. The extraction of cream from the milk is best done just after milking, and excepting the want of the creamy matter, say the inventors, after the extraction the milk will not be discerned from fresh milk.

IMPROVED HORSE HAY RAKE.

Adolphus W. Stevenson, Xenia, O.—The teeth of this rake are curved in the usual way, the points being bent upward, so that they will slide along, but will not scratch or catch upon the ground. The bodies of the teeth are flattened a little just below they reach the axle to give them greater elasticity and render them less liable to break should their points strike an obstruction. A spring latch rests against the convex surface of a curved bar attached to the axle, so as, when the teeth are in working position, to engage with a notch, shoulder, or catch formed in the said bar to prevent the teeth from rising and passing over any of the hay. When a sufficient quantity of hay has been collected the driver presses the upper end of the lever forward with his foot. The first effect of this movement is to draw the spring latch back from the bar to allow the teeth to rise. The next effect is to push the clutch outward to engage with the clutch teeth of the wheel to cause the said wheel to turn the axle and raise the teeth, leaving the hay in a windrow.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

John W. Anderson, New York city.—This invention relates to certain improvements in thill couplings of that class in which the thill iron is made in the form of a hook, and is fastened to the pivot pin by being hooked over the same in a certain position and afterwards turned to the working position in which the parts cannot be separated. The improvements consist mainly in constructing the hooked or open slotted thill iron with a notch upon its rear side, and combining the same with a rubber block and a detent held between the ears of the clip, whereby the devices are prevented from being accidentally detached if the position of the thill iron should be changed from the falling of the horse or from other causes. The improvement also consists in forming the clip with a lip just above and outside of the edge of the ears, for the purpose of retaining and holding the rubber block and locking detent in place. The improvement also further consists in combining the hooked thill iron with an oblong tumbler located upon an eccentric pin or rivet, whereby the thill iron is made to bind against the spring and rubber blockwhen in the working position, and thus increase the tension to prevent rattling, the eccentric location of the pin serving to better adapt the parts to each other.

IMPROVED SHUTTER FASTENER.

George M. Mudgett, Edgartown, Mass.—This invention relates to fasteners for shutters, doors, etc., and it consists of a button upon the opposite sides of which nibs or catches are formed, which engage automatically with a pin in the window stool when the shutter is closed, or with an L-shaped hook projecting from the wall when the shutter is open, there being also a sector-shaped portion. The operation is as follows: As the shutter is closed the plate strikes the pin and is moved so as to throw the nib over the said pin. When the shutter is open the nib is made to engage with a hook that projects from the side of the building in a similar way. The plate not only moves the button, but it also limits its motion as it strikes the sides of the screw.

NEW HOUSEHOLD INVENTIONS.

IMPROVED BED BOTTOM.

William M. Ward, Eureka, Ill.—This invention relates to that class of bed bottoms in which the bed bottom is connected with and supported on the posts and end rails of the bedstead, so as to dispense with the strips on the side rails, and take off all strain from the same. The bed fastenings are provided with hooks, cast therewith, on which are hung by end eyes longitudinal rods, which are lengthened or shortened, to be exactly adjusted to the bedstead by a swivel connection, that turns on the flanged head of one rod section and the threaded end of the other. By shortening the rods the bedstead is braced and made firmer. In this manner a threefold spring action is obtained, namely, in the rods, in the slats, and in the springs at the ends of the cross pieces. The slats "give" just enough to make the bed easy to rest on, and settle all alike whatever weight is placed thereon. No strain is thereby thrown on the side rails of the bedstead, but all on the posts, which are stronger and better fitted to bear the same. The bed bottom may be readily taken out for cleaning the bed, and forms, when in position, a connecting part of the same, being cheap, durable, and strong, and readily applied to old and new bedsteads with little additional expense.

IMPROVED WATERPROOF CELLAR BOTTOM.

James R. Anthony, Cedar Rapids, Iowa.—This bottom is designed for wet or any springy ground and for quicksand. In constructing the bottom, the timbers are first laid and upon them tapering boards are placed, a small distance apart. Laths are nailed transversely to the said boards, and upon the laths a layer of waterproof mortar or cement is laid, into which the bricks are embedded. The spaces between the boards lead to the well, and the water that rises while the bottom is in process of construction escapes to the well, and may be removed in any convenient manner. The wall should be continued upward above high water line, and it may with advantage be carried to the same height as the outer wall.

