SCIENTIFIC AMERICAN

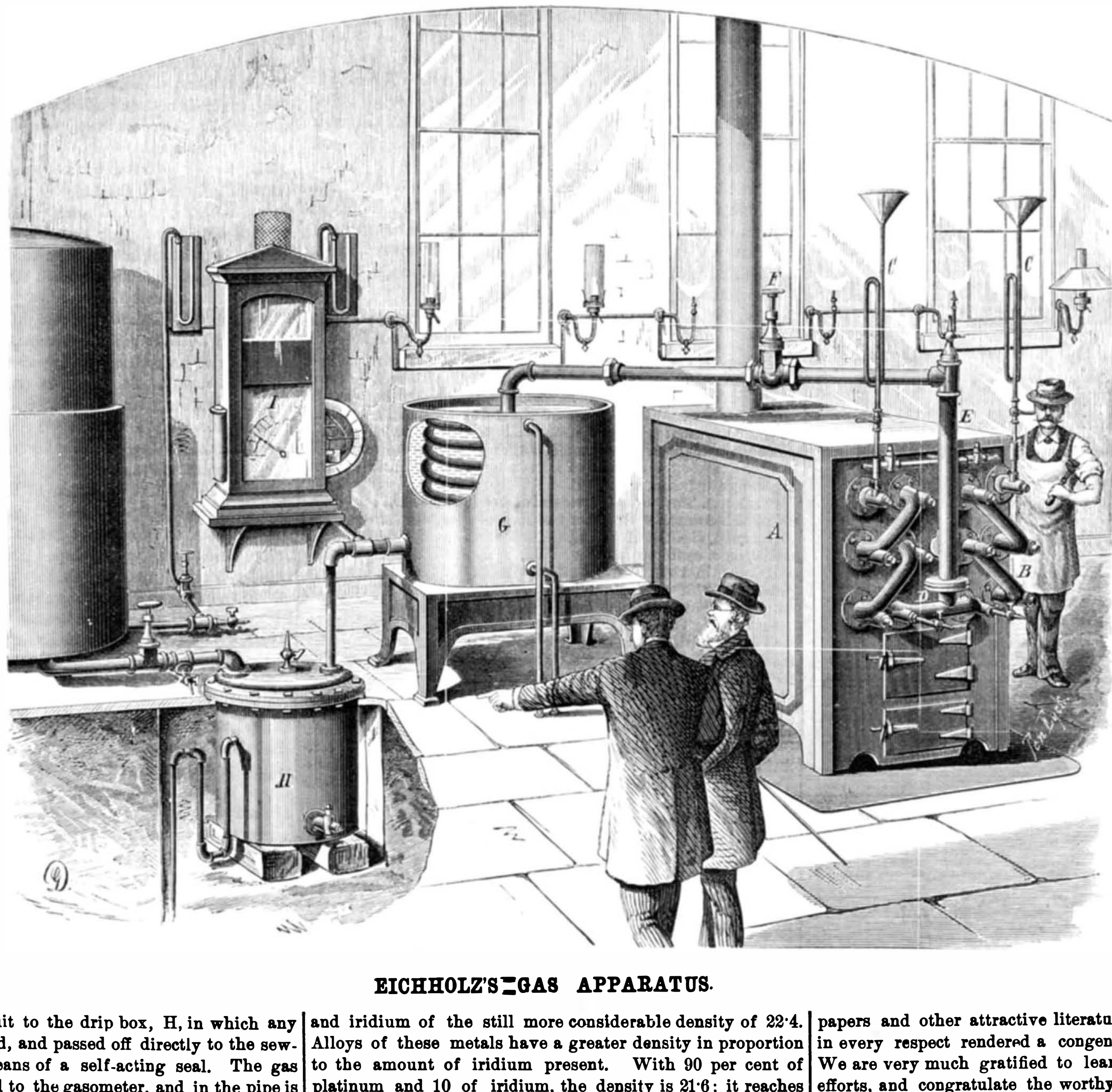
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XXXIV.–No. 5.] [NEW SERIES.] NEW YORK, JANUARY 29, 1876. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED GAS APPARATUS.

The object of the invention herewith illustrated is to furnish private residences, country seats, hotels, railroad depots, and all large buildings with a cheap and efficient portable apparatus for the manufacture of illuminating gas. The engraving shows a front elevation of a complete gas works based on this system. A is the generator, which consists of a furnace and oven, made of a cast iron case and firebrick lining, in which are two series of three retorts each, contrived in a simple way, for graduating the heat to the different substances, according to the progress of the work. The retorts are made of cast iron, and can, it is claimed, be replaced at very little expense or labor. They are free from all danger of obstruction, and they can be used alternately for oil or steam, as desired; so that should the oil retorts, by any chance, become obstructed, the steam can be used to remove the obstacle immediately. At B are shown the outside connections of the retorts, and at C C the inlets for feeding the materials of which the gas is made. The outside connections of the two series of the retorts are at D, and at E is the standpipe, connected with the valve, F, which secures and shuts off the generator from the rest of the works. There is also a connection between the two upper retorts and the valves, between which is another connection leading by a T into the generator, for the purpose of blowing off (after the valve, F, is closed) the gas remaining in the retorts, after shutting down, by means of the superheated steam.

Inside the ash pit is a water pan for extinguishing any spark or coals which may fall through the grate bars, as a precaution against danger to the building if the generator is situated in one. By the pipe shown, connection is made with the cooler, G, from which there is a conduit to the drip box, H, in which any condensation is collected, and passed off directly to the sewer or drain pipe, by means of a self-acting seal. The gas from the drip box is led to the gasometer, and in the pipe is a valve to prevent any gas escaping back to the inlet pipe. Should any alteration or repair become necessary, this valve is closed, and the rest of the apparatus is disconnected without danger. The outlet pipe for distributing the gas, to the various pipes leading to rooms or streets, is also secured by a valve. Connected with the outlet is a branch pipe under seal, leading from the outlet to the drip box, to collect all condensation which has not before been gathered. Connected with the drip box pipe is a pressure gage which shows the pressure of the generator on the gasometer when manufacturing gas. There is also a pressure gage connected with the outlet, which shows the pressure carried by the gasometer. I is an improved jet photometer, by which the candle power of the gas is correctly shown at once. Test cocks are provided to test the hydrogen and carbon separately, and also o test them when mixed, as a fixed gas before cooling. This process, the inventor considers, may be adopted by large or small gas works throughout the country, with the result of producing better gas at less expense and with less labor. It requires but one man where ten are needed in the coal gas process. The inventor also claims the process to be absolutely and perfectly safe. There is no distillation or purification necessary; and during the coldest weather of 1875, the candle power was not in the least affected, and no condensation whatever found.



EICHHOLZ'S GAS APPARATUS.

The apparatus needs no especial skill for its management, any ordinary laboring man being able to run it with perfect safety, after three days' experience. It can quickly be taken apart and put together, and it also occupies but small space, averaging about one fourth that required by a coal gas works of the same capacity.

Patented through the Scientific American Patent Agency, November 16, 1875, by Mr. John H. Eichholz For further particulars apply to Messrs. Eichholz & Green, 115 Freeman street, Brooklyn (E. D.), N. Y.

Platinum and Iridium.

MM. Saint-Claire Déville and Debray have succeeded in preparing platinum and iridium in a state of purity hitherto unattained. They prepare platinum of a density of 21·5, and iridium of the still more considerable density of 22·4. Alloys of these metals have a greater density in proportion to the amount of iridium present. With 90 per cent of platinum and 10 of iridium, the density is 21·6; it reaches 22·38 if the iridium form 95 per cent of the whole.

Canal Steaming.

The use of steam on the Chesapeake and Ohio Canal is destined to increase the transportation facilities of that enterprise, and eventually make a larger quantity of Cumberland coal available. The Ludlow Patton recently made a round trip between Cumberland and Georgetown, including lockage, in four days and nineteen hours, said to have been the fastest time ever made on the canal. The owner of the Ludlow Patton claims that the simple and ingenious arrangement for submerging her propeller has conducted largely to her success. She has been running the entire season just closing, has consumed for fuel 4½ tuns of coal per trip, and the repairs to her motive power have thus far cost but 90 cents.

Mysterious Fires.

We are now arrived at a season of the year when fires are abundant, and mysterious fires especially so. The mystery of a fire is one of three kinds—the mystery of fraud, the mystery of carelessness, and the mystery of ignorance. The latter characterizes people of all ranks in life, and is, seemingly, as persistent as carelessness, and sometimes as culpable as fraud. For instance, how many people know precisely what a defective flue is? How many know anything about spontaneous combustion? How many know that hollow walls are actual flues, which have the power of carrying flames from the bottom of a house to the top, almost instantly? How many know that the heat of a stove, even when separated by some little distance from wood, will, in the course of time, so char it that a spark will fire it? How many know that, under favorable circumstances, fires will smolder for hours, ready to flash into actual flame when fanned by the opening of a door, or the slightest current of air caused in any manner whatever? In brief, how many know anything of a hundred and one circumstances that will cause mysterious fires, which a slight degree of practical knowledge might easily prevent?—*The Index.*

Working Men's Reading Rooms—One Result of Our Suggestion.

A few weeks ago we published a brief editorial about working men's reading rooms, suggesting that it would be an excellent idea to establish resorts of this kind in every village and town, and to furnish them with newspapers and other cheap reading and interest the men, while, at the same time, educating them and preventing their wasting their evenings in taverns and bar rooms. The seed we thus threw broadcast fell, in one instance at least, on fertile soil. At a recent meeting of a Good Templar's Lodge, in Plattsburgh, N. Y., a lady read our article, "little expecting," says the local journal, the *Plattsburgh Sentinel*, "that it would lead to any immediate practical result." The members, however, at once seized upon the idea; one, Mr. Thomas Armstrong, offered a room free of charge, and a committee was then and there appointed to carry out the project. The *Sentinel* says that a cheerful, well lighted, and well warmed room, well supplied with newspapers and other attractive literature, will be provided, and in every respect rendered a congenial and pleasant resort. We are very much gratified to learn of this result of our efforts, and congratulate the worthy Good Templars on their generosity and public spirit.

Sixty-Foot Rails.

The Edgar Thompson Steel Works have filled an order for 60 foot rails. Several advantages are claimed for rails of this length. They cost no more per pound than 30 foot rails; and as two crop ends are saved, the cost of production is considerably lessened—no way of using crop ends economically having yet been devised. The cost of laying is lessened; fewer fish plates, etc., are required; and as the hammering caused by the rolling stock in passing from rail to rail is lessened by one half, the wear and tear of rails and rolling stock must be greatly diminished. On bridges, also, the strain will be greatly reduced. The practical results of the use of these rails will be awaited with considerable interest. —*Chicago Railroad Review.*

HOW TO GROW FAT.—It is said that a pint of milk, taken every night just before retiring to rest will soon make the thinnest figure plump. Here is a simple and pleasant means by which thin, scraggy women may acquire plump, rounded figures.

A GOOD alloy for making working models is 4 parts copper, 1 part tin, and ½ part zinc. This is easily wrought. Doubling the proportion of zinc increases the hardness.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year, postage included.................................$3 20

One copy, six months, postage included.................................1 60

Club Rates.

Ten copies, one year, each $2 70, postage included.....................$27 00

Over ten copies, same rate each, postage included.....................2 70

☞ By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 5. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, JANUARY 29, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 5.

For the Week ending January 29, 1876.

TABLE OF CONTENTS.

The SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

COMBINED RATES.

The SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT will be sent together for one year, postage free to subscribers, on receipt of $7.00.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York.

☞ Single copies of SUPPLEMENT sent to any address on receipt of 10 cents.

A PRACTICAL dairyman sends the following about rendering winter churning easy: Strain the milk into pans and set them on a pot of boiling water on the stove. Heat the milk quite hot, but not so as to scald. Set away the pans, and in 36 hours thick cream will have formed. At each skimming stir the cream well together, and, when enough for a churning has accumulated, take care, in cold weather, to have the chill taken off the cream; then scald the churn, put in the cream, and churn gently; and if the butter does not come in less than ten minutes, you may judge that your cream is too cold.

STEAM ON THE HIGHWAYS—TEN THOUSAND DOLLARS REWARD.

The State of Wisconsin has taken a very practical initiative in the important matter of promoting the use of steam power on the highways, by offering a reward of ten thousand dollars to the inventor of any successful machine, to be tested as stated below.

This reward appears to be intended simply as a token of the importance of the matter to the State—a sort of recognition, merely, of the great benefit that the discoverer will bestow upon Wisconsin, to say nothing of the advantages he will confer upon the world in general.

We subjoin the text of the law, which is now in vogue, having been passed at the last session of the Legislature. We may add that it is to the efforts of Mr. G. M. Marshall, of Big Spring, Wis., a member of the Legislature, that the passage of the law is due. Mr. Marshall is a most enterprising, intelligent, and practical man, and we could wish that many more of such gentlemen were chosen to represent the people in our various State legislatures. There is undoubtedly a vast work to be done, an astonishing economy to be gained, by the adaptation of steam to highway traffic, and we commend the subject to the serious study of our inventive readers.

We will make but one suggestion, which is that, in the study of plans for machinery for this purpose, the inventor should endeavor to provide a practical method of increasing or diminishing, at will, the leverage of his engine upon the vehicle, so that, without changing the speed of his engine, he may be able to reduce or increase the velocity of the vehicle thus enabling him to surmount bad places and heavy grades at a slow velocity, while running faster where the roadway is level and smooth.

The provisions of the law are so plain and simple, and the payment of the reward so certain, that we have no doubt there will be many competitors; while the general benefits of the competition will reach far beyond the particular object for which the reward is offered. The study which this competition induces will unquestionably lead to many new and useful collateral discoveries and inventions.

It will be observed that the successful inventors of this machine are not required to surrender any of their rights in respect to patents: but in addition to the pecuniary reward, they may enjoy the patent monopoly of their inventions in all the States of the Union, and in fact in all foreign States.

The following is the text of the law:

The People of the State of Wisconsin, represented in Senate and Assembly, do enact as follows:

Section 1. There is hereby appropriated the sum of ten thousand dollars, out of any money in the Treasury not otherwise appropriated, to be used as a bounty, and to be paid to any citizen of Wisconsin, who shall invent and, after five years' continued trial and use, shall produce a machine propelled by steam or other motive agent, the object of which is a substitute for the use of horses or other animals on the highways or farm.

Section 2. The test of successful use shall be that any machine or locomotive, entering the lists to compete for the prize or bounty, shall perform a journey of at least two hundred miles, on a common road or roads, in a continuous line north and south in this State, and propelled by its own internal power, at the average rate of at least five miles per hour, working time.

Section 3. The said locomotive must be of such construction and width as to conform with or run in the ordinary track of the common wagon or buggy now in use, and be able to run backward or turn out of the road to accommodate other vehicles in passing, and be able to ascend or descend a grade of at least two hundred feet to the mile.

Section 4. The Secretary of State is hereby empowered and authorized, when satisfactory proof that the above conditions have been complied with, to draw his warrant on the Treasury for the sum of ten thousand dollars, and pay the same to the inventor of the successful machine.

Section 5. This act shall take effect and be in force from and after its passage and publication.

GALTON'S NEW THEORY OF HEREDITY.

Next to the origin of life, and of far greater practical importance, the question of heredity is preëminently the great biological question of the day. How is it that, in the higher orders of plants and animals, the offspring resembles not only the parent, but often, and in a more remarkable degree, some remoter ancestor? How are characteristics of figure, temperament, mental and moral traits, etc., carried over from generation to generation? More mysteriously, how are the peculiarities of the grandparent transmitted to the grandchild, skipping the intermediate link? And how do acquired traits become hereditary?

Like the author of pangenesis, Mr. Galton adopts the hypothesis of organic units as the necessary basis of the science of heredity. This hypothesis almost necessarily implies: First, that each of the enormous number of *quasi* independent units, which make up each and every organism, must have a separate origin or germ. Second, that the stirp (by which term he designates the sum total of the determining elements of the newly fertilized ovum) contains a host of germs, much greater in number and variety than the organic units of the structure to be derived from them; so that comparatively few germs are developed. Third, that the germs which are not developed retain their vitality, propagate themselves while latent, and contribute to form the stirps of the offspring. Fourth, that organization wholly depends on the mutual affinities and repulsions of the separate germs, first in their stirpal, and subsequently during all the, processes of development. For proofs of the reasonableness of these postulates, the reader is referred to the arguments of Mr. Darwin. By means of them, and what to him appear to be their necessary consequences, Mr. Galton explains why it is that none of the higher races admit of being long carried on by any system of unisexual parentage: consequently the necessity of double parentage, and therefore of sex. This necessity in complex organizations is, he holds, the immediate consequence of a theory of organic units and germs.

Suppose, for example, a gardener takes the second bud of a plant and raises from it another plant, the second bud which is used in like manner, and so on consecutively. At each successive stage there is a chance of the dying out or omission of some one or more of the various species of germs in the stirp; and of course when they are gone, they are lost for ever. From time to time, this chance must fall unfavorably, causing deterioration of the race. If the loss be vital, the race will be extinguished at once: otherwise it will linger on until the accumulation of small losses becomes fatal. Exactly the same argument applies to every other unisexual process, all of which lead to deterioration and final distinction: subject, we should say, to the contingency of an origination *de novo* of organic units or their germs in the race. On the other hand, when there are two parents, the chance deficiency of any particular species of germ in the contribution from either parent will be likely to be supplied by the other, and the extinction of the family indefinitely postponed. And even if a few lines do run out, the remaining families fill up, only too easily, the gap.

From the rapidity of the visible changes in the substance of the newly fertilized ovum, it is inferred that the invisible germs in the stirp are in restless and eager pursuit of new positions of organic equilibrium, due, it may be supposed, to the unequal rates of development of some of the better nourished germs. Segregations occur as much as aggregations, repulsions concurring with affinities, doubtless, in producing them. The probable behavior of these germs under various conditions, Mr. Galton illustrates by analogy with political affairs. The successive segmentation of a cell is compared to the division of a political assemblage into parties, having thenceforward different attributes. Or the stirp may be compared to a nation, and the germs that achieve development to its foremost men, who succeed in becoming two nation's representatives.

The great dissimilarity frequently observed between brothers and sisters is similarly illustrated by a political metaphor. A uniform constituency will always have representatives of a uniform type; and this precisely corresponds with what occurs in animals of pure breed, whose offspring always resemble their parents and each other. On the other hand, when a constituency is very varied, trifling circumstances will change the balance of parties, and therefore, although there may be little real variation in the electoral body, the character of its political choice at successive elections may change abruptly. Similarly, in mongrel breeds, the greater the mixture, the greater the variety of the offspring. In like manner Mr. Galton explains why it is that the likenesses and differences of twins are more marked than those of ordinary brothers and sisters.

It is an essential condition in the theory of pangenesis that the developed portion of the stirp is the chief agent in maintaining the progeny of germs. Mr. Galton, on the contrary, holds that the developed part of the stirp is almost sterile, fertility residing in the non-developed residue, or rather in its progeny and representatives (whatever, or however numerous, they may be) at the time when the individual has reached adult life. In this way he explains why, although hereditary resemblance is the general rule, the offspring is frequently deficient in the very peculiarity for which the parent was exceptionally remarkable. "We can easily understand," Mr. Galton remarks, "that the dominant characteristics in the stirp will, on the whole, be faithfully represented by the structure of the person who is developed out of it; but if the personal structure be a faithful representative of the dominant germs, it must be an unfavorable representative of the germs generally, and therefore *a fortiori* of the undeveloped residue: nay, in extreme cases the person may be absolutely misrepresentative of the residue, the accidental richness of the sterile sample, in some particular valuable variety of germ, having drained the fertile residue of every germ of that variety." Instances of this sort frequently occur in the offspring of men of extraordinary genius, in which cases it is inferred that all the germs of genius were used up and rendered sterile in the structure of the parent, leaving the child exceptionally deficient. Another alleged result of the sterility of the developed elements of the stirp is the strong tendency to deterioration in the transmission of every exceptionally gifted race. By the same hypothesis, Mr. Galton explains the almost complete non-transmissions of acquired modifications through abruptly changing conditions, education, etc.

According to the theory of pangenesis, the germs or gemmules must freely circulate with the blood. On the strength of his experiments with rabbits, showing them to breed true after large transfusion of the blood of alien species, Mr. Galton holds that Darwin's theory demands too much: he is satisfied, however, that the segmentations of the stirp are not perfectly clean and precise, but that each structure includes many alien germs, whereby the progeny of all the contents of the residue of the stirp are distributed over the body, thus enabling the lower animals to replace lost limbs and the higher to restore wounded tissues.

