SCIENTIFIC AMERICAN

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

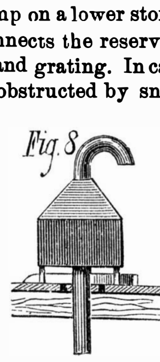
Vol. XXXIII.—No. 22. [NEW SERIES.] | NEW YORK, NOVEMBER 27, 1875. | $3.20 per Annum [POSTAGE PREPAID.]

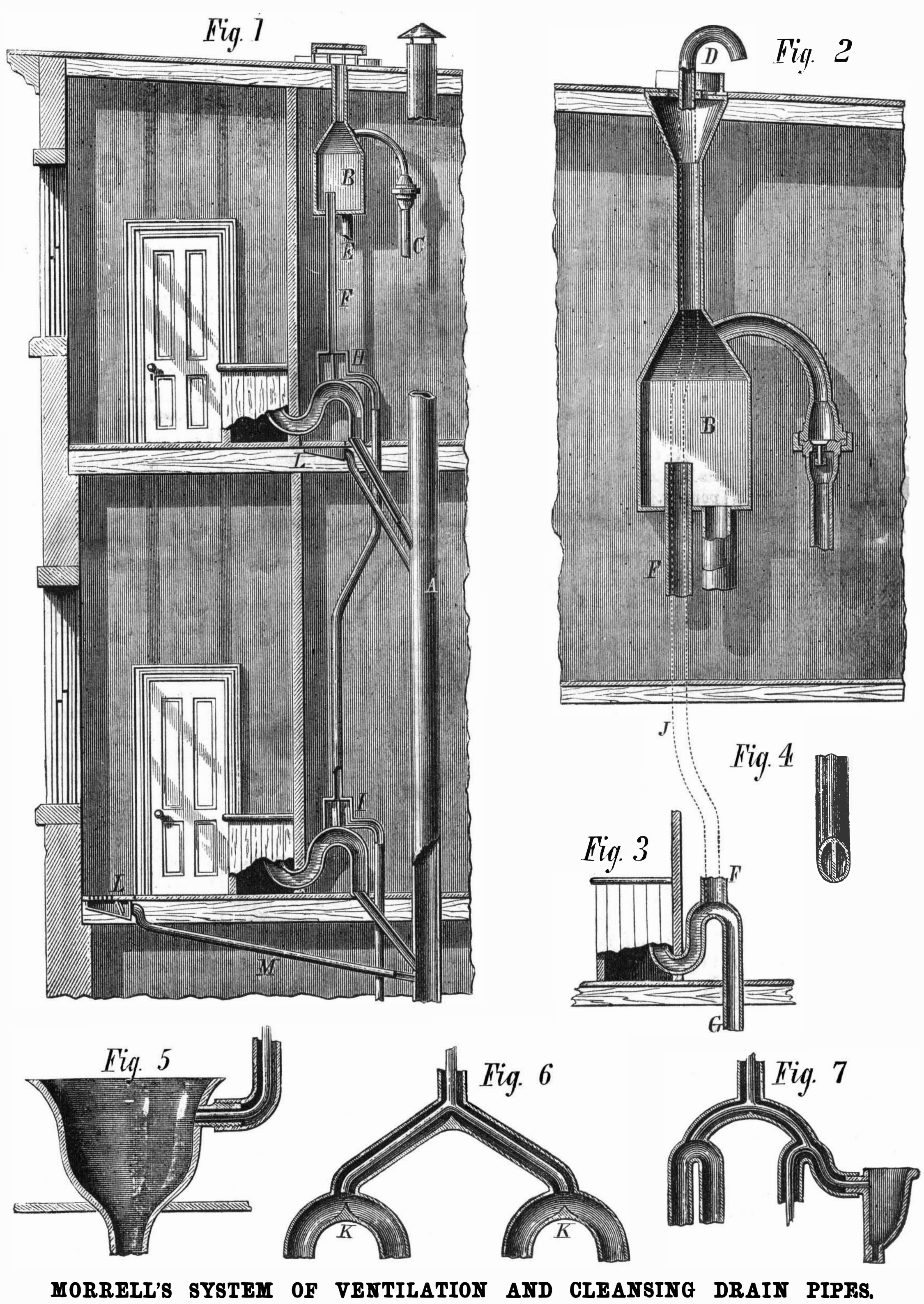
NEW SYSTEM FOR VENTILATING AND CLEANSING DRAIN PIPES IN BUILDINGS.

We illustrated, not long ago, a new form of floodway for buildings, intended to drain off water from floors deluged either through leaks in the supply pipes or through the means adopted for extinguishing fires, and so to prevent injury by water to other portions of the edifice. The inventor of this ingenious device, Mr. John H. Morrell, of New York city, has lately patented, through the Scientific American Patent Agency, another invention of equal and perhaps greater utility, and one which will commend itself to all who appreciate the necessity of an economical supply of water and the complete prevention of the escape of noxious sewer gases from the drains and sinks of a dwelling. The danger of these foul emanations, carrying as they do the germs of typhoid and diphtheria, cannot be too forcibly impressed upon the public; and since of late numerous severe cases of disease, directly traceable to the miasma, have been prominently brought to general notice, inventions tending to improve the sanitary arrangements of residences possess a present and timely interest.

Mr. Morrell's device, of which we give engravings in detail herewith, involves arrangements both for ventilating and for cleansing the sinks. By means of a reservoir, from which distributing pipes lead to the various receptacles, the rain water which falls on the roof is collected and conducted to the various traps or closets, or water may be supplied to said reservoir by a pump or any other convenient means. Utilizing the rain water, however, is mentioned here in advance, because such employment virtually renders the apparatus automatic. That is to say, supposing the house to be closed and empty, the system of pipes will serve as ventilators; and when a fall of rain occurs, they will then serve to fill the traps, thus supplying the water evaporated from the latter, and, besides, washing them out, so that the very frequent occurrence, of an unoccupied house becoming filled with foul gases from its drains receiving no attention, is thus rendered practically impossible. There are various other advantages of Mr. Morrell's plan, which will be found noted in proper place in the following description

The large pipe, A, Fig. 1, is the sewer conduit, which it is proposed to lead up through the roof, and to provide with an open top and cap above, for ventilation of its interior. B is a reservoir, which receives water from the roof or from the pipe, C, connected with a suitable pump on a lower story. In Fig. 1 the mouth of the tube which connects the reservoir with the roof is shown covered by a cap and grating. In case this opening is frequently liable to be obstructed by snow and ice, another arrangement, shown in Fig. 2, which exhibits the reservoir and its parts on a larger scale, is employed. The supply pipe, C, would be used for water, and ventilation gained by the curved tube, D, in connection with a register cover. It will be observed that this tube, D, is made of sufficient size and high not to be impeded by ordinary deposits of snow or ice, and that it is always open for ventilation, whether the register cover be open or not. But as a security against the obstruction of the register, the inventor proposes to use a double walled box or hood, placed above the register, as in Fig. 8. The warm air which collects within the hood, directly above the register, will always keep the latter free from ice or snow. The water supply pipe, C, has a check valve to prevent back flow of water or gas. At E, in the reservoir, is attached a pipe for carrying off the water to any portion of the building where it may be needed. F is the overflow pipe, so arranged as to conduct off all water which rises above its orifice in the reservoir, directly to the trap of a water closet, in manner shown by the dotted lines connecting Figs. 2 and 3; so that the water, after filling the trap, passes off by the pipe, G, to the sewer. Instead of leading the pipe directly to the trap, it may, as in Fig. 1, connect with a receiver, H, which contains a partition so arranged that water, entering from F, will be divided, one portion passing to the trap and thence to the sewer pipe, and the other running through another pipe to another receiver, I, Fig. 1, there to be again divided and led to other traps, and so on to as many sinks as may be desired. The above described arrangement is such that, in addition to cleansing the traps whenever there is a down flow of water, the system, when its pipes are empty, offers through the latter a free exit for foul gases, so that the fourfold advantage is gained of a storage reservoir, a distributing reservoir for water, a water closet trap supply and pipe cleaner, and a ventilating apparatus. As we have already pointed out, the action is automatic, and therefore no care or attention is necessary, thus adding still another and important advantage. To facilitate the ventilation of the system during the down flow of the water, the curved roof pipe, in Fig. 2, is extended, as shown at J, through the interior of pipe, F. At convenient points, openings are made in it for the upward escape of the gases. It may also extend down through other pipes and chambers, eventually connecting with the sewer pipes; and it may also be led to the traps, as shown in Figs. 2 and 3. The same arrangement of inner and outer pipe may be carried to a water closet basin, as represented in Fig. 5, so as to ventilate the same. Instead of using double pipes, a single pipe may be employed, having a partition, as in Fig. 4, one side being for ventilation and the other for a water conduit. Fig. 6 shows the application of the double pipes to distributing pipes and branches, a rise, K, being formed just at the points of junction, in order to divide the water equally into each branch. Fig. 7 represents the application of the double pipe to urinals. In Fig. 1 is also illustrated the floodway drain referred to in the initial paragraph. L is the sunken receptacle, beneath the floor and covered with a grating. In this the water collects, and then, by the inclined pipe, at M, escapes into the sewer pipe.





MORRELL'S SYSTEM OF VENTILATION AND CLEANSING DRAIN PIPES.

For further information address or apply to the inventor, 475 Fourth avenue, corner 32d street, New York city, where a person will be ready to show the entire invention, now in full operation, in a building near by

A Physiological Problem.

A rather curious problem for physiologists is engendered by experiments recently tried by M. Ponchet upon a puppy. It is the general opinion that the brain of an infant, when the eyes are first used, or that of a person born blind and afterward restored to sight, is unable to translate correctly the impressions conveyed from the retina by the optic nerve. The individual has no idea, it is asserted, of relative distances, nor of the relative physical characteristics of bodies, but only learns the same through practice, and therefore it is to be expected that the sudden restoration of sight will result in a kind of optical confusion, which is only reduced to order after lapse of time. M. Ponchet's experiment, however, seems to negative all this, so far as the use of one eye is concerned; that is to say, if a person, blind in one eye, regains sight therein, and at the same time loses vision in the former perfect organ, the newly acquired sight is exactly as good as that lost, and the new eye requires no education whatever. The eyelids of one eye of a puppy, immediately after birth, were surgically treated so as to cause them to grow together, completely of course shutting off vision from the organ. The animal as it grew used but the single eye until it was four months old, when the good eye was similarly closed and the eyelids of the other opened. Although the left eye had never been used, and although it served as the sole means of sight, not the slightest difference could be detected in the actions of the animal. It recognized objects or avoided obstacles with perfect facility, and, in brief, the most careful examination failed to prove that the dog experienced any different sensations from those to which it had become accustomed.

The subject is interesting in view of the theory which already exists of there being corresponding points in both retinas, from which vibrations are transmitted to the brain.

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 he 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.

VOLUME XXXIII., No. 22. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, NOVEMBER 27, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE GULF STREAM AS A HEAT CARRIER.

The Gulf Stream finds a sturdy champion in the author of "Climate and Time," Mr. Croll, of the Scottish Geological Survey. Dr. Carpenter, who has a theory of his own, goes out of his way to belittle the influence of the Gulf Stream as a modifier of climate, calling the stream a mere rivulet compared with the (theoretically) grand surface drift of tropical water into the North Atlantic: whereupon Mr. Croll resorts to the logic of fact and figures, and demonstrates the enormous influence which the body of warm water, entering the Atlantic through the Straits of Florida, must have in mitigating the climate along its subsequent path. Mr. Croll's argument is presented at great length, proving beyond a doubt that, so far from being currently overestimated, the thermal effect of the Gulf Stream is vastly greater than has ever been suspected hitherto.

The observations of the United States Coast Survey, in regard to the breadth, depth, and temperature of the streame were many and careful. Unfortunately, however, no observations were made to determine precisely the velocity of the current at all depths along any particular section; consequently, while the mean temperature of the stream may be determined with considerable precision, it is impossible to make an accurate estimate of the volume of the current. From the limited data afforded by the records of the survey, Maury considered the volume of the stream to be equal to that of a stream 32 miles wide and 1,200 feet deep, flowing at the rate of five knots an hour. That would give a flow of 6,165,700,000,000 cubic feet an hour. In his "Physical Geography," Sir John Herschel estimates it as equal to a stream 30 miles wide and 2,200 feet deep, flowing at the rate of four miles an hour, that is, having a volume of 7,359,900,000,000 cubic feet an hour. More recently Dr. Colding estimated its volume at 5,760,000,000,000 cubic feet an hour. From the same data, Mr. Croll, some years ago, determined its volume to be equal to that of a stream 50 miles wide and 1,000 feet deep, flowing at the rate of four miles an hour, or considerably less than the lowest of the foregoing estimates. To obviate any possible objection on the ground of overestimating the volume of the stream, Mr. Croll calculates its heating capacity on the basis of a velocity of only two miles an hour, according to which the flow would be 2,787,840,000,000 cubic feet an hour, a little over one third of Herschel's estimate.

The average temperature of the surface water in the Florida Channel, for the whole year, is 80°. The bottom temperature, according to Dr. Carpenter, is 60°, which would make the mean temperature about 75°. Mr. Croll thinks this estimate much too high, an error arising from an underestimate of the sectional area of the stream. Believing that the current extends to a depth where the temperature is below 60°, he calculates that the mean temperature of the stream is not over 65°. In its passage to the arctic regions, the water is cooled down to about 30°. Assuming that part of the return current, by the way of the Azores, is fed from the water of the Gulf Stream proper (not entirely from the larger current further east, discovered by the Challenger expedition, and considered by Captain Nares to be an offshoot of the Gulf Stream), a considerable portion of the stream is not cooled below 45°. Altogether, however, Mr. Croll thinks he cannot be overestimating the cooling of the water in fixing the average minimum temperature at 40°, thus allowing for the loss of 25° of heat while the water is making its northern journey. At this rate each cubic foot of the water must transport from the tropics to more northern latitudes upwards of 1,158,000 foot pounds of heat. Consequently the total quantity of heat transferred daily by the entire stream amounts to 77,479,650,000,000,000,000 foot pounds.

The effect which this vast amount of heat must have in mitigating the climate of the regions to which it is carried can best be estimated by comparing it with the amount of heat received from the sun by the same areas.

According to the observations of Sir John Herschel and M. Pouillet, the sun pours down upon every square foot of the earth's surfaces at right angles to its rays about 83 foot pounds of heat a second: this allowing for no absorption of heat by the atmosphere. M. Pouillet estimated the loss of heat by atmospheric absorption to be 24 per cent of the amount received from the sun. Mr. Meech (*Smithsonian Contributions*, Vol. IX) estimates the loss at 22 per cent. At the latter rate of absorption there would remain 64·75 foot pounds of heat a second to fall on each square foot of the earth's surface when the sun is directly overhead. On the equator at the time of the equinoxes, the sun shines daily for twelve hours. Were it to remain at the zenith all this time, its heating effect per square foot would be 2,796,768 foot pounds. Not so remaining, its effect is less in the ratio of 1 to 1·5708; so that each square foot of the earth's surface at the equator, under the most favorable conditions, receives 1,780,474 foot pounds of heat during the twelve hours from sunrise to sunset. A square mile receives 49,636,750,000,000 foot pounds. As we have seen, the Gulf Stream carries from the tropics daily 77,479,650,000,000,000,000 foot pounds, or as much as falls upon 1,560,936 square miles at the equator.

Mr. Meech estimates the quantity of heat received from the sun annually, by each square mile of the frigid zone, taking the mean of the whole zone, at 0·454 of that received at the equator: consequently the heat conveyed by the Gulf Stream is equal to that which falls on an average of 3,436,900 square miles of the frigid zone, or nearly $\frac{2}{5}$ of its entire area: this, assuming that the percentage of heat absorbed by the atmosphere in polar regions is no greater than at the equator. If the obliquity of the sun's rays is allowed for, it appears that the Gulf Stream conveys not far from half as much heat as the sun furnishes to the entire area within the arctic circle.

The mean annual quantity of heat received from the sun in temperate regions, per unit of surface, is to that received by the equator as 9·08 to 12. Consequently the Gulf Stream furnishes as much heat as the sun gives to an area of 2,062,960 square miles in temperate regions. Since the area of the Atlantic from the latitude of the Straits of Florida to the arctic circle is only about 8,500,000 square miles, it follows that the quantity of heat conveyed to that region by the Gulf Stream is to that received from the sun by the same area, as 1 to 4·12: in other words, very nearly one fifth of all the heat possessed by the water of the Atlantic within those limits, even supposing that every sun ray is absorbed thereby, comes from the Gulf Stream.

To assert that this enormous reinforcement of the normal heat supply of the North Atlantic is without sensible effect upon its climate is simply absurd. To Mr. Findlay's assertions that the inability of the Gulf Stream to affect the climate of England is self-evident and needs no calculations, Mr. Croll retorts with calculations from Mr. Findlay's own data, most effectually disproving his rash assertions. Mr. Findlay says, for instance, that all the water passing through the Florida channel will not make a layer of water more than six inches thick a day over the space which the stream is supposed to cover off the coast of England. Mr. Croll replies that a layer of water six inches thick, cooling 25°, will give out 579,000 foot pounds of heat per square foot. The amount of heat received from the sun in the mean latitude of Great Britain, 55°, taking the mean of the sun's heat for the entire year, is 1,047,730 foot pounds per square foot a day. Consequently Mr. Findlay's layer of water must give out an amount of heat equal to more than one half of all that is received from the sun. But assuming that the stream should leave the half of its heat on the American shores, and carry to the shores of Britain only $12\frac{1}{2}$° of heat, there would still remain a heating power of 289,500 foot pounds per square foot, or more than a fourth as much as the sun supplies in that latitude.

THE PATENT DRIVE WELL.

This consists of a small tube driven into the ground by means of a hammer, until water is reached. A pump is then applied to the tube, and the well is complete. It is the invention of Colonel Nelson W. Green, of Courtlandt, N. Y., patented by him May 9, 1871, but discovered and put into use by him in 1861 while he was serving in the United States army. It has been brought into use all over the world, and is one of the most valuable of inventions. Nearly all the dwellings at the famous watering place of Oak Bluffs, Martha's Vineyard, are supplied by this means with water, including the Sea View Hotel. At the latter establishment a six inch pipe is driven down 22 feet into the ground; and such is the abundance of the supply that a steam pump of equal bore, running constantly for eighteen hours out of twenty-four, never lacks water, which is pure and excellent. There appears to be a fresh water lake or stratum under the whole island, at about the above depth. When the drive well tube is sunk to 27 feet, it strikes salt water. If the well tube is sunk in the salt-water-covered bottom, a few rods out from the shore, the result is the same; fresh water is found at about 22 feet, and salt water at about 27 feet. The drive well patent has been a subject of litigation for several years. The owners are at present conducting an important litigation against W. & B. Douglas, of Middletown, Conn., who are alleged to be infringers. Nearly a year has been occupied in taking testimony, which reaches three thousand pages of foolscap, while the costs so far are estimated at upwards of a hundred thousand dollars. The case is before the United States Circuit Court, Brooklyn, Judge Benedict presiding.

CEREALS AND THEIR CHEMICAL VALUE.

Wheat, oats, rye, barley, and Indian corn are cereals which yield to men all the principles which build up the human frame. Some other plants make fat-forming matter; some merely afford acids, which assist the digestion of food. Among the latter are the various fruits, particularly the grape, so much recommended to the invalid, the acid of the grape being the active agent. But in wheat and its companions of the field, namely, oats, barley, and rye, we meet with every substance necessary for the staff of human life. We will first glance briefly at the constituents of the cereals, and ascertain something of their properties.

If we take a grain of wheat or other cereal, and burn it in a gas flame, we find that only a portion of it is consumable. The unconsumable portion that remains is termed the ash, which is the mineral or inorganic portion. The consumable portion is the organic or combustible compound of vegetable matter, the proportion being 94 per cent of principally vegetable matter, and from 1 to 6 per cent of mineral matter. The organic constituents of wheat, oats, etc., are: The woody fiber, next comes the starch, then the sugar, gum, and oil, and after these the two nitrogenous substances, the albumen and the gluten, which contain large quantities of nitrogen, these latter being the flesh-forming substances in wheat; the others are the fat-forming substances; and the mineral ash contains the constituents which are necessary for building up the structure of man. Let us examine these bodies in their proper order.

If we take a piece of paper or wood, or almost any organic substance, we find that it contains a very large quantity of woody fiber. Hemp and flax also contain large quantities of this fiber, which is the back bone of the plant. Starch is a white, glistening substance which will not dissolve in water, although it will mix with it in small quantities. Potatoes, wheat flour, and oatmeal are chiefly composed of starch. Sago and tapioca are pure starch. To detect the presence of starch, put a little iodine into the substance to be tested; if it turns blue, chemistry will at once tell you that starch is present. To detect the presence of iodine, you have only to get a similar reaction, by applying starch; and although there are many different forms of starch, which may be distinguished by the microscope, it may always be detected by iodine. Gum and sugar are also present, as we have already stated, but the quantities are so small as to call for no special remark. Albumen exists not only in the vegetable, but also in the animal kingdom. The white of an egg, for instance, is entirely pure albumen. It is met with in flesh, and is the commencement of the formation of muscle. One of the chief characteristics of albumen is its coagulation by heat. The coagulation may be easily effected by chemicals. For instance, nitric acid will do it; and although albumen and gluten are both nitrogenous substances, gluten cannot thus be coagulated. Both are found in wheat. Gluten is of a very tenacious character, and makes good birdlime. Oil is chiefly found in many seeds of plants, generally in the outer portion of them. In making wheat flour, we ordinarily throw away that which we ought to retain, that which is the source of the development of the bony structure, namely, the woody fiber, and keep the starch.

Of the mineral or inorganic matter of cereals, water is 14 per cent, while the principal constituent of wheat, phosphoric acid, is present to the extent of 40·91 per cent, potash being 31·30, and silica only 9·71. The silica of wheat is identical with the widely diffused silica of sand and flints, and is combined in cereal products with alkali, in which it is soluble. Silica, taken alone into the system, would pass right through; and to secure its assimilation to the human body, it must be connected with potash or soda. But it can be recovered from its solutions by putting nitric acid in the mixture; it at once separates in the form of solid flint. The ash of wheat contains nearly 10 per cent of this substance. It may be seen in the glaze on straw, and some plants are almost entirely composed of silica. Phosphorus and lime are the chief bone-making elements in cereals, bones being nearly one half composed of phosphate of lime; and artificial phosphates of lime are largely used as manure for wheat. There are two kinds of phosphate, soluble and insoluble. The insoluble phosphate takes years to decompose; therefore, in order to grow wheat by it, it must be converted into soluble phosphate, such as the superphosphate, familiar to our agricultural readers.

Plants require two kinds of food, vegetable and mineral, or rather organic and inorganic, as the former constituents are also to be obtained from animal matter; and the inorganic matter is found in the soil and in the air. But altogether, growing cereals must be supplied with nitrogen, carbon, silica, and phosphoric acid; and without these, no profitable crops can be obtained.