IMPROVED WASHING MACHINE.

Oscar Jurden, Ackley, Iowa.—This invention consists in the arrangement, in a suitable frame, of two vertically reciprocating pounders and gearing for operating the same. The clothes to be washed are placed in the tub and the pounders are rapidly moved by turning the wheel by means of a crank attached to its shaft. The tub containing the cloths is turned, as occasion may require, either by hand or foot. If there should be a greater quantity of clothes in one side of the tub than in the other, the rubber springs yield, and prevent straining any part of the machine or injuring the clothes.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

Notes & Queries

(1) J. V. asks: 1. How to color brass or rolled plate chains, etc. red or copper colored, without a battery? A. Steep in warm dilute oil of vitriol for a short time. 2. In making chloride of gold, is it best to heat to dryness? A. It should be carried as nearly to dryness as possible, but a very moderate heat only should be applied, so as not to cause the decomposition of the salt.

1. Would you advise sulphurizing a fertilizer before or after drying, to fix free ammonia? A. The fixation should be before drying, or otherwise the ammonia will be lost. 2. Would not sulphur fumes do? A. No.

(2) Mrs. J. M. D. asks for some simple method of preserving autumn leaves so they will retain their color? A. Dry the leaves perfectly, immerse them for a short time in a solution of clear gum arabic in 20 parts of water, and dry. The colors cannot be so fixed that long exposure to light will not alter them. If protected as above and kept in the dark, the colors will suffer little alteration.

(3) W. H. H. asks for a recipe for making yeast or baking powders? A. Baking powders are usually composed of bicarbonate of soda, mixed with cream of tartar, tartaric or citric acids, or a mixture of these. Dry at a moderate temperature, grind separately to finest powder, and then mix thoroughly 20 parts bicarbonate of soda and 50 parts cream of tartar; or 20 parts bicarbonate of soda, 30 parts of cream of tartar, and 10 parts of tartaric acid. As the cream of tartar of commerce is often of variable character, it may be necessary to use it slightly in excess of the above proportions.

(4) K. X. says: I have a half lb. of phosphorus in a bottle which by exposure to heat has melted and formed a solid cake. How can I reduce it again to sticks, or to any shape convenient to use in small quantities? A. Unstopper the bottle and immerse it carepletely in a large vessel of water: heat the water over a water bath until the phosphorus is liquified; then draw it into tapering glass tubes (previously moistened and warmed) of suitable size, close the upper end of the tube, quickly invert it under water and transfer to a vessel of cold water. When cold the phosphorus may easily be shaken or forced out of the tube (under water).

(5) A. J. G. asks: 1. Is a heavy driving wheel, say of 150 lbs., an advantage on a common lathe not back geared, or would a lighter one, 75 or 80 lbs., be better for all purposes? A. For common light work a wheel of 80 lbs. is sufficiently heavy. For heavy work one of 150 lbs. might be at times preferable. One disadvantage of the heavy wheel is in starting and stopping. 2. Should the wheel be counterbalanced, so as not to stop on dead centers, or would the lathe run steadier without? A. It is well to counterbalance the wheel for convenience in starting, but the lathe will not run any steadier for so doing.

(6) Mrs. M. A. C. asks: What compound would be the most durable as a paint for gravestones, that would stand all kinds of weather? A. Use a turpentine solution of pure asphaltum mixed with a sufficient quantity of willow charcoal ground to impalpable powder.

(7) C. J. H. asks: 1. How can I best stiffen the ends of sewing silk or thread, so as to readily pass through a fine capillary tube without bending? I want the ends about as stiff as shoemaker's bristles and impervious to water. I have tried dipping in shellac and solution of rubber. A. Try the following: Fuse together equal parts of gutta percha and resin. This may be dissolved in carbon disulphide.

1. Is the "plume miraculeuse" made of aniline color? If so, how can I best copy writing done with it without a press? A. Yes. Slightly dampen the tissue in the usual manner, place in contact with the writing between sheets of unglazed paper and pass, with moderate pressure, a suitable rubber-covered roller over the whole. 2. What is the best fluid gold for illuminating on parchment and paper? A. Rub up fine gold leaf with a little honey, dissolve out the honey with warm water, and mix the fine gold dust remaining with sufficient gum water and a few drops of oil of cloves.