Of the inheritance of non-congenital peculiarities, Mr. Galton is more than ordinarily sceptical. At most, "acquired modifications are barely if at all inherited, in the correct sense of that word." He accepts the supposition that they are faintly heritable, however, and accounts for such inheritance by a modification of pangenesis, to the effect that each cell may be supposed to throw off a few germs that find their way into the circulation, with a chance of occasionally finding their way to the sexual elements, and of becoming naturalized among them: a process independent of the causes supposed mainly to govern heredity.

To illustrate the relationships of parents and offspring, Mr. Galton resorts again to a political comparison. The idea of such relationship being one of direct descent he holds to be quite untenable. From his point of view, the stirp of the child is to be considered as descended directly from a part of the stirps of each of its parents, while the personal structure of the child is an imperfect representation of his own stirp, and the personal structure of each of the parents is no more than an imperfect representation of each of their own stirps. The idea of filial relationship, which likens it to that which connects colonists to their parent nations, errs in making the relationship too close and strong. It resembles more that which connects the representative government of the colony with that of the parent nations. This is his first approximation. The second approximation consists in making allowance for the limited power of transmitting acquired peculiarities, that is, for the reaction of the personal structure upon the sexual elements and thereby upon the future stirp. This he allows for by supposing the governments of the parent states to have the power of nominating a certain proportion of the colonists.

INFERNAL MACHINES.

Recent European mails bring further details of the diabolical plot which accidentally culminated in the fearful dynamite explosion on the wharf of the steamer Mosel, in Bremerhaven. It seems that the igniting mechanism was a common clock, of strong construction, and with its works so arranged as to cause a thirty pound hammer to strike a blow every ten days. The dynamite was placed in four zinc boxes arranged one above the other, the clock and hammer being between the second and third. As to how the explosion was caused there is much difference of opinion, but it is probable that it was due to one of two causes: either the dynamite exuding out of its receptacles and being exploded by the concussion of dropping the box, or the premature fall of the hammer.

It is curious to mark how much mechanical ingenuity has been expended on these engines of destruction: ingenuity which, if devoted to honest ends, would have gained for its possessors far greater rewards than they ever might hope to obtain through the terrible crimes intended. Thomassen's apparatus, above described, is comparatively crude, notably so in view of the fact that he must have examined other devices before deciding upon its use. Take, for instance, the machine which, some three years ago, it was attempted to ship aboard one of the Messageries Maritime Company's vessels, at Bordeaux or Marseilles. As usual, a heavy insurance on worthless goods was the object of the plan. The principle of this arrangement was that of the needle gun. The needle was set in a bolt, which was acted on by a spring in a tube. In order to hold the bolt back, thus compressing the spring, a catch on the former engaged with a hammer-headed lever. The lever was also attached to springs, which tended to draw it away from the catch, but the operation of which was opposed by a large disk placed close against the lower part of the lever head and held in its place in front of the catch on the bolt. In the disk there was a notch deep enough for the lever head to drop into when that portion of the disk was suitably presented. The disk was rotated by a train of clockwork at a fixed speed, and its edge was spaced off so that two consecutive marks would come opposite a fixed point in exactly one day. Supposing, therefore, the disk to be marked in ten portions, and the machine to be required to explode in eight days, the lever would be set at the eighth mark from the notch. The clockwork started, the disk would revolve until, at the eighth day, the notch would come opposite the lever, and the latter would fall into it, so freeing the needle and exploding the cartridge. All of this mechanism was placed in a common packing box, and nitro-glycerin or other fearfully powerful explosive was used. Fortunately the scheme was discovered and frustrated in time.

The coal shell is another infernal device, the invention of which, the London *Times* intimates, may be attributed to some over-zealous supporter of Mr. Plimsoll's parliamentary endeavors to prevent the sacrifice of sailors' lives in rotten ships. Each shell was a hollow brass casting, resembling a moderate-sized lump of coal, and was simply filled with an explosive mixture. When coal was delivered to a vessel, it was intended (said the witness, who is supposed to have concocted the shell and the sensational story) to mix in a few of the shells, which, when carefully blacked, it would be impossible to distinguish. They would, with the coal, be shoveled into the furnaces, and instantly blow up, destroying the vessel, whose loss would probably subsequently be attributed to a boiler explosion.

Ingenuity of a much higher and hence more fiendish order has been brought to bear in the construction of "rats," which are of two species, one intended to operate on iron, the other on wooden ships. The iron ship rat consisted of a pig of iron, similar in appearance to that commonly used for kentledge or ship's ballast. Of course where several hundred of these pigs were carried next the keelson and on the floor of the ship, careful scrutiny of each would be altogether impossible. Into the block a hole was made, and in this a tubular boring tool, hollow and filled with acid, was placed. Above the tool a weighted lever was rigged, and so placed as to work to and fro horizontally in a space cut out of the top of the pig. The whole was carefully boxed in, and the surface of the iron restored. The rolling of the ship would cause the lever to sway back and forth, and so act on the tool as to carry it against the ship's side. A spring helped to push the tool, and the latter, aided by the acid, very slowly but surely made its way through the iron and opened a leak. The latter, being in a location very difficult to find or even to plug, unless closed in some way would cause the ship to fill and sink.

The wooden rat was much more complex, and certainly more ingenious. In a box were placed, at a distance of five feet apart, two vertical cylinders. Between these was a horizontal cylinder having a piston working in it, the rod passing through a stuffing box. The other end of the rod worked a weighted ratchet drill. The vertical cylinders were each half filled with water, and each connected by a separate pipe with opposite ends of the horizontal cylinder. When the ship rolled, the water, alternately leaving and returning to the vertical cylinders, acted on the piston, the reciprocating motion of which was converted into rotary motion at the auger, which thus worked its way through the vessel's side. After the hole was made, the auger was freed from its fastening and dropped through into the water, so that it neither choked the hole, nor remained as evidence of how the same was produced. The box, even if discovered, would indicate nothing save to a mechanical eye. Both of the rats, of course, required that their originator or a confederate should adjust them to their work.

The use of infernal machines for wholesale destruction, in order to gain insurance, is of comparatively recent date, as the old and common employment of these devices was, and still is in a measure, to destroy individuals obnoxious to the perpetrator of the crime. In 1838, it will be remembered, Fieschi devised an ingenious arrangement of twenty-five gun barrels (perhaps the prototype of the modern mitrailleuse), which were discharged all at once at the object of his hatred, Louis Philippe, without accomplishing the purpose intended, however. The Orsini bombs, designed for the slaughter of Louis Napoleon and his family, were small iron shells made in halves and screwed together. The interior was filled with powder, and the outside completely studded with nipples and percussion caps, so that it would be impossible to throw down the bomb without some cap exploding the charge. These, when tried, killed several people; but the Emperor escaped unharmed.

The simplest infernal machine is that peculiar to the New York rascal, who occasionally dispatches it per express to politicians who have fallen from his good graces. The last recipient we can recall was Comptroller Green, of this city. The arrangement received by this gentleman, luckily without injury, was a small innocent-looking box having a sliding lid. The interior of the latter was lined with sand paper, against which the heads of several matches (of the parlor or explosive kind) were placed. On withdrawing the lid, the friction of the sand paper would ignite the matches and then the powder of a heavy cartridge in the box. The effect would be to blind or severely injure the opener; but in the case above mentioned, nefarious designs were suspected, and thorough soaking in water allowed of the box being safely examined.

We had prepared drawings of some of the ingenious machines which, as above described, have been applied to such diabolical uses, and contemplated publishing engravings of the same in connection with the foregoing article; but on second thought, it seemed to us wiser not to do so. Crimes, say those who have made the evils of mankind a study, are epidemic; and there are minds so delicately poised that but a mere touch is necessary to turn them in the direction of evil. Mr. James T. Fields has recently had a lengthy conversation with that incarnate infernal machine, the Boston boy murderer Pomeroy, who so mercilessly mutilated his little playfellows; and as a result of his interview, Mr. Fields traces the boy's mania for blood, in some measure, to the perusal of the sanguinary yellow covered literature of the dime novel type. Doubtless the writers and publishers of the murderous adventures would be as much shocked as any other good members of the community would be, could the effect of their work on badly balanced and illiterate minds be demonstrated to them beyond doubt. So therefore we, desiring above all else to avoid even the remotest probability of working evil, think best to deny our pages to the semblance of the means whereby crimes so horrible and atrocious have been committed, for the harm caused might vastly exceed the advantage of such knowledge as the pictures might impart.

SAFE SAVINGS.—AN IMPROVEMENT NEEDED.

Our English cousins are fast reducing the problem of how to live cheaply and save money to a science. They have invented coöperative societies of which the members can buy the necessaries as well as the comforts of life at greatly reduced rates, and have long since brought annuity schemes and similar facilities for putting by funds to a high degree of perfection. The latest invention of this kind is the Provident Knowledge Society, an incorporate association whose professed object "is to endeavor to make regular weekly saving a national habit, and so increase the facilities for saving that it shall be as easy for a man to put by a small sum as it is now for him to spend that sum in beer or spirits." A high aim certainly, and one cannot but feel curious to know will be the practical result.

The association, it seems, works in two ways: First by advising people, either verbally or by letter, relative to forming schemes to encourage frugality, and second by issuing pamphlets, written in the simplest and plainest language, about various subjects of the same nature. Supposing, therefore, a workman can save a few pence a week, and has no idea how to do it, or what the result will be if he does, he sends a penny stamp to the society with his question, and back comes the necessary manual, telling him all he wants to know with official precision. There are pamphlets about life insurance, pawnbroking, saving banks, hints for working men, to general employees, and to servants, and suggestions how to start coöperative stores and penny banks, the details of which it is hardly necessary to go into, since in this country a very different condition of affairs in point of facilities for saving money, unfortunately perhaps, exists. We say unfortunately, because there is really among us no definite and absolutely certain system whereby a man, after he has put by his savings, can be assured that they will always be his. He has a choice, to be sure, of depositing his funds in a bank and leaving them there idle, but subject to check at sight, or of placing them in a savings' banks, gaining a certain interest, or of buying an endowment or annuity policy from an insurance company. We refer, of course, to very small amounts, and therefore such investments as good mortgages or government bonds are out of the question. The difficulty with all three plans abovementioned is their lack of absolute security. Banks, flourishing one year, may find cause to suspend the next; saving institutions (as did several of the largest recently in this city) may suddenly collapse and sweep away the hardly earned savings in an instant; and insurance companies are by no means exempt from a like fate. So that, after all, the working man, who here puts his money out of his possession for safe keeping, does so with the knowledge of incurring a risk.

It has frequently occurred to us that a plan might be perfected whereby the government could be made the repository of the public's savings, and perhaps a system of post office savings banks devised, imitating that now in vogue in England. There every post office is a legal recipient for deposits of any sum over one shilling; the account of each and every depositor is kept at the head office in London, and, immediately after he pays in a deposit, he receives post free a letter from the metropolis announcing the placing of the sum to his credit. When he wishes to draw all or a portion of his funds, he notifies his postmaster, who reports to London the amount called for, and the depositor again receives a free letter, advising him of the fact and inquiring whether all is right. This letter he carries to the postmaster who, in return therefor, pays him the money. This plan effectually precludes every possibility of fraud by intermediate agents, and the depositor has the security of his government for the safety of his cash. He is provided with a bank book, and in other respects deals with the post office as if it were an ordinary savings' bank. Two and a half per cent interest is allowed him on his deposit. In conjunction with this system, the government sells annuities, so that any person can, by depositing a small sum for a certain period, purchase an annuity for the rest of his life.

In one of the pamphlets published by the society above mentioned, the inquirer is told what, under the annuity plan, can be done for eight pence (16 cents) a week. For that sum, paid from the age of nineteen to sixty, any man may obtain, on government security, a pension of five shillings ($1.25) a week for the balance of his life. For four pence (8 cents), paid during the same period, he may buy a pension of 60 cents a week, and more or less in proportion. If the depositor who begins at nineteen dies before he attains the age of sixty, say at forty years of age, the money that he has laid by is returned to his heirs at law in absence of a will, or to any one he may designate; it amounts to £35, or $175. If he dies at fifty, about $260 would be returned, and so on So that the arrangement is entirely different from an endowment life policy by an insurance company, which might be forfeited through failure to pay premiums. This advantage more than compensates for the comparatively small returns which the investment at first sight appears to yield. There is beside, under this pension or annuity arrangement, a provision for drawing out money in case of illness.

It will be seen therefore that the depositor may either use the government as a temporary depositary for his savings or he may buy from it, for a very small weekly sum, a pension sufficient to keep him from want in his old age. There are several circumstances which militate against the adoption of a scheme of this kind here, but we imagine that ultimately the objections might be overcome. The principal one lies in the fact that our post office is a non-paying institution, and is a charge instead of a source of revenue to the country. The question then arises of whether the increased burden which the post office savings' bank department would add, to that already existing, would be compensated for by the benefits gained. Again, this being a country of magnificent distances over which to send a free letter for each deposit or withdrawal, it would be an expensive proceeding; and it would be necessary to designate several cities where accounts for adjoining sections of the country could be kept. There are various other considerations which might be mentioned, relatively to adopting the system here. In England, however, recent statistics show that about one person in every seventeen of the population takes advantage of the facilities thus afforded, a fact which fully demonstrates the value and popularity of the plan.

There is no mistaking that the circumstance of the recent collapse of the savings' banks in this city has, for a time at least, shaken public faith in institutions of that character, and indicated moreover how little people examine into the affairs of concerns to which they entrust their funds. Whether the safe English system be adopted here or not, certain it is that a safer plan for poor people's savings is badly needed; and in modifying the English or devising another or better plan, our political economists and financiers will find a useful opportunity for the exercise of their abilities.

BATHE weak eyes before retiring at night with a little sugar dissolved in warm water.

IMPROVED FIRE PLUG.

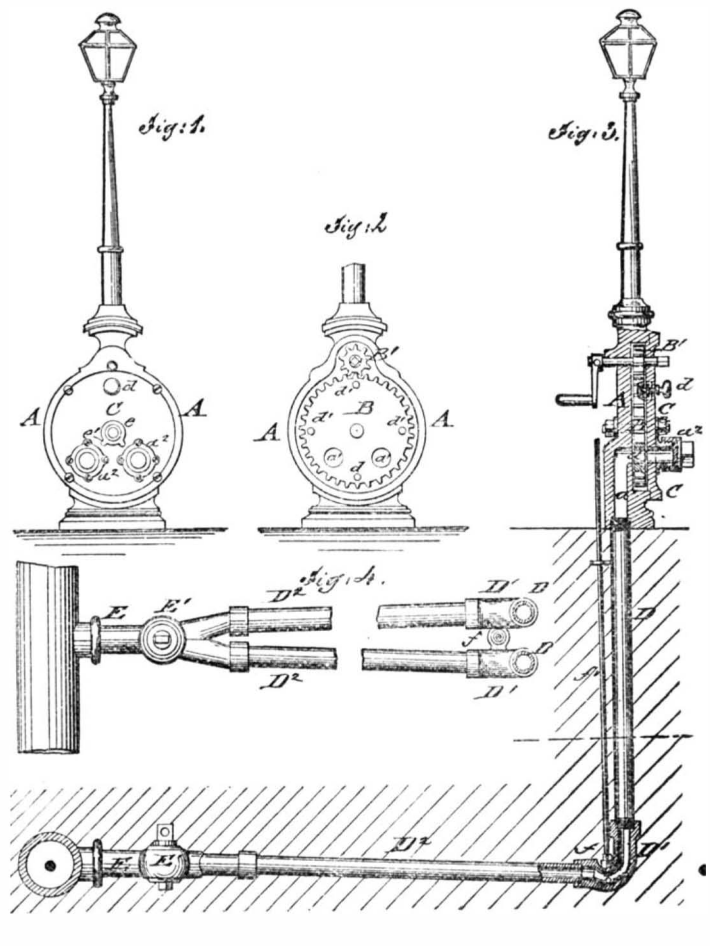
Mr. Christian Rapp, of Cincinnati, Ohio, has recently invented a new form of fire plug, which, for convenience sake, he prefers to locate in the base of a street lamp, as shown in Figs. 1 and 3 of our engraving. Fig. 1 represents a front elevation; Fig. 2, a front view of the interior, with face plate detached; Fig. 3, a vertical transverse section of the same, showing connection with the main; and Fig 4, the connection of the main with the branch supply pipes of the plug.

The plug is constructed of a casing, an interior disk, and a front plate, with adjustable openings to establish connection with the supply pipes of the casing and the nozzles of the closing front plate, to open or close the plug, a spring stop locking the disk into position. A waste cock at the elbow of the supply pipes serves to drain any water from the same.

In the engraving, A represents the main casing, B the interior revolving wheel or disk, and C the outer face plate, secured to the casing by suitable fastening screws. The casing, A, is cast at the back with two supply openings, *a*, and turn at right angles toward two corresponding openings, a^1, of the disk, B, and the nozzles, a^2, of the front plate, C. The disk, B, turns on a central shaft, that passes through perforations of casing and front plate, and is provided with screw nuts at the ends to tighten the parts closely to prevent leaking. The contact parts of casing, disk, and face plate are lined with soft metal to allow the tight packing of the same. The wheel, B, is turned by means of a pinion, B^1, at the upper part of the casing, the pinion being revolved by a crank applied to its projecting shaft. A spring stop device, *d*, of the front plate locks into recesses, d^1, of the disk, to secure the same either in closed position or with one or both holes open. The spring stop has to be released before the disk can be turned by the crank. A washer, *e*, with indicators, e^1, is keyed to the shaft of the disk in such a manner that the indicators follow the motion of the disk, and show the position of the exit holes of the same. The nozzles of the front plate are closed by screw caps, which are taken off when the hose is to be screwed on.

When the fire plug is constructed in connection with a lamp post, suitable arrangements for the gas pipes have to be made.

For the purpose of protecting the fire plug against frost in winter, after use in supplying fire engines with water, the stopcock is closed, so that by a few strokes of the engine the water in the supply pipes may be entirely pumped out. During the warm season the plug may be closed directly by the disk, as there is no danger of the plug being frozen.



RAPP'S FIRE PLUG.

THE RIDER COMPRESSION ENGINE.

We illustrate herewith a new motor, the operation of which is produced by the use of highly compressed cold air. This is heated thoroughly without change of volume, and its efficient expansion to a point at or below the pressure of the atmosphere utilizes all the force or mechanical effect possible. All these changes are consecutively and rapidly effected in this motor without the use of valves, springs, levers, or, in fact, any delicate parts whatever, the moving parts being reduced to the lowest possible number, namely, the pistons, shaft, and connections. As may be seen by the annexed sectional engraving, Fig. 2, the engine consists essentially of a compression cylinder, A, and a power cylinder, B, with their respective pistons, C D, and connections, and a regenerator, H. The lower portion of the compression cylinder, A, is kept cold by a current of water which circulates through the cooler, E, which surrounds the lower portion of the cylinder, while the lower portion of the power cylinder is kept hot by the action of the fire below the heater, F. The heating and also the cooling of the air is instantaneously effected by its alternate presentation to the surfaces of the heater and cooler in a thin annular sheet.

The compression piston, C, extends downward to the base of the engine, and is a trifle smaller than the interior of the cooler, E, thus leaving a thin space on all sides for the air to pass downward and become thoroughly cooled on its way to the bottom, and through which space it flows on its way back to the heater. The power piston, D, likewise extends downward into the heater, F, which presents to the action of the fire a narrow annulus all round the bottom. Within this heater is the telescope, G, which is a thin iron cylinder about one fourth of an inch less in diameter than the interior of the heater. It is fitted to the interior of the power cylinder, and extends nearly to the bottom of the heater. Its office is to cause the air which flows from the compression cylinder to be presented in a thin sheet all round the interior surface of the heater, and particularly at the lower and hotter portion. By this means the air is thoroughly and rapidly heated.

The same air is used continuously, as there is neither influx nor escape, the air being merely shifted from one cylinder to the other. Between the compression and power cylinders is situated the regenerator, H, composed of a number of thin plates slightly thickened at their edges, which, while affording a free passage to the air, sub-divides it into thin sheets. It is so placed between the cylinders as to be traversed by the air in its passage each way between the hot and cold cylinders.

The other portions of the engine are readily understood on inspection of the engraving. The two pistons are attached directly to the cranks, I I, by simple connecting rods, J J, and all the movements of the various parts are uniform, being solely derived from regular, circular, and rectilinear motion; and as there is an entire absence of all complicated parts and the irregular intermittent impulses which characterize caloric engines, a high rate of speed and smooth action may be safely and easily obtained. K K are the packings, which are in duplicate for each cylinder. The lower one has its lap downward to resist the escape of air below the piston, while the upper one has its lap upward to prevent the lubricating material from entering too freely into the cylinder. Between them is a patent relief ring to relieve the friction of the packings. L is a simple check valve which supplies any light leakage of air which may occur.