WHEN IS WATER UNFIT TO DRINK?

BY PROFESSOR ALBERT R. LEEDS.

There is perhaps no question more important to the inhabitants of many cities, nor one which more severely taxes the resources of applied science, than the determination of the fitness or unfitness of a water supply. The difficulty arises from the fact that, in some cases, a water may have taste, smell, color, and a considerable amount of foreign matter, and at the same time be drunk with little or no injury: while another water, which is agreeable to the taste, limpid, colorless, and with little foreign matter, may yet contain abundant sources of disease.

The literature of the subject shows that there are two classes of thinkers, one of which puts great faith in the efficacy of natural agencies to bring about the purification of polluted streams, the other which contends that the only safe plan is to reject water which has ever been contaminated by sewage, etc. The evidence elicited by the Royal Commission on the water supply of London is that principally quoted by both classes, and cannot be regarded as conclusive. The rapid extension of our knowledge in this branch of sanitary chemistry is such, however, that we may anticipate greater certainty in these matters, and imparts great interest to some recently published methods of investigation. Anyone who refers to analyses, made a few years back, will find that it was deemed sufficient to give the character and amount of the mineral substances contained in the water, while the organic and volatile substances were expressed in a sum total, no attempt being made to determine their precise character. But, except in cases where the mineral substances were positively deterious or excessive in quantity, this did not settle the question. Of late, the greatest attention has been paid to the organic constituents, and the analyses state what amount of putrefiable matter is present. A careful determination is also made of the amount of ammonia, and of nitrous and nitric acids. These are regarded as the forms which the organic matter in large part assumes after it has passed through the putrefiable stage, and indicate therefore the degree of previous contamination.

But it is said, and with truth, that all these things may be known to a wonderful degree of nicety, and yet there may be substances present capable of rendering the water altogether unsafe for drinking. It is urged that the living organism is exceedingly sensitive to substances whose capacity for injury is fatal, even when present in amount so small as to render their weighing, and even detection, impossible. But of late, the fauna and flora of water courses have been studied, with a view of learning what assistance they could be in the matter, and the results are highly encouraging.

It has long been known that dissolved oxygen played a great part in the purification of streams, and was the principal agent by which putrefiable substances were broken up and converted into harmless inorganic compounds. A recent essay by M. Gerardin, to which the prize was awarded by the Paris Academy of Sciences, contains some striking results obtained by the abovementioned methods of investigation. To summarize, these methods were:

1. A determination of the amount of oxygen held in solution. 2. An observation of green plants and aquatic mollusks. 3. A microscopic examination of algæ and infusoria. It is claimed that the results obtained by these three methods were identical, and that, where the water was clear, with abundance of fish, watercress, etc., the water contained a correspondingly large amount of oxygen; while in places where the dissolved oxygen was small, fish and the higher types of aquatic plants were wanting, and certain low forms of vegetable growth had taken their place. The river Vesle in France from Rheims to Braisne was taken as the field of observation. It was studied over a distance of 37½ miles, during which it received the sewage of one large town (that of Rheims, the daily flow of which amounts 4,180,000 gallons) and other impurities. Above Rheims, the water (which was clear, wholesome, and with abundance of fish, charas, watercress, iris, etc.) contained 0 66 cubic inch in 61 cubic inches of water. In passing through a suburb above Rheims, the Vesle received the refuse of some dye works, which colored the water: and in place of the fish and watercress, *sparganium simplex* makes its appearance. At a point where the water had received the contents of the five principal sewers of Rheims, the water was thoroughly polluted and contained but 0·03 cubic inch of oxygen in 61 cubic inches. Two species of *algæ*, the *biggiatoa alba* and the *oscillaria natans*, were developed largely, the latter to such an extent that the whole surface of the sluggish water was covered with a thick blackish coat.

This coat was seemingly so solid that animals and even men have rushed on it, mistaking it for *terra firma*. Above the mill at Macan, where the oxygen had increased to 0·45 cubic inches, the two varieties of *algæ* mentioned above had disappeared, and the bed of the Vesle was covered with a long whitish *alga*, called *hypheothrix*.

At Compensé mill, the oxygen had increased to 0·5 cubic inch, the *hypheothrix* had almost completely disappeared, and the *sparganium simplex* was again abundant. Below this point the amount of oxygen increased, and with it a corresponding change took place in the vegetation until, at Braisne, the water contained 0·66 cubic inches of oxygen per litre, all traces of pollution had disappeared, and fish and watercress flourished.

From this it would appear that a properly aerated and pure water showed, when polluted, the amount of pollution by a corresponding diminution of oxygen, by the appearance of *sparganium simplex, spirogyra, hypheothrix, biggiatoa* and *ossilaria*, and a progressive improvement by a corresponding increase of oxygen, and the appearance of these plants in reverse order. It remains for us to apply and extend this knowledge to our own streams. Fortunately, the means are not wanting, since the great monograph on the fresh water *algæ*, magnificently illustrated with plates, by Dr. H. C. Flood, which was not published by the American Philosophical Society, has been recently printed by the Smithsonian Institution.

THE FAIR OF THE AMERICAN INSTITUTE.

After a successful exhibition, the fair has closed. The display, remarkably good in the early weeks, improved as tardy exhibitors gradually added their contributions, until, during the closing days, every available foot of space was filled with a variety of articles certainly exceeding in interest, if not in numbers, those presented at the fairs of several preceding years. The venerable Institute, we think, needed the new life which evidently has been infused into it, to rescue it from the state of respectable fossilism into which it was rapidly lapsing. Its fairs, herefore, have been conducted more on the principle of advertising a few steady exhibitors, and furnishing a chronic yearly grievance for a very large number of others, than as an instructive and attractive exhibition for the general public. The energy which has characterized the management of the fair just over has worked a great change for the better; and since the favor of the public has been courted by means well calculated to win the same, it is to be hoped that the substantial rewards thus fairly merited have been received.

During our last stroll through the building, we noted a few novelties which have recently been added. Of these, we give brief descriptions below: Captain J. B. Stoner, of life-preserving-suit fame, exhibits three huge models of

FLOATING LIGHTHOUSES

or telegraph stations. These are large floats made in different ways, some being tanks, others being stages supported on buoys. It is proposed to moor these in deep water, and to connect them with the submarine cable, so that ships reaching them during their voyages may be able to transmit intelligence to their owners or consignees. A superstructure of light and strong construction is raised on the floats, and is suitably built either for a lighthouse tower, fog whistle, or any other purposes desired. Whether these peculiar craft can be moored at sea so as to withstand heavy weather is questionable; but it seems that the system of large floats with houses built on them might serve better for hospital purposes than the old hulks which have been devoted to that end in the Quarantine Station near this city.

A NEW PIN

is exhibited, which will become quite popular, we think, for many purposes, on account of the impossibility of its working out of the fabric in which it is placed. It is made of a piece of ordinary wire sharpened at both ends. One extremity is then turned down and wound spirally for a couple of turns about the shank. When the pin is inserted, a slight twist given to the bent end causes the sharp point on the spiral to catch and enter in the cloth. The inventor has not only devised the pin, but some very ingenious machinery for its manufacture. One apparatus cuts off the wire, sharpens the ends, and throws the piece into a hopper, whence it passes into another machine which produces the spiral. The rate of production of the pins is about 200 per minute. Mr. R. W. Huston, of Brooklyn, N. Y., is the inventor.

We mentioned, last week, the

MINERAL WOOL

made of blast furnace slag, which a mistaken foreign contemporary announced as a new German invention. Specimens of this material have been exhibited at the fair, manufactured under the Player patent, granted in this country in 1870. The wool weighs about 30 pounds per cubic foot, and is sold at 2 cents per pound. It costs about 5 cents per square foot of surface, 1 inch in thickness. It closely resembles genuine wool, but is of much shorter fiber, and is somewhat gritty. From a report of tests made by a committee of the Franklin Institute, we learn that, when used as felting, the mineral wool retains heat somewhat more than one tenth longer than common felting. The material is entirely indifferent to dampness and fire, and does not decay.

A NEW CESSPOOL

is exhibited, in which the novel feature is a stirrer, shaped like a propeller blade, and placed horizontally near the bottom. It is mounted on a vertical shaft, which terminates in a crank handle above. During a rainfall, when water is escaping rapidly through the sewer pipe leading out of the cesspool, the crank is turned first one way and then the other, until currents are established in the mass, when the latter is carried into the sewer. It is stated that, by this means, cesspools can be rapidly and effectually cleansed, without manual labor.

A CAPPING MACHINE,

for affixing the metallic caps to jars, is a useful invention for druggists, grocers, and others who put up large quantities of bottled goods. The cap is placed in position over the cork, and the top pressed against a die, which, being supported by a spring, yields, allowing swiftly revolving smoothers to act upon the cap, behind the rim of the bottle mouth, and press it neatly in place. Various sizes of dies are used for different bottles. A gross of caps are easily attached in about fifteen minutes.

ARTIFICIAL HONEYCOMB FOUNDATIONS,

prepared by Mr. John Long, a well known apiculturist of this city, are a novelty, and one which, it seems, may be productive of considerable economy in the cost of securing honey for the markets. It has been estimated that the actual cost of a pound of comb is equivalent, at least, to that of twenty-five pounds of honey; and beekeepers cannot, without considerable loss, afford to melt down any combs that can be used to advantage. Mr. Long makes comb foundations of pure bleached wax, and from these the bees raise their cells on an amount of feed which ordinarily would not induce them to build comb at all. The foundations, it is said, make white delicate guides. They are very easily fastened in the boxes, and honey stored in them has been shipped long distances without damage either through leakage or fracture, and the bees seem to like the improvement. Thus even the honey bee has become the patron of a patented invention.

SCIENTIFIC AND PRACTICAL INFORMATION.

FERMENTATION FROM INORGANIC SUBSTANCES.

M. Mairet communicates to the French Academy of Sciences a curious experiment which, from the extraordinary result, leads to the belief that either the author has failed to take into account some circumstances not noticed, or else that a discovery of importance, worthy of further and careful investigation, has been made. He says that he mixed acetate of potash, nitrate of potash, and phosphate of soda together, all being in aqueous solution. At the end of a few days, the acetic acid appeared to be destroyed, nitrogen was disengaged, and the liquid contained only carbonate of potash and phosphate of soda. The action may be compared to a sort of fermentation in the case of the acetate, and more especially since it was accompanied by the development in the liquid of a glassy substance, similar to that which sometimes accompanies the fermentation of sugar.

GAS FROM DEAD ANIMALS AND SEWAGE.

A process of making gas from dead animals, sewage, and other refuse, which recently received a very favorable report from a commission appointed by the authorities of Breslau, Germany, has been subjected to extended practical tests and proved a failure. The material produces less than half the gas than is evolved by an equal quantity of coal; it costs twice as much, and requires a special combustible; and the gas is so full of impurities as to render its purification both difficult and very expensive.

DISCOVERY OF TELLURIUM IN CHILI.

For a long time tellurium was found only in Transylvania but of late years deposits of it have been discovered in Turkey, and in Colorado and Nevada. Recently the element has been found in Chili in the shape of tellurate of silver or tellurate of lead.

THE ENGLISH 81-TUN GUN ECLIPSED.

According to the *Kölnische Zeitung*, Krupp is making preparations for the construction of a 124-tun cannon. This enormous gun will throw steel bolts weighing more than 2,200 lbs. each, and will require a load of powder weighing 400 lbs. It is estimated that the projectile will pierce at a distance of 3,200 feet the heaviest plates, of 23·8 inches thickness, now used on the English ironclads, and that its extreme range will exceed seven miles and a half.

A NEW ADULTERATION OF PORT WINE.

This new adulterant, unlike many others, is easily detected by non-chemists, and is in some cases dangerous, especially when partaken of by the feeble, delicate, and convalescent. It is an artificial coloring, which, Shuttleworth says, consists of a mixture of azalin and magenta red. The aniline colors, objectionable in themselves, are the more dangerous because they not unfrequently contain arsenic. The adulteration is detected by shaking the suspected wine (and all cheap wines are to be suspected) with an equal volume of amylic alcohol (fusel oil). If the wine is genuine port, the amylic alcohol remains colorless; but if adulterated, it dissolves out the coloring matter, and itself appears of a purple red color.

THE coarse long hair from the neck of an old chamois, if drawn between the finger and thumb from the root to the point, becomes positively electrified, but if drawn in the reverse direction it becomes negatively electrified.

A PIECE of wood cut from a tree is a good conductor; let it be heated and dried, it becomes an insulator; let it be baked to charcoal, it becomes a good conductor again; burn it to ashes, and it becomes an insulator once more.

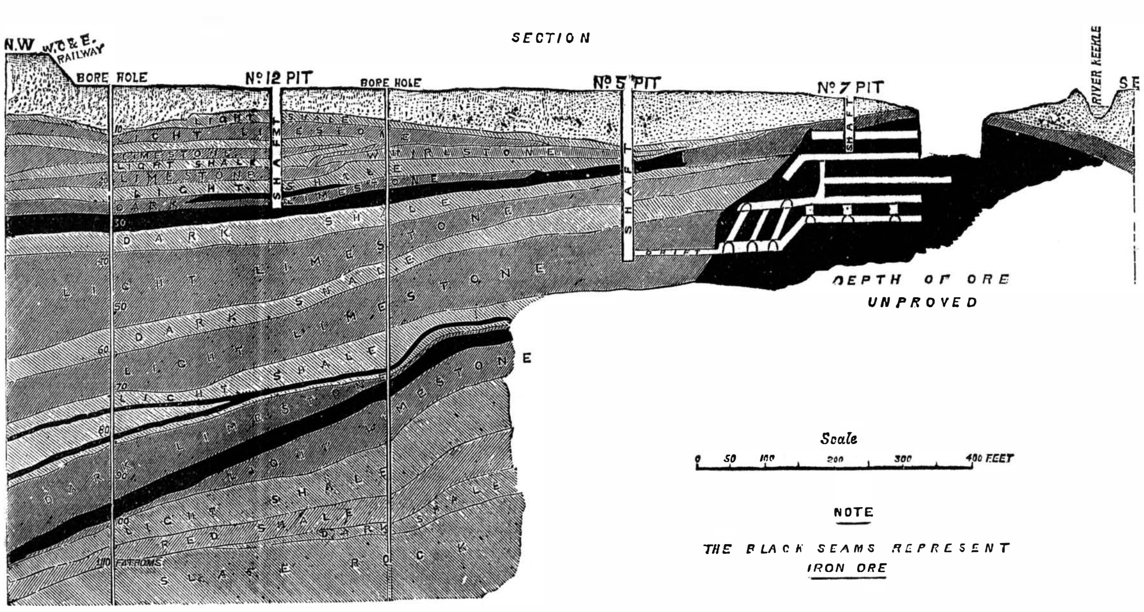
R. H. H. send us the following recipe for staining light wood in walnut color: Take asphaltum varnish 1 part, turpentine 3 or 4 parts, linseed oil 1 part, and Venetian red ground fine in oil to suit. This will impart to light wood a good imitation of walnut, so that it can hardly be detected.

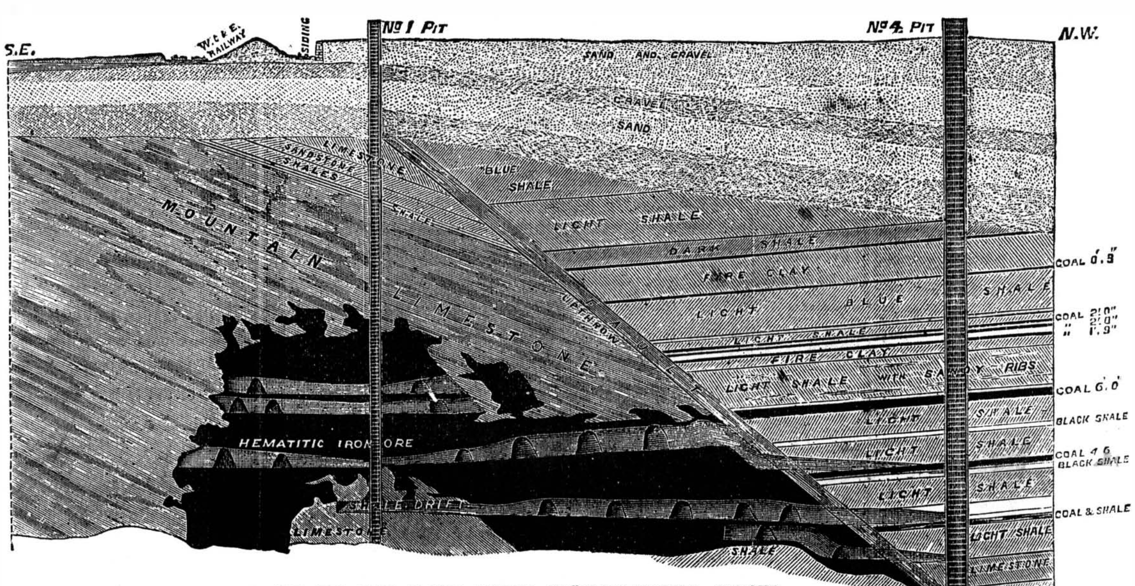
THE HEMATITE IRON MINES OF ENGLAND.

The creation of a new field of iron manufacturing industry in Cumberland and Lancashire, England, is mainly due to the success of the Bessemer steel-making process, for which the hematite ores of that district, although long neglected, are found to be especially suitable. The town of Barrow-in-Furness has grown out of this important trade, and many other busy scenes are largely increasing their population and resources. Landowners and farmers are investigating the strata which underlie their possessions, and companies for raising iron ore and bringing it into market, as well as for manufacturing the metal on the spot, are becoming very numerous. The geological features of the ore-bearing formations are full of interest, and they are generally well defined, and prospectors look upon them as certain indications of the presence of metal.

We publish herewith sections of the Montreal mines of West Cumberland, distant about five miles from Whitehaven. They are the property of Mr. John Stirling, and are situate on a band of mountain limestone, which extends from Egremont to Cleator Moor. On the east of this limestone formation are found slates, the basic rocks of the district, on the edges of which, upturned, the limestone reposes. To the west of the limestone are the coal measures, brought into contiguity with the limestone by a large fault, bearing nearly east and west.

The limestone is in many places capped by the millstone grit; and it is between this latter group of rocks and the underlying limestone that many of the iron deposits in the district are found. The form they assume in this position approaches that of a bed. Other deposits in the limestone are found lying by the side of the large fault, which brings the limestone and coal measures into contact. Among the deposits in the latter position is the one which constitutes the greater part of the Montreal mines, a section of which is shown in Fig. 1. An other set of deposits occurs in shallow basins in the limestone, covered only by the boulder drift, or, at most, with a very thin shell of rock. To that description belong the remainder of the deposits worked by the proprietor of the mines under notice; a section of one of these last is given in Fig. 2.





SECTION SHEWING HOW THE ORE IN THE LOWER CARBONIFEROUS SERIES IS CUT OFF BY THE COAL MEASURES

THE MONTREAL HEMATITE MINES CUMBERLAND ENGLAND.

The method of working the Montreal mines is partly shown by the drawings. When the shafts have been put down to a sufficient depth, a level is put out a few feet below the top of the ore, and when that level has been continued to a sufficient distance, say five or six fathoms—that is, supposing the foot of the shaft to be on ore, as in the case of No. 1 shaft, Fig. 1—levels are put off on each side. From these, other levels are put off in their turn; and so on, until the whole of the deposit at that hight has been opened by a sort of post and stall system of working. The size of the levels—or rather workings, as they are called—is variable; they are sometimes 30 feet wide and about 20 feet high, but as a general rule they are only about 12 feet square in section. The size of the pillars also varies very much, according to the nature of the ground. Sometimes they are very large, consisting almost entirely of rock; but where the ore is not interfered with, or mixed up with limestone, they are from three to five, or even six, fathoms square.

While the first hight of workings is being wrought out in the manner described above, the second is commenced about five fathoms below the first, and carried on in much the same way. A third and fourth hight may also be put out, if the size of the deposit renders such a course advisable, to be worked in the same manner; but by the time the fourth hight has been thought of, it is probable that a great many of the pillars in the first hight, and perhaps in the second also, have been taken away, and the roof allowed to fall in. Unless this extraction of the pillars is accomplished in a very systematic manner, it is more than probable that a great many of them will become buried in the *débris* of the fallen roof; in which case drifts, timbered as they proceed, have to be driven through this fallen rubbish for the purpose of reaching the ore. If much ore is extracted in this way, a very large amount of timber is required, as the ground, when once thoroughly broken up, brings such an enormous weight on to the timber by which the drifts are kept open that it very frequently requires to be repaired.

The output of the Montreal mines is now 250,000 tuns per annum, which is the largest turnout of any mine in either the Whitehaven or the Furness district. The area is about 1,000 acres, of which nearly half is ore-bearing ground. The total number of hands employed above and below ground varies from 1,000 to 1,200, figures which give an idea of the importance of the enterprise. There are altogether twelve shafts, of which three are now in process of sinking, while the remaining nine are in active operation; the greatest depth at present attained is about 75 fathoms. In addition to the shafts there is an open working from half an acre to an acre in extent, but the outcrop ore only is here being worked

SHELDON'S AUXILIARY CAR SEAT.

The fact is pretty generally recognized that, so long as there is an available inch on which a foothold can be got, either inside a street car or on a platform, people will endeavor to

occupy that space, and there they will remain, clinging to strap or bar, in positions uncomfortable both to themselves and to those whom they crowd. Nothing short of a sentry with a sharp bayonet, stationed at each end of every car, will serve as an effective preventive; but as the use of that weapon might lead to disagreeable complications, that plan, together with the scheme of an india rubber car, capable of indefinite extension, must be reckoned as infeasible. They are more civilized than we are in Russia, for there they have a rule that no more people can enter a car than there are seats vacant; the same excellent regulation is enforced in some Paris omnibuses. Sometime in the distant future we may have a similar regulation; but until that happy period arrives, it behooves us to consider the best means for ameliorating the present unfortunate state of affairs.

To Mr. Cevedra B. Sheldon a gentleman thirty-one times a patentee through the Patent Agency connected with this paper, is the public indebted for the happy idea shown in our engraving, for relieving the standing committee in horse cars, who heretofore have had to ride for miles, wearily hanging to a greasy strap, and whose toes woefully attest the solidity of the conductor's pedal extremities as that individual, bell punch in hand, ruthlessly tramps up and down the narrow passage.

Mr. Sheldon's invention provides extra seats, arranged as shown in the engraving, to be folded under the main seat when not in use, and to be readily shifted into position in front of the main seat by means of suitable standards. The standard is bolted to a riser a little below the main seat, and is so shaped that it supports the auxiliary seat far enough forward to be out of the way of the passengers' legs. The standard has a locking joint for holding it up and a lug for maintaining the seat level. The seat is prevented from oscillating; and when folded, the top side turns inward so as to be protected from dust. The mechanism is exceedingly simple and strong, and may be modified in various ways to meet different requirements.

The device is one which might be added to both street cars and stages, with profit both to the passengers and to the owners. It would prevent the crowding of the passage, and would increase the seating capacity of the vehicle probably one half. The companies who manage our public conveyances would do well to put themselves in communication with the inventor. His address is No. 7 State street, New York city.