(8) K. M. R. asks for the preparation that is used at the laundries to give goods a glossy appearance? A. Starch, 1 oz.; paraffin, about 3 drachms; white sugar, tablespoonful; table salt, tablespoonful; water, q. s. Rub up the starch with soft water into a thick smooth paste. Add nearly or quite a pint of boiling water, with the salt and sugar dissolved in it, and, having dropped in the paraffin, boil for at least half an hour, stirring to prevent burning. Strain the starch and use while hot. Sufficient bluing may be added to the water, previous to the boiling, to overcome the yellowish cast of the starch, if necessary. Spermaceti may be used in place of paraffin. Starched linen can only be properly finished by hard pressure applied to the iron.

(9) J. H. P. asks how to take the bitter taste from crab apple vinegar? A. Warm a sample of the vinegar and agitate it with a little egg albumen. If this does not improve it, distillation must be resorted to.

(10) A. G. asks how the hair can be permanently removed from a person's forehead, on which it grows very low, without injury to the person? A. Preparations called depilatories are used for this purpose. Delcroix's Poudre Subtile consists of orpiment (sulphide of arsenic) 1 part; finely powdered starch and quicklime each, 11 parts. These are mixed together, made into a paste with warm water, and applied to the part closely shaven. As soon as it becomes dry it is washed off with water. Ryder's depilatory consists of lime, 1 oz.; carbonate of potassa, 2 ozs.; charcoal powder, 1 drachm; used as above. All of these preparations are more or less pernicious, and those containing arsenic, when improperly applied, are dangerous. They speedily destroy the vitality of the capillary bulbs, but, if allowed to remain too long in contact with the flesh, are apt to disorganize it.

(11) D. E. H. says: Please give me information as to method and cost of preparing farina from potatoes for market, cost of machinery, etc.? A. Potato flour is simply fine potato starch ground to powder between millstones. Suitable mills may be had for from $200 to $1,000. For a concise description of the process and machinery for extracting starch from potatoes, you should consult Wagner's "Chemical Technology."

(12) P. B. C. asks for a recipe to make mock silver, to resemble that metal in color and ring? A. Copper, 71 ozs.; zinc, 7 ozs.; nickel, 16½ ozs.; iron, 1¼ ozs.; cobalt (oxide), 1¾ ozs.; tin, 2½ ozs. First fuse the zinc with 12 parts of the copper; then fuse the nickel with its own weight of the zinc alloy in a good blacklead crucible, and and the iron, the remainder of the copper, and the oxide of cobalt mixed with charcoal. Cover the mass with charcoal, lute, and expose to a high heat. When properly fused, allow the heat to subside and add the remainder of the copper-zinc alloy when the temperature is just sufficient to fuse it. Remove the crucible from the fire and stir its contents well with a hazel stick. Wrap the tin in several thicknesses of dry paper, drop it into the alloy, stir for a moment, and run into the moulds. When cold, it is ready to be wrought like silver, which it resembles in every respect. The zinc is nearly all volatilized during the process of fusion.

(13) J. E. asks (1.) how hydrargyrum bisulphide (bisulphide of mercury) is manufactured? A. It is made by treating mercury, or its oxide, with sulphuric acid. 2. Also, which is the best solution for carbon batteries used for electric bells? I have used bichromate solution, but it will only work a few hours. A. The Leclanché or Prudhomme battery is best for this purpose. Use one twentieth of sulphuric acid with your bichromate solution, but the bichromate battery will require cleaning more than once a year.

(14) S. H. M. asks: 1. Can the Grenet battery be used for silverplating? A. Yes; but it is not good for this purpose as it is accumulative; it is better to use a sulphate of copper, or Smee's battery. 2. If so, how many cells of No. 1 will it require? A. That depends on the amount of surface; one cell will answer to plate an article, such as a teaspoon. 3. How shall I connect the wires of the battery with the silver and the article to be plated? A. Connect the zinc of the battery with the article to be plated; and the copper to the silver anode. 4. Also how to give the articles plated a fine polish? A. Polish with pulverized chalk.