The operation of the engine is briefly as follows: The compression piston, C, first compresses the cold air in the lower part of the compression cylinder, A, into about one third its normal volume, when, by the advancing or upward motion of the power piston, D, and the completion of the down stroke of the compression piston, C, the air is transferred from the compression cylinder, A, through the regenerator, H, and into the heater, F, without appreciable change of volume. The result is a great increase of pressure corresponding to the increase of temperature, and this impels the power piston, D, up to the end of its stroke. The pressure still remaining in the power cylinder, and reacting on the compression piston, C, forces the latter upward till it reaches nearly to the top of its stroke, when, by the cooling of the charge of air, the pressure falls to its minimum, the power piston descends, and the compression again begins. In the meantime the heated air, in passing through the regenerator, has left the greater portion of its heat in the regenerator plates, to be picked up and utilized on the return of the air toward the heater.

These motors are valveless, noiseless, simple, and claimed to be absolutely safe; emit no heated air or unpleasant odor, as is the case with caloric engines; require no steam, cannot explode, do not increase risk of fire or cost of insurance, and can be operated by any one who can manage an ordinary stove.

They are well adapted for running all kinds of light machinery, printing establishments, etc., but are particularly valuable for pumping. One of these little six inch pumping engines (household size) has, we are informed, pumped for 6 months, without intermission or stoppage from derangement, each consecutive day of ten hours, 10,000 gallons of water to a hight of from 70 to 100 feet; and the engine required the services of an attendant less than thirty minutes each day, and consumed only 20 lbs. of coal per day, thus pumping 2,000 gallons of water 100 feet high at a cost of only one cent.

For railroads, city and suburban residences, French flats, hotels, boarding houses, etc., these engines are very desirable. As may be seen by Fig. 1, the pump is placed on the side of the cooler, and worked directly from the compression piston. All the water is passed directly through the cooler on its way to the tank or outlet.

For further information, address the agents, Stafford & Cammeyer, 93 Liberty street, New York city, at which address the engine may be seen in operation.

Fig. 1.

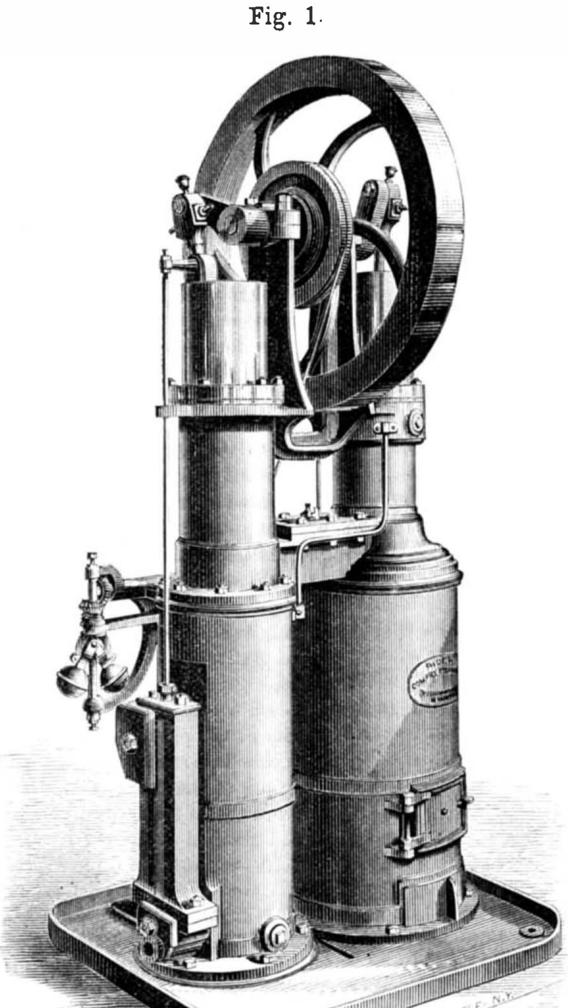
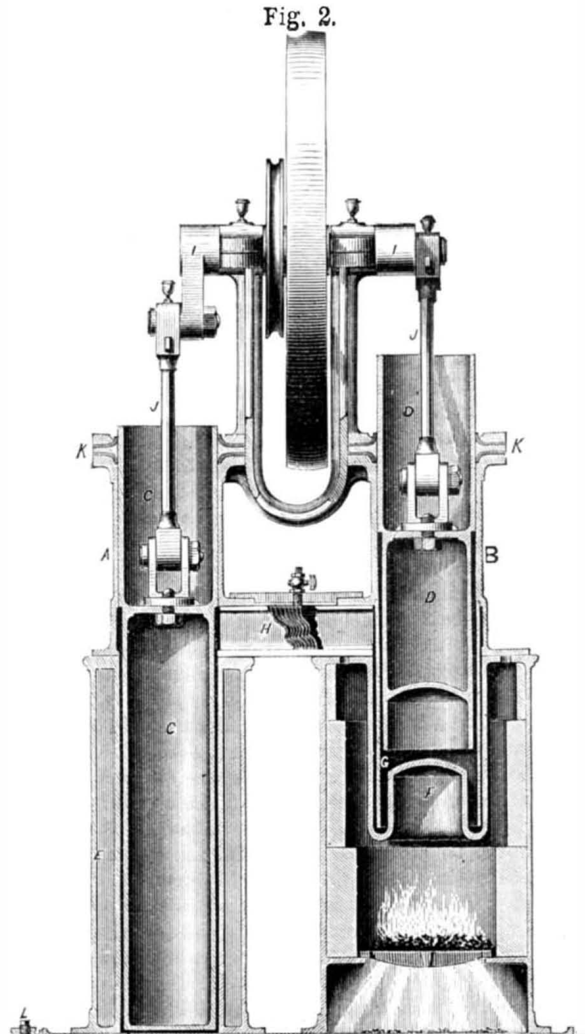


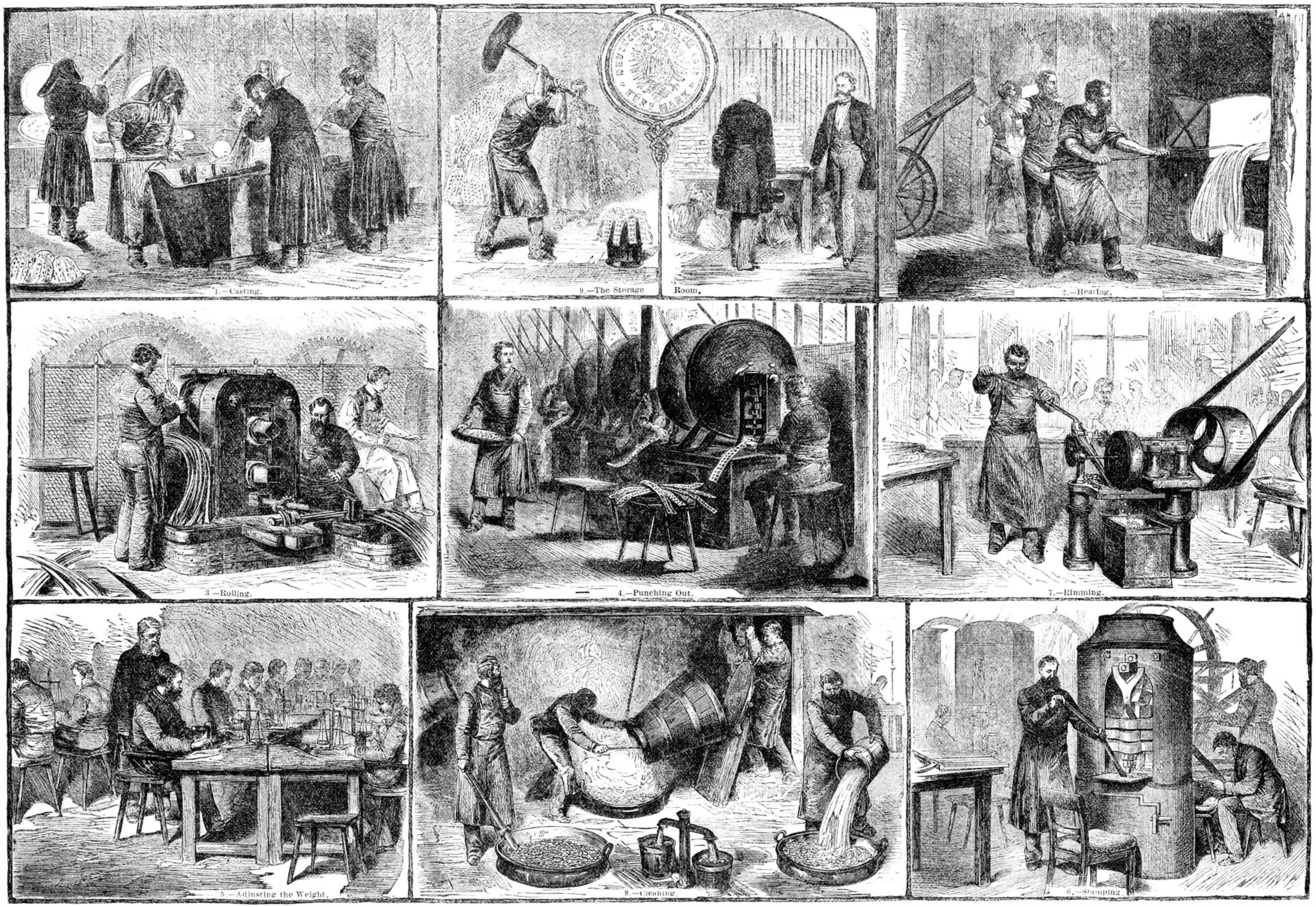
Fig. 2.



THE RIDER COMPRESSION ENGINE.

One Man's Work.

The enormous statue of Herrmann, the ancient German warrior, which was inaugurated some months ago by the Emperor of Germany, was entirely made by one man. The figure is of embossed copper, one hundred feet high, and every inch of the immense surface was hammered by hand. A Westphalian nobleman, Herr von Bandel, performed the entire work, from the preliminary modeling to the finishing with the hammer, many years of his life being devoted to the work. The statue stands near Detmold, the capital of the principality of Lippe, and the artist's workshop was located on the spot.



THE MANUFACTURE OF COINED MONEY.

COINING.

We publish on our previous page a series of engravings illustrating the various processes employed in the manufacture of money, a business which, being mostly in the hands of governments, is not in the category of ordinary manufacturing operations, but which is, nevertheless, a very extensive and important trade. The amount of money annually minted is prodigious; and the necessity for perfect accuracy in weight and fineness of every coin gives the business the peculiar interest attaching to all minute and delicate operations conducted on a very large scale.

The first step is the mixing of the alloy, which in this country consists of 9 parts pure metal to 1 part alloy. The alloy for silver coin is copper; for gold, a mixture of silver and copper, the proportion of silver in the mixture being not more than one half. In practice, but a small portion of the alloy for gold is silver. The silver is readily prepared for coining; but the gold frequently is found to be brittle when cast into ingots, owing to the presence of impurities. Many of these foreign matters are diminished by treating the molten metal with a stream of chlorine gas. When the standard of purity is accurately adjusted, the metal is cast into ingots, long enough in proportion to their thickness to be rolled into strips of the required thickness (see Fig. 1). The ingots are then heated (Fig. 2) and rolled into long strips (Fig. 3). In our Fig. 4 is shown the operation of punching out circular disks from these strips; and this process is one of great nicety, as the disks require to be so nearly correct in weight that the final adjustment can be readily made. In Fig. 5, is shown the weighing room, where any trifling overweight on each disk is removed with the file, care having been previously taken to make the pieces over rather than under the correct weight. Fig. 6 shows the coining presses, in each of which are a die and a countersink, engraved with the devices for the obverse and reverse sides of the coin respectively. This operation completes the coin, except as to its edge, which is finished by the machine shown in Fig. 7, which raises the circumferential rim which protects the embossed face of the coin from abrasion by friction in use. This machine rims from 800 to 900 coins per minute; and words or devices can be embossed on the rim, when required, by a straight steel die, against which the coins are pressed with great force, and rotated. Milled edges are made by this machine, the die being properly cut for the purpose.

The coin is now finished, being perfect in value, weight, and form; and all that now remains to be done is to cleanse it from the dirt of the manufacturing processes, and give it the beautiful appearance which characterizes new money. This done by scouring and washing, as shown in Fig. 8; and the money is then put up in packages for storage, as shown in Fig. 9. The waste strips are readily beaten into ingots, as shown in the same engraving; and all filings and dust of the precious metals are carefully saved.

The series of illustrations gives a clear and accurate idea of the system generally in use; but of course the processes are varied in different establishments.

THE BUDDHA CRAB.

Rev. C. W. Everard writes to *Land and Water* that he was, two years ago, in the northeast of China, and was then told that the natives there not unfrequently caught some small crabs which have a most ridiculous face on one side. "They call them the Buddha crabs. I was very anxious to see some; and before I left, the two that I now have the pleasure of sending you, and which I beg you will accept, were brought me. One has, unfortunately, suffered in its long journeys, but the other is nearly perfect. The face is very distinct, and looks like a very jovial old fellow much given to wine."

In reply, the editor, Mr. Frank Buckland, says: "I now give a portrait of this remarkable crab; it is just the size of the top of the thumb; the claws are very small. The nearest approach to it is the masked crab (*corystes Cassivelaunus*), sometimes found in the British seas. One of these was exhibited alive in the aquarium of the Zöological Gardens, in 1860. I think it would puzzle even Mr. Darwin to account for this extraordinary resemblance to the human face on the back of a crab. This crab comes from China, and, strange to say, the markings on his back exactly resembled the face of an ugly old Chinaman. The eyes are closed, but they are oblique to the face, and are surmounted by heavy eyebrows. The nose is rounded and flattened; at each corner there is a warty projection. The moustache is curled exactly like the moustache we see on a Chinaman. The mouth seems ready to open and swallow any quantity of food."

Ducks and Terrapins.

Everybody, says the Baltimore *Sun*, has heard of Chesapeake canvas-backed ducks and diamond-backed terrapins, and a great many people know something of how they taste when served up for the table, but not a great many are acquainted with the manner in which they are handled by the dealers in those and other famed gastronomic luxuries. There is an establishment in Baltimore which has been fitted up especially for this trade, where canvas backs and all kinds of game are kept by the thousands in apartments where the temperature remains at 18° above zero, and where terrapins in multitudes live and grow fat on nothing. There are five large closets on the premises, built in the walls, similar to bank vaults, and these, by a scientific process, are arranged to keep their interiors at a very low temperature, by the use of ice, but in a different manner from the freezing process of a refrigerator. In one of these the canvas backs and other wild game are kept perfectly fresh; in another there are all varieties of fish, including shad from Savannah, white fish from the lakes, rock and perch from the Chesapeake tributaries, and blue fish, haddock, and codfish from the North. In another closet the smaller and more common fish are kept, and all of the closets are filled with some of the special products dealt in. For a month past shipments of canvas backs by the barrel have been made to London, Liverpool, and Paris by steamships from New York and Baltimore. The fowls are taken from the cold closets, and, when on board the steamers, are put in ice, and reach their destinations in excellent condition. Oysters in barrels are also sent to Europe, the oysters being packed with seaweed and corn meal. But the most novel feature of the house is the terrapin department. This room is kept warm, and the terrapins luxuriate in airtight chests, each from five to ten bushels capacity. These are packed full of terrapins, which number many hundreds in the aggregate. The most of them are of the Chesapeake diamond back variety, and all are at least seven inches across the under shell, that being the measurement which the terrapin must reach before, in the opinion of the epicure, it is fitted for the table. There are also kept, in some of the chests, hundreds of slider or red fender terrapins, a fresh water variety, chiefly from the James river. The habits of the terrapin have been made a study by the dealer. He keeps them in his airtight chests, without food, and says they not only exist deprived of air, but grow fat, and if kept in the chests for six months will each weigh four or six ounces more than when put in. If the terrapins are allowed to have liberty or free air, even in the most limited space, they become very poor, as they seem to draw sustenance from themselves, but do not take food. All the terrapins in the chests are enjoying vigorous existence, as proved by their movements when the lids were raised. The terrapins are principally sold to hotel keepers, and to be served up at extra junketings, and bring about $24 a dozen. During the terrapin season of 1874, one house in Baltimore sold a thousand dozen.

Contagion in our Schools.

The prevalence and spread of scarlet fever and diphtheria among the children of this city are facts which should awaken an anxious concern of the profession. It is unnecessary to say that the occurrence of these cases is explained by the fact of direct contagion. No matter what particular views may be advanced in regard to the *modus operandi* of the poison, we hardly believe there are any, at all acquainted with the diseases in question, who would be willing to say that they are not communicable, and hence not amenable to ordinary preventive measures. But, notwithstanding this belief, a belief shared in by the most intelligent portions of the lay community, we have these diseases cropping out in the schools day by day, under the very eyes of the teachers, and without any apparent effort on their part to arrest the spread. When a child carries a contagious disease from his school to his home, there is always trouble and anxiety in the train, and not unfrequently death, besides the danger of the propagation to other members of the family and among the neighboring children. In the absence of sanitary inspection in our schools, it may seem hardly fair that we urge upon any extra duty to supply the deficiency; but we are convinced that, with very little trouble on their part, a great deal of good can be accomplished. And after all, in this particular the teacher is the fittest person to act, being always in direct communication with every scholar, and being the first to be informed of any illness. It would seem to be a very simple task to send the ailing child home, and at the same time to assume, especially during epidemics, that the sickness may be of a contagious character. Neglect of such precautions causes the sacrifice of many valuable lives yearly; and so long as teachers consider that they have no moral obligations in the matter, we can hardly hope for any change.

THE BUDDHA CRAB.

Even in the most contagious diseases the danger of infection during the initiatory symptoms is comparatively slight. This certainly is the strongest possible argument in favor of the prompt quarantining of a suspicious case. But while we allow that, with the right disposition on the part of those who have charge of the children, much disease may be prevented, there is another element in the question, and one which it is more difficult to meet, because in a measure beyond the control of the teacher: and that is the premature appearance at school of those who have been the subjects of these infantile diseases. It is well known that the power of propagation lingers in many of these disorders long after convalescence has commenced; and as such a fact is one of the difficult things for ignorant parents to appreciate, there is no wonder that, many times, the most dangerous poisons are sown broadcast.—*Medical Record.*

TO CLEAN colored leather, use 1 oz. oxalic acid dissolved in 1 pint distilled water.

Seal Flesh.

Dr. A. Horner, surgeon to the Pandora, speaking of the Greenland Esquimaux, says: "From the length of time these people have inhabited this cold country, one naturally expects them to have found some particular food, well adapted by its nutritious and heat-giving properties, to supply all the wants of such a rigorous climate; and such is found to be case, for there is no food more delicious to the taste of the Esquimaux than the flesh of the seal, and especially that of the common seal (*phoca vitulina*). But it is not only the human inhabitants who find it has such excellent qualities, but all the larger carnivora that are able to prey on seals. Seal's meat is so unlike the flesh to which we Europeans are accustomed that it is not surprising that we should have some difficulty at first in making up our minds to taste it; but when once that difficulty is overcome, everyone praises its flavor, tenderness, digestibility, juiciness, and its decidedly warming after effects. Its color is almost black, from the large amount of venous blood it contains, except in very young seals, and is, therefore, very singular-looking, and not inviting, while its flavor is unlike anything else, and cannot be described except by saying "delicious!" To suit European palates, there are certain precautions to be taken before it is cooked. It has to be cut in thin slices, carefully removing any fat or blubber, and then soaked in salt water for from 12 to 24 hours to remove the blood, which gives it a slightly fishy flavor. The blubber has such a strong taste that it requires an arctic winter's appetite to find out how good it is. That of the bearded seal (*phoca barbata*) is most relished by epicures. The daintiest morsel of a seal is the liver, which requires no soaking, but may be eaten as soon as the animal is killed. The heart is good eating, while the sweetbread and kidneys are not to be despised.

The usual mode of cooking seals' meat is to stew it with a few pieces of fat bacon, when an excellent rich gravy is formed, or it may be fried with a few pieces of pork.

The Esquimaux make use of every part of the seal, and, it is said, make an excellent soup by putting its blood and any odd scraps of meat inside the stomach, heating the contents, and then devouring tripe, blood, and all with the greatest relish. For my own part I would sooner eat seal's meat than mutton or beef, and I am not singular in my liking for it, as several of the officers on board the Pandora shared the same opinion as myself. I can confidently recommend it as a dish to be tried on a cold winter's day to those who are tired of the everlasting beef and mutton, and are desirous of a change of diet.

Bath Bricks.

The annual importation of Bath bricks into the United States is estimated at 10,000 boxes, there being 24 bricks in each box. These bricks are manufactured from the deposits of the river Parrett, Bridgwater, England, where millions are made annually. Nowhere else are these deposits found, so that Bridgwater supplies the world, and Bath brick are as well known in America, China, and India as in England.