Salt.

Hall's Journal of Health thus sums up some of the many uses of salt: "It will cure sick headache, make cream freeze, make the butter come, take inkstains out of cloth of any kind, kill wens, kill worms, make the ground cool; so it is more congenial to celery, cabbage, etc. It will ease the itching pain caused by irritating skin diseases, like hives, itch, etc. It will produce vomiting or stop it, as you like; and many other things too numerous to mention. All pure salt will do this to a certain degree, but sea salt is the most effectual in its action."

Salt is a most remarkable and highly useful substance; but we think that our cotemporary will find, on practical trial, that the article will not do all that is above claimed. For example, salt will not make cream freeze, it will not take inkstains out of cloth, and probably will not do more than one or two of the other things abovementioned.

Tunnel at Rio de Janeiro.

The Brazilian Government have under favorable consideration a project by Mr. Bucknall for connecting the north and south railway system of the empire with the capital, by a tunnel, under the narrow entrance to the bay of Rio de Janeiro, between the capital and the submarine city of Nitheloy, a distance of about two miles. The preliminary investigations clearly demonstrate the practicability of the undertaking; and its important bearing on the future of the country will be apparent to those acquainted with the commerce, railway system, and topography of that part of the empire. Mr. Peter W. Barlow, C.E., has gone to Rio, commissioned to conduct the survey and prepare the necessary plans and estimates.

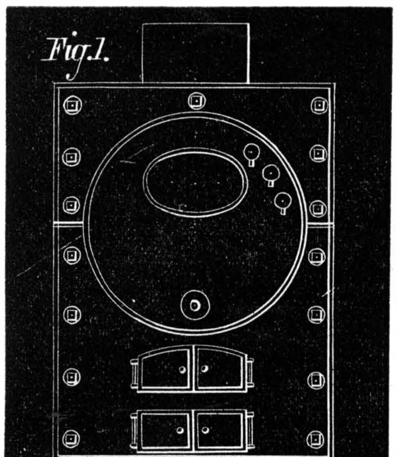
CORN-fed hens do not lay in winter, for the simple reason there is no albumen material in the corn. When wheat is given to them, there is fat enough in it to supply all that is needed for the yolk, and albumen enough to make the white, and lime enough to furnish the shell; it does not thus seem difficult to understand why corn-fed hens should not lay, as they do not, and why wheat-fed hens should lay, as they do

SETTING BOILERS.

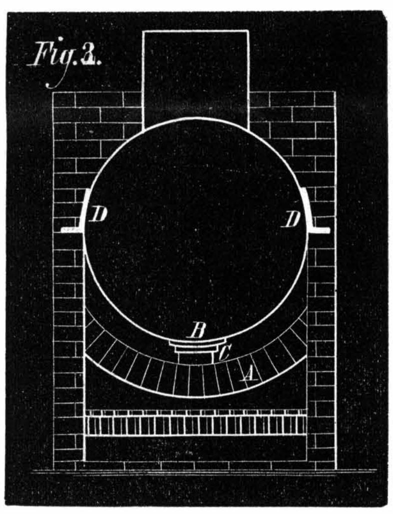
This subject seems to be generally neglected by writers on the steam engine. When a boiler is to be set, the ordinary plan is to send for a mason and entrust the work to him, without giving any specific directions. The result of such a course can easily be foreseen, and an examination of numerous boilers shows that there seem to be no rules for setting them that are adopted as standards. The practice of boiler makers, who furnish the necessary irons for setting boilers in brickwork, is also quite varied; so that a mason, however experienced he may be, cannot always do the work in the best manner possible. In view of these facts, it may not be amiss to devote a little space to the description of the best methods in use.

I.—THE BOLTS AND CASTINGS.

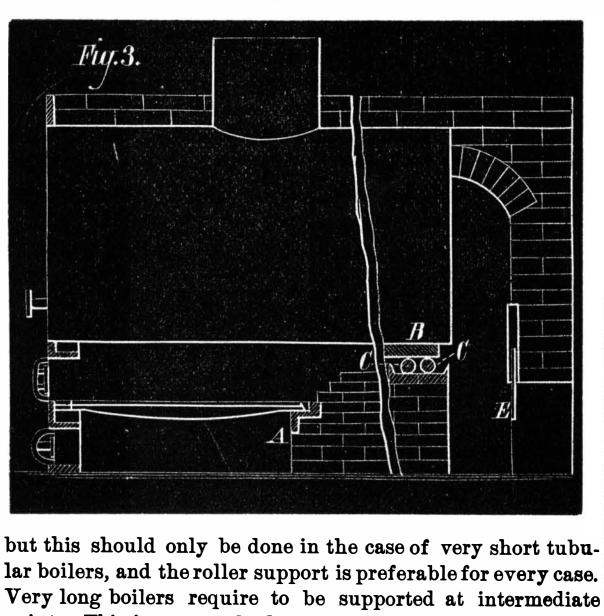
The irons usually employed in setting a boiler in brickwork are: The front, tie bolts, bearing bars, grate bars, supports, damper, connection, and chimney doors.



The front, shown in Figs. 1 and 4, should be made high enough to extend above the top of the boiler, so that the side walls and back can also be built up and the boiler covered on top. For the sake of cheapening the price of the fixtures, some boiler makers furnish a low front, so that, when the boiler is set, the top is left uncovered. Although this plan reduces the cost of the fixtures and setting, it is the dearest in the long run, since there is a great loss of heat by radiation from the uncovered portion of the boiler.



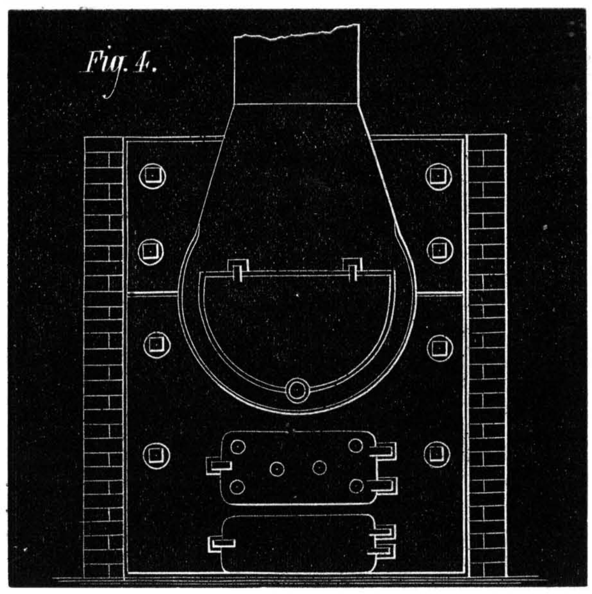
The supports for the boiler may be of two kinds, a single support at the end for a boiler of ordinary length, and intermediate supports for a long boiler. The best form of support for the end of a boiler is shown in Figs. 2, 3, 5, and 7. The boiler rests on a cast iron saddle, B, which is supported on rollers, C, the latter resting on a plate, D, on the brickwork. By this arrangement the boiler is free to expand and contract under changes of temperature. Sometimes the boiler is supported by lugs, D, Figs. 2, anchored in the side walls;



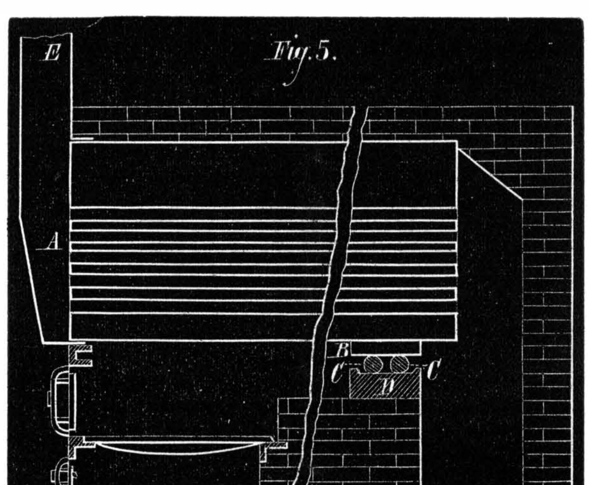
but this should only be done in the case of very short tubular boilers, and the roller support is preferable for every case. Very long boilers require to be supported at intermediate points. This is commonly done by means of suspension rods, which can be adjusted by nuts, but this practice is by no means commendable. When a fire is made under a long boiler, the bottom becomes more highly heated than the upper portion, so that the boiler tends to take a curved form If rigid suspension rods are used, this curving is prevented, and in many cases fracture occurs, or the boiler is said to break its back. Mr. Head, an English engineer, has devised a form of suspension rod, which is easily constructed and effective. This is represented in Fig. 7. The suspension rods, E, are attached to a plate, D, on the boiler, and, instead of being rigidly secured by nuts to the guard, F, have stiff volute springs, G, which keep the boiler in proper position when cold, the rods having lugs, *e*, to check the action of the springs at the proper point. Of course, when the boiler is heated, the springs will allow it to be drawn down, and it will return to its normal position when cooled. If the weight of water in the boiler is considerable, suspension from the top might produce distortion of the circular form; and to counteract this, a piece of angle iron, H, may be secured within the boiler.

Tie bolts are often used to connect the two side walls. The ordinary form is represented in Fig. 6, the bolts passing through castings, B, which act as large washers.

The damper is generally a slide, as shown at E, Fig. 3, which is placed at the junction of the back connection or connecting flue with the chimney. Openings should be left large enough to permit a person to enter the back connection and chimney, and these are closed by the connection and chimney doors.



The bearing bars are for the supports of the grate bars. The front bearer is often cast on the front, or bolted to it, and the back bearer is laid on the bridge wall. In the case of long grates, an intermediate bearer is required, which is anchored in the side walls, and supported on the middle on bricks, if the grate is also very wide. It is better, however, instead of using one wide furnace, to divide it by walls or arches into several narrow ones, both for convenience and economy in firing. Wide furnaces have sometimes been divided in this manner, after the boilers were set, producing a considerable gain of efficiency. The arrangement of the boiler front fixes the position of the grates, or their distance below the boiler. There is not a great deal of difference in the practice of boilermakers, with respect to this distance, which is usually between 18 and 24 inches—generally nearer the former figure.

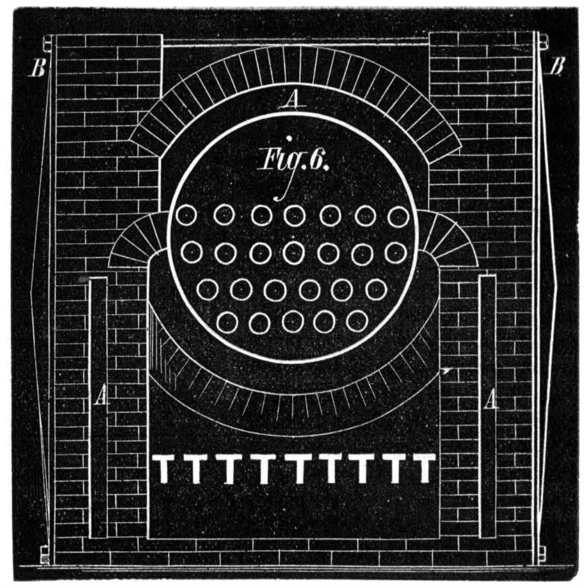


It is obvious that the iron front can be dispensed with, if desired, and the boiler sustained on brickwork alone. This is quite frequently done, but the plan does not appear to possess any special advantages, since, if the setting is properly performed, it will be quite as expensive as if the iron front were used.

II.—THE BRICKWORK.

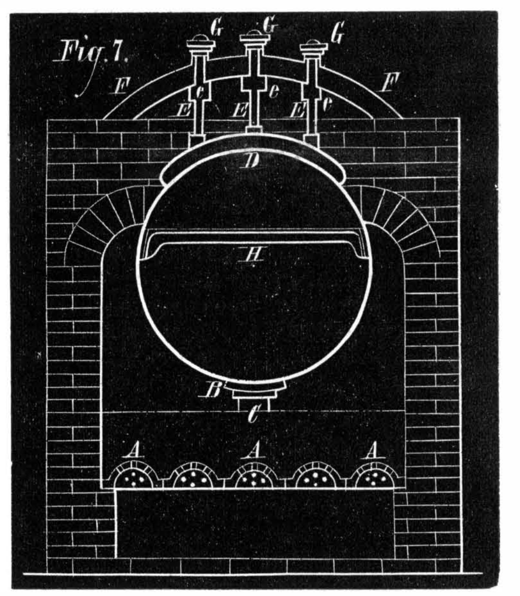
The general arrangement of setting for a plain cylinder boiler is shown in Figs. 1, 2, and 3, and calls for little remark. In the engravings, the top of the boiler is covered with brickwork; but it is a very common plan to run up the walls to a sufficient hight, and fill in the space with dry earth or sand. Whichever course is pursued, the brickwork should be carried up high enough around the boiler to make a tight joint, so that none of the heated gases can escape. It will be seen that an arch is turned to form the bridge wall. This, however, is a matter of no importance; and if is more convenient, a horizontal bridge wall can be built, care being taken to leave the proper opening between the wall and the boiler for the passage of the products of combustion. An average value for the proper area over bridge wall is three twentieths of the area of the grates; and though in practice this area is very differently adjusted by different masons, the best results are obtained when the area is an approximation to the figure given above.

In the engraving the grate bars are set level. They are frequently dropped a little at the back, on account of some supposed advantage in firing. There is no objection to this practice, and it is extremely doubtful whether any benefit is derived from it. It will be seen that the front is secured to the brickwork by bolts, which are built into the wall, with large washers on the ends. The boiler front, the side walls, and the bridge walls should be lined with fire brick set in fire clay. If any pipes are brought from the boiler through the brickwork, openings should be made for them, closed with iron doors, so that they shall be readily accessible for exami-



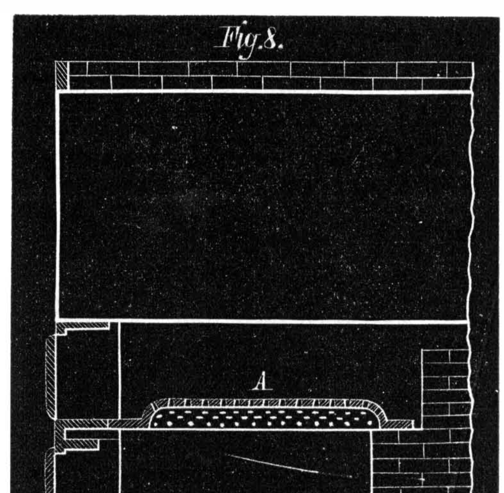
nation and repairs. It is better, however, to attach the pipes to the front or back of the boiler, where they need not be built in.

The setting suitable for a tubular or flue boiler is shown in Figs. 4 and 5. Here the products of combustion, instead of passing from the back connection to the chimney, return



through the tubes or flues to the front connection, A, and thence pass to the chimney by the flue, E. The engraving shows one of the best arrangements of fronts for this kind of boiler.

In Fig. 6 is shown what is probably the best manner of setting a boiler in brickwork, namely, with double walls and an air space, A, between, to prevent loss of heat from radiation. It is much more expensive than the ordinary setting,



and must be done with great care to make solid and stable walls

III.—FURNACES FOR SAWDUST.

There are several patent furnaces for burning sawdust and tan bark, which are said to be very economical and efficient; usually, however, in a sawmill it is more important to get rid of the sawdust than to burn it with great economy, and in such a case the furnace represented in Figs. 7 and 8 will answer every purpose. The boiler should be quite short, and the grate surface and area over the bridge wall should be about twice as great as for coal. A peculiar form of grate bars, known as cone grates, shown in the engravings, should be employed. These bars can be obtained from almost any builder of portable engines. The furnace should be set back some distance from the front, as shown in Fig. 8, leaving a flat plate, on which the sawdust is first piled, and gradually pushed upon the fire as it becomes dry. It is generally well to have at least two distinct furnaces, which can be fired alternately. It is also necessary to have a high chimney or a forced draft.

IV.—THE CHIMNEY.

The chimney may be constructed either of iron or brickwork, and as high as is convenient. It should be at least from 40 to 50 feet for good effect, and can, of course, have its hight increased to advantage. It is well to make the chimney with the same internal cross section throughout. It is generally considered that the circular section is better for a chimney than a square or rectangular section, and the interior should, of course, be made as smooth as possible. Chimneys are frequently constructed with double walls and an air space between, forming two distinct chimneys, the inner one of which is lined with or often wholly constructed of fire bricks. The cross section of a square chimney should be at least seventeen one-hundredths of the grate surface of the boiler, and for a round chimney, thirteen one-hundredths; but it is a good plan to make the chimney somewhat larger than this, since, if it is too large, it is easy to close the damper, but, if it is too small, the remedy is not so easily applied.

Correspondence.

A Lost Art Re-Discovered and Patented in America.

[From the following letters, furnished by a Detroit correspondent, it appears that, a hundred and fifty-five years ago, in 1720, in the quiet old town of Ross, Herefordshire, Eng., an ingenious individual, John Kyrle, celebrated in Pope's "Elegy" as the "Man of Ross," established a system of water supply for that town, which from that time to the present has been uninterruptedly in use. The distinctive feature of this system consists in forcing water by pumps into the street mains, so as to supply the town with water under such pressure as may be required. At the Ross works the ordinary pressure for many years has been 45 lbs. per square inch.

On March 2, 1869, the United States Patent Office grants a patent for the same system, as a new invention, to Birdsill Holly, and gives him a still broader claim in a re-issued patent, August 2, 1870. It would seem that the broad claim must now be abandoned. But the ingenious valves and the devices for regulation of the water employed in the Holly system will doubtless remain good.—EDS.]

To the Editor of the Scientific American:

There has been a great deal of controversy here about the Holly system of waterworks: Mr. Holly claiming that no one but himself can build waterworks pumping direct into the mains and keeping a pressure on them, as he holds letters patent from the United States for the same. Now, as I understand the law of patents in the United States, a patent will not be granted, and if granted will not be sustained, if the object sought to be covered by patent has been in use before. I have always contended that the "Holly system," so-called, was older than Holly himself.

You have no doubt read Alexander Pope's elegy on the Man of Ross (Mr. John Kyrle); and in thinking over this pumping work, I remembered having seen in my youth some very old pumping works at Ross, in Herefordshire, England, and, believing that they were on the same system as this under dispute, to make sure I wrote to the Mayor of the town of Ross, describing the Holly system to him, and have received his reply; and I would like to see it published (for the use of waterworks contractors and builders) in the SCIENTIFIC AMERICAN, which I believe all such persons read. The letter is as follows:

DEAR SIR:—As I was born in this town in 1812, spending the greater part of my 63 years here, I am enabled to give the information you require. I purchased the waterworks in 1849 and still own them. They were established by the "Man of Ross" about 1720, and have undergone but little modification until now, when steam power is supplemented. As you know, then the water wheel was about 11 feet diameter and 30 inches wide; it drove two six-inch plungers, and was direct-acting or without reservoir, exactly the same arrangement as you describe. It is so now, and I know of but little advantage in storage, except from intermittent sources of supply. * * * As you know the Royal Hotel, I may inform you that it is 94 feet above the plungers, so that I have more than three atmospheres at the works. I pump from the river.

Ross, October 12, 1875. S. B. WALL, Mayor.

You see by this that this system has been in use to our certain knowledge 155 years, and this should nullify any such claim as that made by the Holly Waterworks Company.

Detroit, Mich. W. PENDRY, M. E.

Silvering Glass.

To the Editor of the Scientific American:

Having had occasion to silver some small plates of glass, I tried several formulas. In some I found the silver solution so weak that it required repeated applications to give an opaque deposit. In others, the silver was so strong that there appeared to be a waste. After trying several modifications, I found that the following works very finely, giving a heavy deposit by a single application:

No. 1. Reducing solution: In 12 ozs. of water dissolve 12 grains Rochelle salts, and boil. Add, while boiling, 16 grains nitrate of silver dissolved in 1 oz. water, and continue the boiling for 10 minutes more, then add water to make 12 ozs.

No. 2. Silvering solution: Dissolve 1 oz. nitrate of silver in 10 ozs. water; then add *liquor ammoniæ* until the brown precipitate is nearly but not quite all dissolved; then add 1 oz. alcohol and sufficient water to make 12 ozs.

To silver: Take equal parts of Nos. 1 and 2, mix thoroughly, and lay the glass, face down, on the top of the mixture while wet, after it has been carefully cleaned with soda and well rinsed with clean water.

Distilled water should be used for making the solutions. About 2 drachms of each will silver a plate 2 inches square. The dish in which the silvering is done should be only a little larger than the plate. The solutions should stand and settle for two or three days before being used, and will keep good a long time.

New York city. D. C. CHAPMAN.

The Relation between Spectral Lines and Atomic Weights.

To the Editor of the Scientific American:

The following facts, disclosing an intimate connection between the Fraunhofer lines of the solar spectrum and the atomic weights of the substances whose glowing vapors they represent, will, if confirmed, prove of the highest importance and interest. Being desirous, on this account, of bringing them at once to general knowledge, I send you the following condensed statement, which I hope you will publish.

The Fraunhofer lines of hydrogen gas are, according to Angström's wonderfully accurate measurements (given in millimeters, a millimeter being 0·3937 of an inch):

0·00041012mm.
0·00043400mm.
0·00048606mm.
0·00065618mm.

Their distances from the shortest wave lengths are consequently:

43400 —41012=0·00002388mm.
48606 —41012=0·00007594mm.
65618 —41012=0·00024606mm.

Referring these distances to 0·00041012, the shortest wave length, as a common standard of value, the figures obtained are:

0·00041012 : 0·00002388=17·1742
0·00041012 : 0·00007594=5·7247 × 3=17·1741
0·00041012 : 0·00024606=1·9082 × 3= 5·7246

being to each other as 1—3—9. Supposing the quantity expressed by 1·0982mm. to represent 3 units of a certain measure of length, the distances of the H lines increase as the squares of 3: 3—9—27.

The H molecules of the solar atmosphere which give rise to these lines consist of ponderable matter; and (the mechanical force of the luminous impulses having been so recently demonstrated by Professor Stokes) the inference is that refraction, the angles of which are measured and expressed by the wave lengths, is the function of the energy proper to the different constituent particles of the luminous molecules: that these particles are held together by attraction, the common property of matter, decreasing inversely as the squares of distances.