(15) R. K. T. and C. E. F. ask: 1. Of what gauge and length should the fine silk-covered wire be as used in the Bell telephone? A. The wire used is No. 40 silk covered. 2. Should the poles of the magnet be the same on each instrument, or should one be north and one south? A. The poles are the same in each instrument. 3. Of what strength should the magnet be? A. Magnetized to saturation. 4. Of what thickness should the iron disk be? A. About one hundredth of an inch.

(16) A. B. writes: I have five jars of a Lockwood battery. I wish to make a permanent magnet magnet; will you please give me directions? A. Wind a spool of 800 feet of No. 19 copper wire, "magnet insulation," on a half inch round rod of hard wood, covered with two layers of note paper; have the spool about eight inches long, and give the outside a coat of glue, to keep it from unwinding. When dry slip it off the rod. This is called the helix or spool; any piece of hardened steel is now placed inside the helix, and the poles of the battery are connected with the terminals of the helix; on breaking the battery connection and removing the steel, it will be found permanently magnetic.

(17) C. C. McC. says that he uses brass moulds to cast arms for chandelier work, but the molds do not fill. The castings are imperfect. A. Use zinc for the castings. Warm the moulds preparatory to using them. Pay attention to the ventilation. Confined air may cause the imperfect castings. Pour the metal slowly so as to allow the heated air to escape as the metal enters and fills the moulds.

(18) J. T. asks for a good steel pen ink? A. Digest in an open vessel 10 ozs. coarsely powdered nutgalls, 4 ozs. gum senegal, 4 ozs. sulphate of iron (free from copper), ¾ drachm of ammonia, 6 ozs. alcohol, 4½ quarts distilled or rain water. Continue the digestion until the fluid has attained a deep black color.

(19) D. T. S. asks: How is the filling made that is used in filling the pores of black walnut wood? A. Whiting, 6 ozs.: japan, ½ pint; boiled linseed oil, ½ pint; turpentine, ½ pint; corn starch, 1 oz.; a small quantity of burnt umber. Mix well together.

(20) A. S. asks for a recipe for making whitewash for woodwork that will not peel off? A. Alum is one of the best additions to make whitewash of lime which will not rub off. When whiting is used, thin glue water is good, but it will not do for outside work, exposed to rain.

(21) W. C. asks for a grease for boots that will turn water, and also make them soft? A. Beeswax, 2 ozs.; beef suet, 4 ozs.; resin, 1 oz.; neat's foot oil, 2 ozs.; lampblack 1 oz. Melt and mix well together.

(22) J. W. asks how to produce a regular shade on mixed cotton and woolen rags? A. For drabs, work for half an hour in a solution of 8 ozs. copperas and 4 ozs. tartar; lift and drain; then work for half an hour in 4 ozs. logwood and 1 oz. bichromate of potash; wash out and dry. By varying the quantity of logwood, and by introducing a little fustic in combination with the logwood, a great variety of drabs, slates or fawns can be produced.

(23) W. W. asks how to color woolen goods black? A. For an amount of goods equal to a lady's dress, if of a dark color or brown, take ¾ oz. of bichromate of potash in 3 gallons of water. Boil the goods in this 40 minutes; then wash in cold water. Then take 3 gallons water, add 9 ozs. logwood, 3 ozs. fustic, and 2 or 3 drops of oil of vitriol: boil the goods 40 minutes and wash in cold water. All colored goods with cotton warps should be previously steeped one hour in sumach liquor; and then soaked for 30 minutes in 3 gallons of clean water, with a small teacupful of nitrate of iron; it must be then thoroughly washed and then dyed as for woolen goods.

(24) A correspondent says: I have a fire alarm, the wires of which come in at the top of a third story window, go to the floor, thence along behind a bed, and down through the floor and to the indicator in the second story room. Is there any danger from lightning to an occupant of the second story room, or an occupant of the bed in the third story? A. There is a slight danger, but it may be obviated by the use of a lightning arrester. The parties who furnished the indicator can supply it.

(25) W. B. asks how to destroy bedbugs? A. Take five cents worth of quicksilver, and the white of one egg. Beat the egg to a froth and add the quicksilver. Brush upon the places where the insects frequent. Make the amount of the ingredients according to the surface to be brushed over.