Artists' Brushes.

In a detailed description of the business of a large manufactory of artists' materials, in this city, a *Tribune* reporter gives the following interesting information in regard to the various sorts of hair used in brushes. The principal kinds employed are: Hog's bristles, which, being coarse and stiff, make good varnishing brushes; bear's fur, which is also stiff and hard, and used mainly for varnishing brushes; badger hair, which is long, soft, and elastic, and of which are made graining and gilding brushes; sable tail hair, which is very long and very elastic, and is made up into the finest and costliest of artists' brushes; camel's hair, also long and elastic, and second only to sable in fineness; and ox hair, which is pulled from the inside of cow's ears, and, being exceedingly long and elastic, makes good striping and lettering brushes. The skins of the animals mentioned are imported in bales, and boys with shears cut off the hair in handfuls, which are afterwards arranged by the brush makers. The denuded hides are then sold to glue makers. The value of some of the most costly kinds of hair exceeds that of equal weights of gold, so that each particular hair may be said to have its price, and great care is taken to prevent its loss. A double handful of sable tail hair, for instance, is worth $100, and camel's hair is only a little less valuable. The variety of brushes made is almost infinite, and artists sometimes order them made after some particular pattern or device of their own. More than a hundred different sizes and shapes are kept in stock, the finest consisting of a few long, delicate hairs, capable of making a mark as fine as the scratch of a needle point.

The Centennial Exposition.

A correspondent writes to point out that many persons will decline to exhibit at the Centennial because the Commissioners have made no arrangement to receive exhibits by railway and to place them in the proper situations in the department to which they belong. For an exhibitor to go there to put his goods on show, and again, 4 or 5 months afterwards, when the judges are making their awards, will be expensive if he live some distance from Philadelphia. He suggests that the Commissioners should appoint properly qualified men to undertake the removal of exhibits from the railroad depots to the buildings, and to put them in place for exhibition; and he states that exhibitors living at a distance from Philadelphia would gladly pay the expense of such an arrangement.

Correspondence.

Mr. Edison's New Force.

To the Editor of the Scientific American:

I have recently made some experiments with the so-called etheric force, the results of which will be found below.

As the subject is one which has attracted considerable attention of late, I have taken special care while making the tests, and have also carefully verified the results by repetition. You will notice that the indications tend continually in one direction, identifying the force with electricity: indeed, from what I had learned of the subject, I had little hesitation in pronouncing the phenomenon one of an entirely electrical nature. I was also led to believe that its origin was attributable solely to the induction of the battery current on itself, in the coils; but it remained to prove these conclusions correct, in order to settle the question so far as the development of a new force was concerned.

It has been stated that this force traverses with equal facility both good and bad electrical conductors, that it cannot be insulated, and that, in this particular at least, it is quite different from electricity. These statements seem strange in connection with another, which accompanies them, to the effect that manifestations have been transmitted through coils equivalent in resistance to many thousands of miles of telegraph wire. In a case of such apparent contradiction, the statements should certainly be qualified by some evidence that the manifestations traversed the wire rather than that they passed through the insulator. In any event, however, the first statements are wholly irreconcilable with the following tests, made a few days ago:

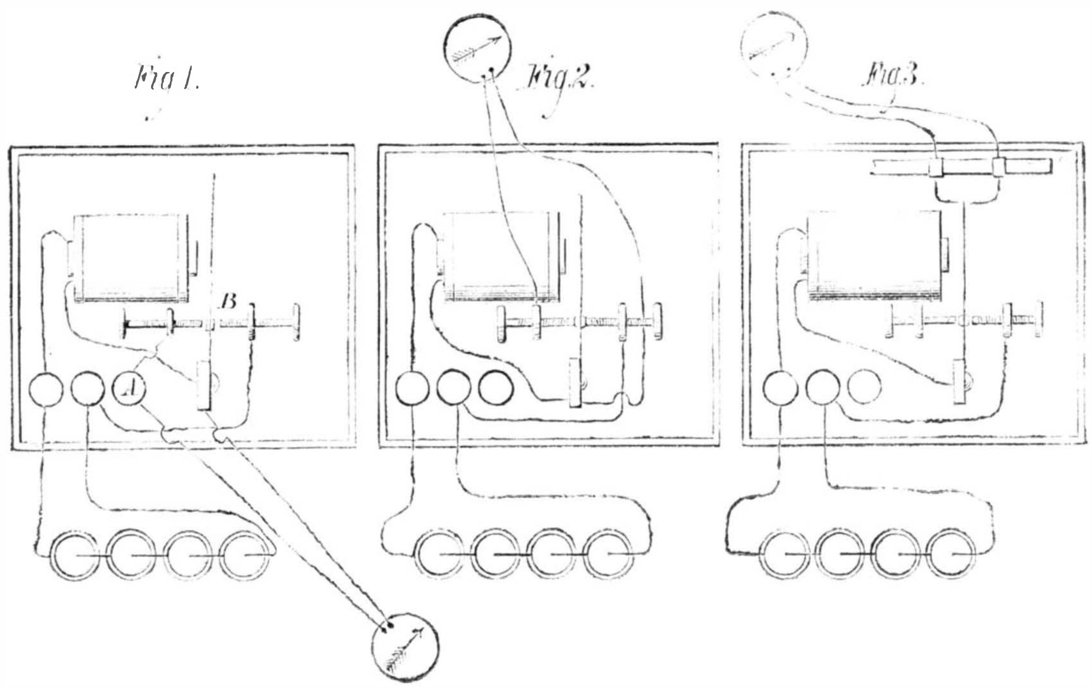
A short piece of wire was fastened to a brass ring on the end of a glass rod, the latter carefully dried. The wire was then placed in contact with the armature of a vibrator, or at least very close to it. Sparks passed readily between the wire and armature, and were plainly visible in daylight. Another brass ring was afterwards placed upon the rod, but not a single spark could be obtained from it until it almost, if not actually, touched the first. This was repeated several times, once when fifty cells of gravity battery were used to work the vibrator. Four cells were used most of the time.

The above experiment plainly indicates that the force can be insulated. The latter, however, is of a much higher tension than the battery current which produces it. When the piece of wire on the end of the glass rod is very short, sparks no longer pass between it and the vibrator. The same would be the case if an electrical machine, giving electricity of low potential, were used. But, unlike the electrical machine, the vibrating armature seems to be oppositely polarized when the circuit is opened and closed. This sufficiently explains why Mr. Edison was unable to obtain galvanometer deflections by the methods which he employed; it is also just what we might expect would result from the extra current. I was thus led to try the plan represented in the accompanying diagram, Fig. 1. One wire from the galvanometer was connected directly with the armature of the vibrator; the other led to the binding post, A. The galvanometer was therefore in connection with the battery by one of its terminals only. When the vibrator was put in motion, deflections were obtained at once. Fearful, however, that the spark was sufficient to close up the gap between the armature and B, and thus shunt the galvanometer, and that by this means part of the battery current would pass through the galvanometer and cause a deflection, I closed all of the points (see Fig. 2). This gave me a deflection of 25°, and indicated approximately what might be expected in case the spark did actually close the gap. The adjustable points were then separated, and the armature allowed to vibrate. The spot of light immediately ran up to 50° or more. By carefully regulating the points, I was enabled to get a deflection of over 400°, and could obtain it either to the right or left. The deflection in the direction of the battery current, however, was somewhat greater than the opposite one. It was evident, therefore, that the battery current did not directly produce the deflections.

A still more decided test was next made, which I am disposed to regard as conclusive. The galvanometer wires were led directly to the rings on the glass rod already mentioned. The rings were slightly separated, and each provided with a short wire, between the ends of which the armature was allowed to vibrate, striking one wire at each vibration. Fig. 3 shows the arrangement. Sparks immediately appeared on each side of the vibrator in the very slight interval which separated it from the ends of the wire, and a deflection of 300° or 400° resulted. This was always in one direction, so long as the direction of the battery current and connections remained unchanged, but passed in an opposite direction when the poles of the battery or wires leading to the galvanometer were reversed. With fifty cells of battery, the spot of light was thrown entirely off the scale.

The vibrator used in these experiments consists of an electro-magnet about two inches long, with a thin piece of iron for the armature. The coil measured perhaps two or three ohms. Fig. 1 gives a fair idea of the instrument. The galvanometer was one of Thomson's mirror instruments, and contains something over 29,000 ohms resistance.

New York city. ELECTRON.



EXPERIMENTS ON THE NEW FORCE.

The New Force.

To the Editor of the Scientific American:

In your paper dated January 1, you publish a letter from Thomas A. Edison, in the last clause of which he describes an "inexplicable phenomenon," namely: "An uninsulated wire, proceeding from the source of power (highly insulated), was taken into the street and laid in the gutter around a whole block and back into my laboratory by another door, and up to the floor above the one where the generator was. Excellent sparks were drawn from that end of the wire, although the ground the wire laid on was wet, it having rained all night."

The "source of power" he speaks of, I take it for granted, means that source from which he derives what he terms the "etheric force." I see nothing inexplicable in that, as it does not conflict with the action of a current derived from the ordinary galvanic battery used for telegraphing. I have operated the relay and recording register through a naked wire, laid in sea water one quarter of a mile, as perfectly as it can be worked on an insulated air line. I then extended it to half a mile, when it worked so that I could read most of it, but the current was very weak. I then extended it to three quarters of a mile, when I could get only a slight deflection of the galvanic needle. At that distance the current did not perceptibly affect the relay. Electricity, however produced, is hard to return or bottle up. It always selects the road which has the best conductivity, without regard to distance. The relative conducting power of the uninsulated metallic wire and water will show that it requires about one mile of water to equal the better conductivity of the uninsulated wire.

I have no doubt that Mr. Edison will thoroughly ventilate his discovery, and hope that he will succeed in finding it both practicable and useful. J. P. H.

New York city.

What is the Tail of a Comet?

To the Editor of the Scientific American:

I have not been particular to note the date when my discovery, described below, of the origin of the tails of comets was made, that discovery being only an incidental result of some other investigations; and the explanation is so absurdly simple that I have waited several years for astronomers to make the assertion that I am about to make, and which almost any person can demonstrate without need of the complex apparatus by which it was incidently revealed to me.

Briefly: The tail of a comet is the light projected by its nucleus upon that portion of its hazy envelope which lies in the shadow cast by that nucleus when near enough to the sun to cast a shadow. The ordinary observer can prove the correctness of this statement by means of two lamps, differing only in size; while the more profound investigator can satisfy himself beyond question, through the mystery of the photometer and suitably prepared lights, the one consisting of an incandescent solid having a gaseous envelope to represent the sun, while the other or less light is of similar nature, with the addition of one or more outer envelopes exceedingly attenuated. By using suitable lamps, a multitude of spectators can be convinced of the truth of the theory on any misty or foggy night, if one lamp be moved about the other in an elliptical path; indeed the proof is so simple that I have never failed to convince the spectators by using two ordinary lamps.

Comets are originated whenever any sun, by eruption, ejects portions of its substance directly outward at a speed sufficient to overcome the attractive force of that sun's gravity. In the case of our sun, a speed of 380 miles per second is sufficient for the purpose.

The expelled mass flies outward into space, still under the influence of the sun's gravity, as the sun is the largest near object, and all matter is subject to gravity; and as the sun's outward course changes its position, it also causes the comet's course to deviate from a straight line, because it is constantly pulled aside by the sun. This deviation continues until the comet's course becomes momentarily parallel with the sun's course, after which it gradually curves toward the sun, the entire path of its movement being an ellipse, constantly approximating to a spiral circle. The comet's fiery mass having been projected as a fragment from a body revolving upon an axis, it also has an axial motion in conformity with a universal law, which also assists to convert its bulk into a spherical shape, as its own gravity acts upon its mass to concentrate it toward its center. Thus, in time, its mass comes to consist of a fiery nucleus, with various spherical envelopes of gaseous material, more or less separated from each other by gravity. Its matter being extremely attenuated, its bulk may be immense, while its weight is relatively small. It has an axial and an orbital motion. In this condition, it is observed by a spectator as a bright speck in space, which rapidly enlarges under continued observation as it approaches, its fiery nucleus illuminating its hazy envelope like a lamp in a globe, the whole revolving on its axis as an immense sphere of attenuated matter, perhaps 180,000,000 miles in diameter. As it approaches nearer, still revolving, it apparently increases, but less rapidly, in size; and as it gradually meets the increasing light of the sun, its own spherical glow, conquered by a superior light, gradually pales on the side nearer the sun; and it accordingly shows a tail of perhaps 90,000,000 miles (or half its diameter) in length in the solar shadow which its nucleus casts and illuminates, that being the only portion of its huge envelope which the eye is permitted to distinguish under the conquering influence of the sun's light

When still nearer, its head and its apparent tail become more defined; and if the conditions of the comet's envelopes permit, the appearance of more than one tail may be observed: this tail, or illuminated shadow, obeying the known laws of light, being projected as nearly in a direct line from the sun: that is, it forms a slight curve, because each ray of light reaches the observer from the point of its emanation, and not from the further point which the comet occupies at the instant of observation, as the comet has moved constantly from the exact point of light emanation during the time required for the light itself to reach the observer. As the comet nears the sun, and swings around it, its apparent tail swings too, that is, the illuminated shadow swings with terrific velocity, but with no exertion of force, repulsive or otherwise, as far as the shadow is concerned; and as the comet leaves the sun, its shadow necessarily goes before it and is as necessarily illuminated as that portion of fog lying in the path of a locomotive headlight moving away from a house on fire.

As the comet flies away, its spectacular phenomena are rapidly reversed, its apparent tail fades, and the luminous glow of its sphere expands and then diminishes to a mere disappearing speck of light. When, after many circuits, its elliptical orbit gradually becomes a spiral circle, and itself becomes a planet of more or less dignity, its apparent tail disappears by absorption of its attenuated gaseous envelope, which settles on its nucleus by gravity; and its possible apparent fail becomes too short for observation. Thus the true answer to the astronomical conundrum: "What is the Tail of a Comet?" is: "It has none," and this insignificant result is a good and sufficient cause for my inactivity in heralding the fact, which was know to me at a much earlier date.

Mohawk, N. Y. CARL MYER.

The Wreck of an Air Ship.

The Schröder air ship which, according to the inventor's claims, was going to carry fast mails between the principal cities of the country, and which subsequently would fly across the Atlantic in some incredibly short space of time, came to an unfortunate end recently. The machine, nearly finished, was carelessly left in an exposed situation overnight, on a common in Baltimore. A strong gale arising tore it from its fastening, and converted it into a useless and shapeless mass of broken boards and wicker work.

Another Explosion of Factory Dust.

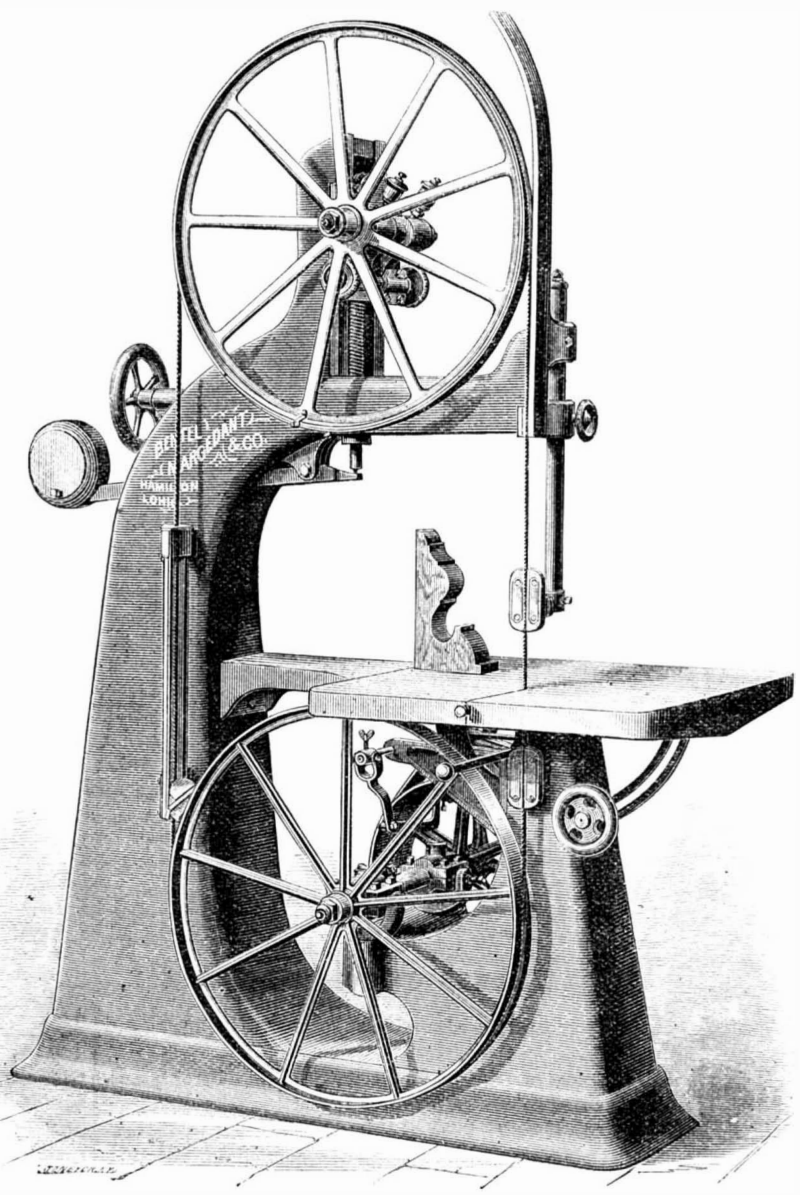
The singular catastrophe which took place at the Pullman Car Works at Detroit, Mich., on November 10, 1875 (which was described on page 368 of our volume XXXIII, has been paralleled by an explosion which took place at Champion Mills, Chicago, Ill., on December 31, 1875. One of the millers was pouring some fine middlings down a chute, when the fine dust ignited on contact with the flame of a lamp which he held in his hand. A loud explosion followed, and his hands and face were terribly burnt. The building at once took fire, and property to the amount of about $4,000 was destroyed.

IMPROVED BAND SAWING MACHINE.

From the year 1809, when William Newberry, of London, England, constructed the first band saw, and up to the year 1862, that useful machine met with little favor at the hands of woodworkers, principally on account of the disadvantages encountered in the breakage of the saws and the difficulty of joining them. Since the last mentioned year, however, mechanics have found easy ways of attaching together the parts of the dissevered blade, and consequently thereupon the band saw has rapidly grown in usage; but in preventing the breakage, certainly a more important desideratum, little has been accomplished. Why band saws break is not difficult to understand. Forming, as the delicate thin ribbon of steel does, the sole connection between the pulleys over which it runs, it is obvious that, if one pulley be started into sudden motion, the saw must slip over the other pulley before the inertia of the latter is sufficiently overcome to allow of the imparting to it of a velocity, say, of 400 revolutions per minute. Slipping produces friction; friction, heat and crystallization of the steel blade, and hence conditions are determined which, coupled with the strain set up, ultimately may break the saw. At the same time further injury is done by the rubbing of the blade over the covering of the pulley. So also, when work is presented to the blade, its speed is retarded and the momentum of the upper driven pulley causes it to overrun the lower or driving one, and thus friction is again created between blade and surface; the same ensues on the sudden stoppage of the lower wheel. Various methods have been tested to avoid this trouble, and of these the most common is making the upper wheel less heavy than the lower one. In the machine which we now illustrate, a new plan enters, which admits of both wheels being constructed of the proper strength and weight.

In the rim of the upper cast iron pulley is formed a recess about $\frac{5}{16}$ inch deep, which has a number of projections that are ground to a circle corresponding to the diameter of the wheel. The space between the projections is filled with plumbago, and over all is located a band of steel or other material, rolled true to the diameter of the projections. The band is open, and after being placed in position is so closed as to allow of adjustability of its diameter. It is covered with leather or rubber as desired. With this device, when the lower wheel is started, before the inertia of the upper wheel is overcome, the band slides in the recess, rubbing on the projections, and thus the upper wheel is gradually set in motion without any friction taking place against the saw. As soon as its velocity equals that of the driving wheel, the pressure of the band is sufficient to maintain the same, since it requires more power to slide the band on the periphery than to run the wheel on its axis. Now, when a piece of wood is put to the saw, it is obvious that the effect of the band is to equalize the speed of the wheels: and so also, when the lower wheel is suddenly stopped, the upper one will expend its momentum in running on inside the band, the saw remaining at rest. It is usual to cover the upper wheel with elastic material which, to some extent, yields to the irregularity of motion. The manufacturers of the present machine point out that the band above referred to forms a very excellent elastic bed, as its tendency is to be thrown outward by centrifugal force, in opposition to which is the pressure of the blade. So that the band is in a condition of equilibrium, and constitutes a yielding surface to the saw.