On this supposition, the attractive forces of the H molecule proceed from a center where they are at their maximum; and the distances between the different constituents being known, the value of their attractive energy can be calculated from the constant relation between attraction and distance. To the distances 3—9—27 correspond the respective forces $\frac{1}{3}$—$\frac{1}{9}$—$\frac{1}{27}$; and a unit of force, by which the values of attraction of all solar substances can be measured and compared, is represented by the length of shortest waves. In dividing the atomic weights of the substances whose spectral lines are known by the length of their shortest waves, and converting the result into chemical weight by taking the quotient obtained for H=1, the values are as follows:

Atomic weight.	Shortest wave length.	Divided by 2438.
H =1·00	0·00041012=	2438=1
Ca = 40	0·00039330=	101704=41·72
Fe = 56	0·00039330=	142385=58·4
Al =27·3	0·00039428=	69240=28·4
Mn = 55	0·00039882=	137907=56·6
Ti = 48	0·00041631=	115299=47·3
Cr = 52	0 00042532=	122261=50·15
Ni = 58	0·00044020=	131758=54
Mg = 24	0·00044805=	53565=22
Ba =137	0·00045241=	302823=124·21
Co = 59	0·00045303=	130234=53·4
Cu =63·4	0·00046510=	136315=56
Zn = 65	0·00046790=	138919=57
Na = 23	0·00049825=	46137=18·9

Notwithstanding the differences, the figures of the last column so closely correspond to the atomic weights that the inference of a near relationship between the spectral lines and atomic weights seems irresistible. When the extreme faintness of the lines in the portion of the spectrum of the greatest refraction is taken into account, some of the difference may not unreasonably be attributed to the existence of shorter waves than those quoted. The definite proportions between differences and atomic weights point to this. Thus 18·9 is nearly $\frac{1}{2}$ of 23; the line corresponding to the atomic weight of 23 is 0·00040900: if this line, which really exists, should prove to belong to Na, the test would be decisive. The importance of the conclusions to be derived from the existence of such relations is apparent. The evidence of atomic molecules, when brought within the reach of scientific investigation, and their dependence on the general law of gravitation, would disclose the inner constitution of matter, the nature of chemical affinity and valency, and the nature of electricity and magnetism; and it would be instrumental in the solution of many problems.

San Francisco, Cal. E. VOGEL.

Poisoning by Strychnine.

To the Editor of the Scientific American:

I have seen in your issue of September 14 an account of the death of Dr. J. O. Hill, of Ithaca, N. Y., by strychnin, as described by S. J. Parker, M. D.

I once happened to receive a similar dose of strychnin, in the year 1853; but as I knew the remedy, I was cured, being promptly attended to by Mr. Gregson Harrison, who applied the means discovered by Dr. Crace Calvert, in 1852. The remedy is: To counteract strychnin, and cause it to be brought away by vomiting (if it has not been taken more than 30 minutes), pour down the throat $\frac{1}{2}$ grain of nitrate of soda every 20 minutes until vomiting takes place. The patient will then sleep about 40 hours, and awake all right.

The sensations caused by strychnin are first slight pains in the back of the head, then extreme cold in the toes, traveling up to knees; then cold in the fingers, traveling to the bottom of the breast bone. JOHN PEARSON.

Chorlton-on-Medlock, Manchester, England.

Specific Gravity and Dimensions of Molecules.

To the Editor of the Scientific American:

W. B. M., whose letter appears on page 244 of your current volume is laboring under a great mistake in asserting that the lightness of a substance is not evidence of its possessing larger molecules, and that, if this were true, it would at once dispose of the atomic theory.

I am at a loss to know what he is hammering at. He says: "Take absolute alcohol (specific gravity 0·8°) and you will find that, to two similar glassfuls of water, you will be able to add more alcohol than water before overflow." In this he is correct, and this disproves his argument.

But he is also mistaken as to specific gravity of absolute alcohol. Absolute alcohol has a specific gravity of 0·7939 when combined with water at its maximum density, (39·4° Fah.), water being 0·9991.

I stated that the specific gravity of absolute alcohol is 0·7939 and of water 0·9991, making a difference of 0 2052 in the specific gravity, showing that the molecules of alcohol are considerably the larger. Now let W. B. M. take 100 ounces of alcohol of 80 per cent (specific gravity 0·8631), and 104 ounces of water, and he will just have 200 ounces of diluted alcohol possessing a specific gravity of 0·9510, and a strength of 40 per cent. It will be seen that 4 ounces have disappeared, consequently the molecules in the mixture must be of less size than those in alcohol of 80 per cent.

He says that, in the case of heavy liquids, the heavier the liquid, the greater the volume which may be added without altering the apparent volume. Let him try mercury, and the result will be the same as if he had added an equal volume of water.

I have not as yet experimented with mercury, but I have with simple sirup; and I find less contraction caused than with water. I should like again to hear from W. B. M., and hope in his next he will be more explict. Instead of attempting to overflow a glass, let him employ a given volume of each liquid, and ascertain the resulting volume of each; in this way he can easily find what the greatest contraction caused by combination of liquids is.

San Francisco, Cal. PRO BONO PUBLICO.

New Mode of Cleansing Cloths and Yarns.

A patent has been taken out in France by M. A. Huet for compositions with bases of glycerin and soap, with or without the addition of an antiseptic, for the purpose of cleansing any textile matter. Glycerin, says the inventor, has the property of being soluble in all proportions of water, and also of dissolving nearly all the substances which water itself dissolves, such as salts, soaps, and metallic oxides.

Starting from this point, M. Huet, after many experiments, arrived at the following composition for wool, which he calls soluble *ensimage*:

Neutral glycerin at 28°	70
Soap	4
Water	24
Solution of oxide of mercury	2
	100

The sulphates, quinine, carbonic acid, etc., might be used as the antiseptic. But the antiseptic is not always necessary, in winter, when there is no fear of fermentation, for instance; for fermentation requires 77° to 86° Fah., and then takes months to establish itself. The solution must be well mixed and filtered.

M. Huet says that he has found, after careful trials, that, by substituting his composition for the oils and fatty matters in ordinary use, the necessity for cleansing cloths during manufacture was entirely done away with, and that they may fulled at once, without any previous preparation; and thus the danger is avoided of the tints being injured by long contact with the fuller's earth and the alkalies which are often obliged to be added to the earth in order to saponify the oils or other fatty matters. When it is necessary to get rid of size, a simple washing in water will remove both it and the glycerin composition at once.

In other branches of manufacture the yarns must be cleansed before weaving them, in which case also plain water will remove the composition at once. The inventor, therefore, claims for his method great economy in time and money.

The proportion of glycerin to other matters in the composition may be varied according to the nature and fineness of the wool, but that given above is the average amount.

THE strain on belts is always in the direction of their length: and therefore holes cut for the reception of lacings should be oval, the long diameter being in line with the belt

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NUMBER XXXVI.

LINING OR MARKING OUT.

We now enter upon an entirely new and distinctive part of the machinist's art, namely, the marking work out by lines upon its surface, indicating to what shape and size it requires to be cut. When a piece of work has to be exactly duplicated in large numbers, as in the case of a sewing machine the labor of marking out may be entirely dispensed with by the employment of special chucks and tools, adjusted to suit the requirements of the case; but in all other cases, especially upon large work, the marking-out must be performed, and should be executed with great exactitude, for a variation of the thickness of a line gives the thickness of two lines to file off, entailing upon large surfaces an enormous loss of time. Suppose, for example, a large pillow block to be marked out the thickness of a line too small, and the brasses to be marked out the thickness of a line too large: when both were cut to the lines, the labor of fitting them together would be unnecessarily increased by one third. Nor is this all the mischief, for the inaccuracy of workmanship that will mark off to the thickness of a line too large will sometimes mark off to the thickness of a line too small; and the consequence is that, after a few such experiences (and consequent spoiling of the work), the machine hands will leave the lines on each side of the work as a witness, thus giving the thickness of four lines to be filed off in fitting. Now it


Fig.161.

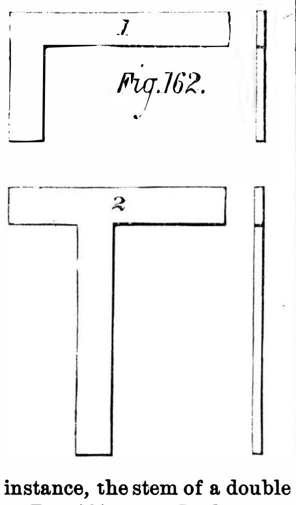


Fig.162.

is perfectly true that, in most cases, it is practicable and customary to use gages or calipers as well as the lines; but there are numerous instances in which that cannot be done. Nor is it at all times desirable, because the lines, correctly marked, may be sufficiently correct for the purpose, as in the case of cutting down a surface requiring to be finished but not fitted to anything. Take, for another instance, the stem of a double eye, having an offset, as shown in Fig. 161, at A. In this case, the lines being accurately marked, the proper amount of offset and of thickness, at A, may be more easily obtained by working to the lines than by any gaging or measuring.

A marker-out, as the operative is termed, should not only be one capable of great exactitude in his measurements, but should also be an expert workman at the lathe, vise, planing machine, and drilling machine; because it is by his lines that the work is chucked, and hence he should know the very best method of chucking or holding the work in each of the machines. Furthermore, a line over and above those necessary to define the outline of the work is often necessary for use as an assistance and guide in chucking it. Upon the truth of this lining, in many cases, will the truth of the finished work depend; and even in those instances where the method of chucking will correct any inaccuracy in the marking-out, the usefulness of the latter is almost entirely destroyed, because the lines will become entirely removed on one side, and left fully in on the other side of the work. If, however, the marking-out is performed reasonably true, one of its main elements of usefulness consists in that it denotes if there is sufficient excess of metal upon the piece of work to permit of its being cleaned up all over. But if there is any one part of the work scant of metal, as is sometimes the case in forgings of unusual and irregular form, the marking-out requires to be very true, and may be made to just save a piece of work that otherwise would have been spoiled. By accommodating the marking to some spot or place in the work, which will only come up to the full size by throwing the whole of the rest of the lines towards the opposite side of the work, a costly piece of forging may be saved from the scrap heap. And again, in castings where the surface appears spongy, showing the presence of air holes beneath the surface, or in forgings where the surface may indicate that a weld is not perfect upon one side, the whole of the marking-out should be performed with a view to take off as much metal as possible on the faulty side. In other work there may be a part very difficult to turn or plane on account of the conformation of the job; in which case the marker-out, foreseeing such to be the case, will so place the lines as to give as little to come off that particular place as possible, disregarding the excessive heavy cut or amount of metal which it may be necessary to cut off other and more accessible parts of the work. There are many other considerations, which need not be here enumerated, all tending to show that a marker-out should be a master hand at the various branches of his business, and possess much judgment and experience

The tools necessary for marking-out operations are a true flat surface plate, having its edges squared true, which plate is usually of cast iron, and enough larger than the size of the work, both in length and breadth, to admit of the use all round the work, of the scribing block illustrated in Fig. D, in a previous issue (page 133, Vol. XXXI.), supposing the needle or scriber there shown to be extended horizontally The ordinary L and T squares, and a flat one of each kind as shown in Fig. 162, are required. We have next the bevel square, shown in Fig. 163, A representing the stock, and B

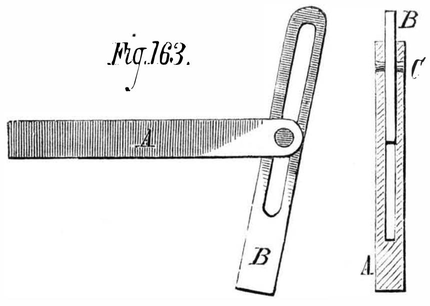


Fig.163.

the blade, the latter being provided with a slot so that it may be extended to any required distance (within its scope) on either side of the stock. C is the rivet, which is made sufficiently tight to permit of the movement by hand of the blade, and yet it must hold firmly enough to be used without moving in the stock. Instead of the rivet, C, however, a thumbscrew and nut may be employed, in which case, after the blade is set to the required angle, it may be locked in the stock by the thumbscrew. For the angles of nuts and other hexagonal work, we have the hexagon gage shown in Fig. 164. The edges, A B, form a hexagon gage, and edges, C D, form a square, while the edge, E, serves as a straight edge.

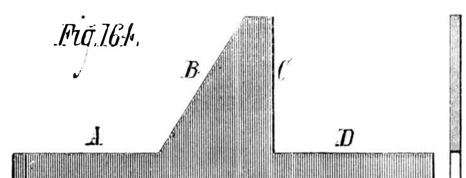


Fig.164.

All these tools should be made of cast steel, the blades being made of straight saw blade, so that they will not be apt to permanently set from an ordinary accidental blow; while on the other hand, if it becomes, as it does at times, necessary to bend the blade over to the work, it will resume its straightness and not remain bent. To cut saw blade without causing it to split, as it is apt to do, especially in cutting out narrow square blades, it should be cut by gradually centerpunching it on both sides till it is completely perforated, when a flat chisel may be employed to nick between the centerpunch perforations, the whole operation being performed lightly and repeated until the plate is completely severed.

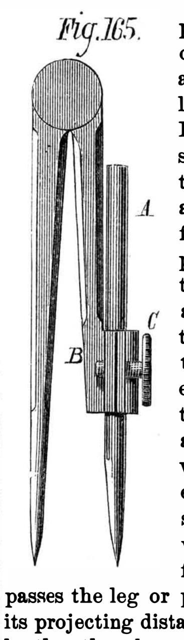


Fig.165.

We next require a pair of long and a pair of short legged compasses, the latter of which should have an adjustable leg, as shown in Fig. 165. A is the adjustable leg, which passes through the split clamp, B, and is locked therein by tightening the screw, C, the object being to always use that leg as the marking one and the other as the pivot, and to lower it as it wears from grinding, thus keeping the compasses of their original length, and for the further purpose of lengthening out the adjustable leg when one of the faces of the work stands much below the level of the other, as we shall find, in some of our examples, will be the case. For long distances, to which compasses would be inapplicable from their excessive size and weight, trammels, shown in Fig.166, are employed. A A A represents a bar of square steel; or for very long trammels, wood may be used. B represents a head fastened tightly to one end, and through B passes the leg or pointer, C, which is thus adjustable as to its projecting distance, as B can be fastened in any position by the thumbscrew, D. The head, E, is made to a good

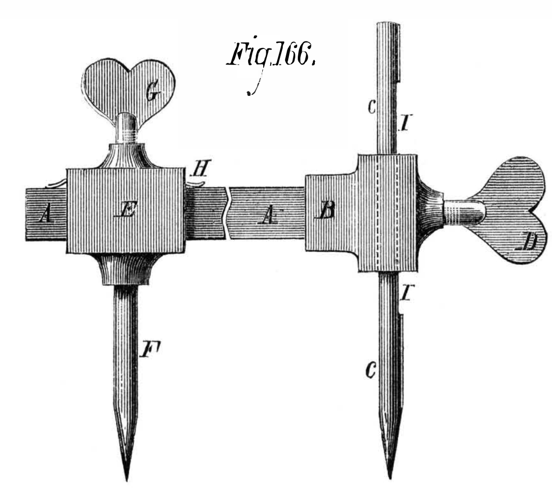


Fig.166.

sliding fit upon the bottom and two side faces of A A A; but at the top, there is sufficient space to admit the spring, H H, which passes through E, as denoted by the dotted line. F is the leg screwed into E, which is locked in position by the thumbscrew, G. The head, E, is thus adjustable along the whole length of the bar or rod, A A A. The object of the spring, H H, is as follows: If the head, E, were made to fit the bar, A A A, closely on all four sides, the burrs raised upon the top side of the rod, A A A, by the end of the thumbscrew, G, would be likely to impede its easy motion. Then again, when the sliding head, E, had worn a trifle loose upon the bar, A A A, and was loosened for adjustment, it would be liable to hang on one side, and only right itself when the screw, G, brought it to a proper bearing upon the under side of the bar, A A A; and thus tightening the head, F, would alter the adjustment of the point. The spring, H H, however, always keeps the lower face of the square hole through E bearing evenly against the corresponding face of the bar, so that tightening the screw, G, does not affect the adjustment, and furthermore the end of the set screw, bearing against the spring instead of against the top of the rod, prevents the latter from getting burred. The flat face, I I, on the leg, C, is placed there to prevent the thumbscrew, D, from raising burrs, which would prevent C from sliding through B. The points of all compasses or trammels should be tempered to a straw color, as should also the points or ends of the set screws or thumbscrews

FORK SCRIBERS.

For marking small circles, there is no tool equal to a fork scriber, such as shown in Fig. 167, which represents a piece

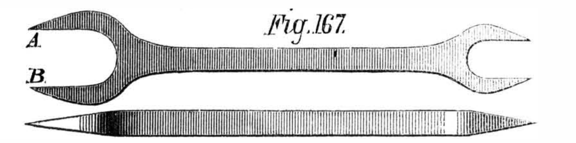


Fig.167.

of steel wire flattened out at the ends and filed to the points, A B, the distance between them being the radius of the circle they are intended to scribe or mark. These tools may be used to advantage to mark circles ⅜ of an inch and less in diameter, the sizes varying by sixteenths of an inch, and the points being hardened to a brown or straw color.

A Pocket Gymnasium.

The profits from patents on small inventions are practically illustrated by the recent introduction of an elastic tube, about 2 feet long (not unlike a small india rubber garden hose), fitted with a plug of wood at either end, and a cord running loosely through the tube, fastened at each end by a knot to the plug, to prevent injury from the flying ends of the tube in case of breakage. The object of this invention is to furnish a portable exercising device, which is inexpensive, and is designed as a substitute for the more complex and costly health lift apparatus. A patent was secured through this office for the invention last June, and we are informed that the demand for the device has become so great that the manufacturer finds it difficult to meet it, thus confirming what we have repeatedly stated, that there is always a ready sale for small patented inventions. The article referred to is advertised in another column; and for persons of sedentary habits, or ladies and children needing physical exercise, we would recommend a trial of the new pocket gymnasium.

Makaroff's Mats.

As a substitute for sails in stopping leaks in ships, Lieutenant Makaroff, a young officer serving in the Russian navy, designed a mat of peculiar construction. The Makaroff mat has for its basis a closely worked structure of rope about ⅜ inch in diameter, made of the finest hemp, while the matlike surface closely resembles that common to all mats of the kind used for street doors. The texture of the mat is wonderfully close; and as the whole is treated with a waterproof composition, it may be regarded as practically impermeable to water. The hairy side of the mat is that applied to the ship's side, and it is stated—and we see no reason to doubt the statement—that these mats may be dragged over jagged edged holes in iron plates without sustaining any injury.

Pneumatic Pontoons.

Knapp's open-bottom pneumatic jacks or pontoons are attached by chains passing under the wreck, and the chaining is ingeniously effected by means of a small tube passed under the wreck, through which a float and line attached to the cable is drawn. Compressed air is then admitted to the pontoons, which instantly give the lifting power. The advantages of this system consist in easy management and the possibility of being used in exposed situations; and it appears to be extensively patronized.

French Patents.

In 1874 there were taken out in France 5,746 patents: 4,202 for fifteen years, 54 for ten years, 32 for five years, 283 foreign patents, and 1,175 extensions of former patents. The objects for which patents were taken out were in the following order for number: Chemical industry, including foods and drinks, machinery, textile industry, agriculture, domestic appliances. The average number of patents per annum in the ten years before the Franco-Prussian war was 5,800.

Donkey Street Cars.

A little girl, daughter of an American officer now in the service of the Khédive, Egypt, writes home that they use passenger donkeys in the city of Cairo, instead of street cars. The donkeys are not much larger than good sized dogs. If you wish to ride, you straddle a passing donkey; the Arab driver follows and, when you get off, collects your fare, then looks out for another passenger. Advantages: No crowding; plenty of air.

IT is proposed in France, by the telegraphic administration, to encourage the introduction of private wires, and to offer such inducements that no great factory and no rich man's house in the country will be without its wire.

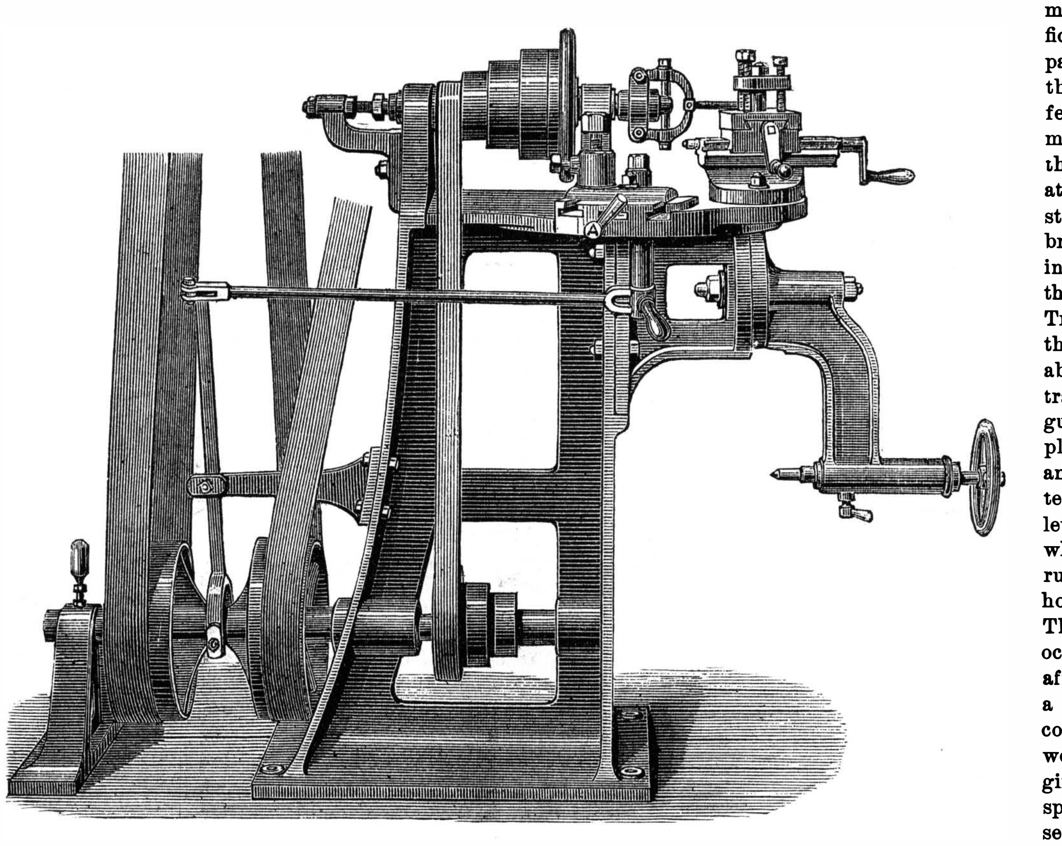
CAVENDISH showed that nitrogen and oxygen in air formed a mixture only, but that the passage of electric sparks produced their chemical combination—nitric acid being the result.

COMBINED HAND AND SLIDE LATHE.