(26) D. A. says: I am very much troubled by the tarnish and rust on brass and steel jewelry. How can I remove the tarnish and rust, or prevent it? A. The only method to remove the tarnish and rust is to re-polish orre-finish the articles, as when first made. Care in handling is the best preventative.

(27) F. M. E. asks for the number of vibrations representing the tones of the two middle octaves of the standard scale—natural? A. C has 264 vibrations, D 296, E 333, F 352, G 395, A 444, B 498, middle C 528, D 594, E 660, F 704, G 792, A 880, B 990.

(28) H. H. E. asks how to cut stencils on copper by the use of acids, and the method of doing so? A. Cover the copper with a thin coat of wax; with sharp cutting tools remove the wax on the portions of the metal where the cutting is to be done. If necessary surround the plate with a ledge of wax. Pour aquafortis over the plate and it will soon eat through the metal where unprotected by the coating of wax,

(29) J. S. asks how to melt or work over pure rubber, so as to make it into articles of use? A. Pure gum rubber is softened by immersion in boiling water so that it may be kneaded or forced into moulds—on cooling it contracts and hardens. It is completely dissolved by a mixture of carbon disulphide with 6 per cent of absolute alcohol, and on evaporation of the solvent regains its former properties. It is also soluble in chloroform or naphtha. It cannot be melted by heat without suffering partial decomposition.

Is the glycerin that is used for chapped hands, lips etc., the same as that used for making nitro-glycerin? A. Yes, but purer and stronger.

(30) A. R. L. and others ask: Is the Gramme magneto-electric machine made in this country? A. No. It is made by L. Breguet, No. 39 Quai de l'Horloge, Paris, France.

(31) L. D. D. asks: How could alcohol and water, used for making pickles, be made into good vinegar? A. Alcohol may be converted into vinegar by adding to it a little yeast and keeping in a moderately warm place until acetification is complete. In pickling, only strongest wine vinegar is used, mixed with the spices and sometimes a little olive oil.

(32) L. J. says: I have a brass hopper on my coffee mill which is badly fly-specked. How can I polish it? A. Remove from the mill and polish with fine emery applied with a woolen cloth moistened with oil.

Please give me a recipe for making a baking powder? A. Powder and thoroughly dry separately by gentle heat ½ lb. tartaric acid, ¾ lb. of pure bicarbonate of soda, and ¾ lb. of potato farina. Mix dry, pass through a sieve, and preserve as much as possible from air and moisture.

(33) W. B. N. asks how cavendish tobacco is prepared? If it is steeped in any liquor or any preparation? A. Tobacco, by the better class of manufacturers, is not steeped in any liquor, but after stripping, the leaves are sprinkled with licorice and white sugar, made into rolls and closely packed into oak boxes, and subjected to pressure, in which form it is sent to market.

(34) W, H. L. asks how to bleach or whiten ivory piano keys? A. Ivory is whitened or bleached by rubbing it with finely powdered pumicestone and water, and exposing it to the sun while still moist, under a glass shade to prevent desiccation and the occurrence of cracks. Repeat the process until the proper effect is produced. Ivory may also be bleached by immersion for a short time in water holding a little sulphurous acid, chloride of lime, or chlorine in solution; or by exposing to the fumes of burning sulphur, largely diluted with air. Where the ivory keys cannot be removed the polishing process may be the best.

(35) Star asks how to remove writing ink from paper? A. Apply muriatic acid diluted with five or six times the quantity of water, and after a minute or two wash with clean water. A solution of oxalic acid, citric acid, and tartaric acid may be applied where there is printing, as it will not attack the printed text.

(36) L. G. asks how to remove fruit stains from cotton and linen goods? A. Wash the stained portion clean and apply a weak solution of chlorine, chloride of lime, or oxalic acid. Lemon juice will frequently remove stains. Some stains may be taken out by dipping the cloth in sour buttermilk and drying in a hot sun. Thoroughly wash in warm water and dry.

(37) S. H. asks how to test a rough diamond and tell it from glass? A. Put the stone in a leaden cup with some powdered fluorspar and a little oil of vitriol. Warm the vessel over a fire where there is a copious draught to carry off the noxious vapors that will be evolved. When these vapors have ceased, stir the mixture with a glass rod to fish out the diamond. A genuine stone will remain intact, but a fictitious one will be corroded by the hydrofluoric acid that has been generated around it.