The use of the band, it is further stated, permits the employment of a direct brake acting quickly and not endangering the lower wheel. To this end an improved clutch brake is arranged, which takes hold of the outside and the inside of the tight pulley rim, pressing at each side with equal force, so that its tendency is not to dislocate either pulley or shaft. By turning a small screw, friction may be increased or diminished, or wear compensated for. The saw guide consists of lateral and back thrust guides or supports. The former are flat pieces of wood on each side of the saw, which may be closed up to the blade and adjusted to compensate for wear. The back thrust guide consists of a series of chilled iron balls, with steel washers, balls and washers lying on each other alternately in a cylindrical inclosure drilled in the cast iron support. The back of the saw comes in contact with the balls through a groove in the cylinder; and as the balls rest only on the edge of small holes made through the supporting washers, all can be brought forward and adjusted to the back of the blade which, passing downward, rotates the balls without cutting them. Devices are added which cause the balls to revolve irregularly, presenting gradually the whole surface of the ball to the support of the blade. By this general arrangement, it is claimed, the friction of the fast passing blade is reduced to a minimum, while heating is avoided.



BENTEL, MARGEDANT & CO.'S BAND SAWING MACHINE.

The last improvement, of the four which constitute the principal features of the invention, is the device for making the adjustment, for straining the saw blade, more sensitive to the varying length of the latter. The short arm of a weighted lever presses against a regulating screw, which passes through horizontal miter gear, and engages therewith, by means of a slot and feather, to a nut on the idler wheel carriage. By turning a hand wheel connected to the miter gear, the carriage is raised and lowered on the guide slide. For changing the plane of rotation of the upper wheel, the journal boxes are connected by a circular flange provided with circular V slides. The latter are engaged and held by a sliding cross head. Adjustment is made by a worm and screw, and is permanent and not affected by vibration. There are numerous other advantages of construction embodied in this machine. The principal ones are, however, before the reader; and if to them we add that the apparatus (which was patented through the Scientific American Patent Agency, November 30, 1875) is the manufacture of the well known house of Bentel, Margedant & Co., of Hamilton, Ohio, and received the first premium at the recent Cincinnati Industrial Exposition, no further statements relative to its remarkable excellence and value will be required.

A SENSIBLE AND SUBSTANTIAL GRINDING MACHINE.

The engravings given herewith represent a grinding machine that is claimed to obviate a great many of the difficulties hitherto existing in this class of machinery. It is built to stand very firmly on the floor, its greatest length being in the direction of the motion of the wheels. Its journals are large and long, and can be placed in any position on the top of the machine or bed, or underneath by means of a slot placed in the top and bottom of the bed, in which the holding down bolts can be moved. This allows the wheels to be placed in any position, as the special work to be done requires. And if it is desired to use only one wheel, the pulley can be hung on the outside of the frame and the emery wheel inside, where the pulley is shown in the engravings. If only one wheel is used, and the boxes are hung underneath the bed, the wheel can be made to project above the top of the bed, and the side of the wheel can be used, the upper side of the bed forming a rest, upon which the work can be passed in grinding. Or the wheel can be lowered, so that the face of the wheel will only project through a table secured to the top of the bed, and in this manner a surfacing machine is made. It will be almost im-

Fig. 1.

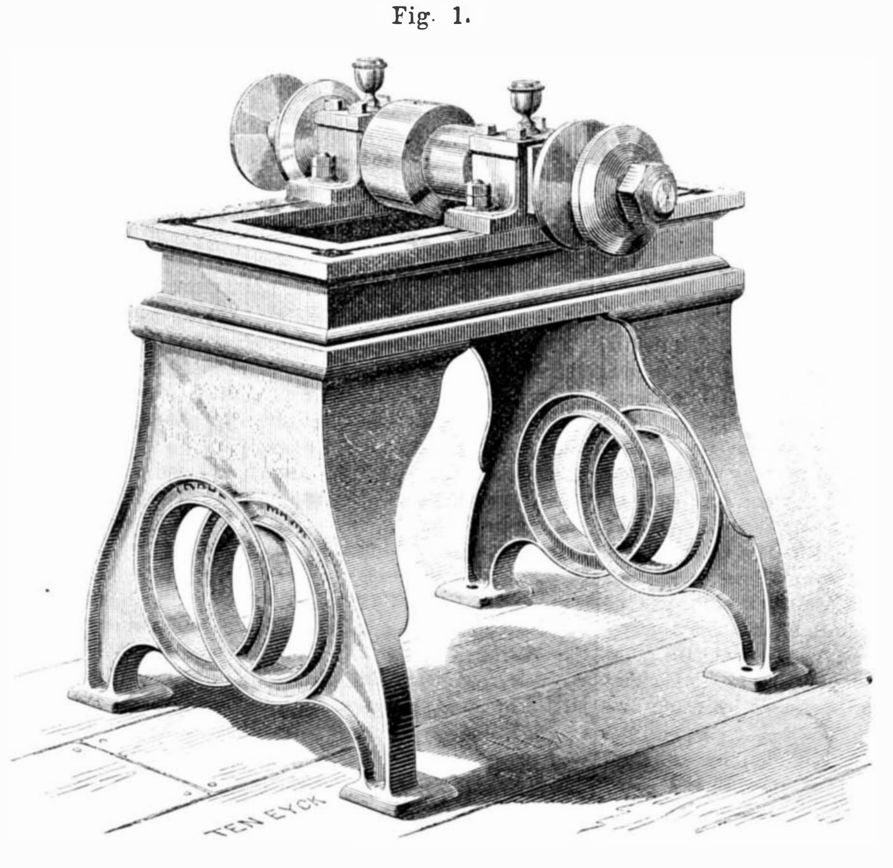
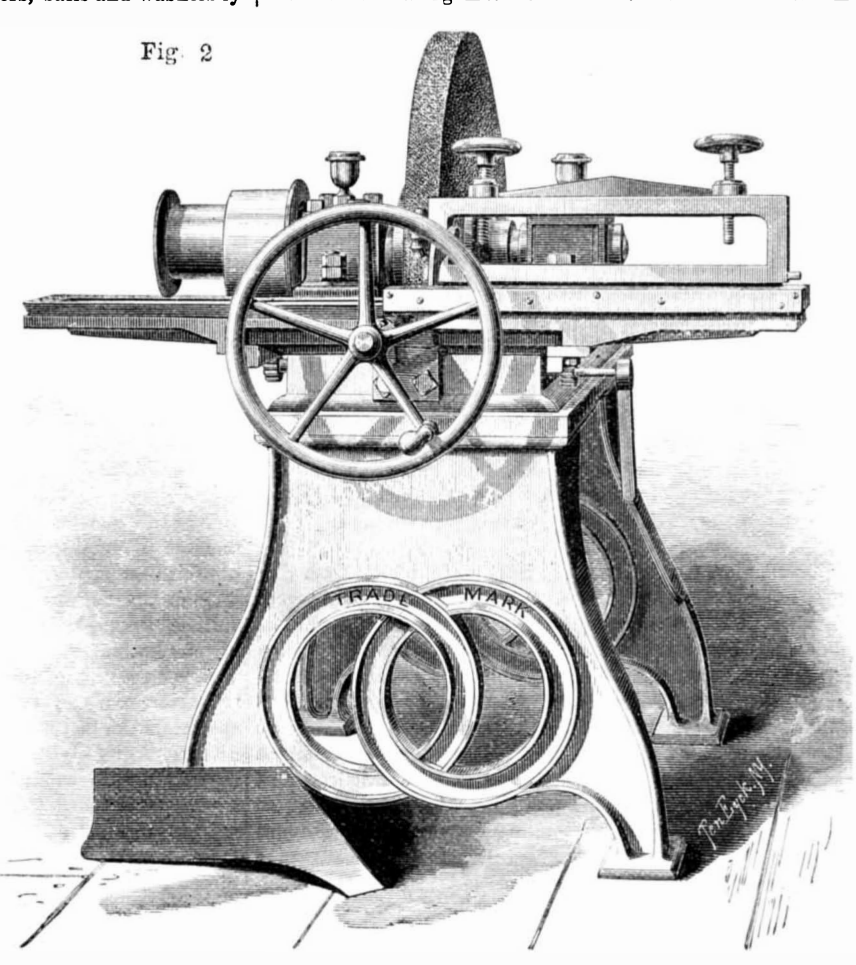


Fig. 2



THE UNION STONE COMPANY'S GRINDING MACHINE.

possible to give in detail the various positions into which the machine can be adjusted, but those acquainted with machinery will readily see that the apparatus will really form a foundation upon which almost any attachment for special work can be placed. The bed of the machine is very strong, and the slots in it can also be used to hold the various attachments; so that, without any alteration in the frame, the various devices can be put on or taken off at a moment's notice, and thus one machine can be made to take the place of several special machines. A number of attachments have already been applied to this machine, among them those adapted to the following purposes: Jointing plows (as shown in Fig. 2), beveling boiler plates, grinding the faces of pulleys, grinding car brasses, etc. Four different sizes of machines, after the style of the one illustrated, are made, with 1¼, 2¼, 3, and 3½ inch arbors, weighing about 600, 800, 1,000, and 1,500 lbs. each. The smallest are to carry small wheels to 18 inches in diameter: the largest, wheels to 6 feet in diameter.

Large emery wheels are more economical than small ones, when they can be used at all; and with substantial and heavy machines like the above, manufacturers will soon see that their interest lies in using emery wheels in place of grindstones, and large emery wheels in place of small ones.

A patent for this machine has been applied for through the Scientific American Patent Agency. For further particulars, address the Union Stone Company, 38 Hawley street, Boston, Mass.

THE PENGUIN FAMILY.

The penguins are a family of web-footed birds, with very imperfectly developed wings; they are found in immense numbers around the rocky coasts of the Southern Pacific Ocean, and on the shores of the Cape of Good Hope. The king penguin is one of the best known of the species; it belongs to the genus *aptenodytes*, being particularized by zoölogists as *aptenodytes Pennantii*. The bill is slender and curved at the points, which are acute; and the wings are very small, resembling fins in appearance, and having no quill feathers or plumes; they are therefore unfit for purposes of flight. Indeed, it would appear that this singular tribe is entirely unfitted for traveling through the air, as the bones have no air chambers, are filled with marrow, and are very heavy. The feet are very far back, and the posterior surface touches the ground as the bird walks.

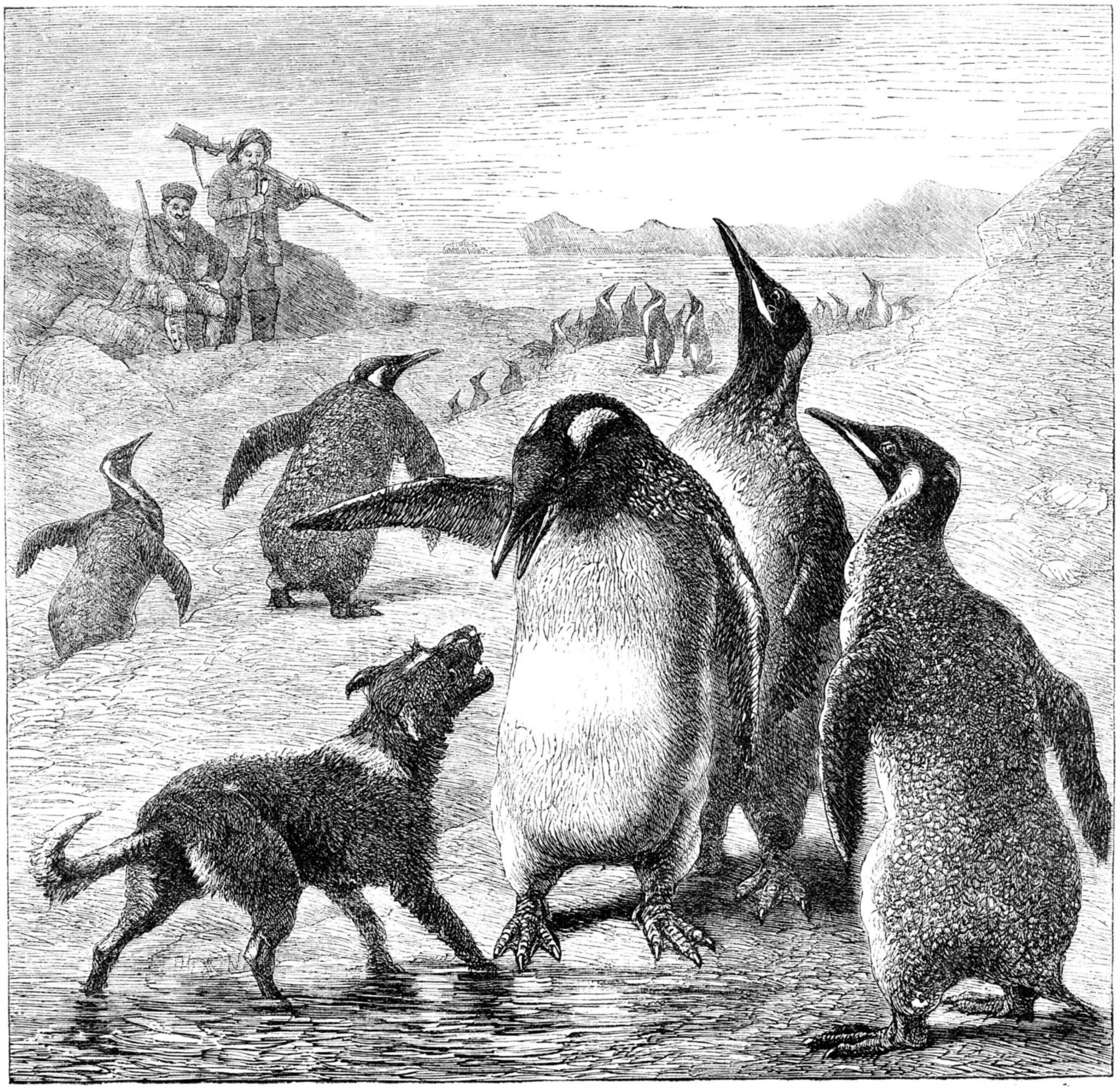
Great numbers of these birds were found on Kerguelen's Island, a rocky island in the Indian Ocean, by the expedition which traveled thither to observe the transit of Venus, which took place on December 9, 1874. At a distance they appear as white stationary bodies; but on approaching, they are seen to be waddling along with an indescribably ludicrous gait, which is made still more absurd by the turned heads, as the birds look back distrustfully at their pursuers. As the body sways from side to side, the bird looks like an animated coat with empty, swinging sleeves. When attacked at close quarters, as shown in our engraving (which represents a scene on the coast of Kerguelen's Island), the penguins will use their beaks with considerable effect; but their sense of helplessness is strong, and they soon take to running away. Being clumsy and slow in walking, they frequently fall on their breasts, and move their wings (as if they were in the water) like fins. When congregated in numbers, they will unite to resist an attack, and will form a close phalanx. They are frequently killed for the sake of their skins, which are covered on the breast with fine, close feathers of remarkable softness, and are used, in place of furs, for wearing apparel. They are generally slaughtered by being knocked on the head with a club; but sometimes they are taken alive with a lasso thrown over the head. If they can reach the water, they can usually elude the pursuer, as they swim and dive with astonishing rapidity, remaining under water for some time and reappearing at a considerable distance from the place of first immersion.

The king penguin, the largest of the species, has an orange tinted breast, which becomes white near the abdomen. The back is grayish black, and the front and back are separated by a sharply definitive line of a steel gray color. They stand about 2 feet 9 inches high, and their plumpness gives them considerable weight. Their diet causes the flesh to be rank and fishy, but it is eaten by the natives of some countries.

Professor Osborne Reynolds as a Water Wheel Inventor.

Professor Osborne Reynolds, M. A., of Owen's College, England, has taken an English patent for what he supposes to be a new invention in turbine water wheels, which is engraved and described in a recent number of the *English Mechanic.* Briefly, the Professor's invention consists in using a double turbine, or two turbines in combination instead of one, the water passing necessarily through both.

The invention also consists in the use of what he terms curved movable vanes or plates, by which the water openings are enlarged or diminished, according to the head of water or the speed required. From the description given, it seems evident that Professor Osborne has simply reproduced some of the inventions already patented in this country. For example, the American patents of A. P. Conant, April 10, 1866, for turbine, of C. Shaw, February 15, 1870, and others that might be cited, appear to fully anticipate Professor Osborne.



KING PENGUINS ATTACKED BY A DOG.

SCIENTIFIC AND PRACTICAL INFORMATION.

ARTIFICIAL TEETH ON NATURAL STUMPS.

Mr. Moon has recently stated, in a communication to the English Odontological Society, that the stump of a tooth may be preserved as the basis of an artificial tooth, and rendered painless, by leaving the root canal empty and drilling a hole into it just below the edge of the gum. This hole becomes a permanent vent and thus saves the stump from disturbing influences, which, if deprived of means of escape, would ultimately destroy it by a painful process.

LIFTING EFFECT OF FROST ON TREES.

Dr. Lapham, State Botanist and State Geologist of Wisconsin, says that frost exerts a lifting power on full grown trees, so as to cause the impression on some that the tree begins to grow again after once attaining its full growth. When the land freezes expansion ensues, drawing the tree up with it, leaving of course a cavity whence the root was drawn. When the first frost comes, the moisture, carrying earthy matter, enters the cavity, and thus the root is prevented from returning to its original position. Dr. Lapham suggests that one of the chief offices of the tap roots may be to guard the tree as much as possible against this frost-lifting.

AMERICAN MEAT SOLD IN ENGLAND.

Quite a large quantity of American meat was recently sold in the Liverpool markets at paying prices. It was taken over by the steamer Illinois, in a large tank surrounded by ice and cooled by air driven in by a steam-worked blower.

BEET CIDER.

We mentioned not long ago that a cider made from beets was coming into use in France. We learn that it is prepared by adding 7 lbs. of red garden beet to every 2½ bushels of apples, pressing all together. The cider must not be used for about eight months, when it will be free from the beet flavor.

TO OBTAIN A BROWN PATINA ON ZINC.

A solution of molybdic acid, or molybdate of ammonia, in very dilute aqua regia, or a solution of molybdic acid in excess of very dilute caustic soda, produces, according to Kletzinsky, a very useful patina bath for articles of cast zinc. Zinc statues or other ornamental articles, when dipped into this bath, become covered with a very pleasing brown patina showing the prismatic colors. This covering is nothing but a thin film of oxide of molybdenum, which exhibits polarization colors and adheres firmly to the metallic zinc.

EXPLOSION OF CHROMIC ACID WITH GLYCERIN.

Explosive prescriptions are sometimes sent to innocent pharmacists by careless or ignorant physicians. The latest case of this kind is related by Austrian journals. The following mixture was ordered for external use: 7·5 grains chromic acid and 60 grains glycerin. The chromic acid was mixed with water in a flask and the glycerin mixed with it by shaking. Suddenly the contents of the flask exploded with a loud report, flying all about the shop, while the vessel remained unhurt in the hand of the astonished apothecary, and was covered with a black mass. This case deserves the more notice because the quantity was so small and the detonation so extremely violent.

Economy in Machine Shops.

The following suggestions, in regard to the care of tools and waste of oil in machine shops, are contained in a paper read before the New York Society of Practical Engineering, by James C. Bayles, editor of the *Iron Age:*

"The proper care of tools is always attended with an important economy. In small establishments this seldom receives due attention. As a rule, a tool belongs to anybody who happens to have it; consequently, no one is responsible for it. It is neglected, abused, mislaid, broken, stolen, or worn out before it has rendered half the service it is capable of performing. In some shops the time of one man, and sometimes two, is constantly lost in looking for missing tools and putting them in order for use when found; and a great deal of capital is wasted by the premature destruction of tools which, with proper care, should have lasted for years. In all manufactories there should be a place for tools not in constant use, and some one should have charge of them. A very good system, which I have always found to work well, provides for the charging of every tool in use to the man using it. When it is returned he receives a credit for it which balances his account with the tool department. For tools added to his individual kit, such as files and other implements supplied by employers, charge is made and no credit is given until the tool is returned broken or worn out, when a credit entry is made, with date, showing how long it has been in use. Such a record induces men to be careful of tools, and, by inculcating good habits in this respect, leads to economy in a direction in which waste and extravagance are easily overlooked.