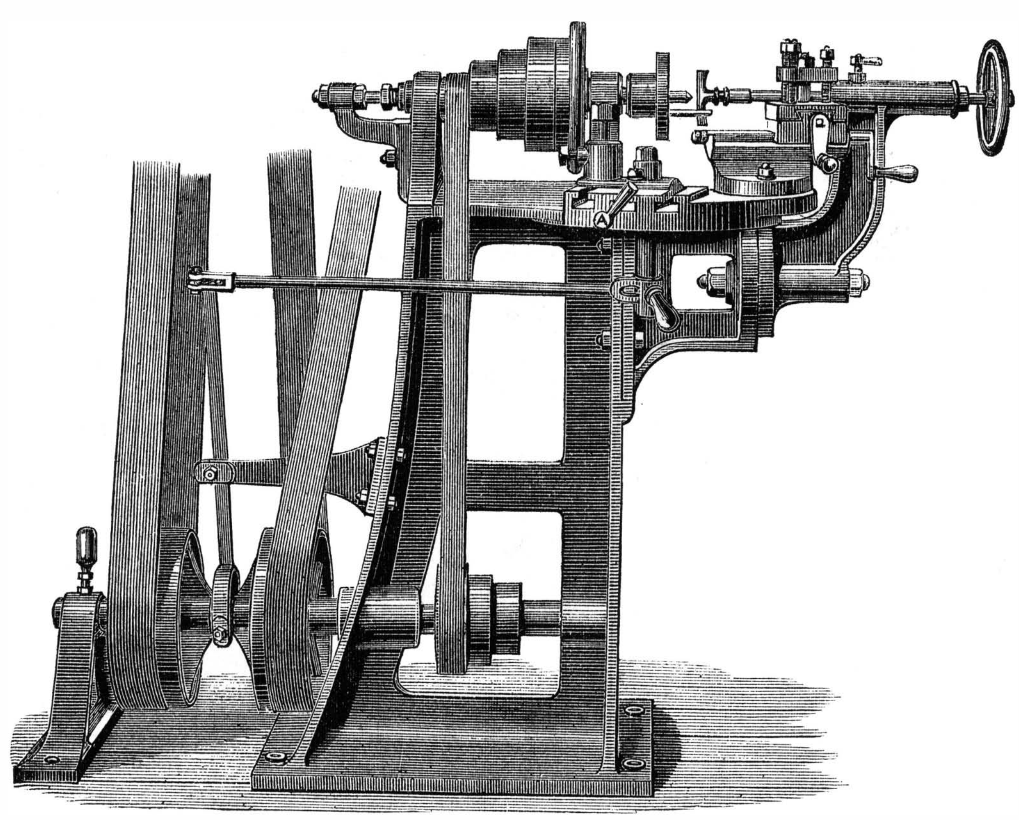
We illustrate herewith a very useful combination lathe, constructed by Messrs. Low and Duff, of Dundee, Scotland, and exhibited by them at the recent Exposition at Manchester, England. The tool is specially adapted, says *Engineering*, for small brasswork, etc., and it is fitted with a reversing motion for tapping.

In Fig. 1 the tool is shown as arranged when fitting the key or plug of a gas joint with the slide. This operation having been performed, the set screw, A, is loosened, and the slide moved on the circular table to the back of the lathe, the hand rest being brought round into the position which the slide occupied. The barrel of the joint is then put on, the hole drilled and tapped at the end for the small screw, and the piece of work finished without being taken out of the chuck. The slide is so mounted that it can be readily set to any desired taper, and the table on which the slide and hand rests are mounted is moved up to a stop, so that, when the slide is once set to any desired angle, it can be moved out of the way and brought back again without requiring further setting, so long as the same class of work is being gone on with.

For work which requires to be mounted between centers, a loose head is provided, this head being shown swung down out of the way in Fig. 1, but in use in Fig. 2, where the plug of a large cock is being operated upon. Altogether this machine is a very compact and handy one, and it appears capable of getting through a large quantity of work.



IMPROVED HAND AND SLIDE LATHE.—Fig. 1.



IMPROVED HAND AND SLIDE LATHE.—Fig 2.

Hypodermic Injection of Nutritious Substances.

Dr. Krüg, a physician in a private lunatic asylum, gives an account of a trial of this which he has recently made.

C. E., aged fifty-seven, a Hungarian proprietor, has been in an asylum at Ober-Döbling since 1868, and for the purpose of suicide had often refused all food, so that for twenty-seven months at a time he had to be daily fed by means of the tube; of late he has been more inconstant in his refusals, sometimes eating even abundantly, and at others allowing himself to be fed. On January 18, however, he began again to absolutely refuse food, and so continued, with the exception of one day, to the 24th, when it was resolved to feed him by the tube as heretofore; but all attempts to pass this proved fruitless, such violent coughing and irritation did it cause, so that the patient became breathless and cyanotic. Even when the tube was got into the stomach, the fluid injected was immediately expelled again by its side; so that the whole procedure, inducing so much suffering, proved useless. As ten days had elapsed without his taking any food, with the exception of some soup once, it was resolved to try the subcutaneous injection, under the hope that a slight quantity of nutriment might be so supplied, so as to ward off danger to life and perhaps exert a favorable impression on the patient when he found his resistance unavailing. Olive oil was the substance injected, the syringe employed holding 0·9 cubic inch. To the syringe was attached a thin caoutchouc tube, terminated by the canula of an ordinary subcutaneous syringe so that the movements of the patient did not derange the working of the apparatus. One or two syringes full were injected daily, being from 0·9 to 1·8 cubic inches of oil. At first each syringe-full was thrown into five apertures, but afterwards into three, or even only two. The oil passed, drop by drop, out of the canula, so that at first an hour, and afterwards half an hour, was occupied in the emptying of each syringe. This slow procedure rendered the injection painless, and prevented reaction, which, as well as pain, was caused when the injection was made too rapidly, or too much fluid thrown into one spot. Most of the injections were made in the foot, some in the belly, and others in the sides. Some effect was produced upon the patient's moral condition, so that he partially abandoned his opposition to food. Thus, during thirty nine days, he completely fasted during nine, ate voluntarily during ten, and was supported by the injections during the other twenty. It was not possible to weigh him, but his general appearance was not changed for the worse. With some occasional exceptions, when the injections were resumed, the patient gradually abandoned his resistance, and at last ate in a natural way, the experiment lasting altogether about two months. The chloroform odor, characteristic of fasting persons, disappeared soon after the first injection.

Salt for Domestic Animals.

Salt is not only a mild aperient or deobstruent, but it operates, to some extent, as a tonic. It is a very great rectifier of the acidity of the stomach when taken in proper quantities; and it not only renders very palatable food which would be disagreeable and insipid without it, but it keeps the functions of the stomach in a healthy state and often alleviates the effects of debility and disease. The true way is to have a tub of salt placed where cattle, horses, and sheep, can have access to it at all times, whether they are in the pasture or in the barnyard. Then, when the appetite calls for a lick or two of salt, they can go and get it, at the very time it is most needed, and when it will exert the most beneficial effect on digestion or on any part of the system.

A good plan is to keep salt in a small tub or strong water-tight pail, in the pasture during the pasturing season, and in the yard during winter. Animals will not consume as much when they are supplied with it in this way as they will when they are salted once or twice only during a week. It is slovenly and wasteful to throw salt on the ground for animals, and especially for sheep, as they will often waste half as much as they consume.

For salting sheep, drive three or four high stakes around a pail, or small tub, leaving one side only, so that they can thrust their heads separately into it. For cattle and horses, encircle the tub with a lot of boulders as high as the top of it, or drive a half dozen strong stakes around it, letting them extend above it a few inches, to protect it from being pawed to fragments. If the tub is watertight, in case it should rain in it there will be nothing lost, as they will lick the salt water as readily as they will the salt; and should the water evaporate, the salt will remain. When sheep or neat cattle are kept in pasture where there is much clover (*trifolium pratense*), they usually have a great hankering after salt; and if they can have access to it, they will go and lick, more or less, several times during the day; and they will consume just enough to rectify the acidity of the stomach, and keep them from bloating. Many a farmer has lost a fine animal, in consequence of bloating, which one pound of salt would have kept in good health.

High Speed Brake Trials.

In consequence of a statement made by one of the principal officers of the Midland Railway Company, England, with reference to the collision at Kildwick, to the effect that the engine driver of the mail train would have been able, with the means at his disposal, if traveling at the rate of 50 miles per hour, to stop his train in 400 yards, certain brake experiments were lately made in the presence of Captain Tyler, on the Derby, Castle Donnington, and Trent line. There were four trials. In the first of these experiments all available means were used to stop the train, namely, tender brake and one guard's van brake at rear of train applied, sand used, and engine reversed and steam against it, with the Le Chatelier tap open. The gradient was level; the train, the total weight of which was 102 tuns 7 cwt. 2 qr., was running at the rate of 49·9 miles per hour when the brake was applied. The result was that 54 seconds were occupied in stopping the train, which, after the application of the brake, ran a distance of 807 yards. In the second experiment all available means were used except reversing the engine; gradient 1 in 330 up and level, speed 49·9 miles; time occupied, 60 seconds; distance run, 843 yards. In the experiment all available means were used, and when the engine was reversed, the regulator was allowed to remain wide open all the time; gradient, 1 and 220 down, speed, 52·5 miles; time occupied, 55 seconds; distance run, 867 yards. In the final experiment all available means were used. When reversing the engine the steam was first shut off, then the lever pulled into back gear, and then steam was turned on again as in first experiment; gradient, level; speed, 52·5 miles; time, 50 seconds; distance run, 787 yards. The weather was fair, and the rails slightly greasy. Captain Tyler, in his report to the Board of Trade, states that the engine driver of the mail train, who at present awaits trial on a charge of manslaughter, could not have acted so promptly as those who, on the experimental train, listened for the word of command. He adds that, instead of 400 yards, 800 yards should have been stated as the distance in which, with the assistance of the guard, he could have stopped his train. From this it appears that, at almost 50 miles an hour velocity, a train will run nearly half a mile after the brakes are applied.

Dotting Pens.

An ingenious little apparatus for assisting in mechanical drawing, has been patented by its inventor, E. O. Richter, a watchmaker in Chemnitz, Saxony. In machine drawing, projections, and the like, the drawing of dotted, half dotted, or stroke lines is a mechanical task, the wearisomeness of which this apparatus is designed to relieve. An upright plate, sliding on the paper, has on its lower edge a toothed wheel catching in a bent lever which carries the pen point. A spring keeps the pen close to the paper. The wheel is kept in position by an adjustable plate. Wheels of various patterns can be used for producing a mixture of dots and strokes, the length and variations of which correspond to the indentations on the circumference of the wheel.

Nickelization.

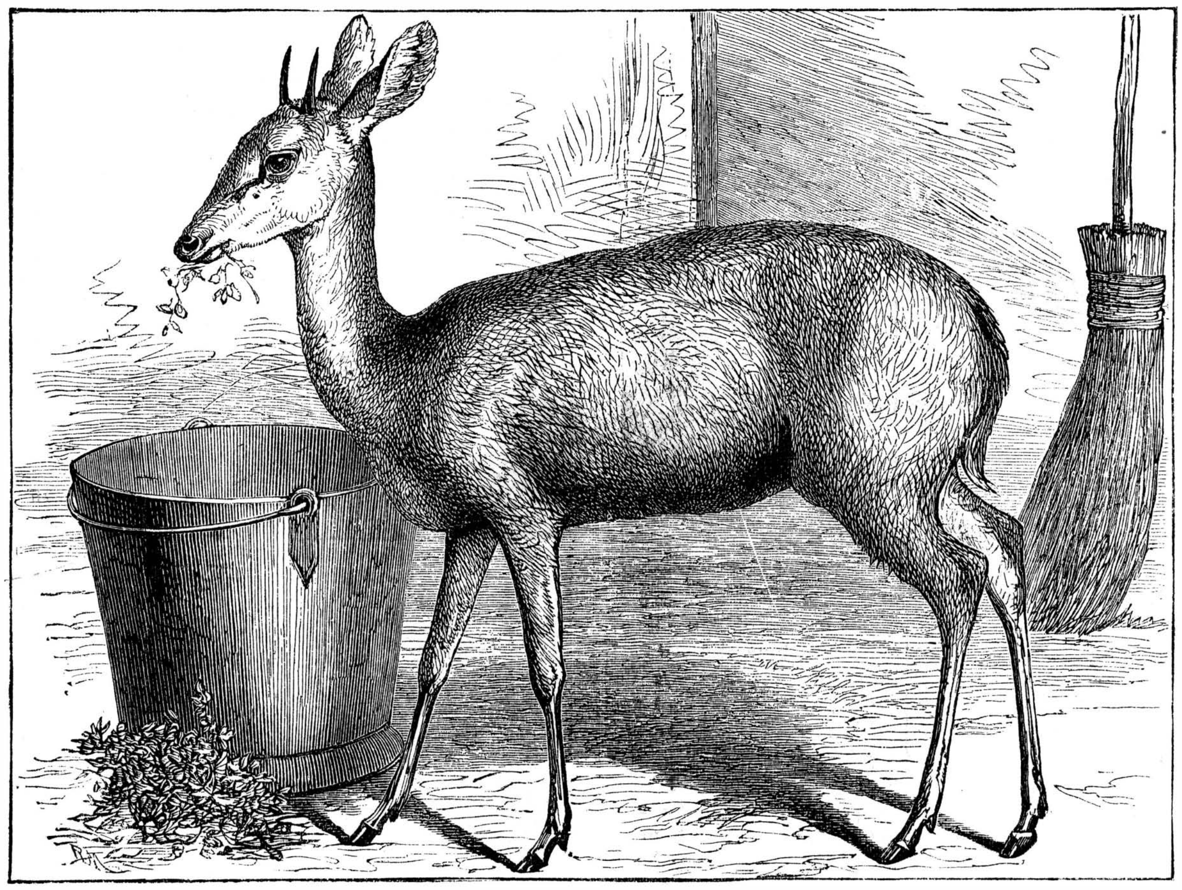
In Plazanet's process a bath is used of 87·5 parts sulphate of nickel, 20 sulphate of ammonia, 17 citric acid, and 1,350 of water. A bath much used in France is formed of a solution of 4 parts of nitrate of nickel in 4 of liquid ammonia, and 150 water in which 50 parts of sulphate of soda have been dissolved. Using a moderate weak current the operation is at an end in a few minutes. There is no need to interrupt it by taking the objects out and brushing them. When the film of nickel is of sufficient thickness, the objects are withdrawn from the bath and dried with sawdust.

SHINGLE roofs can be made doubly durable by giving them a coat of thin oil before they get wet.

THE ANTELOPES.

Among the widely extended family of deer, the tribe of the antelopes is especially worthy of attention. The name is generally considered to be synonymous with grace and beauty; but the race is so varied by climate and locality that some of its members resemble the horse in size and the goat in configuration, while others are wild and untamable. The sable antelope, for instance, has horns three feet long; it is exceedingly handsome, being quite black on the back and sides, and white on the belly. The gemsbok is a very fierce animal, defying even the African lion to combat; and the gnu (called *wildebeest* by the Dutch settlers of the Cape of Good Hope, its native place) has the appearance and gait of a horse. The largest antelope is the *nil ghau*, which much resembles an ox; and closely allied to it is the beautiful eland, which has been domesticated at Moor Park, England, and is a very handsome creature in the fields. It fattens well, and is most excellent beef. The smallest antelope is the madoqua (*antilopex saltrara*), the most diminutive of horned animals, scarcely larger than a rabbit.

But for beauty the gazelles must be allowed to carry off the palm. This genus varies in different countries, those of Egypt and Asia being well known for their gentle docility. They are the favorite domestic animals among most oriental nations. Their eyes are mild and lustrous: "brightly bold and beautifully shy," as Byron well describes them. Our illustration shows the brown Indian antelope, one of the tallest of the genus, and remarkable for its fleetness. Its legs are finely formed and exceedingly muscular, and the body has no superfluous weight on it; and it is very strong in the lumbar regions and the hind legs. There is little doubt that many species of antelope could be domesticated in this country. In summer they would be sure to thrive, while a little care in winter would protect them from the inclement weather, and the trouble would be amply repaid by the beauty of the denizens of the park and paddock.



THE BROWN INDIAN ANTELOPE.

THE SAMBUR.

The sambur or rusa deer (*rusa Aristotelis*), found in most of the large jungles surrounding the hill ranges throughout India, is considerably larger than the Scotch red deer, and more powerfully built. A full grown stag averages from 14 to 15 hands at the shoulder, and his hind quarters are as well shaped as those of a high caste arab, whereas the Scotch red deer generally falls off low behind, and is more or less cat-hammed. The head is beautifully formed, the forehead being broad and massive, while the line of the face is straight and the muzzle very fine. The eyes are very large and beautiful, being fringed with long black eyelashes, and the suborbital sinus—which is very conspicuous — expands greatly when the animal is excited. The horns of the sambur vary very much in their development, according to the district in which they are found, some being long and slender, while others are massive and short. The horns are rather upright, having two short brow antlers only, and at three years old two points at the extremities of each beam, as shown in the engraving. Sometimes the inner and sometimes the outer tine of the terminal fork will be found the longer; and occasionally, but rarely, three tines are seen at the summit of the beam. The horns of a mature stag average 35 inches in length from base to tip, having a circumference of 11 inches round the burr at the base, and 8 inches at the thinnest part of the beam; but some antlers greatly exceed these dimensions. The color varies slightly, but is usually of very dark slate mingled with gray, nearly black about the face and points, and a light buff between the haunches and underneath. The hair immediatelynext to the jaw is longer than on any other part of the neck; and when the animal is alarmed or excited, it stands on end and forms a kind of ruff, sometimes called the mane. The hinds are smaller than the stags, and of a lighter color; and both sexes have canine teeth in the upper jaw.

Old stags, during the rutting season, in October and November, are extremely vicious, and may be heard all over the forest, calling to each other. When they meet they engage in savage conflicts, sparring with their fore feet and butting each other with their antlers, like the American deer.

THE SAMBUR AT BAY.

Wagner's Free Institute of Science.

This institution, situated at the corner of Montgomery avenue and 17th street, Philadelphia, was founded and endowed by Professor William Wagner, formerly the confidential manager of Stephen Girard, and was incorporated in 1855.

In the large lecture room of the Institute, there are delivered, nightly, free lectures upon scientific subjects; while at the monthly meetings, recently inaugurated, there are presented exhaustive reports of progress in science and the arts, besides practical exhibitions and explanations of recent and meritorious novelties of interest, machinery in motion, etc. The programme for the autumn course of lectures is as follows: Mineralogy, William H. Wahl, Ph. D; Physics, Professor J. Child; Anatomy and Physiology, C. C. Vanderbeck, M.D.; Botany, Henry Leffman, M.D.; Philology, R. Grimshaw, Ph.D.; Elocution and Oratory, Professor J. W. Shoemaker, and others. The monthly meetings are in charge of Dr. Wahl and Professor Grimshaw. At the initiatory meeting, there were presented to the public, for the first time in Philadelphia, the Brayton ready motor, the National Timber Preserving Company's new process (shown on a huge log), and some dozen other interesting novelties. Drs. Wahl and Grimshaw are desirous of hearing from inventors, producers, and manufacturers throughout the country, who are thus offered an excellent opportunity of bringing before a large and practical audience whatever novelty they may be interested in. At the first meeting, there were over a thousand in the audience, while many were unable to gain admittance.

Economy in Use and Manufacture.

How to save in cost of manufacture is thus suggested by James C. Baylis in a paper before the New York Society of Practical Engineering:

"We are very near the maximum of economy as regards the cost of power. We can build boilers that will evaporate ten pounds of water for every pound of coal burned under them; and when it is attempted to economize still farther, it is found that the interest upon the increased cost of the boiler amounts to more than the value of the coal saved. It is doubtful if any important improvement is possible upon the Corliss engine gear, or the Cornish cataract double-head valve. Steam jacketing has not yet, in this country, received the attention to which its importance entitles it; and with this, and in clothing with felt and other non-conducting substances, there is room for profitable experiments. For the next half century we must look to economy in little things for the cheapening of the cost of manufactured products.

Among the attainable economies not generally carried to their ultimate application, the saving of fuel is the most prominent, and it is one of the most serious drawbacks to our industrial prosperity. Waste of fuel results mainly from bad firing. In an experiment made with different men, each with the same amount of fuel, the best man ran the engine 56,000 revolutions, and the poorest 28,000 revolutions. A few years ago, the best engine driver in Great Britain, and who was always in request at competitive trials, was a lad 13 years of age. This boy could run an engine longer with a given amount of fuel than any other engineer in the country, and the fact is suggestive. The next, after economy in the cost of power, is the task of economizing skilled labor. An important plan is to employ unskilled labor to supplement skilled artisans. 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 whoever happens to have it. Consequently, no one is responsible for it. There is great waste of lubricating oil; and above all, in our manufactories, time and material are wasted for want of proper system. System should begin with the building of the shop. If we can bring ourselves to take care of the small economies, the great ones will take care of themselves."—*Paper Trade Journal.*

Utilizing Cobwebs.

Cobwebs have been applied to various uses. The delicate cross hairs in the telescopes of surveying instruments are fine webs taken from spiders of species that are specially selected for their production of an excellent quality of this material. The spider, when caught, is made to spin his thread by tossing him from hand to hand, in case he is indisposed to furnish the article. The end is attached to a piece of wire, which is doubled into two parallel lengths, the distance apart exceeding a little the diameter of the instrument. As the spider hangs and descends from this, the web is wound upon it by turning the wire around. The coils are then gummed to the wire and kept for use as required About a century ago, Boa of Languedoc succeeded in making a pair of gloves and a pair of stockings from the thread of the spider. They were very strong, and of a beautiful gray color. Other attempts of the same kind have been made; but Réaumur has stated that the web of the spider was not equal to that of the silkworm, either in strength or luster. The cocoons of the latter weigh from three to four grains, so that 2,304 worms produce a pound of silk; but the bags of the spider, when cleaned, do not weigh above the third part of a grain.—*Appletons' Cyclopædia.*

A NEW CHROMATROPE.

BY PRESIDENT HENRY MORTON, PH. D., STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

There are a number of phenomena, related more or less to that illustrated by the seven-colored rotating card known as Newton's disk (phenomena, in other words, involving the composition of colors and persistence of vision) which it would be desirable to illustrate by means of a transparent apparatus and a magic lantern, rather than by an opaque disk of large size viewed directly. In fact, for twenty years or more, Duboscq has been making several chromatropes of this character. One of these consisted of a Newton's disk made of sectors of colored gelatin, mounted between two thin disks of glass, which were rotated by a small central pulley, over which passed a barrel moved by a large driving wheel. Another consisted of two disks so painted as to produce by their opposite motion the appearance of undulatory movements in certain spots of light. These were driven by a cord carried continuously round the driving pulley and both the device disks. This chromatrope, when rapidly moved, developed by persistence of vision a figure of luminous chainwork, in a way which illustrated the phenomenon of persistence of vision very satisfactorily. Another of these chromatropes illustrated Faraday's observation of the toothed wheels rotating in opposite directions. While all of these were good of their kind, there yet remained something to be desired, as regards rapidity of rotation, solidity of machinery, and clearness of vision.

Wishing to employ many of these and other illustrations at a lecture on color which I delivered at the Academy of Music in Philadelphia, I applied to Mr. George Wale, of the firm of George Wale & Co., instrument makers to this institution, and he made for me the instrument which I have found very admirable in in its effectiveness and durability, and will now describe

Fig. 1.