(38) C. H. D. asks how to Babbitt the boxes of an emery wheel shaft? A. Clean the boxes of

the old Babbitting and whatever grease there may be. If practicable heat the lower boxes quite warm. After removing them and while warm, put them in place, and adjust the shaft in the way it is to run. If there is any danger of the metal running out at the ends of the boxes, cut thick straw board and fit to the ends of the boxes and up to the shaft so as to retain the metal until it hardens. Heat the metal hot, and pour carefully so as to fill the box and come to the diametrical center of the shaft, remove the shaft and trim off the superfluous metal. Put the shaft again in place. Put on the upper box and pour through the oil hole. Remove the box, trim off, and drill out the hole for reception of oil.

(39) J. F. P. asks for the process of tempering edge tools, etc.? A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 71, p. 1123.

(40) A subscriber asks: What is the simplest way of keeping the temperature of my greenhouse above 45° winter nights? It is ten feet square, and is well warmed by the sun during the day. A. Put in a few lengths of cast iron pipe, fill them with salt water brine, and connect them with a stove so as to bring a portion of the pipe in contact with the fire. Let the pipe be 4 inches in diameter and set at a grade, leaving the stove at a high point and returning to it at a lower one. This will insure a circulation, and by keeping a slow fire a permanently low temperature may be maintained. This apparatus can be constructed by your plumber, or a similar one may be ordered of any dealer in this city. The salt will prevent the water from freezing should the fire be suffered to expire.

(41) A. G. M. asks for information about the fruit called Aku? A. Guinea is the native country of this fruit. It was brought to Jamaica by Captain Bligh in 1793, where it grows well. The fruit is about the size of a goose's egg and has a sub-acid flavor. It is considered wholesome and nutritive.

(42) B. H. asks what or-moulu is? A. It is a name given to a particular alloy of zinc and copper, generally about 52 parts zinc and 48 of copper. It is so finished as to have the appearance of gold. The term is often applied in a general sense to works of art. The metal is sometimes finished by dipping in an acid, which helps produce the gold-like surface. Lacquer is often applied to prevent tarnish.

(43) E. G. M. asks how marquetry is made? A. It is different pieces of colored wood glued to a ground of some firm wood. It is now chiefly confined in its use to floors, in which the various pieces of wood are usually disposed in regular geometrical figures.

(44) H. C. D. asks how to weld tortoise shell? A. Provide a pair of pincers or tongs. File the tortoise shell clean and make so as to form a lap joint. See that there is no grease about it. Wet the joint with water, apply the pincers hot, following them with water, and the shell will be joined as if it were one piece. Be careful that the heat be not so great as to burn the shell. You can test it by trying it on a piece of white paper.

(45) M. G. asks how to make extract of cinnamon? A. Dissolve 2 drachms of oil of cinnamon in 1 pint of good alcohol; add gradually 1 pint of water, and then stir in by degrees 4 ozs. powdered Ceylon cinnamon; agitate for some time and filter through paper.

(46) T. H. asks for a good indelible ink to use with stamps? A. Mix equal parts black oxide of manganese and hydrate of potash, heat to redness, and rub with an equal quantity of smooth white clay into a paste, water being added for that purpose, or, sulphate of manganese, 2 drachms; lampblack, 1 drachm; powdered loaf sugar, 4 drachms; rubbed into a paste with water. After stamping, dry the linen and wash well in water.

(47) N. P. asks how to test castor oil? A. If the oil be adulterated with rape oil, it may be detected by its not dissolving in strong alcohol, and also by its density. Pure castor oil is soluble in an equal weight of alcohol, specific gravity 0·820.

(48) J. H. asks: The bluing on some of our try-squares and bevels has come off; how can I re-blue them? A. Remove the blades, polish them and blue by heat, immersing the blades in a pan of powdered charcoal while being heated. Remove from the fire when the desired color is obtained. Or use an application of thin shellac varnish colored with Prussian blue.

In purchasing a glazier's diamond, is there any way by which an inexperienced person can tell which are good? A. No.

(49) S. H. J. says: I wish to fasten photographs to glass for coloring. What perfectly transparent fastener can I use which will not crack? A. See answer to E. F. (25) No. 12, p. 187, current volume.

(50) J. M. asks how the power of a telescope is estimated? A. Divide the focal length of the objective in inches by that of the eye piece in inches. This will give the magnifying power of the instrument.