"Another important saving in many shops would attend a more judicious oversight of the consumption of oil. In machine shops, and to a greater or less extent in all shops where machinery is used and iron worked, the amount of oil wasted constitutes a very large proportion of the total amount used. This waste results from a certain looseness of habit which most men acquire in handling materials which some one else pays for. When a drop of oil is needed, it is customary for the mechanic to pour a stream from his oil can, and wipe off the surplus with a wad of cotton waste. It is no exaggeration to say that half the oil used about many manufactories of machinery and metal goods is wasted, and the waste constitutes a serious item of expense. Oil is almost always used exclusively for lubricating purposes, especially in small establishments, yet there are other lubricants that might be kept constantly on hand, which are at once much cheaper and much better than oil, for such purposes as drilling, tapping, screw cutting, etc. There is also a great deal of oil wasted in applying it to machinery and shafting. Whenever we see a drip pan that has not been attended to for a few days, we may be pretty sure of finding it half full of oil which has rendered no service, and which has become unfit for use, being gummy, foul, and filled with foreign impurities. There is no need of this waste, which never occurs when the oiling of the shafting and machinery is properly looked after; but it is an evil against which the manufacturer can guard only by constant watchfulness."

THE PATENTS OF 1875.

[FROM THE FORTHCOMING ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.]

Number of Patents issued by the United States Patent Office to Residents of the different States, Territories, and Foreign Countries, from Jan. 1, 1875, to Dec. 31, 1875.

[The proportion of patents to population is shown in last column.]

States, etc.	No. of Patents.	One to every	States, etc.	No. of Patents.	One to every
District of Columbia..	214	615	Nebraska...............	22	5,833
Connecticut............	706	761	Texas	118	6,939
Massachusetts	1,846	787	Louisiana	103	7,057
Rhode Island..........	229	943	West Virginia	48	9,209
Colorado Territory....	36	1,107	Kentucky..............	132	9,303
New York..............	3,771	1,163	Montana Territory....	4	9,974
California..............	399	1,404	Tennessee..............	117	10,765
New Jersey............	656	1,534	Virginia..............	101	12,130
Pennsylvania	2,034	1,728	Washington Territory	3	12,710
Illinois	1,098	2,313	Idaho Territory.......	1	14,999
Ohio	1,091	2,443	South Carolina.... .. .	46	17,513
New Hampshire.......	127	2,506	Georgia.........	63	18,795
Vermont	122	2,709	Utah Territory.... .	5	19,916
Delaware...............	44	2,841	Mississippi	38	21,787
Michigan...............	405	2,923	Florida	7	26,821
Maryland....	260	3,003	North Carolina.........	37	28,956
Minnesota..............	146	3,011	Alabama...............	31	32,161
Nevada....	16	3,369	New Mexico Territory	3	37,101
Wisconsin..............	284	3,743	Arkansas....	11	44,042
Iowa..................	315	3,790	U. S. Army	5	
Maine..................	158	3,964	U. Navy..........	1	
Indiana................	378	4,462			
Oregon	22	4,631	Total for U. S....	15,698	2,412
Dakota Territory......	3	4,727	To subjects of foreign governments	590	
Missouri...............	362	4,754			
Arizona................	2	4,829			
Kansas.................	66	5,521	Aggregate.... ...	16,288	
Wyoming Territory...	2	5,759			

RECAPITULATION.

Issued to citizens of—	
United States..........................	15,698
Canada..................................	150
Other subjects of Great Britain........	221
France..................................	91
Other foreign countries................	128
Aggregate.	16,288
Number issued in 1874................	13,599
Increase over 1874....................	2,689

PATENTS EXPIRED.

Number of patents expired during the year 1875............	579
Number of design patents expired during same time........	782
Whole number of expirations....	1,361
Less number of extensions granted................	38
Leaving the actual number expired..............	1,323

SECTIONAL ANALYSIS.

An analysis of the table shows interesting facts. The geographical distribution of inventors, to whom patents were granted in 1875, appears by it to be as follows:

To the six New England States there were issued 3,188 patents, being one to every 1,094 people.

To the seven Middle States (including Delaware, Maryland, and West Virginia) 7,905. one to every 1,623 people.

To the nine Western States (including Missouri) 3,076, one to every 3,360 people.

To the twelve Southern States, 814, one to every 13,279 people.

To the three Pacific States, 437, one to every 1,699 people.

To nine Territories, 59, one to every 12,203 people.

And to the District of Columbia, 214, one to every 615 of population, being the highest ratio in the Union.

GAINS AND LOSSES.

All the States and Territories have held their own, or made gains over 1874 in the number of their patents, save the following, which show losses: Alabama, Arkansas, Florida, Georgia, Kansas, Mississippi, Nebraska, Oregon, Vermont (for a wonder), and Dakota, Utah, Washington, and Wyoming Territories.

New Hampshire and Nevada remained stationary, the former having 127, the latter 16 patents, the same as in 1874.

The principal increase was made in the following States: New York, 986; Pennsylvania, 390; Massachusetts, 340; Illinois, 164; California, 98: and the District of Columbia, 69.

Useful Recipes for the Shop, the Household, and the Farm.

A great many directions have been published for mending india rubber boots and shoes, most of which were worthless. The following can be relied on: Procure a small tin box of prepared rubber in a semi-liquid condition, which can be purchased for a few cents at almost any store where india rubber goods are kept for sale. The boot must be washed clean and dried. Then the surface around the rent is to be roughened a little with the point of a knife, after which the semi-liquid rubber is spread on with a spoon as thickly as it could be without flowing away. Then a neat patch is prepared and covered with one or two coats of rubber. When the prepared rubber is almost dry, the patch is applied and held on firmly for a few minutes.

It frequently happens that chemists and others desire to utilize pieces of broken glass apparatus by cutting the same into forms. The following is a simple method of this. Make a paste of ⅛ oz. gum tragacanth with water, and also ¼ oz. powdered gum benzoin with alcohol. Mix the two compositions, and add powdered beech wood charcoal, forming a thick dough, which mold into little sticks about 4 inches in length and ⅜ inch thick. The glass to be cut is first scratched deeply with a diamond, and then one of the sticks, previously ignited, is held against the crack. The glass will divide neatly as the end of the stick, which becomes a pointed glowing coal, is drawn over the diamond scratch.

S. A. T. says: To stick leather, paper, or wood to metal, to a gill of glue dissolved in water add a tablespoonful of glycerin.

The best treatment for slight burns is to apply cotton batting soaked with a liniment made of equal parts of linseed oil and lime water. Be careful not to break the blisters, should any form.

The finest quality of indigo has the least specific gravity, and floats upon water. It may also be tested by its not readily leaving a mark on drawing it across a piece of paper, and also by the clear blue which it imparts to water when dissolved.

To prevent the skin discoloring after a bruise, take a little dry starch or arrowroot, merely moisten it with cold water, and place it on the injured part. This is best done immediately, so as to prevent the action of the air upon the skin. Invaluable for black eyes.

Excellent toy balloons can be made out of turkey's crops, in the following manner: Free the crop from the thick coating of fat, turn the inside out, and cleanse. Soak in water for two days, and then, with a blunt knife, scrape off the internal coating. Wash the crop well, and dry. Turn it right side out again, and make an incision through the external coats, carefully avoiding cutting the lining membrane. Draw the coats at one side over one neck of the crop, and tie the latter firmly with silk. Proceed at the other neck in the same way. Distend the bag thus formed with air, and hang it up to dry. A light coat of varnish may be added afterwards. Thus prepared, an ordinary crop will hold a gallon of gas and will weigh only 30 grains, which is considerably less than the weight of a bladder of similar capacity.

When a teaspoonful of any medicine is prescribed by a physician, it should be borne in mind that the quantity meant is equal in volume to 45 drops of pure water at 60° Fah. It is a good plan to measure off this amount in water in a small wineglass, and mark on the latter the exact hight of the fluid. This will give an accurate and convenient standard for future use. Teaspoons vary so much in size that there is a very wide margin of difference in their containing capacity. It is well to remember, also, that four teaspoonfuls equal one tablespoonful or half a fluid ounce. A wineglassful means four tablespoonfuls, or two fluid ounces; and a teacupful, as directed by cookery books, indicates four fluid ounces or one gill.

A good dentifrice, largely sold and advertised, is made of ½ drachm white Castile soap, dissolved in 1 oz. alcohol, ¾ oz. water, and ¼ oz. glycerin. This is colored with cochineal and flavored with peppermint, wintergreen, and clove oils. The powder which accompanies each bottle is a mixture of precipitated chalk, powdered orris root, and carbonate of magnesia.

To make a handy snow shovel, take a light, tough, half inch board, twenty inches long and a foot wide. Sharpen one end, and over it rivet a strip of thin sheet iron, bent sharp to fit the edge; this forms the cutting edge. Across the other end nail firmly a piece an inch thick, five inches wide, and long enough to extend across the shovel board. Bore an inch hole through this, slanting downward and forward, so that the handle when passed through the hole will strike the board three or four inches in front of the cross piece. Bevel the end of the handle to fit the shovel board, and fasten it with a staple. The handle should be long enough to work without stooping, and the whole thing should be as light as possible.

The easiest way to burn stumps is to use a sheet iron chimney, big enough in diameter to fit over the largest stump, and some six feet in hight. An opening near the bottom answers for a door. The stump should be set on fire by placing around it some kindling wood inside the chimney, and the latter will produce a draft which will materially hasten the burning of the wood.

Black lead well mixed with white of egg is a good stove blacking. Lay on with a paint brush, and when dry polish with a hard brush.

To prevent flat irons from rusting, melt ¼ oz. camphor and ½ lb. fresh hog's lard over a slow fire, take off the scum, and mix as much black lead with the composition as will bring it to the color of iron. Spread this over the articles for which it is intended. Let it lie for 24 hours, and then rub it well with a dry linen cloth. Or smear the irons over with melted suet, and dust thereon some pounded unslaked lime from a muslin bag. Cover the irons with baize in a dry place when not in use.

A farmer correspondent sends us an excellent wrinkle for finding the weight of horses or steers without scales. He says: "Make a weighing stall about 3 feet wide with a level floor. In the latter make a recess for the platform of the scales so that the platform will be flush with the planking. Now lead your horse or steer into the stall so that the forefeet of the animal rest on the platform and note the weight. Start him ahead until his hind feet are on the platform; note the weight again. Add the two weights thus taken, and the sum will be the total weight of the animal."

Leather pump packing requiring to be very tight, for small work, should not be more than $\frac{1}{32}$ inch thick, and not be bent up round the bore or sides of the barrel more than $\frac{1}{16}$ inch.

The cause of streaked butter is the imperfect working of the butter after it is salted. Salt in butter sets the color, or deepens and brightens it; so that if the salt is worked into the butter and not so fully worked as to salt every part, then the fresh butter retains the color it had when it came from the churn, and the salt butter grows so much darker that it is decidedly streaked. The remedy is to work the streaked butter more thoroughly.

Patent Matters in Congress.

Senator Frulinghuysen, of New Jersey, presented (on January 6) a petition from George W. Hunt, administrator of the estate of Walter Hunt, deceased, praying for an extension of Walter Hunt's patent for a paper collar-making machine. It was referred to the Committee on Patents.

Senator Eaton, of Connecticut, presented (on January 8) a petition from Ezra G. Cone, of East Hampton, Conn., praying for an extension of his patent for a sleigh bell. It was referred to the Committee on Patents.

Mr. J. H. Bagley, of New York, introduced (on January 11) into the House of Representatives a bill to protect the revenues of the Patent Office. It was referred to the Committee on Patents.

A Boiling Lake.

The discovery of a boiling lake in the island of Dominica has excited much scientific interest, and investigations of the phenomenon are to be made by geologists. It appears that a company exploring the steep and forest-covered mountains behind the town of Rosseau came upon the boiling lake, about 2,500 feet above the sea level, and two miles in circumference. On the wind clearing away, for a moment, the clouds of sulphurous steam with which the lake was covered, a mound of water was seen ten feet higher than the general level of the surface, caused by ebullition. The margin of the lake consists of beds of sulphur, and its overflow found exit by a waterfall of great hight.

DECISIONS OF THE COURTS.

United States Circuit Court—Eastern District of Missouri.

PATENT FIRE BRICK COMPOUND.—INTERFERING PATENTS.

ALFRED T. FOSTER *vs.* WM. M. LINDSAY.

[Before Treat, J.—Decided October 28, 1875.]

Treat, J.:

This is a suit in equity under section 4,918 of the Revised Statutes of the United States, concerning alleged interfering patents. The defendant's patent was prior in date to plaintiff's; also the application therefor. The plaintiff claims that the invention was by him; that he had, previous to any knowledge thereof by the defendants, not only invented the patented composition, but actually reduced it to a practical and successful test; that he had shown to the defendants the manufactured article, and when, as their foreman in the brick business, he was consulted thereafter about manufacturing fire-brick by means of which they could obtain a large and profitable order, he called their attention to the fact that he had exhibited to them before entering upon their service a specimen brick of the needed quality, that thereupon he, as their foreman, directed various experiments to be made at defendant's brick yard; that when the defendants suggested subsequently that they proposed to obtain a patent for that mode of making an improved fire-brick, he remonstrated against their doing so, claiming that he was the original inventor, and alone entitled to a patent, if one was obtainable.

On the other hand, the defendants claim that it was only after a series of experiments under their direction and supervision, in their own establishment, that the success of the mode patented was ascertained. *

The defendant in this case, among other defenses, has set up that the patented compound or process had been anticipated and in use before either of the interfering patents had been claimed or issued. The evidence fully establishes the fact. *

The plaintiff in this case contends that he has the prior and better right, although his application and patent are of subsequent date, and that the court is bound to adjudicate solely as between his and the interfering patent, leaving one of the patents to stand for subsequent adjudication when assailed in a proper suit. *

The controversy is between two patentees or those claiming under them. If neither has a valid patent, the court should adjudge both void, and thus end the strife. It is on this theory that the defendant was permitted to set up in his answer the lack of novelty, not of plaintiff's patent alone, but of his own. True, he might voluntarily have surrendered his patent, and contested the plaintiff's right in a suit for infringement; but why should he not, when sued, insist upon a full defense, whereby a second suit could be avoided? The power vested in the court to adjudge either of the interfering patents void, in whole or part, is held to confer full authority, where the evidence justifies, on issues fairly made, to decree, not one of the patents alone, but both to be void.

The court so adjudges in this case, and the decree will be accordingly at the costs of the plaintiff.—*St. Louis Central Law Journal.*

Recent American and Foreign Patents.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED RUNNING GEAR.

Lorenzo D. Hurd, Wellsville, N. Y., assignor of one half his right to Thomas Puller, of same place.—This is an entirely new construction of the running gear of wagons, which cannot be explained without detailed drawings. It however includes several simple devices of much strength, and also is so made that any one of the wheels may rise to pass over an obstruction or elevation, or sink to pass through a hollow, without affecting the other wheels or straining the reach.

IMPROVED TIRE.

Harry Thompson, Decatur, Ind., assignor to himself and George W. McConnell, of same place.—The invention consists of an outer and an inner rim or band forming the tire. The inner rim, having an inwardly projecting flange at each edge, protects the sides of the felly, and keeps the tire on the wheel. The outer one serves to bind the inner over fast to the wheel, and is kept on by a convex inner face, which shrinks into the concave outer face of the inner rim.

IMPROVED OPEN THILL.

Conrad H. Matthiessen, Odell, Ill.—The object of this invention is to enable the horse drawing a single or one-horse wagon or sleigh to travel in the regular track in roads where double or two-horse teams are principally used, and at the same time allow the vehicle to follow the regular track. The rear end of the thill is forked and connected with the axle. This brings the body of the thill about in line with the center of the vehicle, so as to be over the ridge between the two tracks in the road. The forward part of the thill is curved into U shape, so as to pass around the horse's breast and to the body of the thill. The free end of the thill has a joint formed in it, at such a distance from the end, and in such a way, that the said free end may be turned down to rest upon the ground to support the thill in proper position while bringing the horse into position, and harnessing and unharnessing him.

IMPROVED WINDOW SHUTTER.

Sofie Victor, New York city.—This is an improved window shutter that may be readily adjusted to combine the free circulation of air and shade of an awning with the protecting features of the common shutter. It consists of an outer shutter frame without slats, to the top part of which is hinged a separate shutter, that may be retained in outwardly inclined position by folding brace rods, and folded down to the open frame to be secured.

IMPROVED FOLDING CHAIR.

Frank A. Patch, New York city.—The side bars of the chair frame are curved, so that their lower parts may serve as the forward legs of the chair, and their upper parts as the posts of the back. The brace bars of the arms are curved and pivoted to the side bars; the rear bars are attached in similar manner. The seat is flexible, so that the whole forms a chair of strong and simple construction which may be folded into a small space.

IMPROVED SAW-SHARPENING MACHINE.

Wm. L. Covel, Beloit, Wis.—The object of this invention is to provide a machine for sharpening mill saws. It consists in an adjustable frame pivoted in the center and having parallel guide ways, in which moves a sliding block, to which the saw is detachably fastened. Through said sliding block passes a screw-threaded rod whereby the block and saw may be adjusted in the frame, and to the lower end of this rod is attached a lever, connected through of than with the crank of a slowly revolving shaft, by means of which the saw and block are together elevated and made to approach a revolving emery wheel each time a tooth is sharpened. At the top of the main frame is a pivoted latch feed controlled by a guide, which latch feed moves the saw by engaging with the face of the saw teeth for the purpose of bringing the teeth successively in position for the emery wheel.

IMPROVED MORTISING MACHINE.

Simeon Duck, Victoria, British Columbia, assignor to himself and Joshua Davies, of same place.—This embodies a novel construction of a machine for cutting square and angular mortises at any desired inclination. The device consists of a tilting bed, by which the material may be carried into any desired inclination to be mortised by a vertically operating tool. A cog segment and worm shaft tilt the bed frame on the rock shaft in longitudinal direction, while a lateral screw shaft admits its position in lateral direction. A longitudinally sliding frame is guided in the bed frame, and adjusted by rack and pinion, the adjustable heads of the same holding the material to the tool. One of the heads is arranged with a rotary chuck, with holes in its periphery for a pivoted spring clutch, that holds the materials for exposing it rotatively to the action of the tool.

IMPROVED IRONING TABLE

Lewis P. Lawrence, Port Morris, N. J.—This is an ingeniously constructed table, adapted to be attached to a ledge or window frame by a spring catch, and having an outside adjustable leg by which the outer end of the table may be placed at any desired hight.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED GAS BURNER.

Owen J. McGann, Chicago, Ill.—This invention has for its object to provide an improved mode of attaching the ring holder of a water lens or reflector to its burner, which latter is also provided with a socket, adapted to be detachably applied to the burner of an ordinary gas bracket.

IMPROVED SPRING SCALES.

Abram Harper and Laroy W. Cross, Edgerton, Ohio.—This invention consists of a contrivance of levers and springs for the support of the measure, so arranged that the weight of the contents of the measure will be indicated on a scale, the levers and spring being concealed in an inclosed base, which protects the apparatus from injury.

IMPROVED CARBON PHOTOGRAPH.

Claude Léon Lambert, Paris, France.—This is a new process for producing carbon photographs or sun pictures, produced in salts of chromium or other pigments, combined with gelatin or its equivalent, and rendered permanently insoluble by the action of light. The especial features of novelty consist, first, in a compound consisting of water, sugar, liquid ammonia, and permanganate of potassa, to form a bath in which a negative obtained from a transparent positive may be immersed, and thus intensified; and second, a process of obtaining double tinted prints in salts of chromium and on ordinary albumenized paper, by placing the sensitized paper in a press, the blank for the picture being covered with a black or yellow mask, and the whole being then precipitated by hyposulphite.

IMPROVED CONDENSER FOR ILLUMINATING GAS.

George W. Edge, Jersey City, N. J.—The invention relates to wheels having spiral vanes, and arranged in the pipe leading from the retort to the purifier, so as to be revolved by the current of gas. The impact and rubbing action of the latter on the vanes of the wheels effect the desired condensation of the tar and other heavy matters, which are thrown off by centrifugal force—the rotations being ordinarily near two hundred per minute—and are thus collected in the pipe, and thereby conducted to a suitable place for removal.

IMPROVED HORSE COLLAR.

Jacques Meyer, New York city.—This collar has metallic stiffening plates or hames, which are hinged at the top and locked at the side by means of a hinged piece of the hame entering a socket and spring lock of the other collar section. The terrets and trace fasteners are connected in rigid but detachable manner to the stiffening hames. The collar may thus be applied without straps, buckles, or other parts visible from the outside, while the ready opening and closing at the side of the neck allows its putting on without the animal stooping or bending down.

IMPROVED SIGHT PROTECTOR.

Marmaduke H. Mendenhall, Wabash, Ind.—This inventor now improves the sight protector for which letters patent were granted to him January 12 and April 20, 1875, so as to bring the light under perfect control as to quantity, direction, and distance, and at the same time protect the eyes from the glare, intensity, and heat. This is mainly done by the use of suitably adjustable plates of colored glass.

IMPROVED CIGARETTE MOUTH PIECE.