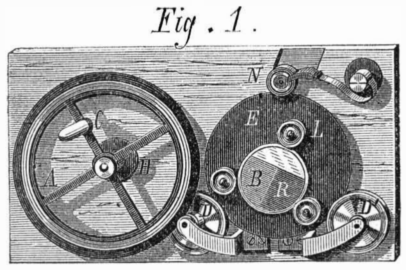


Fig. 1 shows the arrangement of parts, with an addition to be presently described.

The large wheel, A, is made of brass, with a rectangular groove on its periphery, into which is sprung a flat ring of thick sheet rubber. This gears by friction into the smaller part of the pulley, D, and this gives to it a high velocity. C is a handle and H the axis, clamped in a slot in the frame so that it can be brought nearer to D to increase the driving friction.

The chromatrope disk rests on the larger part of this same pulley, and also on the other two pulleys, D and N. It is thus readily driven at a high speed by its edge, the grooves of the pulleys in which it rests being covered with thin sheet rubber.

The entire field of the chromatrope is thus clear and unobstructed by any belt, pulley, or the like. In order readily to change the design disk of the chromatrope, the pulley, N, is held by a spring and can thus be pushed back so as to release one disk and admit another.

The design disks used in this apparatus may be multiplied ndefinitely, but those at present supplied are the following:

Fig. 2

1 2 3 4

1. Newton's color disk. This consists of seven sectors, red, orange, yellow, green, blue, indigo, and violet respectively. This and the other color disks are made of pieces of stained glass, cemented with Canada balsam to a disk of plate glass, and so admirably fitted that the effect on the screen, even, is of the most perfect finish. Their richness, regularity, and accuracy of color surpass anything which has ever been produced by painting.

2. Disk illustrating Young's theory. Six sectors of red, green, and violet are here arranged, and when rotated they produce white.

3. Disk illustrating Young's theory, Professor Rood's design, showing that green and violet produce blue. This consists of various partial sectors, arranged as shown in the accompanying engraving, Fig, 2, third circle. Here we have a number of sectors, of which the large are colored green and the smaller violet. The shaded portions are black. When such a disk is rapidly rotated, we have on the outside a ring of green, so far as to the portion where the violet sectors begin; then we have a ring where both green and violet occupy the field in succession, and thus by persistence of vision blend and give their resultant impression; lastly, where the green sectors end, we have a circle of simple violet. In the case of this disk, the combined color obtained by the union of the green and violet is a light sky blue.

4. Disk illustrating Young's theory, Professor Wood's design, showing that red and green produce yellow. This is arranged on exactly the same principle as the previous one, except that the smaller partial sectors are made of red glass in place of violet.

5. Disk illustrating the fallacy of Brewster's theory, Professor Rood's design, showing that blue and yellow do not produce green. See Fig. 2, fourth circle.

This resembles the foregoing, except that the eight sectors are entire, and consist alternately of blue and yellow glass, and when rotated produce white light.

6. Disk illustrating persistence of vision, being the present writer's design of the chameleon top.

This is shown in position in Fig. 1. The disk, E, is of hard rubber, with an opening eccentrically placed, over which is supported, between three small pulleys, L, the glass device disk, B R.

If, while this disk is rapidly rotating, the finger is made to touch lightly the little wheels at a single point of their revolution, it will cause them to move slightly so as to rotate the device disk, R B W, very gradually. This is placed, as we have seen, eccentrically to the large disk; and having on it the irregular design shown in Fig. 3, in which R is red glass, B blue, and W white or transparent, it will, by the slow rotation described, have one color after another shifted into the center of rotation of the large disk, and also the combination of colors in circles outside of the center will be changed. Thus: Suppose, in the first case, that the position

Fig. 3.

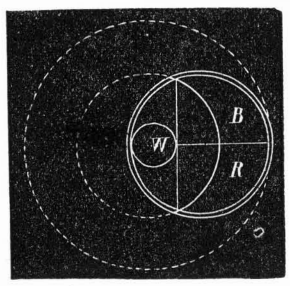
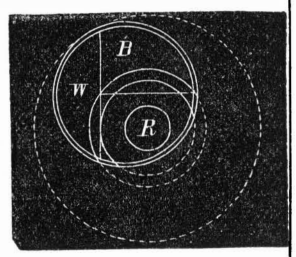


Fig. 4.



of the disks is indicated by Fig. 3, the largest dotted circle representing the large disk, and W, B, and R being the white, blue, and red parts of the device disk. In this case the white occupies the center of the large disk, and thus the rotation of this leaves the portion included in the small central circle always white. Outside of this, however, it is evident that, in the ring between this smallest circle and the next one, white, red, and blue will be carried in succession by the rotation of the large disk over the field, and thus, by persistence of vision, a blending of these three will occupy this ring-shaped space. Moreover, since the proportion of the colors will vary concentrically, this will not be a flat, but a shaded ring. Thus, just beyond the smallest circle white will predominate, while just inside the next circle there will hardly be any white.

Again, between this second circle and the outermost, there will be a similarly graduated ring, red and blue with no white.

Now suppose the small disk to rotate so as to shift the red portion into the center of the large disk, as shown in Fig. 4. Here evidently, when the large disk rotates rapidly, we shall have, by persistence of vision, a red center within the small circle; between this and the next circle a ring of combined red and blue; then a narrow ring of red, blue, and white; then a broad graduated ring of blue and white.

The shifting of the center is of course accomplished gradually, and thus the figure on the screen passes imperceptibly from change to change in countless variety, and with a beauty of effect that hardly admits of description. The prominent idea suggested to most is that of an ever-opening and changing morning glory, or of a fountain of light and color, from whose center wells out a succession of colored waves, chasing each other outwards until they are lost on the margin of the basin.

At the suggestion of Professor C. A. Young, of Dartmouth College, a further development was given to this chromatrope. The pulley wheel, D, in place of having one groove to drive the glass disk, was made a little broader and furnished with two grooves. The outer one was cut a little deeper than the other, so that it would act as a wheel of less radius and communicate a slightly lower velocity to the glass disk it drove. The other pulleys, D' and H, were each made of two independent wheels.

Two disks, being placed in this arrangement, would therefore rotate in the same direction with high but slightly unequal velocities, so that one would, as it were, travel slowly over the other. The inner one of these disks was painted with a design, and the outer made part black and part white (that is, clear). The clear part, exposing in succession different parts of the design, produced corresponding changes in the persistence-of-vision figure developed. The simplicity of the means by which this result was obtained is a very admirable characteristic of the plan.

Other designs have been made by Professor MacCord, of the Stevens Institute, for driving disks in opposite directions, and indeed this fundamental idea of Mr. Wale, of driving the device disks directly by friction on their edges, seems to open the way for quite a number of developments of this piece of apparatus.

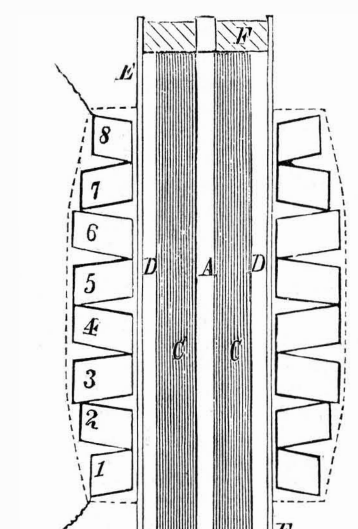
Cleansing Goods by Naphtha.

Naphtha is being used as a cleansing agent for furniture, carpets, clothing, etc., at an establishment recently opened in this city. The process consists simply in placing the article to be cleaned in a bath of the hydro-carbon and there leaving it for a couple of hours. Huge vats are used, capable of holding several barrels of naphtha at a time; and in these, sets of furniture or rolls of carpet are secured so as to be entirely submerged in the liquid. No preparation of the goods is necessary, and the naphtha seems to exercise no deleterious effect upon varnish or gilding, upon glued joints, or upon the finest silk or satin fabrics. Dirt and grease are entirely eradicated, the latter sinking to the bottom of the vats, from which it is from time to time removed in the shape of a thick yellowish mass. Moths are of course totally destroyed.

Several fine sets of furniture were shown us, which had been treated by the naphtha process. They appeared like new so far as the fabrics were concerned, and there was no discernible smell of the fluid. The process is patented. The principal item of expense is the evaporation of the naphtha; but this being allowed for, the cost of cleansing is somewhat less than that incurred in the ordinary method followed by the clothes-scouring establishments. It may be added that naphtha does not act upon linen or cotton, and is practically available only upon animal fibers.

A NEW INDUCTION COIL.

Mr. C. F. Brush, M. E., communicates to the *Engineerin and Mining Journal* a description of a novel induction coil designed by him, an engraving of which, in section, we give here with. The three eighths inch iron rod, A, is secured by a collar and nut in the base, B, and serves as a support for the core, C, which is composed of about 1,200 iron wires (No. 20 gage) made perfectly straight and carefully annealed. This core is covered by four layers of paper saturated with paraffin, then one layer of the primary wire, D, which is of copper one eleventh inch in diameter and 90 feet in length, then six layers of paper, and, finally, the second layer of wire. The latter is not covered but is wound with a narrow strip of paper between the consecutive turns, the object of this being to economize space. A hard rubber tube, E, incloses the primary wire, and is 12 inches long, 2½ inches in internal diameter, and ⅛ inch thick. It is held by the pieces of wood, F, which also support the core. The secondary wire is 30,000 feet in length, is wound in eight sections, 1, 2, 3, 4, etc , and covers 8 inches of the tube, as shown. Sections 1 and 8 contain 35 layers of wire each; sections 7 and 2, 55 layers each, and sections 3, 4, 5, and 6, 67 layers each. This arrangement places most wire around the middle portion of the core, where its inductive force is greatest. The consecutive layers of wire in each section are insulated from each other by ten thicknesses of unsized paper saturated with melted wax; and the consecutive turns of wire in each layer are insulated from each other by being wound with a space of one two-hundredths of an inch between them. The wedge-shaped space between the sections is filled with paraffin, which insulates them, and the exterior of the sections is also covered with the same material, until the shape of the apparatus becomes as shown. The secondary wire begins with section 1, and forms the outside layer first; thence it passes from layer to layer until the innermost one is reached, there it crosses over to section 2, where sections 1 and 2 touch each other, and forms the innermost layer of section 2, thence from layer to layer until the outside one is reached; thence it passes to section 3. forming the outside layer first, and thus it proceeds until it ends in the outside layer of section 8.



The advantages of this arrangement, as regards economy of space, is obvious. No insulating material being required between the sections, where the wire passes from one to the other, none is used. But as the quantity of wire, and consequently the tension of the induced electricity, increases directly as the distance from this point toward the opposite edges of any two contiguous sections, so the thickness of paraffin increases until finally it is thickest of all where insulation is most needed. A space of one eighth of an inch between the innermost layer of the sections and the tube, D, is filled with melted paraffin, which, together with the rubber tube itself, forms the insulation between the primary and secondary wires.

The object in using the secondary wire bare is economy of space. It is a matter of the greatest importance that the whole of the secondary wire be placed as near as possible to the magnetic core, E, as the inductive force of the latter varies inversely as the square of the distance from its axis. The same amount of silk covered wire would occupy at least double the space, and would, consequently, average a much greater distance from the core.

The condenser used with this coil consists of two hundred and forty sheets of tinfoil, five by ten inches, arranged in the usual manner, and separated by single sheets of varnished paper. The break piece is Foucault's automatic, in which the rupture of the current occurs at the surface of mercury covered by a layer of absolute alcohol. It is operated by a separate electro-magnet, which, however, is in connection with the primary wire of the coil. The instrument is provided with a communicator by which the primary current is started, stopped, or reversed at pleasure.

The performance of this coil is quite extraordinary for an instrument of such small size. When operated with two cells of Bunsen's battery, it gives sparks three and a half inches in length; and with one large cell of the Grenet battery, three inch sparks are obtained. The sparks are very dense, and are attended with numerous and brilliant ramifications.

DECISIONS OF THE COURTS.

United States Circuit Court.---Eastern District of Michigan.

PATENT HOTEL REGISTER.—CHARLES L. HAWES *vs.* WILLIAM W. ANTISDEL.

[In equity.—Before Longyear, J.—February, 1875.]

In order to defeat a patent on the ground of want of novelty, the proof of prior use or previous knowledge must be such as to establish the fact clearly and satisfactorily, and beyond a reasonable doubt.

Where the proofs are contradictory, mere preponderance is not sufficient to sustain the allegation. The preponderance in such case must be such as to remove all reasonable doubt. * * *

To doubt in such a case is to solve the question in the negative. Letters patent No. 63,889, for a new and useful Hotel Register, granted to Charles L. Hawes, April 16, 1867, sustained.

Longyear, J.:

The invention in question is what is commonly known as the "advertising hotel register," the book being constructed so as to have inserted advertisements at the top and bottom and on the margin of each page, with a blank space for the registering of names of guests, or on each alternate page, leaving the opposite page blank for registering of such names, or on both pages of each alternate leaf, such leaf being sometimes made of bibulous or blotting paper.

The proofs showed that the complainant perfected his invention and put it into practical use as early as in May, 1866, and it was to that date the proofs as to prior use and previous knowledge related.

No advertising hotel register book purporting to antedate complainant's invention was put in evidence. Such a book, duly verified, would be the best evidence possible. Each page would be an intelligent speaking unimpeachable witness to its own chronology, and the book itself the best evidence of the date of its use. The case is left to stand exclusively upon the recollections of witnesses, and at a distance in time from eight to twenty years, and unaided in any single instance by any contemporaneous memorandum or writing whatever. I shall recur to this peculiar aspect of the case in another part of this opinion.

The places where and the persons by whom such prior use and previous knowledge are alleged to have taken place, and as to which proofs have been made, will be taken up in the order in which they were alleged in the amended answer.

1. Prior use in the Exchange Hotel at Sturgis, in the State of Michigan, by E. W. Pendleton.

Pendleton, with five others, testify to the use of an advertising register in the hotel named prior to May, 1866, namely, in 1864 and 1865, and nine witnesses testify to the contrary. That registers of some kind were used in that hotel during the years 1864 and 1865, and that advertising registers were used in it after May, 1866, the testimony on both sides is entirely agreed. The vital question is whether the registers used in 1864 and 1865 were advertising registers, or, what is the same thing, whether the conceded use of advertising registers commenced in that hotel before May, 1866.

As to this question, the testimony is in direct and irreconcilable conflict. The testimony was taken at a distance of time of from eight to ten years. The witnesses on both sides testify from memory alone, unaided by any memorandum or writing whatever of the fact itself, or of concurrent facts. The uncertainty of memory as to dates, under such circumstances, is well understood; and where, as in this case, the event in question was one not calculated to fix itself in the memory of the persons called to testify, except Pendleton, on account of any interest it was to them, and those persons have equal means of knowledge, are of equal credibility, and apparently of equally sound memory, and they positively disagree, it may well be said, in a case like the present, that prior use is not made out in that clear and satisfactory manner requisite, as we have seen, in such cases.*

2. Prior use in the Michigan House, at Tecumseh, in the State of Michigan, by Mrs. W. H. Hoeg.

Four witnesses testify to the use of an advertising register at the place named in 1855, and five, including the then clerk or manager for the proprietor, George R. Southworth, testify to the contrary. Southworth certainly had better means of knowledge, and would be more likely to remember what the fact was, than any of the witnesses testifying to such use at the date mentioned, except perhaps the witness Spafford, who testified that he, being a binder, procured the printing done and himself bound the book and put it into use there while he was in charge of the hotel during a temporary absence of Southworth. But Southworth was absent only two or three months, and Spafford testifies that the register so put there by him continued to be used there after Southworth's return. So that if there ever was such a register at the time specified it was there when Southworth returned and resumed the management of the hotel; and he testifies positively that there was no such thing there. He describes what he says was the only book used in the office to his knowledge, and that was not an advertising register, or, in fact, a register at all as commonly understood. He describes it as simply a book in which the names of guests were entered by the clerk and a minute kept of what they had at the hotel. The other four of complainant's witnesses corroborate Southworth both as to the fact that no advertising register was used there during the time mentioned by Spafford and as to the description of the book that was used.

In such a conflict of testimony perhaps nothing more need be said than that the case is such that there is such a want of clear and satisfactory proof of prior use and, to say the least, that it is involved in so much doubt that, under the rules laid down, it must be held that the allegation of prior use at Tecumseh is not made out. *

The proofs showed that the hotel building in question was consumed by fire in 1858 with its contents. The absence of the register or book used there at the time specified (1855) is therefore satisfactorily accounted for. *

3. Prior use in the Bentley House, at Dexter, in the State of Michigan, by Nelson J. Alport.

Alport, with eight others, testify to the use of advertising hotel registers in the place named prior to 1866, namely, in 1863, 1864, and 1865, and eight witnesses testify to the contrary. As in the instance of the alleged use at Tecumseh, so here, the hotel was destroyed by fire after the alleged prior use, and the two register books claimed to have been so used there are represented to have been destroyed with the hotel. So that here, as in both the preceding instances, the case is left to stand exclusively upon the recollections of witnesses as to both the fact and the dates, and in this instance at ten and eleven years distance of time. *

The conflict of testimony is not whether there was or was not a register or book of some kind used at each of the hotels in question during the periods of time covered by defendant's testimony, for the witnesses on both sides are all agreed that there was; neither is it as to some of the places, as at Sturgis and Dexter, that there was or was not an advertising register used at some time by the person named in a hotel kept by him, for as to this the witnesses are also all agreed that there was. The conflict is simply as to the description or kind of register so in use at such prior periods of time, and, in respect to Sturgis and Dexter, as to the time when they saw an advertising register in use there in a hotel kept by the persons named—whether in 1867 or from one to three years earlier. One set of witnesses testify in the one case that the register so used was an advertising register, and in the other case that it was at the earlier date the advertising register was used; and the other set describes the former as a plain register, and that the latter was used at the later date. Each set testify to an affirmative equally with the other, and neither has any advantage over the other under the rule laid down in Stitt *vs.* Huidekopers.

Upon the whole consideration, it results that there must be a decree for the complainant according to the prayer of his bill.

Decree accordingly.

[*J. J. Allen*, *W. W. Taylor*, and *E. C. Walker*, for complainant. *Moore* and *Griffin*, for defendant.]

Recent American and Foreign Patents.

NEW AGRICULTURAL INVENTIONS.

IMPROVED PLOW.

Irvin Freeman, Corpus Christi, Texas.—This invention relates to a shovel or subsoil plow, and consists of a hook rod attached thereto, and a lever having a pawl that works in a beam rack. This mode of fastening a subsoiler or shovel to a skeleton frame is found in practice to be very convenient, and a great labor-saving device.

IMPROVED HARROW.

William Frank, Mound Station, Ill.—This invention relates to certain improvements in harrows, and it consists in three equilateral triangular frames, constituting a sectional harrow in which the parts are capable of use either singly or collectively, and with either angle for the front. The invention also consists in the peculiar construction of the draft attachment and the means for coupling the sections together.

IMPROVED CORN HUSKER.

William Allen Dick, Cleves, Ohio.—This is a kind of pod auger-shaped tool, with a pointed top a little in advance of the cutting lip arranged on a horizontal revolving axle, in combination with a sliding table to feed the corn ears up to the tool. The object is to remove the shucks without the loss attending the old methods, and to leave them prepared for use without the stubs.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED CIGAR BOX.

Charles S. Brown, Baltimore, Md.—The object of this invention is to provide a cigar box better adapted to preserve the cigars from dampness, and so constructed as to allow the quality and brand of the cigars to be inspected without opening the box or breaking the revenue stamp. It consists in a tight sheet metal box, having its end walls slightly elevated and formed into beads, in combination with a glass cover contained into a suitable frame, which, when the box is to be shut, closes in between the said beads, which clasp and firmly secure the cover so as to render any other form of fastening unnecessary.

IMPROVED OPERA CHAIR.

Ira Chase, New York, and George M. Ball, Green Point, N. Y.—The new feature in this device consists in telescopic braces attached to the lower part of the support and to the edge or the seat. These fold back out of the way when the seat is turned up, and at the same time form a strong and durable support.

IMPROVED HUNTING JACKET.

Henry L. Daigre, Alexandria, La.—This coat contains the requisites for hunting, distributed in a neat and convenient manner over the body. In the skirts are game pockets, having side gussets and bottom nettings. Within the game pockets are separate pockets of smaller size for the empty shells. The game pockets have covering flaps, which may be thrown up and attached to buttons for exhibiting the result of the day's sport.

IMPROVED EGG CARRIER.

Wendelin Weis, St. Paul, Minn.—This inventor proposes to cheapen and simplify egg-carrying devices by doing away with the hinged covers or sheets which separate the horizontal trays and providing the lateral partition strips of the egg cells with broad bottom and narrow top extension pieces that serve to support the eggs in an equally secure manner.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED WAGON WHEEL SCRAPER.

Norton Sage, Pekin, Ill.—In order to keep the tires of wagon wheels free from sticky mud, in this invention there is provided a bent iron bar attached to the rear axle, and having at its outer end U-shaped scrapers, which accommodate themselves to the rim of the wheel, no matter in what position the latter may be.

IMPROVED SCROLL-SAWING MACHINE.

Jerome H. Plummer, Brooklyn, N. Y.—The new features in this machine are a reciprocating saw frame (attached to a table extension) and slotted arms above and below, which serve as guides for the frame. The extension has a curved arm, which supports a shelf for holding tools. The machine in general is compactly built and well adapted for foot power.

IMPROVED CHILDREN'S CARRIAGE.

Ernst Krueger, New York city.—This relates to a novel and ingenious construction of the body, which has a flexible bottom stretched by lazytongs frames. The axles are similarly extensible, and the whole is adapted to be folded in its longitudinal axis so as to be conveniently packed for storage, etc.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

MACHINE FOR PACKING TOBACCO IN BOXES.

James B. Farrar, Cary, N. C.—This invention relates to an improved machine for filling and packing bags or packages of smoking tobacco. It consists in an intermittently revolving belt provided with seats in which the bag holders are placed, containing the bags and the bag shapes. As the belt revolves, the flared ends of the bag shapes pass beneath an automatic and adjustable feeding apparatus, which delivers into the bags a requisite amount of the tobacco. The bag holders and bag shapes then pass in their seats in the belt from the rotation of the latter beneath two vertically moving plungers, one of which settles the tobacco in one bag shape, while the other packs the tobacco in the preceding bag. At the same time that the packing plunger descends, two lifters automatically rise and withdraw the bag shapes, leaving the filled bags and bag holders to be removed, and the latter prepared for insertion at the other end of the belt.

IMPROVED CAR COUPLING.

John H. Johnson, Brooklyn, Mich.—The new feature in this is a fulcrumed side lever attached to a vertically swinging drawhead, which last may be set and worked at any hight for coupling. There are also devices to prevent the escape or detaching of the links.

IMPROVED LEVER POWER.

Henry C. Bell, Edina, Mo.—A vibrating lever is provided with notches or sockets, adapted for receiving the links or chains which pass around the object to be raised. The lever is suspended and vibrated on a central pivot, so that the hoisting chains are alternately slackened and subjected to strain, each chain being shortened when slack. The operation of alternate slacking and straining is continued until the shortening of the chain has raised the object to the desired hight. This application of power is utilizable in a large number of ways.