(51) T. G. A. asks: Would you advise the use of any hair-producing elixir on the face? A. No.

(52) G. F. S. asks: 1. What is the best method of mending articles of celluloid, such as jewelry, etc.? A. Dissolve good glue in a small quantity of strongest vinegar or acetic acid by aid of heat. 2. Is there no way to restore the bright coral red which celluloid loses after long exposure? A. No.

(53) J. B. asks: 1. Will the airo-hydrogen blowpipe produce as strong a heat as the oxyhydrogen blowpipe? A. No. 2. Is the first safer than the latter? A. In inexperienced hands, yes. 3. Is there an alloy of platinum known (to solder platinum) which would resist a greater heat than fine gold? A. No. With skillful manipulation and a good blowpipe (oxyhydrogen) platinum may be welded perfectly. 4. If so, will you please state whether such could be brought to melt by the illuminating gas and common blowpipe? A. No; the heat of an oxyhydrogen flame is requisite.

(54) G. A. says: Volatile oils cannot be used in public buildings at frontier posts, and candles do not give sufficient light for the post schoolroom. Can you suggest any simple contrivance for illuminating purposes that will produce a brilliant light, like the lime light, etc.? A. We do not know of such a device. Simple machines for making illuminating gas automatically from the vapor of light hydrocarbon oils are in the market. The electric lamp, using a small magneto-electric machine driven by some small motive power, affords a brilliant light; the first cost of the apparatus, however, is considerable.

(55) H. M. says: 1. I have a lens (double convex) 4½ inches in diameter and 26 inches focus. Will it answer for an objective for a telescope? A. Not very well. 2. What size and focus will the eyepiece need to be? A. The eyepiece may be an inch in diameter (leaving an aperture in mounting of about ⅜ inch), 1 inch focus, and placed at 27 inches from the objective.

(56) G. G. says: I wish to etch letters on glass. Have tried asphaltum varnish, shellac, etc. which all fail to keep the fluoric acid from spreading even after being dry a long time. What I wish is something which I could use to cover the whole glass, except the letters, and which will withstand the action of the acid? A. Beeswax or paraffin is used for this purpose; melt and apply it to the glass previously warmed; when cooled, cut out the letters and expose to the acid.

(57) J. D. asks: What are the fire-extinguishing chemicals composed of, also whether they are explosive by contact with steam? A. The materials used in the Babcock and similar fire extinguishers are carbonate or bicarbonate of soda dissolved in water and a small quantity of oil of vitriol contained in a leaden cup, the inversion of which brings the acid in contact with the soda solution. The chemicals are not explosive in any way.

(58) A. M. G. asks for a recipe for removing superfluous hair? A. Sulphuret of barium 3 ozs., water 12 ozs. A little powdered starch is wetted with this solution and immediately applied. When dry it can be removed and takes the hair with it.

(59) R. M. H. asks: 1. What causes animalculæ to appear in the vinegar, and do they always come when it is made of grain or fruit? A. Nearly all vinegars prepared by slow fermentation contain microscopic organisms, derived from the germs present in the ferment, and from the air. 2. What must I do to remove them from the vinegar? A. Add a little of solution of sulphite of soda, agitate, allow to stand for a few hours, and strain off into clean barrels. 3. About how long a time should elapse after making until it must be corked tight, or is it better to leave the bung out of the cask? A. As soon as the fermentation is complete, it may be drawn off into clean tight barrels for storage.

(60) G. T. L. asks: 1. If the vapor of bisulphide of carbon will have any deleterious effects upon a steam engine as ordinarily constructed, the vapor being used instead of steam to drive the engine? A. It would have no bad effect other than that of dissolving all oil or grease with which it might have contact. 2. Would there be any danger of explosion on decomposition of the liquid bisulphide on being evaporated in an ordinary steam boiler? Would the liquid have any effect on the iron of the boiler if the boiler were heated by steam? A. Bisulphide of carbon vapor is very inflammable, and when mixed with air, very explosive when ignited. It would suffer no decomposition by being heated to boiling, and, if pure, would have little effect upon the iron. 3. If water and bisulphide of carbon be mixed together, the water predominating, and the mixture be evaporated in a boiler, would there be an explosion or any chemical action of any kind, altering the character of the two mixed vapors? A. No, but the liquids would not mix, and the bisulphide would become entirely vaporized before the temperature of the water attained the boiling point. 4. Is the liquid bisulphide compressible to any appreciable extent, and what is its cost in large quantities? A. No. The price, we believe, is about 75 cents a gallon. 5. Would it be safe to let the exhaust escape through a blast pipe into the stack? A. No.