Diedrich Marquis, New York city.—This invention consists of a cigarette with tapering mouth piece, that is wound with an inner and outer spiral, decreasing in width, to which a wrapper of tobacco paper is connected in spiral shape, to be filled and closed at the end.

IMPROVED REMEDY FOR RHEUMATISM.

Aug. Severin, New York city, assignor to himself and Frederick Zarnfaller, of same place.—The proposed remedy is a composition of iodide of potassium, solid extract of aconite, wine of colchicum, morphine, and compound sirup of sarsaparilla.

NEW AGRICULTURAL INVENTIONS.

IMPROVED SHEARS FOR CUTTING HOGS' NOSES.

William H. Grow and Crawford M. Sloan, Rock, Kan.—One handle carries an inclined plate which rests against the hog's nose and supports the cartilage while the same is being cut by a blade on the other handle. The blade has an offset at its middle part, so as to leave a portion of the cartilage connected with the nose of the hog by a narrow neck. The end parts of the blade are curved about upon the arc of the upper side of the hog's nose, so as to cut off the rest of the cartilage close to its base.

IMPROVED POTATO BUG DESTROYER.

Isaac W. Griscom, Woodbury, N. J.—This is an apparatus mounted on wheels, and so designed as to be drawn over the plants. The poisonous powder is placed in a hopper, in which is a stirrer and other devices, which reduce the powder to a very fine state before it passes to a distributing device, which finally sprinkles it upon the plants beneath.

IMPROVED CLEVIS.

John G. Miller, Fredericksburgh, Va.—By this device the plowman, when he turns the team and reverses the plow, can, by means of a rod, shift the doubletree clevis from one to another of the notches of a notched clevis on the beam, to cause the plow to take more or less land, as may be desired.

IMPROVED SELF-RAKE FOR REAPERS.

Samuel B. Gilliland, Salisbury, Mo.—This rake is operated by a pitman, which connects with a lever operated by a grooved wheel on the axle. When the rake is pushed outward by the outward movement of the pitman, the teeth will be turned down beneath the platform, so as to pass beneath the cut grain lying upon said platform without disturbing it, and that, when the rake is drawn inward by the inward movement of the pitman, the teeth are turned up, so as to sweep the cut grain from the platform. The whole is a simple and doubtless efficient device.

IMPROVED HARROW ATTACHMENT FOR CULTIVATOR PLOWS.

Frederick D. Ladenberger, Glenbeulah, Wis.—This is a combined implement, comprising a shovel or breaking plow, two side plows, and two harrows, the two latter being connected to the former by eyebolts and brace rods, and made adjustable in width by means of a curved bar. The farmer is then provided with several useful implements in one.

IMPROVED PLOW.

Joseph Phillips, Smithton, Ill.—This is an improved cast iron upright for plows, having a flange formed upon its upper end. The lower end is forked, and a horizontal prong is formed upon it, having a longitudinal rabbet upon the rear part of its landside, and two longitudinal flanges upon its mold board side, to adapt it to receive the beam, the landside, the mold board, the share, and the handles.

IMPROVED BUTTER WORKER.

William H. Lilly, Bethlehem, Pa.—The chief parts or elements of this improved machine are a horizontal, continuously revolving bowl having a concave bottom, a revolving worker of peculiar construction, a stationary segmental block for pushing or transferring the worked butter from the side of the bowl towards the center of the same, and a central discharge tube for the buttermilk expressed from the butter. These parts, and the gearing necessary to operate such as rotate, are arranged in a frame having no peculiarity of construction.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MANUFACTURE OF HEXAGONAL NUTS.

George Johnson, Haverstraw, N. Y.—The inventor claims that, by this improved system of manufacture, a stronger nut is obtained, any waste of iron in cutting avoided, and a convenient feeding of the bar to the nut-cutting machine is propuced. In the accompanying engraving, Fig. 1 represents a top view of the

fig. 1.

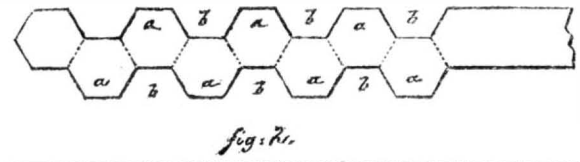
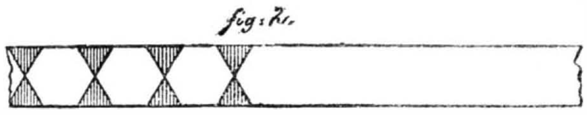


fig. 2.



improved bar for making hexagon nuts, and Fig 2 shows the straight bar hitherto employed for making these nuts. The straight blank bar is passed through rolls or dies, and forced into such shape that alternating semi-hexagonal projections and recesses at both sides are produced. The recesses at one side are parallel, and correspond to the projections at the other side. The bar is fed in this shape (on its edge) to the nut machine, being turned after each cutting of the same to bring the nuts always into the same position for the tool. Cutting such nuts from straight bars, as shown in Fig. 2, produces a great waste of iron at the sides in the form of small triangular pieces, and disturbs the fiber of the iron, requiring also the frequent sharpening of the cutting tools, as there are for each nut four cutting planes.

IMPROVED LEATHER-DRESSING MACHINE.

Bart M. J. Blank, Jersey City Hights, N. J., assignor to Morris Rubens, New York city.—This inventor proposes an improved machine, by which the creasing and polishing of leather may be rapidly and uniformly accomplished. The invention consists of a revolving feed roller, in connection with a series of creasing or polishing dies, that are secured by gage and set screws to socket grooves of a hollow spring-cushioned tube. The latter is heated from the inside, and capable of being swung back to admit the ready insertion of the dies.

IMPROVED NAIL PLATE FEEDER.

William H. Field, Taunton, Mass.—In this invention, feeding jaws, in which the gripper rod rests, are made to close on the rod, and then move forward the breadth of one nail by a rod moved forward by the machine and backward by a spring. In its backward movement, the jaws open and travel along the rod for a new hold to feed again.

IMPROVED KEY FOR LOCK.

Warren H. Guthrie, Hudson City, N. J.—A common device of burglars for entering locked doors is to seize the key from the outside by a fine pair of nippers, turn it, and so draw back the latch. The present invention prevents this by means of a swinging staple-shaped guard hung to the key and surrounding the wards, so that, when the key is in the lock, each of the key holes will be filled by a wedge-shaped plate, which prevents the introduction of nippers or the planting of a drill.

IMPROVED WATER WHEEL.

Cloud Chalfant, Penningtonville, Pa.—This invention is an improvement in the class of horizontal outward-flow water wheels. The improvement consists chiefly in providing the wheel with vertical rising and falling buckets, and in adapting the wheel to be raised and lowered within the stationary case.

NEW HOUSEHOLD ARTICLES.

IMPROVED BED BOTTOM.

Elias Stillwell, Rockville, Mo.—The object of this invention is to provide a cheap, comfortable, and elastic bed bottom, without the use of slats or springs as ordinarily employed; and it consists in two inside detachable rails, over which a stretcher of canvas is placed. The said rails are kept apart by notched bars, and have arms which rest upon a subjacent support, and, when pressed down from the weight of the occupant, tighten the canvas. In connection with said rails are employed one or more bolts on each side, which pass through the bedstead rails, and also the detachable rails, to prevent the accidental displacement of the latter.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries

H. H. will find a full description of jade on p. 49, vol. 34.—J. C. will find a recipe for cement for iron pipes on p. 185, vol. 33. Tempering mill-picks is described on p. 202, vol. 31.—W. H. will find on p. 347, vol. 32, a recipe for an alloy fusible below 212° Fah.—D. G. F. will find good recipes for bronzing on iron on pp. 11, 85, vol. 33, and on brass on p. 51, vol. 33. "Electricity, its Theory, Sources, and Applications" is a good book on electro-plating.—H. A. H. will find on p. 139, vol. 31, a formuly for the lifting power of gas. The silvery coating on iron wire, given in our recipe, will wear well with careful usage. Steel wire is best for springs that are much used.—E. B. will find a description of leather pulp on p. 296, vol. 31.—E. T. C. will find directions for cleaning brass on p. 102, vol. 25.—J. C. Jr. will find Bloxam's "Chemistry" an excellent work for students' use.—W. S. S. will will find on p. 10, vol. 27, a full description of the phosphorus lamp. This also answers H.W.S.—T. E. will find on p. 11, vol. 31, a recipe for waterproof varnish, which he can apply to his bronzed work. —H. A. P. will find full directions for molding rubber on p. 283, vol. 29.—H. F. H. is informed that no boiler incrustation preventive can be recommended unless the nature of the feed water is known, as the impurities of water differ so widely in their nature.—W. F. McL. will find a recipe for marine glue on p. 42, vol. 32. Mix enough gutta percha with bisulphide of carbon to make a thick varnish.—J. S. is informed that a pump made of a tin pipe with a wooden plunger is commonly used to draw oil out of casks. Coal ashes do excellent service in earth closets.—F. K. will find a good recipe for baking powder on p. 27, vol. 34.—J. N. will find a description of soluble salicylic acid on p. 86, vol. 33.—B. F. will find a description of an apparatus for freezing water in bottles on p. 82, vol. 33.—J. W. will find a description of the Russian circular ship on p. 87, vol. 33.—F. J. C. will find a description of bisulphide of carbon on pp. 114, 283, vol. 30.—W. C. will find a recipe for cement for millstones on p. 251, vol. 31.—R. N. can ascertain the horse power of a small engine by the rules given on p. 33, vol. 33.—T. F. can harden screw plates and dies by the process described on p. 75, vol. 28.—R. J. W. can harden tallow by the process described on p. 202, vol. 24.—W. N. will find a description of the philosopher's or hydrogen lamp on p. 242, vol. 31.—W. N. K. will find, on reference, that the paper stereotyping process is described on p. 363, vol. 30.—M. P. is informed that the only way of ascertaining the power of a spring is by experiment.—J. C. W. will find directions for making spongy platinum on p. 330, vol. 25. Files can be hardened by the process described on p. 212, vol. 26.

(1) J. B. asks: 1. What is the cause of the sulphuric smell in a room where a register is used? A. Your description is too meagre; you should state the arrangements of flues, furnace, etc. 2. Can the air of a room be analyzed so as to find what gases it contains? A. It can, but it requires the tact and skill of a chemist to obtain accurate results.

(2) F. S. W. asks: Please give me a recipe for making blue and red stencil paste, which can be cast into cakes, to be used for branding flour barrels. A. Mix any of the ordinary pigments with sufficient chalk or carbonate of magnesia to form a paste of the required consistence.

(3) G. D. V. asks: What is the effect of ice on milk? I have been using a spring to prepare my milk for cartage over some fifteen miles of country roads, and find that it will churn somewhat in warm weather. I have thought of putting broken ice in the tank used for cooling, thereby lowering the temperature below that of spring water. Do you think this would be an advantage in helping the milk to withstand the shaking? A. A very low temperature, such as that obtained by a mixture of crushed ice and salt, might be of some advantage; but the only sure method is that of filling the vessels full, so that there can be no possibility of shaking.

(4) D. M. C. asks: Can we use cast steel for punching machine mandrils, and will it sustain great weight and not crush in such use? A. Steel castings are far preferable to forgings, and will suit your purpose admirably.

(5) J. M. S. says: One cool Monday morning our fireman, while firing up, burst the globe of the main valve and a quarter turn in the main steam pipe running from the boiler to the engine. The pipe was 20 feet in length and 4 inches in diameter, and took one turn downward: it was probably partly filled with water, the drip cocks not having been opened. Experts here explain that steam, thus let on to confined water, exerts ten times as much force as if the pipes were free from water, bursting the pipes on account of the non-elasticity of water. Is this so? A. There was probably ice in your pipes, and they burst from unequal expansion.

(6) R. S. B. M. says: I have often observed men riveting steel plates together with soft iron rivets. Will the resistance of the plates to the contraction of the rivet, as the latter cools off, lengthen the time occupied in cooling? A. Theoretically, yes.

(7) A. M. B. says: I put a set of tubes into a boiler, and in less than a year one of them gave out. They have been going out one at a time until 8 have given out. There are small holes in them, that look as though they had been drilled. I use nothing but rain water in the boiler, but the condensed steam drips back to the cistern of a condenser, and I use tallow in the cylinder. Can you tell me a remedy? A. There are possibly chemical impurities in the tallow. Try purifying it by the process given on p. 182, vol. 29.

(8) C. C. R. asks: Is there any objection to using the common expansion valve (on the back of the slide valve), worked by another pair of eccentrics and link, in order to have the exhaust independent, for locomotives? A. It would give no advantage.

(9) T. C. says: I have built a small steam engine with cylinder 1½x3 inches, and have an upright boiler 12x16 inches, with one 3½ inch flue in the middle. Boiler and flue are made of copper, of No. 18 wire gage. What is a safe pressure? A. Safe working pressure 30 lbs. per inch. 2. Will the boiler run two such engines? A. No. 3. What books would you advise me to study, to get a thorough knowledge of land, marine, and locomotive engines and boilers? A. Bourne's "Handbook" and "Catechism of the Steam Engine," Forney's "Catechism of the Locomotive," and Colburn's work on the "Steam Engine."

(10) W. A. B. asks: Which of the following oils are best for shafting and printing machinery: Black lubricating oil, lubricating castor oil, or light engine oil? A. Lubricating castor oil.

(11) E. H. R. says: Last year I had trial gages to my steam boiler of a kind that worked with a hinge by raising the handle end. These handle ends, if raised too high, would drop out, letting the steam escape (if above the water level) until readjusted. One day I noticed, when the handle had become detached and a full head of steam was on, that, although there was the usual hissing by the escape steam (or what I thought should be escape steam) there was no steam visible, although the escaping gas was through an open door and with sufficient force to prevent, for some minutes, the readjustment of the handle. My curiosity was then excited, and I inquired of the engineer what was the reason that no steam was visible, only what appeared to be hot air or gas? He said he did not know. He only knew that, when mud was in the gage pipe, no steam was visible. When the pipe was clean, steam would issue. Now if this mud filtered all the steam out or decomposed the steam, what was this escaping gas, that seemed to have lost no force but to have entirely changed from steam to hot air or gas? The escaped gas did not deposit any moisture upon cooling. A. We have heard of many similar cases, and can afford no satisfactory solution of the question. We shall be glad to hear from any of our correspondents having had any experience in this matter.

(12) J. H. asks: Is there anything with which a horseshoe magnet could be covered so as to stop its influence or attracting force, a wax or paint of any kind, for instance? A. No.

(13) C. D. P. F. asks: 1. Is it practicable to heat a house 40 by 50 feet, three stories high, a greenhouse 16 by 100 feet, a stable, and two small cottages by steam from one boiler? A. Yes. 2. How large should the boiler be, the buildings being within a circle of 500 feet radius, and a separate steam pipe leading from the boiler to each building? A. You do not give the hight of stories of the buildings, from which the cubic feet of air to be heated might be computed, and upon which the size of the boiler should be predicated. Assuming the stories to be of about the usual hight, the boiler would require to have about 185 feet of heating surface, or about 14 horse power. There should be two pipes leading to each building in order to secure a circulation—one for the return; and these may be about 2½ inches in diameter. They should be packed with a cement of asbestos and cattle hair to about one inch in thickness, to save steam by preventing the radiation of heat. 3. How deep should the pipes be buried in the earth? A. At least three feet, and the boiler should be set in a cellar or vault low enough to receive the return pipe above the bottom thereof. The greenhouse could be warmed to a more uniform and safe temperature by means of a hot water apparatus of its own.

(14) C. H. A. asks: How can I silver the inside of glass globes? A. Make a reducing solution of one fourth, and a silvering solution of one tenth, the strength as published in No. 22, vol. 33, SCIENTIFIC AMERICAN, and fill the globe with equal parts of each solution.

(15) G. A. A. asks: 1. What should be the length of focus of the pair of 4 inch plano-convex condensing lenses for a magic lantern? A. The crossing (or smallest) point of the beam of light when in use may be ten or twelve inches from the condensers. 2. What should be the diameter and power of the pair of magnifiers corresponding to the 4 inch condensers? A. The quarter size photographic portrait tube, of 1¾ inch aperture and 6 or 7 inches focus, works very well. 3. What is the advantage of having the condensing lens made up of two glasses? A. That the focus may be made sufficiently short, and not lose too much light by reflection.

(16) J. F. asks: What kind of ammonia is used in a nickel bath to keep it neutral? A. The sulphate is preferable.

(17) C. C. M. asks: 1. Can I use a small telegraph machine for striking bells in different portions of my factory with simply the use of two wires? A. If you mean what telegraphers call a sounder, yes. 2. Will it be necessary to have a coil below the bell, so as to make the bell a magnet? A. No.

(18) J. D. B. says: The teacher of our astronomy class says that, were it not for the reflecting power of the atmosphere, we could see nothing not in direct sunlight. I claim that the reflection from the earth and adjacent objects would be sufficient to enable us to see many things not in the direct rays of the sun. Am I not right? A. Yes.

(19) W. H. A. asks: Has electricity been used in deep sea soundings? A. We do not recal any instance where it has been used for this purpose.

(20) J. A. S. says: If we had a material which was a non-conductor of magnetism, wrought into thin slips, which could be used as an interposer to cut off magnetic influence suddenly, and at regular intervals, would we then be able to propel light machinery by the power derived from common steel magnets of good quality, that is, could we utilize the power in magnets? A. Certainly, but if such a substance existed no economical advantage would result; work must be done to operate it, and this would more than overbalance any power which it would give.

(21) D. J. C. asks: Is it possible to make an aqueous solution of rosin? A. No.

(22) A. H. T. says: 1. I have constructed a Jamin magnet, but was unable to magnetize it on account of its peculiar shape and form. I was unsuccessful in the attempt, because I could not apply the electro-magnet to the surface of the steel ribbons. How should I proceed to make a magnet of great power? A. You ought to be able to magnetize it with an electro-magnet of the bar or curved form. Use one wound with No. 14 or 16 copper wire, and charged with two or three Grove cells.

(23) R. J. S. asks: How can I settle rain water taken from a pond, so as to make it clear for culinary purposes? A. Mix with a small amount of lime water, and allow to settle until clear.

(24) L. L. asks: 1. Which is the best way to make a stereoscope? A. For what purpose is it to be used? 2. What lenses are the best? A. Double convex, with one side thicker than the other. 3. How many times should they magnify? A. About twice. 5. What should be the distance between the lenses and the picture? A. About six or seven inches, for ordinary eyes. 5. How are the endless chains to hold the pictures in revolving stereoscopes made? A. Formerly they were made of either cloth, leather, or rubber belts, as wide as the picture is long. Across them were fastened narrow strips of wood, with wires at each end for holding the views. The latest improvement is a hinged metal band, but the principle is the same in each case.

(25) P. D. S. asks: How can I make bichromated gelatin? A. Make a hot saturated solution of bichromate of potash in water, and in another vessel make a strong solution of gelatin. Then pour them together, stir well, and allow to cool. Or flow your plate with gelatin in the usual way, and then place it in a bath of bichromate of potash for a short time.

(26) F. C. S. says: Please give me directions for nickel-plating apparatus. A. Take a wooden box and line the inside with sheet lead, having about one quarter of an inch between the box and lead. About midway between the ends place two upright copper poles, and across these lay a copper wire, upon which hang the articles which are to be plated. Insulate the copper wire or rod from the lead cell and connect it to the zinc pole of the battery. The positive pole should terminate in a nickel anode placed in the solution.

(27) F. W. B. asks: What metal will most cheaply and effectually resist the action of phosphoric or phosphorous acid, and the vapor arising from the oxidation of phosphorus? A. Gold or platinum.

(28) W. T. says: I have a quantity of butter from 3 to 5 years old, which is of no use except for grease. How can I get the oil out of it, to use for lubricating purposes? A. Butter is a mixture of several fats. You can obtain these free from salt and other impurities by digesting for a short time in hot water, and then allowing to cool. We do not know of any method by which these fatty bodies may be economically separated.

(29) W. M. M. asks: What chemical preparation can be burnt to produce a dense smoke? A. Try pastilles.

(30) E. B. asks: What is the best solvent for gum copal? A. Copal dissolves in turpentine, which is the usual solvent employed for the gum. Oil of rosemary is said to be one of the best solvents; ether is probably the best solvent, but it evaporates so rapidly that the varnish cannot be equally spread. The oils of spruce and lavender have also been used as solvents. It is almost insoluble in alcohol.

(31) C. asks: In speaking of the 81 tun English gun, is the tun 2,000 or 2,240 lbs? A. 2,240 lbs.

(32) S. G. C. asks: How can I remedy a trouble with a large stationary pot in a furnace? It was used for washing, making lard, etc., without the least trouble; now it is unfit to use, as it makes the water black. How can it be cleaned? A. We are as much at a loss to explain the strange action as yourself. You should have stated whether the pot is of iron or other metal, and if there is any incrustation, in which case please send a sample. State whether or not the water

used is from the same source as formerly; and if so, whether it may not have suffered some change. If the latter is at all probable, send us a small sample of the water also.