IMPROVED DEVICE FOR CHANGING SPEED.

Joseph W. Mead, Dupont, Ind.—Instead of the cone pulleys and belts now in use, a conically faced disk is proposed, located on the driving shaft that transmits the power by conical friction wheels to a similar conically faced disk of the shaft to be driven. The shaft of the friction wheels are hung to boxes of a sliding and spring acted frame, and the wheels are adjusted by suitable lever mechanism.

IMPROVED SEWING MACHINE.

Josiah Glines and Noel W. Stiles, Postville, Iowa.—The novelty here is a shuttle carrier mounted on a pair of cranks, and operated by a crank on the driving shaft in such a manner that the shuttle travels in a true circle without revolving on its own axis, and thus does not twist the thread. This invention is one of considerable importance to sewing machine manufacturers, and we would especially commend it to their attention. The effect of swinging the carrier in a circular orbit, without revolving it, not merely avoids twisting the thread, but also saves friction and prevents noise. The mechanical device used is at once ingenious and effective.

IMPROVED TOBACCO-CUTTING MACHINE.

Augustus A. Hagen, New York city.—For cutting tobacco in a rapid and easy manner, this inventor suggests a new machine having a cutting knife, to which a diagonal shear cut is imparted by a compound slide mechanism.

IMPROVED NUT FASTENING.

Robert C. Watson, Maysville, Ohio.—An eye stud is formed on each end of one of the fish bars, to receive one end of a locking plate. Said plate has holes to fit over the nuts, and its other end is connected at the middle of the joint, where it meets another similar plate fastened to the other end of the fish plate. The two plates are fastened on the stud by a split key, so that they can be readily put on and taken off.

IMPROVED WINDMILL.

John Cook, Harlem, Ohio.—In this the crank-shaft bearing is connected to the horizontal beam which supports the machine in a simple and efficient way by means of stirrups or yokes. Another new feature is a joint in the beam for the tail vane to swing around out of the wind when it blows too strong, in combination with a weighted lever for keeping the vane in the wind.

NEW HOUSEHOLD ARTICLES.

IMPROVED FLUTING IRON.

W. F. Fisher and A. C. Brown, Bremond, Tex.—The invention consists in a hollow smoothing and glossing iron, in which a fluting iron is inserted, the latter being also hollow to adapt it to receive a heating block, so that the several parts may be, so to speak, nested, thus economizing space, material, and the cost of manufacture, and combining several implements in one.

IMPROVED CARRIAGE CURTAIN FIXTURE.

Daniel R. Knight and John M. Ripple, Waynesborough, Pa.—This invention relates to certain improvements upon the carriage curtain fixture for which letters patent No. 166,114 were granted July 27, 1875; and it consists in the improved construction of the roll, the method of attaching the curtain thereto, a stop device for adjusting and regulating the hight of the curtain, and the means for fastening the sides of the curtain.

IMPROVED LANTERN.

Patrick J. Clark and Joseph Kintz, West Meriden, Conn.—A yoke attached to a metal cap above the globe holds the latter to the lantern, while allowing said globe to rise and fall. There are new devices for concentrating the air on the flame, and for the ready admission and securing of the burner. The invention is quite simple and easily constructed.

IMPROVED PAN.

John C. Milligan, South Orange, N. J., assignor to Lalance & Grosjean Manufacturing Co., New York city.—The object here is to enable pans to be made of thinner and lighter metal than is ordinarily the case, without detaching from the wearing quality, and also to increase the capacity of the utensil. The middle portion of the bottom has a downward deflection, and, on the part outside of this, legs or studs are attached.

IMPROVED FOLDING CRADLE.

John Weich and John Jefferys, New York city.—The bottom of the cradle is hinged to one side so as to turn up. The ends are each made in two parts hinged together, and are also hinged to the sides. The rockers are pivoted at one end, and secured at the other by movable pins. With this construction the cradle may be folded so as to require but little space, and be compact in form.

IMPROVED CURTAIN FIXTURE.

Rudolph J. Pospisil, Chicago, Ill.—This is a curtain roller turning in spring brackets, bearing on its ends, and having cords wound in opposite directions around each end, to raise and lower the rollers. The cords are guided in front hooks of the brackets. An illustrated description will be found on page 306 of the present volume of the SCIENTIFIC AMERICAN.

IMPROVED STOVE.

Robert S. Bostwick, Jackson, Mich.—The air passes upward between the fire pots, from side channels into an air chamber, and then mixes with the smoke and fire gases from one fire pot. The sheet of air that is thus supplied to the top of the fire produces the more thorough combustion of the fuel and a higher degree of heat. The unconsumed smoke and gases of combustion are conducted by suitable passages downward to pass between cap and fire pot, and then in upward direction to the chimney.

IMPROVED FOLDING CHAIR.

James H. Bean and Richard W. Box, Pulaski, N. Y.—In this chair the seat, which is pivoted to the back part, and the hind legs slide between the front legs for folding. The hind legs rest by projecting side lugs on the front legs, when the seat is thrown in position for use. This is a simple and strong article, easily packed and well suited for camp use.

IMPROVED CURTAIN FIXTURE.

George C. Mathers, Louisville, Ky.—This invention is an improvement upon that for which a patent was granted to the same inventor February 16, 1875. The improvement consists chiefly in arranging on the same axis both the friction pulleys over which the cord passes, and in locating them above the grooved pulley which is attached to the end of the curtain roller. The result is an economy in the construction of the fixture, and the cord is brought nearer the wall or window casing, thus rendering its operation easier, and the appearance of the fixture more attractive as a whole.

NEW BOOKS AND PUBLICATIONS.

APPLETON'S AMERICAN CYCLOPEDIA, VOL. XIII., "Palestine" to "Painting." In Sixteen Volumes, $5 each. New York city: D. Appleton & Co., Broadway.

The thirteenth volume of the revised edition of this work has lately been issued. It opens with an excellent colored map of the Holy Land, which accompanies an article in which due reference is made to the latest explorations and archæological discoveries in that interesting portion of the globe. The article on "Plants" is very full, and is copiously illustrated with excellent engravings and a chart showing the distribution of plant life over the world. Among other notable articles are those on "Paper," "Paris," "St. Paul," "Patagonia," "Persia" (with map), "Phonography" (an excellent exposition of the science), "Phosphorus," "Political Economy" (by that eminent writer, Henry Carey Baird, of Philadelphia), and "Patent Law," the last article being by Hon. E. T. Drone. The volume is fully up to the high standard of its predecessors.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From October 19 to October 23, 1875, inclusive.

AIR COMPRESSING ENGINE, ETC.—E. Cope *et al.*, Hamilton, O.
ARTIFICIAL FUEL.—T. H. N. McPherson, Washington, D.C.
ATTACHING BUTTONS, ETC.—D. Heaton, Providence, R. I.
BALE TIE.—T. H. Murphy, New Orleans, La.
BUCKLE.—W. T. Reaser, Centralia, Wis.
CUTTING OUT TABLE.—J. Herts, New York city.
DIAMOND HOLDER.—J. W. Branch, St. Louis, Mo.
GRINDING MACHINERY, ETC.—J. W. Blake, Jersey City, N. J.
LEAD TRAP.—F. N. Du Bois, New York city.
PRINTING INKING APPARATUS.—A. Campbell, Brooklyn, N. Y.
RAISING AND DELIVERING GRAIN, ETC.—W. H. Brown, New York city.
REFRIGERATOR, ETC.—L. C. Cattell, Cleveland, Ohio.
WATER METER.—D. W. C. Taylor *et al.*, Brooklyn, N. Y.

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

O. C. W. will find directions for utilizing old tin cans on p. 319, vol. 31.—G. A. B. and W. M. will find directions for bluing steel on p. 123, vol. 31.—S. M. T. can transfer engravings to glass by the process described on p. 123, vol. 30.—W. F. McL. will find a good recipe for making black ink on p. 203, vol. 29.—L. L. L. will find directions for soldering iron and brass on p. 251, vol. 28.—F. S. can exterminate moths from carpets by the process described on p. 388, vol. 29.—J. S. will find directions for making gun cotton on p. 282, vol. 31. Celluloid is described on p. 23, vol. 33.—T. M. W. will find directions for silvering mirrors on pp. 267, 331, vol. 31.—S. C. can mount chromos, etc., by following the directions on p. 91, vol. 32.—A. S. can waterproof his leather boots by using the recipe given on p. 155, vol. 26.—B. A. C. will find a recipe for a depilatory on p. 362, vol. 32.—G. will find a good recipe for stove polish on p. 219, vol. 31.

(1) A. McC. asks: What is the best speed for the bucket of an overshot water wheel? Our wheel runs at the rate of 10 feet per second. Some millwrights claim that if we reduce the speed one half we will get double the power out of the same water. Are they right? A. We could not answer positively without more data; but in general, the speed of the periphery of an overshot wheel is not more than 5 or 6 feet per second.

(2) T. J. C. asks: What is the best way of joining logs together, to form a boom? A. For ordinary cases, chains answer very well, if the logs are kept in position by piles, driven in pairs, at intervals.

(3) S. C. B. says: I intend using a permanent tread power. Is there any disadvantage in placing it on a level, requiring the horse to work in harness instead of on an inclination? My own views are that the horse will work more easily on the level, which distributes the labor upon his legs nearly equally, whereas the other plan overtaxes the hind ones. A. Probably the matter can only be settled definitely by experiment. Some inclination is generally considered advisable, so as to allow part of the weight of the animal to act against the resistance. We imagine some of our readers can furnish useful hints on this subject; and if so, we would be glad to hear from them. The tread power is not ordinarily as efficient as the lever power, in which the horse walks in a circle of large diameter; and for a permanent power, it is better to call in the aid of steam.

(4) H. H. A. asks: What kind of oil should be used as a base to mix with powdered slate to paint a roof with? A. Linseed oil is the best to use, and the expense for one roof would not be very great.

(5) H. C. E. says: 1. I have a boat, 21 feet long by 7 feet 6 inches beam, drawing 12 or 15 inches of water. I built an engine 3x5 inches, with a link motion. Is the engine large enough for the boat? A. Yes. 2. I have a ½ inch feed pipe and ¾ inch exhaust. Is the exhaust too small for the engine? A. It will answer very well. 3. What size of propeller should I use? A. Of 18 or 20 inches diameter, 2½ feet pitch. 4. What size of boiler is required? A. About 2½ feet diameter, 4 feet high. 5. What is meant by the pitch of a propeller? A. It is the distance it would move the boat, at each revolution, if it worked in an unyielding medium, like a screw in a nut.

(6) C. A. A. asks: Is it any benefit to a rubber band to oil it? A. Quite the contrary.

What is the best way to treat posts to make them last? A. It is recommended to dip them into tar.

Are small vertical engines, with cast iron flues, as safe as those with wrought iron tubes? A. We do not understand what you mean by the flues of an engine; but if you refer to the boiler, the wrought iron tubes are preferable.

(7) E. F. asks: Is there anyway of setting glass in skylights? A. To make a good skylight, use iron bars and adopt a steep pitch; 45° is none too steep. Purchase your putty or cement of the patent vault light manufacturers of this city. If you wish to repair a skylight, use the same kind of cement but you cannot depend upon wooden bars.

(8) S. H. D. asks: How can I take a copper counter die from a brass die? A. Take a plaster of Paris cast from the die, and use it as a mold, melting two per cent of spelter with the copper to flux it.

(9) A. L. C. asks: What percentage of sea water is salt? A. Ordinary sea water contains about 3 per cent, by weight, of salt.

It is said that Pythagoras knew how to predict an eclipse by means of the saros. What is a saros? A. It was an ancient astronomical period, the length of which is a subject of debate.

I want to build a model ship 6 feet long. Can you give me some rules that will assist me in shaping the hull? A. Get a drawing of the lines of some well designed ship, and work from that.

(10) J. M. H. asks: By what process can finely ground flint glass be incorporated with Babbitt or other metal for lining boxes, for heavy machinery running at high speed? The object is to prevent the heating and rapid wear of the journals. A. We know of no process, and we think that the mixture would cause the bearings to abrade.

(11) G. E. P. says: Some time ago you discussed the proposition that the top of a wheel of a wagon in motion moved faster than the bottom. Is there any formula for computing how much faster the top moved than the bottom, or than the hub? A. At the highest point the velocity is twice as great as at the center, and at the lowest point the velocity is zero.

(12) A. H. asks: In making bell metal (about 77 copper to 23 tin) I have been in the habit of employing a flux composed almost entirely of lime. Over 5 per cent of the metal is burnt up; and the slag will sometimes be an inch thick in the bottom of the reverberatory furnace. Is there a flux which will effectually separate the metal from all impurities? A. Use a little borax or sal ammoniac.

(13) C. A. B. asks: What will remove, from the walls of a brick building, the oozings or collection of saltpeter? A. It is probably not saltpeter, for if it were the rain would remove it, it being very soluble in water. If it is an insoluble salt of lime, try a little dilute muriatic acid, and then wash well with water.

(14) G. F. says: 1. I have a six horse horizontal engine; it makes a slight thump which I am unable to locate. The center of the driving shaft is ¼ inch higher than the center of the cylinder; would that cause a thump? A. The shaft being out of line is most probably the cause of the thump 2. I am running a line shaft at 120 per minute, and an engine at 75. Could I economize by putting a larger pulley on shaft and running the engine at 100 per minute, using same pressure? A. The proposed increase of revolutions will prove economical, providing the wearing surfaces and the proportions of the various parts are large enough to sustain it. The thump would, however, increase with the speed.

(15) R. R. Z. asks: What will dissolve hair and wool mixed with small pieces of bone? I wish to retain the ammonia. I want to use it in a drill as a fertilizer. A. Ammonia can be obtained from bones, etc., only by a process of destructive distillation. It does not exist, in any quantity, in the bones themselves, but is formed when they are decomposed, in airtight vessels, by a high temperature.

(16) W. H. M. and M. L. L. say: We want to bore a well in low land, where salt water flows and penetrates in the earth to the depth of 15 feet. Will galvanized tubing prevent the salt water from mingling with the fresh without the joints being screwed or soldered together? A. If you strike a spring of fresh water, the tubing you speak of will answer very well.

(17) S. G. asks: How can I extract the oil from kip pieces without injury to the leather, which is to be used for heels for shoes? A. Try bisulphide of carbon.

(18) A. says: The supply pipe from the boilers to a horizontal engine is 75 feet long and 14 inches diameter, It connects to the steam chest by an 8 inch pipe, 15 feet long. The cylinder is 40 inches in diameter, and of 46 inches stroke; it has a waste pipe from each head, that runs along to a flywheel pit, and then, by a quarter turn, down 15 feet into 2 feet of water. The engine worked water while working a heavy train of rolls. Parties here say she drew the water from the flywheel pit through the waste pipe. I say not, as there was 60 lbs. steam pressure to work against. Which is right? A. You are right, according to the account; the other parties may be right if the engine was a condensing one.

(19) B. F. G. asks: Is there anything that will dissolve shellac besides alcohol? A. Shellac dissolves in a hot solution of borax in water.

(20) W. C. asks: 1. What is the stream line theory? Allusion was made to a new theory averring the non-resistance of water or any perfect fluid to bodies moving through it, by Professor Froude, in a lecture which you printed about three weeks ago. That singular theory was called the theory of stream lines; but it was only alluded to. Will you explain what it is? A. It may be briefly expressed, in the Professor's own words, as follows: "A submerged body traveling at steady speed through a stationary ocean of perfect fluid will experience no resistance."

How deep in the water can a dredge operate? A. It might not be safe to fix a precise limit, as it is generally found that, when dredging ought to be done, machinery can be designed to do it.

(21) A. B. says: I heated equal parts of manganese peroxide and potassic chlorate in a test tube, which I drew to a point, but I could not produce an oxygen flame. What was the reason? A. Oxygen, by itself, is not inflammable. Try a piece of wood splint with a spark on the end; the oxygen will cause it to burn very brilliantly.

(22) T. C. asks: How can rosin be purified for violinists' use? A. Treat the powdered rosin with a mixture of 6 parts cold alcohol and 1 of ether; dissolve the residue in boiling alcohol, and evaporate this solution to dryness over a water bath. If the residue be now melted, it yields, on cooling, a colorless substance as clear as crystal.

(23) H. D. M. says: I assert that as high a rate of speed as 70 miles an hour had been made on an English railroad. A friend says that 45 or 50 is the highest speed ever made. Which is right? A. A speed of 70 miles an hour has frequently been made in England for short distances. Some of the trains are timed to run at nearly 60 miles an hour. Similar speeds are occasionally made in this country.

(24) M. S. J. asks: What liquids can I use to dissolve white chalk, so as not to destroy any of the properties of the chalk, but leave it in a liquid state? A. You cannot dissolve chalk and leave its properties unaffected. Rub up precipitated chalk with a little gum water.

(25) J. P. S. says: As I am about to build a burial vault, can you give me some information as to how the inside of the vault should be built, and whether it should be shelved or not? A. A burial vault is usually built into the side of a bank of earth, in such manner as to have the floor thereof one step or so above the ground in front. A medium size would be 12 by 18 feet on the exterior, with the narrow end for front. Make the interior hight 10½ feet and cover with a semi-circular arch. Construct the receptacles for coffins at the back end of the vault; these may be about 20 inches high, 28 inches wide, and 8 feet in depth. Make the bottoms or shelves of these receptacles of planed blue stone or slate slabs, 2½ inches thick, placing the first slab upon the floor of the vault, showing its thickness above the floor; build the upright partition walls of brick in cement, and 4 inches thick. Make the slabs wide enough to serve for two compartments each, there being four in the width of the vault. This will give you four tiers of four receptacles each, and two in the upper curve of the crown, making eighteen in all. The front ends of the partitions should be faced with the blue stone or slate, into which facing cut a groove, and insert a closing slab of marble or other stone to close each opening. Pave the space in front of the cells as a vestibule with stone—which may be fine marble tiling, if so required. The entrance door may be closed with either an iron gate or marble slab, so inserted as to be easily taken out. The exterior may be faced with granite and the walls coped with the same; but the top needs only to be cemented so as to shed the water, covered with mold, and laid with grass sod.

(26) C. D. B. says: I have a compound composed of the following ingredients: Venice turpentine, sweet oil, lard, and beeswax. What cheap substance, that will not injure the skin, can I add to destroy the smell of the turpentine? A. You will have to counteract the objectionable odor by the addition of some agreeable perfume.

(27) E. D. S. asks: Is there any substance that will serve better than good sponge for filtering a $\frac{1}{16}$ inch stream of water? The chamber for filter will be 2x3x4 inches, and I wish to arrest merely the floating particles. A. Try a carbon filter.

(28) G. C. asks: Would the Cornish or double beat valve be suitable for an engine with 30 inch cylinder and 42 inch stroke, making 65 revolutions per minute with a pressure of 80 lbs.? The reason for wanting to adopt it is that the engine has frequently to be worked by hand, with full head of steam. A. If the Cornish valve can be applied, it will be suitable.

(29) A. T. B. says: We make steam in our boilers for the purpose of evaporating brine, using a pressure of 50 or 60 lbs. to the inch. Would the same fuel make more salt if no pressure were carried in the boilers? A. If there be no pressure in the boilers, the heat will not exceed 212°, and only hot water could be conveyed away from the boilers. If steam is to be circulated to any distance from a boiler, there must be a pressure to move the steam through the pipes.

(30) F. F. T. asks: Which would be the most economical as regards fuel, to run an engine at 110 or at 160 revolutions per minute? A. Generally, the higher speed is the most economical.

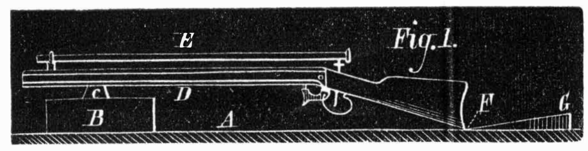
(31) D. M. M. asks: How can I re-japan stands of sewing machines, without baking them? A. Take asphaltum 48 lbs., fuse, and add boiled oil 10 gallons, red lead and litharge each 7 lbs., dried and powdered white copperas 3 lbs.; boil for 2 hours, then add of dark gum amber, fused, 8 lbs., hot linseed oil 2 gallons. Boil till the mixture is pasty, then thin with oil of turpentine 30 gallons.

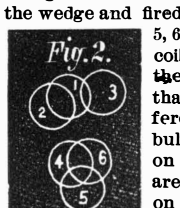
(32) E. H. says: I. I want to build a 20 horse power water wheel, and to have the buckets attached to some flexible material like those of a corn elevator. What would be the best material to fasten the buckets to? A. An endless chain. 2. How can I calculate the horse power obtained? A. In the absence of any given conditions, we cannot tell you how to calculate the power except from the duty obtained from the device when in practical operation.

(33) H. E. K. asks: How are buckskin gloves, etc., cleaned? A. Wash them in lukewarm soft water, with a little Castile soap, oxgall, or bran tea, then stretch them on wooden hands, rub them with pipe clay moistened with beer; let them dry gradually, rubbing them from time to time so that they do not lose their shape in drying.

(34) G. asks: What are the ingredients of blue or mercurial ointment? A. Take prepared lard 1 lb., mercury 1 lb., prepared suet 1 oz. Rub them together in a marble mortar till metallic globules cease to be visible.

(35) A. H. H says: In your answer to G. L. B. you say "the recoil of a rifle is felt before the ball leaves the barrel," which means, I suppose, that the recoil comes before the ball passes out of the gun. Not being satisfied with this answer, I made a few experiments, and the results do not fully agree with you. I tried an experiment as represented in the engraving. The rifle I used had telescope sights and a hair trigger, and weighed altogether 7½ lbs. Caliber was 0·4 inch; the ball was 1⅛ inches long, and 70 grains powder was used. On a very firm table, A, was secured a block, B, high enough to bring the barrel, D, parallel with the table. At C, I fastened a yoke 4 inches long at right angles with the barrel, D, to keep the gun from turning over on one side when it was discharged. The stock rested on the table at F; and back of this was placed an inclined plane or wedge, as shown at G. I fired three shots, and in Fig. 2 have marked them 1, 2, 3. I then removed the wedge and fired three more shots, marked 4, 5, 6. At every discharge the recoil was so great that the rifle left the table entirely. You will see that there is only ⅛ an inch difference in the location of the bullet. By moving the gun back on the wedge ¾ inch, the sights are on the lower shots; and when on the table they are on the upper ones. Distance was 60 feet. Why is it, if the recoil takes place before the ball leaves the gun, that there was not more difference in the shooting? A. The explanation of these experiments is probably somewhat as follows: As soon as the explosion of the powder occurs, a pressure is exerted in the barrel tending to impel the ball forward, and the gun backwards. If there is anything, such as a human shoulder, at the end of the stock, the recoil is felt at once; and if the shock is considerable, it is apt to injure the accuracy of the aim. If, however, the gun is free to move backward, as in the experiments made by our correspondent, it will commence to move at the same time that the ball does, under the influence of the same pressure; but being many times heavier than the ball, the latter acquires the velocity due to the pressure in a much shorter interval, and is out of the barrel when the gun, under the action of the same force, has just moved a little.