(61) W. N. H. asks for a recipe for good writing ink? A. Take Aleppo galls, well bruised, 4 ozs., clean soft water 1 quart. Macerate in a clean corked bottle for ten or twelve days with frequent agitation, add 1¼ oz. gum arabic dissolved in about 2 ozs. of water, lump sugar ½ oz. Mix well and add 1½ oz. of sulphate of iron crushed small. Agitate occasionally for two or three days, when it may be decanted for use. When time is any object boiling water may be used instead of cold, and the ingredients put at once into the bottle and agitated until the ink is made.

(62) C. A. J. asks how sound is transmitted by the telephone? A. The voice causes the diaphragm of the instrument upon which it is thrown to vibrate. Electric undulations are induced in the coil that surrounds the magnet, which are precisely analogous to the undulations of the air produced by that voice. This coil and magnet is connected to a similar one at the other end of the insulated line of wire, and these undulations travel through the wire and are received and resolved into air undulations upon a similar diaphragm of the instrument at the end of the line where they are received.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. M. B.—The white specimen is agate—corresponding to the *Leucachates* of Pliny. The other specimen is a sanded agate pebble or an inferior opal.—J. Y.—No. 1 (powder) contains, besides gold and silver, silica, alumina, lime, and traces of magnesia. It would be called a gold-bearing quartzite rock, with, however, a large percentage of iron. No. 2 is cassiterite or tin stone.—J. B. J.—It is rich in manganese—an impure braunite.—G. M. C.—It is a calcareous deposit filled with the fossil remains of numerous species of trilobites, and some vegetable matter.—Minerals of J. C. and L. S. W. are missing.—E. R. A.—It is a variety of fluorspar—fluoride of calcium.—C. B. K.—Specimens not yet received.—F. P. L.—It is an argillaceous carbonate of iron; its value will depend upon the percentage of iron it contains.—A. H.—No. 1 is serpentine and trap rock. No. 2 is gneiss. No. 3 is quartzite containing graphite.—J. C. and M. S.—Specimens not received.—J. H. P.—It is an ocherous clay, but the amount of metallic base is small. It is not valuable.—J. F.—The incrustation consists of carbonate and sulphate of lime, magnesia, alumina, silica, sesquioxide and carbonate of iron, and a little organic matter.—A. R. P.—No. 1 is a limestone containing mica schist, hornblende, and malachite—carbonate of copper. No. 2 is lime carbonate. No. 3 is a shale rich in malachite. No. 4 is a shale containing much mica, also hornblende.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Using Explosives for Deep Tillage. By J. R. C.
On the Keely Motor. By J. A. F.
On a Remedy for the Glutted Labor Market. By R.S.
On the Navy Yard Fire Test. By ——.
On Weak Eyes. By ——.
On Throwing a Ball in a Curve. By ——.
On Why are we Right Handed? By F. H. P.

Also inquiries and answers from the following:

M. H.—P. L. W.—J. G.—B. C.—W. L. B.—J. T. J.—H. McI.—R. J. K.—H. E. B.—H. H. A.—C. H. R.—J. C. E.—W. B. N.—C. F.—S. H. R.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes tile and brick making machines? Who makes models of boats?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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DESIGNS PATENTED,

10,263.—CARPETS.—Frank E. Allen, Yonkers, N. Y.
10,264.—LACE FABRIC.—Abraham G. Jennings, Brooklyn, N. Y.
10,265.—BRACELET.—H. Lang, Kennett's Square, Pa.
10,2 .—POCKET BOOK CLASPS.—L. Messer, New York, N. Y.
10,267.—PRINTED AND WOVEN FABRICS.—W. Morris, London, Eng.
10,268.—DISH HANDLES.—S. Stevens, Jersey City, N. J.
10,269.—SHOW CARDS.—W. C. Wilson, & T. S. Harrison, Philadelphia, Pa.

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