(33) J. B. J. says: In your issue of December 11, 1875, you give a recipe for mucilage, requiring 30 grains sulphate of aluminum. Will common alum (in equal quantity) do? The latter contains sulphate of potash and water in addition to the sulphate of alumina. A. Probably not so well. Try the experiment for yourself.

(34) F. P. L. C. asks: Is there any chemical composition that may be used for darkening the skin without injury? A. We know of none. Dyes can be applied, but they always affect the normal condition of the cuticle, and for this reason cannot be recommended. Organic solutions cannot be made use of, as they are readily taken up by the system, and most solutions of the metals have a very injurious effect upon the adjacent muscles, etc.

(35) A. M. asks: Is water having a limey taste injurious to the system, when used for drinking and cooking? A. Generally speaking, it is not injurious. On persons unused to drinking such waters, it sometimes acts, producing temporary derangement of the bowels.

(36) J. A. asks: What will remove ink stains from parchment? A. It would be necessary to know what kind of ink, in order to give a definite answer. Try a little pure diluted muriatic acid or cyanide of potassium.

(37) S. L. G. asks: Is water which has burnt gunpowder and tar in it dangerous or unwholesome to drink, or to use for cookery? A. It is not dangerous, but it is less wholesome than common rain or river water.

(38) C. F. asks: Can you give me a good recipe for making and polishing artificial malachite? A. Send a specimen of the malachite which you are confident is artificial, and we shall make the requisite examination.

(39) L. H. says: I tried your recipe for green black writing ink, published in your issue of October 23, 1875. The color is all right, but the stands and pens get all covered with a hard substance (see inclosed). What is the matter? A. This ink should be used with a gold or quill pen. The white powder is sulphate of iron.

(40) I. F. B. asks: Can potatoes be used for manufacturing purposes? A. Yes. They are used on a great scale in the manufacture of starch.

(41) R. B. W. asks: Is alumina fusible before the oxyhydrogen blowpipe, or by any other known heat? A. Alumina (A_2O_3) melts into a colorless glass when exposed to the oxyhydrogen blowpipe flame; and when thus ignited it is found to be soluble in acids with great difficulty.

(42) H. M asks: Why does a magnetized needle float on water? A. Any needle will float on water if it be carefully laid on the surface. A certain amount of impact is necessary to break the surface of the water, and then the needle will sink, whether it be magnetized or not.

(43) G. R., Groningen, Holland asks: 1. What is canary seed (*phalaris canariensis*) used for? A. To feed canaries and other small birds. 2. What is caraway seed (*carum carui*) used for? A. For flavoring cakes and other articles of cookery. It is also used for preparing a liqueur, called in Germany *kummel*.

(44) F. W. A. H. says: Can you tell me of a remedy for itching, not suppurating, chilblains? A. Take oil of turpentine 2 ozs., camphor 3 drachms, and oil of cajeput 1 drachm. Mix, and rub in with gentle friction.

(45) W. L. asks: Can you give me a recipe for a black ink powder that can be mixed up with water for immediate use? A. Take Aleppo galls 3 lbs., copperas 1 lb., gum arabic ½ lb., white sugar ¼ lb.; powder and mix. Put 1 pint boiling water on 2 ozs. of this mixture, and your ink will soon be ready for use.

(46) R. M. asks: How is licorice paste made? A. Dissolve common stick licorice in water, strain the solution, and add a little refined sugar. Then evaporate till a stiff paste is obtained, and press into shape.

(47) T. H. C. asks: 1. Is copper now in use anywhere for edge tools? A. Yes, in China and elsewhere. 2. Would the discovery of the art of hardening copper, so as to make it suitable for tools, be of any great value to the world? A. Not unless steel becomes unattainable.

(48) W. & S. ask: 1. How can we detect the presence of lime in drinking water? A. By blowing into the water through a straw. If the water becomes cloudy, lime is present. 2. How can we make a filter for drinking water? A. Make a wooden cistern, with a false bottom a few inches above the base, and screw a faucet into the cistern to draw the water from the intervening space. Bore some holes in the false bottom, and put in some coarse gravel, then some fine gravel, then some sand, then some crushed charcoal, and your filter is ready for use.

(49) P. S. asks: What is the weight of a cubic foot of gold? A. 1204·1284 lbs. avoirdupois.

(50) G. M. R. asks: How can I anneal cast iron? A. Malleable iron castings are enclosed in iron boxes filled up with pounded ironstone or common lime. The boxes are then luted, rolled into the oven or furnace, submitted to a good heat for about five days, and allowed to cool in the furnace.

(51) C. F. asks: How can I make *eau de Cologne*? A. Take oil of lavender 4 ozs., purified benzoin and oil of rosemary each 2 ozs.; dissolve these in stronger alcohol 9 gallons. Add successively oil of neroli, oil of young orange (called by the French *huile de petits grains*), oil of lemons, each 10·4 ozs.; oil of sweet orange, oil of lime, and oil of bergamot, each 20·8 ozs., and a little tincture of the flower of rose geranium. This is a good imitation of the *eau de Cologne* prepared by the Farinas, and is said by some to be that of the original formula.

(52) J. E. asks: How can I color fancy soaps? A. For red, use tincture of orchil; for yellow, tincture of turmeric or annatto; for brown, burnt sugar or umber. Other colors can be produced by using simple vegetable pigments.

(53) N. S. asks: Will the elasticity and strength of the following spring be nearly permanent? The spring is 15 inches long, 2 inches wide, and of 17 B. W. G. It is used to push the bodies of scalded hogs, so that they protrude 4 or 5 inches within the circle of a revolving spring, about 60 times a minute for 10 hours a day. A. Your spring is too light for the duty, and hence is liable to set.

In the arrangement of a sliding shaft through a hub under pressure, which presents the least friction, a feather in the shaft and slot on hub, or pin through shaft and slot through hub? A. A feather in the shaft.

(54) J. R. B. asks: What solution will clean brass or iron after brazing, while hot? A. We know of none.

Can a governor be made to regulate the speed of an engine, 2x4 inches? A. Yes.

Of how many horse power should an engine be to give power equal to 10 horses in driving a thrashing machine? A. Twelve.

(55) H. M. W. says: I want to divide a circle into 9 parts; these 9 parts are to be subdivided by 10, and again by 10, making in all 900 divisions. Is there a rule by which I can divide a circle in this way? A. The necessary instructions would occupy too much space. The subject will shortly be treated in "Practical Mechanism."

(56) L. S. says: I have been firing a 30 or 32 tun Baldwin locomotive, which always had a thumping on the left hand hind driver. The engineer made some experiments by setting the driving box wedges and wrist pin brasses, but could not stop the thumping. Lately the engine was taken out of shop; the driving boxes were paralleled; brasses, wedges, drivers, and wrist pins were all turned off, and now the thumping is on the opposite side. It can be heard when running either slowly or fast, but mostly when she is drawing a heavy load. Can you explain it? A. Not without examining the engine.

(57) I. D. H. says: We have some heating stove patterns that are too light. We want to thicken them up, so as to enable us to take off another set of patterns of proper thickness Is there any material that can be painted or smeared on the patterns, so that, by repeated applications, they could be thickened up evenly and neatly? A. No.

(58) W. W. McK. & S. asks: Can you inform us how to soften our scrap iron in the cupola, so that it can be bored and turned without using pig iron? Some shops use nothing but scrap, and soften it by putting in certain materials. What are they? A. We think you are mistaken as to scrap iron being softened by anything but the addition of new soft iron.

How can we make a good arrangement for vitriolic castings? A. A shallow tank, sunk in the ground, covered with a movable lid, and placed near a water supply, is all you require to wash castings.

(59) H. G. asks: Can you tell what is used to stop boilers from priming or foaming? A. Plenty of boiler power and steam space is the best general remedy we know of.

(60) J. M. M. G. Jr. says; We have an engine of 20 horse power which last year ran two gin stands very well with 30 lbs. steam. We stopped it in the spring, and did not run it any more until this fall, and now it takes 50 lbs. to run it, and that very slowly. It is clean and well oiled. We got a machinist to examine it, and it was in perfect order. I am afraid to raise more than 60 lbs. steam on boiler, as we have had it 22 years. It has been repaired and a new head put in at one end. What is the matter? A. It would be impossible to say without an examination of the engine.

(61) C. C. G. asks: Does it take more power to run a saw on a long mandrel than on a short one, not counting the extra weight? A. Yes, because of its vibration.

(62) H. C. asks: Is there any practical difficulty in running two engines on the same shaft, in a steamboat, under the following conditions? One cylinder is 14 inches x 30, the other 15 inches x 36. They are to be connected by link motion. A. No, unless the other conditions (situation of engine, etc.) prevent.

(63) J. S asks: How can I temper butcher's steels for sharpening knives, without injuring the silver color? A. It cannot be done.

(64) A. L. O. says: We have been troubled with the bad working of our furnaces. It is impossible to keep one room comfortable. If we opened two registers, a cold stream would rush down one, while a feeble current of warm air would be coming up the other, and *vice versa*. The weather was very cold, accompanied with a high wind from the north and west. What is the remedy? A. When the air is heated in your furnace, it expands and produces a pressure; the register being open, it finds less resistance in the rarefied air of the rooms than in the dense cold air at the mouth of the cold air box; it therefore rushes out of the registers into the rooms, displacing the air in the rooms by driving it out through the joints and crevices or the doors, windows, etc. Now, if it is supplied to two rooms on opposite sides of the house, when the wind is blowing upon one side it interposes a certain pressure from without upon the joints and crevices, and so prevents the air in the room upon that side from being displaced. The result is that, the usual outlet being closed, no warm air can be forced into the room; but on the leeward side, the pressure from without being entirely removed, the warm air enters with increased rapidity. This difficulty might be alleviated by providing weather strips on your doors and windows, and by ventilating by your chimney flue, having a weather cowl upon the top of it.

(65) J. Y. asks: What is a good architectural book, with plans, specifications, and elevations? A. Woodward's "National Architect" fulfils the conditions you require. "Wooden and Brick Buildings" is a more extensive and later work, but does not include specifications. You can probably obtain both or either by addressing A. J. Bicknell & Co., No. 27 Warren street, N. Y.

(66) W. B. M. asks: I have a 5½ x 8 inches vertical engine; at what speed ought it to drive a boat 38 feet in length by 7 feet 4 inches beam? Would this boat be rightly proportioned for that size of engine? Would a vertical boiler 6 feet high by 30 inches in diameter, with 33 two inch tubes, 4 feet long, be of proper size for engine? Would a screw propeller, 36 inches in diameter, of 5 feet pitch, be proportioned to the above? A. The boiler is rather small, and the other proportions are very fair. You should realize a speed of 6 miles an hour.

By what chemicals can you detect the presence of carbonate of lime in water? A. Add lime water, which will precipitate carbonate of lime, giving the water under test a milky appearance.

(67) R. H. M. asks: 1. How long must my rafters be for a house 16 feet wide, to have a Gothic pitch? A. There is no set pitch of roof in the Gothic style of architecture. The pitch is generally steeper than in the other styles. 2. What is half Gothic pitch? A. The term is evidently a provincial one among builders. 3. How much must I raise the roof in the center so that it will be a Gothic pitch? A. Make the length of your rafter equal to the width of your house, and you will have a pitch that will be suitable for the Gothic style.

(68) W. H. S. says: In a trunk or flume are placed four 20 inch turbine water wheels, 7 feet apart, the whole being under a head of 33 feet. The power drives at present a 29½ feet overshot water wheel, 3 feet wide in the clear. Can I derive more power by using the water on 4 wheels than I could by applying it all to one wheel at the bottom of flume, the wheel being also 20 inches in diameter? Could I in either case obtain more power than I can with an overshot wheel? A. If you have a good overshot wheel, we do not think you will gain any material advantage by making such a change.

(69) F. M. R. asks: Given 1,000 cubic feet of atmospheric air at a temperature of 30° Fah., how much in volume would it be increased if heated 20°, and again by steps of 20° each to 250° Fah.? A. It can be determined by the following rule: Let p=pressure of air at temperature 32°, v=volume of air at temperature 32°, P= pressure of air at temperature T, V=volume of air at temperature T. Then $P \times V = p \times v \times [1 + (T - 32) \times 0{\cdot}0020276]$. If T is greater than 32 the *plus* sign is to be used, and the *minus* sign is to be taken when T is less than 32.

(70) M. H. T & Co. ask: 1. Does it impair the strength of an iron chain to galvanize it? A. No. 2. Does it impair the strength of hooks to galvanize them? A. No. 3. We make hooks in two ways: Out of round iron, pointed and bent to shape, and out of square iron, drawn and bent to form the eye, then welding the ends of iron together, and bending to shape. Which is the best way to make them for strength? And which would you prefer to use, a hook made entirely by hand or one made under a trip hammer? A. We think these two questions could be better decided by experiment.

Does air from over salt water rust metals more than air from over fresh water? A. Yes.

(71) H. E. W. asks: What is the best method to kill the sound or echo in a hall or church? A. On p. 356, vol. 29, you will find an illustrated article on this subject, and on p. 324, vol. 30, there is a communication from Mr. J. M. Allen, of Hartford, Conn., which gives a careful statement of experiments, resulting in the discovery of a successful remedy for the echo in churches.

(72) J. H. L. J. asks: What is the reason that Portland or Roman cement cannot be made to answer the purpose of so many worthless compositions for a good roof? A. The reason is to be found partly in the unstable nature of the boarding upon which roof coverings are usually laid, and partly in the friable nature of the cement itself, which is not impervious to water unless laid in large blocks, impracticable for roofing generally.

(73) W. M. B. says, in reply to D. S. C.'s query as to discoloration of aniline: The darkening of the aniline is due to the turpentine in the varnish. I have been experimenting on these most fugacious colors. If some one will tell me of a varnish that will not kill aniline red, I will make my fortune.

(74) C. W. J. says: The upper rock being—the runner (the weight being the same when at rest as when in motion) why is it that the runner is more easily raised by the regulating screw when the mill is in motion? This question may appear to you as absurd, but I have failed to convince an opponent that gravitation is not destroyed by motion, and that any speed may be given the runner in question without its being lifted, in consequence of speed, from the spindle on which it rests. A. We would like to be assured that this is a fact before attempting to explain it. If you have ever made any experiments to verify it please send us a record.

(75) H. M. W. says, in reply to I. G. S.'s query as to cracks in the skin: A good application is: Tincture aloes ½ drachm, glycerin 4 ozs. The alcohol should be evaporated from the tincture before mixing.

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

A. A. D.—It is a variety of clay. The whitewash can hardly be as durable as if made of lime. —J. J. N.—If the specimen referred to was in a small round box, it is yellow hematite, an ore of iron.—E. L. C.—It is a fine earth, apparently of infusorial origin.—G. D.—They are andalusite, composed of silicate of alumina, found in many places in the United States.—J. F.—It is a variety of indurated clay, not especially valuable.—W. H. O.—No. 1 is impure hydrated sesquioxide of iron, with silex and alumina. It is not worth assaying. No. 2 is blue clay, and exists in great quantities in many localities.—C. N. G.—Your description is too incomplete to enable us to identify the specimen. —J. M.—It is galena or sulphuret of lead.—F. M. J. —It is decomposed mica.—J. H. S.—It is quartz containing some silicate of copper or chrysocolla. —C. W. McC.—Nos. 1 and 3 are water-worn silicious pebbles. No. 2 is ferruginous quartz. No. 4 is water-worn silex. No. 5 is pink quartz. No. 6 is blue quartz. No. 7 is drusy quartz.—J. W.—Ordinary spelter is cast zinc. One of the specimens consists of copper and zinc. The black powder is black oxide of copper, formed by oxidation aided by heat. Your plan of cleansing is good.—U. H. —It is sulphuret of iron, and is injurious rather than otherwise to the coal.—V. P. E.—It is green mica, along with iron pyrites. It is of no value. —A. O. F.—It is white quartz with scales of mica. No metal.—C. H. G.—No. 1 is clay containing hydrated sesquioxide of iron. No. 2 is silicate of alumina with silex. No. 3 is arenaceous sand rock. No. 4 is magnetic iron sand. No. 3 is clay with anhydrous oxide of iron. No. 6 is a gold-bearing quartz.

C. asks: 1. What is the weight of the 20 inch gun that was made some years since, at Pittsburgh, I believe? 2. What do the 15 inch guns weigh?—A. H. asks: What is the best way of preparing burnt cork for the face, for theatrical purposes, so that it will easily rub off?—P. A. K. asks: Who got up the first railroad sleeping car, and put it into practical use, and when?—T. H. R. asks: Can you tell me of a cure for kleptomania in a child?—W. G. A. asks: What is the deepest penetration, by the best shot guns that are made, with No. 4 shot, in a white pine board at 35 yards range?—L. C. asks: What is the capacity of the largest flouring mill in the United States?—A. M. M. says: I notice in your issue of January 1 an article on the weight that the threads on ⅜, ½, and ¾ inch wrought iron pipe will sustain. Can any one tell me the weights that different sizes from ⅛ inch pipe to 10 inch pipe will sustain?

COMMUNICATIONS RECEIVED.

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

On Cold Vapor. By R. M. O.
On Crime Cure. By F. S.
On Acadie. By A. A. B.
On Railway Signals. By L. S. W.
On Home Science. By J. J. B.
On Precession. By J. H.
On Belts. By T. F. B.
On a Centennial Problem. By J. L. A.
On Trisecting an Angle. By E. C.
On Life-Saving Appliances. By H. R.
On Bees. By L. E. C.
On the Etheric Force. By J. R.
On Vaccine Virus. By B.
On Dullness of Trade. By B. M.
On Some Electrical Experiments. By M. B.
On Boiling Down. By C. J. T.
On Raising Sheep. By H. G. O.
On Snowfalls in Colorado. By S. H.

Also inquiries and answers from the following:
S. W.—S.—A. O. W.—H. S.—S. P. B.—J. W. S.—A.S. —C. T. S.—E. L. C.—G. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries 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.

Enquiries 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 does photo-lithography and heliotypy? Whose is the best steam threshing machinery? Who makes traction engines in America? Who makes small ice machines? Who puts up lightning rods? Who makes loom shuttles? Who sells tools for marking wood rules? Who makes gutta percha plates for electrical machines? Who makes lathes for turning curtain rollers, etc.?" 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

December 28, 1875.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

DESIGNS PATENTED.

8,866.—GLASS SHADES.—T. B. Atterbury, Pittsburgh, Pa.
8,867.—BAND COMBS.—F. Britton, New York, city.
8,868, 8,869.—INKSTANDS.—B. Brower, New York city.
8,870.—INKSTAND BASE.—J. V. Brower, New York city.
8,871.—BEAD.—S. Cottle, New York city.
8,872.—BAND COMBS.—E. M. Drake, New York city.
8,873.—FLAG.—W. A. Duff, Philadelphia, Pa.
8,874, 8,875.—CARPETS.—H. F. Goetze, Boston, Mass.
8,876.—PRINTING SILK, ETC.—S. Huber, Philadelphia, Pa.
8,877.—PICTURE FRAME.—R. Minshull, Pittsburgh, Pa.
8,878.—BREASTPIN.—S. Pfaelzer, Philadelphia, Pa.
8,879.—STATUARY.—J. Rogers, New York city.
8,880.—CIGAR LIGHTERS.—F. R. Seidensticker, West Meriden, Conn.
8,881.—SODA APPARATUS.—F. H. Shepherd, Boston, Mass.
8,882.—COFFIN HANDLES.—W. M. Smith, West Meriden Conn.
8,883.—CARPETS.—T. J. Stearns, Boston, Mass.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application or Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, December 23, 1875.

5,529.—E. P. Richardson, Lawrence, Mass., U. S. Pegging machine. Dec. 23, 1875.
5,530.—G. W. Kennedy, Hatley Township, P. Q. Combination stove heater. Dec. 23, 1875.
5,531.—F. B. H. Saxton et al., Strathroy, Ont. Seed, corn and bean planter. Dec. 23, 1875.
5,532.—J. C. Smith, Dunkirk, N. Y., U. S. Manufacturing paint. Dec. 23, 1875.
5,533.—W. Dorr, Gardner, Me., U. S. Railway car coupling. Dec. 23, 1875.
5,534.—S. R. Marsh et al., Brasher Falls, N. Y., U. S. Cattle stall. Dec. 23, 1875.
5,535.—R. O. Paterson et al., Cheltenham, England. Process for obtaining salts of ammonia. Dec. 23, 1875.

Advertisements

Advertisements.

Back Page - - - - - $1.00 a line.
Inside Page - - - - - 75 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Friday morning to appear in next issue.