(36) S. S. asks: Please give me a recipe for crystallizing alum on a wire basket. A. Dissolve as much powdered alum in hot water as the water will hold; then suspend your wire basket in by a thread, and let it cool.

(37) W. H. asks: Does water, placed in a cup on the top of a stove, have any effect in purifying the air? A. No; but it prevents the excessive dryness of the air, which is very injurious to health.

(38) J. F. says: I have a gutta percha pocket drinking cup, and I broke one of the rings; can you tell me if there is any way to mend it? Glue would not hold it. A. Melt together equal parts of gutta percha and pitch. Apply hot.

(39) P. H. asks: Is there any method by which scale can be prevented from forming on the inside of a tubular boiler? A. The means of prevention vary with the qualities of the water. Unless the nature of the impurity be known, no specific can be recommended.

(40) D. T. S. says: I have noticed that in this section the willow trees all lean to the north. Can you tell me why? A. We think it is simply indicative of the average direction of the wind. Young willows grow quite rapidly, and their yielding nature makes them very sensitive to the slightest breeze.

(41) I. H. B. asks: How can I fire a charge with a battery? A. Solder a short piece of very thin platinum wire to copper wires leading from the battery to the place where the discharge is to be effected; place the platinum wire in powder or other explosive substance, and, when the proper moment arrives, include the battery in circuit. It is doubtful if one cell will be sufficient, certainly not unless the resistance of the circuit, including that of the battery, is very low. A large bichromate cell without porous cup would answer better than a Grove.

(42) F. M. asks: Can air be heated by electricity? A. Yes.

(43) G. F. B. says: The last two batteries I have made have not been successful. I use zinc and carbon plates. My solution consisted of sulphate of mercury 1 part, bichromate of potash 2 parts, sulphuric acid 4 parts, water 15 parts. When I first put the solution in the batteries, I got a very strong current of electricity; but after 15 or 20 minutes' use, it got very weak, and, after using a few times, the batteries would not work at all. The liquid turned to a greenish color, and there was a black sediment at the bottom of the jar. What is the matter? A. Single fluid bichromate cells cannot be depended upon to furnish a steady current for any length of time. Their constancy, however, may be somewhat increased by causing air to bubble through the solution. Renew the solution, and brighten the connections.

(44) J. W. asks: 1. What is in the porous cup of a Léclanché battery? A. Peroxide of manganese. 2. If the magnet of a relay become partially magnetized, is there any way of drawing the magnetism out? A. Careful annealing is the only permanent way.

(45) J. C. L. asks: What is salt of steel? A. Probably muriate of steel, used in medicine, is intended by this term.

(46) G. W. F. says: I am building a small magnetic battery, and do not know how to arrange the wire to derive the currents from it. Can you help me? A. Make an ivory or hard rubber ring to go on the shaft, to this ring fit another of brass, and fasten the two together with screws; after which saw through the brass ring on opposite sides and in the direction of its length. The outer ends of the coils are then to be soldered to the semi-cylindrical pieces of brass, and two stiff springs, to which wires are attached for terminals, are made to press against the latter.

(47) O. P. asks: 1. Is there any metal that can be permanently magnetized? A. Yes, tempered steel. 2. How is it done? A. By enclosing it in a helix in which a powerful electric current is circulating, or by rubbing it several times from its middle point to the ends with a permanent or an electro-magnet. Care must be taken to use opposite ends of the charging magnet for the different halves of the magnets to be charged.

(48) E. G. A. asks: Are there any cases on record where lightning passed down a lightning rod, when the rod, being tested, was found to be in good order, or (in other words) its resistance was small? A. We do not recall any at this moment; but as more or less electricity continually traverses all rods, cases might be found. Sometimes a very heavy charge destroys the efficiency of the rod; the defects, however, are usually apparent in such cases.

(49) J. A. R. asks: What is the reason that in electro-silverplating the silver blisters on the work and comes off in spots? A. All deposits are apt to blister and come off when the objects are not properly cleaned. 2. Where can a work on electro-silverplating and gilding be bought? A. Works on electro-deposition are obtainable at almost any of the large bookstores. Sprague's "Electricity: Its Theory, Sources, and Application" can be recommended.

(50) C. J. M. asks: 1. Can you give a recipe for varnishing the coils (outside) of an electro-magnet? A. Shellac is good, and is often used for the purpose. 2. In laying wires under carpets or other dry places, must the wires be insulated? A. It will answer to use uninsulated wires if the ordinary battery current is employed. Such wires are, however, apt to cause much annoyance by getting together and thus interrupting the circuit.

(51) J. W. E. asks: Is there any remedy for dreaming? A. When the digestive organs are in good order, and there are no external noises or other circumstances to excite dreams, sleep is seldom disturbed in this way; but any troubles in the alimentary canal are usually accompanied by painful dreams, more or less intense. Keep your body in health, and your rest will probably be uninterrupted.

(52) F. J. asks: What ingredients can we put into flour paste, for uniting two or more thicknesses of paper, and to stand the effect of steam? A. We do not know.

(53) K. asks: Suppose that a gas, condensed by pressure to a liquid form, is cooled by a refrigerating mixture to a considerably lower point than another quantity of gas likewise condensed, but which is at the ordinary temperature of the surrounding atmosphere. Will the first or cooled gas in expansion possess an appreciably greater capacity for absorbing caloric than the non-refrigerated gas? A. The gas which had undergone the greatest refrigeration would, upon the expansion to its original volume, absorb the greatest amount of heat, other things being equal.

(54) F. M. asks: What roots are used in medical practice, which have the property of giving a jet black color? A. Extract of logwood, walnut peels and shells, copperas and nutgalls are employed for staining black. We know of no single root that will give a satisfactory black stain.

(55) K. says: I saw in a recent issue of your valuable paper an answer to a correspondent who wished to obtain a colorless solution of salt of copper. If he will take strong *aqua ammoniæ*, and place it with copper chips in a bottle, in a short time he will have a salt of copper in solution which, while exposed to the action of air, will be of a fine blue color, but, upon corking the bottle airtight, in a few hours will become colorless, until again exposed to the air, and so on. A. Our observations with regard to the ammonio-cupric oxide do not sustain yours.

(56) W. K. asks: Can lighting gas be made from nightsoil and dead animals, the gas be ing used, and the residue employed for fertilization? A. We think the gas would not be rich enough in hydrocarbons to be employed, and the residue would probably be badly carbonized.

(57) J. O. M. asks: Why are bricks made in Philadelphia so much richer in color than those made in Albany? A. It is due to the large proportion of red oxide contained in the material.

1. How is red oxide of lead made? A. It is obtained by roasting litharge at a temperature of about 500°, in contact with the air. 2. How is red oxide of iron made? A. The coarse pigment is obtained by pulverizing and igniting the red or brown hematite. The finer grades are prepared by precipitation of a solution of ferric sulphate or chloride with excess of ammonia, and washing, drying, and igniting the yellowish-brown hydrate thus produced.

(58) S. S. S. asks: What is the most durable paint to put on a steam pipe? A. There is a black varnish, made from petroleum, which answers as well as anything of which we have knowledge. We have received so many inquiries on this subject that we think it would be well for manufacturers of this varnish to advertise in our columns

(59) S. H. B. says: 1. I want to make a steam engine boiler, to be 3 inches by 4 inches and 6 inches long. Would copper nearly as thick as cardboard do for the boiler? A. Yes. 2. Would a mixture of zinc and pewter do for the cylinder? A. Yes. 3. Is there any danger of a boiler bursting that is made of such copper? A. You should put in a safety valve. 4. Please explain how the steam gets from steam chest to cylinder. A. Through an opening or port, over which the valve moves. 5. How large must I make the different parts of the engine? A. Get a good drawing of an engine, and proportion the parts from that.

(60) F. D. says: 1. I have invented a tool for breaking slag in furnaces, and wish to know where it can be put to a very severe test. A. Take it to an iron foundery. 2. Is there much clinker formed in the furnace of steamers, and how is it removed? A. With some kinds of coal a great amount of clinker is formed. It is generally removed with a slice bar.

(61) P. L. V. H. says: My son, aged 19, is desirous of becoming a skillful engineer in the merchant marine; he has worked at the machine business some two years, is well up in mathematics, understands the theory of the steam engine, both marine and land, and can furnish testimonials as to characterand ability. What course should he take to become fitted for the position of chief engineer on one of our large ocean steamships? A. His best plan will be to enter the merchant service in as good a position as he can obtain, and work his way up.

(62) R. K. asks: Is there a machine for carrying sand from a river bank to a boat at a distance from the shore? A. There is a sand pump in the market, working on the principle of the steam siphon. Such pumps were used in making the excavations for the Brooklyn bridge.

(63) W. Y. says: A friend says that when an engine is on the center the live steam port should be open. I say it should be shut. Who is right? A. Ordinarily it is advisable to have the steam port slightly open when an engine is on the center. This is called giving the valve steam lead. 2. He says that the right name for the crank pin is the wrist. I say the crank pin is correct. Who is right? A. Both terms are correct, that is to say they are both sanctioned by general usage. The term wrist pin, however, is more general in its application than crank pin.

(64) E. N. says: I have run a stationary engine for 13 years, but have no certificate. What should I have to pass an examination in to obtain one? A. It will depend upon the local laws of your State. Apply to an inspector.

(65) R. W. asks: 1. What is the proper area of steam passages for small engines up to 6 inches diameter? A. Make the area of your ports one eighth that of the cylinder. 2. When the diameter of cylinder, stroke of piston, and pressure are given, by what rule do you determine the number of revolutions which an engine ought to make? A. Calculate this from the duty to be performed. See p. 33, vol. 33.

(66) H. J. E. asks: I. How should wax be prepared for waxing stove patterns, and how should it be applied? A. Get the best beeswax; then slightly heat the castings, and rub them over with the wax, wiping off the surplus wax with a piece of soft rag.

(67) T. P. says: 1. I have to use a round cast iron sleeve, 9 inches long and 2¼ inches in diameter, with a square 1¼ inch hole through the center of the same. The foundery where I now get my castings uses common sand or clay cores, which leave the corners of the holes rough. The holes must be smooth and straight. Baked cores are liable to warp. Is there not some better plan? A. Have the sand cores faced with plumbago. 2. Could an iron bar be prepared and used as a core, and yet come out of the casting when cold? A. An iron bar cannot be used.

1. How can I polish steel by hand? A. After fine filing, use emery cloth, then crocus, and finally rouge or polishing powder. 2. Is there any liquid used after polishing? A. No.

(68) B. F. S. asks: How shall I fill and polish church pews of ash, trimmed with walnut? A. The best way is to French polish them. See p. 11, vol. 32.

(69) P. D. says: In "Practical Mechanism," Joshua Rose says, of the boring bar with the adjustable cutter head, that it will bore a round hole, even though the bar may run out of true by reason of either or both of the centers being misplaced, or even though the bar itself may have become bent in its length. I should infer from this that he means to say that any other form of a boring bar would bore an oval or other irregular hole in similar circumstances. I claim that no form of boring bar will bore an unround hole by reason of being bent in its length or running out of true. The cutter that is farthest from the center will do all the cutting, but at the same time it will describe a true circle. A. A boring bar with a fixed head will bore a round hole whether the bar runs out of true or not, providing the carriage carrying the work travels in a line with the center line between the centers on which the bar revolves: but if the bar runs out of true with the shears (as in case the back center of the lathe is set to one side), the hole bored will be oval, although the cutters revolve in a circle.

(70) C. F. asks: How can I extract the gold from emery paper which has been used to polish gold? A. If the paper be treated with a little mercury, the latter will remove all the gold, with which it forms an amalgam. If this amalgam be subjected to a strong heat in a small iron retort (the beak of which or its connection should dip beneath the surface of some cold water,) the mercury will be vaporized, and, distilling over, be condensed in the water, leaving the gold behind in the retort. Avoid inhaling the mercurial vapor. It is very pernicious.

(71) F. H. F. asks: Please give me a rule for laying out eccentric gearing. A. Find the center of the hole in the eccentric, and then set the compasses to within half an inch of the extreme circumference of the eccentric part, and mark a line clear across; then find the center of that line, and draw a line from it to the center of the shaft hole, which line will be the throw line, on which a center should be marked at a distance of half the required amount of valve travel, measuring from the center of the eccentric hole; and from these centers mark circles of the required diameters to suit the shaft and the strap. All the marking should be done on the plain and not on the hub side of the eccentric.

(72) D. S. C. asks: How can I mix aniline red to put on leather, so that it will not turn dark when it is varnished with shellac? A. The darkening of color is probably due more to the substances used in tanning the leather than to the varnish. The common solvent is a mixture of equal parts alcohol and water.

(73) F. L. H. says: There is a gentleman at this place who uses old kerosene barrels to put cider in. He claims that a little cider will cleanse the vessel thoroughly, after which it can be used for packing pork and other things, without causing them any injury. The cider seems to have an action on the oil, if added to a portion in a bottle. Please tell me the chemical action by which this result is obtained. A. If this method is successful, it probably depends upon the slight solubility of the oil in the small percentage of alcohol contained in the cider.

(74) A. K. says, in reply to G. A. F.: It is very likely that calamine has been found in Oregon, as carbonate of zinc occurs very frequently in that Territory. But only a wet analysis will determine it.

(75) J. G. says, in answer to C. A.'s query as to the force of gravity deviating the ball from its direction of projection: This is always so, except when that direction is vertical. In firing at any object out of a vertical line, a certain amount of elevation must be given to make up for the distance through which the ball will fall (on account of its weight) between the instants of leaving the barrel and striking the object.

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

B. C.—It is Prussian blue.—T. L.—It is red hematite, a good iron ore, but it contains considerable silex.—W. P. C.—The name of the plant is *apios tuberosa*, a genus in the natural order *leguminosæ*. Its common name is ground nut or wild bean. The tubers are edible, but their value as food has not been determined. The brown-purple flowers are fragrant, and the plant is quite common in moist thickets in New Jersey.—L. B. D.—It is a fine crystal of sulphuret of lead or galena.—H. W. C.—It is lead ore of good quality.

J. P. O'C. says: I am tending a steam hammer, the weight being 4,000 lbs., including drop and piston. The inside diameter of the cylinder is 18 inches, and the hammer has a drop of 3½ feet. How many lbs. will it strike without steam on top, and how many lbs. will it strike with 90 lbs. of steam to the inch? —C. E. B. says: A roller weighing 112 lbs. is supported on an inclined plane, the gradient of which is 1 foot in 2, by a force which acts along its slope. What is the magnitude of this force, and what is the pressure on the plane, friction not being taken into account?

COMMUNICATIONS RECEIVED.

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

On the Interstellar Space. By ——, and by T. H.

On Whistling. By H. B. N.

On the Washington Monument. By J. M.

On Skinning the Rhinoceros. By N. G. P.

Also inquiries and answers from the following:

A. N.—R. K. McM.—R. W.—C. J. J. R.—C. D. B.—J. G. B.—J. J. R.—W. A. H.—R. F. R.—T. M. C.—T. V.—W. M.—C. P. H.—J. O'B.—H. J. R.—P. & K—D. M.—C. D. B.

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; "Whose is the best foot power scrol. saw? Who sells books on pottery, glass, etc.? Whose is the best machine for making wood screws? Who sells steam engine indicators? Whose is the best ice machine?" 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

October 26, 1875,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alarm, electric. J. T. Bedford........ 169,077
Alarm and fastener, burglar, J. J. Woolsey...... 169,220
Alarm, burglar, C. and J. Bonanon........ 169,137
Alarm, burglar, J. A. Weed........ 169,214
Album, photograph, C. D. Mosher........ 169,186
Anch r tripper, E. Robbins........ 169,193
Annealing metals, J. H. Warrington........ 169,320
Antiseptic composition, H. Gahn........ 169,094
Auger, earth, J. Minick........ 169,115
Basket bottom, S. H. Wheeler........ 169,217
Bath, portable vapor, G. W. Brosius........ 169,142
Bedstead fastening, S. D. Butler........ 169,235
Bedstead, invalid, A. J. Goodwin........ 169,099
Billiard table levelers, A. J. Michel........ 169,281
Binder, temporary, W. H. Bennett........ 169,136
Bird cage, D. F. Burns........ 169,145
Bit gage, A. B. Batson........ 169,075
Blind, inside, T. Fetherston........ 169,247
Blind slat operator. W. Strunk........ 169,127
Boiler incrustation compound, J. M. Wishart... 169,219
Boiler, tubular, I. Barton........ 169,225
Bottle opener, etc., Kiehl and Kohler........ 169,175
Box, wooden, Rosborg and Kawan........ 169,297
Brick machine, H. Sea........ 169,197
Buckle, harness, J. C. Smither........ 169.200
Building, metallic frame for, E. Gruwe........ 169,101
Bung and vent, H. B. Cornish........ 168,150
Burner, lamp, J. H. Fouch........ 169,161
Butter package, A. Robinson........ 169,292
Buttons, ornamenting, R. H. Isbell........ 169,268
Caddy, tea, R. Mainer........ 169,113
Calcium light, N. H. Edgerton........ 169,244
Can, oil, Kuessner and Breuer........ 169,.09
Can opener, R. Smith........ 169,202
Car axle lubricator, J. D. Stark........ 169,203
Car coupling, J. Harris........ 169,169
Car coupling, F. L. Small........ 169,304
Car coupling, J. B. Smith........ 169,201
Car wheel chill, W. Wilmington........ 169,325
Car window, railroad, A. Brandon........ 169,140
Cars, lighting railway, J. Story........ 169,126
Carbureter, H. J. Hyams........ 169.105
Carriage jack, Z. McDonald........ 169,279
Carriage painter's jack, G. A. Brice........ 169.082
Carriage seat, S. Gilzinger........ 169,256
Carriage wheel, I Kester........ 169.272
Casting door plates, mo d for, Dodge and Smith. 169,154
Castings, making patterns for, W. E. Craig...... 169,151
Castings, making. W. Harnsworth........ 169,261
Cement, composition for, R. Warwick........ 169.212
Chair, rocking, A. Best........ 169,228
Chair, rocking, J. H. Travis........ 169,314
Cigar mold, H. Voltz........ 169,207
Cigar mouth piece, C. Reinisch........ 169,119
Cistern filter, etc., W. B. Wilson........ 169,130
Clasp for wearing apparel, E. Osgood........ 169,285
Cloth-winding machine, S. C. Dickinson........ 169,240
Compre s, hydraulic, E. D. Meier........ 169,280
Concrete articles, mold for, R. B. Lanum........ 169,178
Cooler, lard, J G. C. Lee........ 169,180
Cooler, milk, W. R. Scofield........ 169,196
Corn marker, T. B. Kirkwood........ 169,177
Cornstalk cutter. S. Bean........ 169,134
Corset, J. W. Askie........ 169,131
Corset, S. B. Ferris........ 169,159
Cotton chopper, McMeekin and Hunt........ 169,185
Cotton, ginning, etc., J. L. Toole........ 169,206
Cradle, E. F. Gazzam........ 169,253
Cradle, J. Sprengard........ 169,123
Curtain fixture, H. L. De Zeng........ 169,090
Curtain fixture, W. H. Sparks........ 169,303
Cuspadores, etc. ornamenting, C. M. Lyon...... 169,278
Cutter bit, A. Streit........ 169,204
Cutter head, S. P. Randolph (r)........ 6,717
Door hanger, E. U. and W. L. Scoville (r)........ 6,718
Door spring, D. R. Lewis........ 169,110
Double tree clip, W. Beckert........ 169,135
Doubling machine, T. Unsworth........ 169,215
Dovetailing machine, L. Atwood........ 169,132
Dredging bucket, C. J. Sands........ 169,299
Drill, ratchet, G. Hayden........ 169,262
Drill, rock, W. R. King (r)........ 6,716
Drill, rock, Seddon and McFaul........ 169,121
Drying apparatus, J. S. Rogers........ 169,194
Eggs, desiccating, W. O. Stoddard........ 169,311
Elevator, water, J. H. Van Dyck........ 169,316
Embossing machine, S. Rogerson........ 169, 29
Engine governor, marine, Briggs and De Peu.... 169,141
Engine, rotary steam, J. C. Johnson........ 169.269
Engine, steam, S. B. Frank........ 169,219
Faucet, W. C. North........ 169,284
Feather duster, J. L. Little........ 169.276
Feed cutter, R. J. Wylie........ 169,221
Fire arm, magazine, A. Burgess........ 169,082
Fire arm handle, A. Trenkmann........ 169,311
Fire dog, D. S. Hale........ 169,166
Fire escapes, folding stair for, T. Garrick........ 169,096
Fishing rod, H. L Leonard........ 169,18
Fluting machine, C. Schneider........ 169,301
Furnace grate, H. W. Granger........ 169,259
Gaiters, button, A. Kenny........ 169,271
Game apparatus, revolving, J. W. Cameron...... 169,085
Game counter, Fey and Pein........ 169,160
Garter, Blakesley and Wright........ 169,221
Gas apparatus, R. H. Ramsey........ 169,299
Gas, illuminating, J. W. Beatley........ 169,326
Glass, manufacture of, J. H. Hobbs........ 169,103
Grain binders, J. Garrard........ 169,251, 169,252
Grain binder, J. F. Gordon........ 169,258
Grain drill feed, E. Morgan........ 169,283
Harness mountings, covering, J. Feder........ 169,158
Harrow teeth, H. M. Williams........ 169,324
Harvester, J. M. Chritton........ 169 088
Harvester, C. W. Levalley........ 169,275
Heater and boiler, T. H. Harrington........ 169,167
Heater, feed water, Andrus & Wallace........ 169,074
Heating apparatus, smoke stack, T. B. Field,.... 169,093
Heel-trimming machine, L. G. Clock........ 169,149
Hook and eye, J. C. Howells........ 169,267
Hook, snap, C. B. Bristol........ 169,234
Horse power, W. I. Grant........ 169,164
Horseshoes, ice nail for, H. M. Patterson........ 169,286
Hose, preparing animal, E. Bauer........ 169,076
Hydrant, Pease & Campbell........ 169,288
Indicator, revolution, C. H. Phinney........ 169,117
Inkstand, S. Darling........ 169,152
Ironing apparatus, R. H. Gardner........ 169,250
Jack for pressing, etc., M. J. Walsh........ 169,319
Journal box, P. Durns........ 169,243
Key hole guard, La Blanc *et al*........ 169,178
Kiln, drying, D. Bonnell........ 169,230
Ladder, Case & Read........ 169,236
Lamp, G. W. Vernon........ 169,318
Lamp extinguisher, J. G. Hehr........ 169,263
Lamp-lighting apparatus, H. Iden........ 169,173
Lamp trimmer, H. L. De Zeng........ 169,091
Lock, seal, A. T. Boon........ 169,231
Loom, hand, J. E. Gillespie........ 169,098
Loom stop motion, Kent & Moore........ 169,108
Loom, swivel shuttle, J. Fish........ 169,248
Lounge, folding, N. H. Borgfeldt........ 169,138
Lubricator, W. P. Stephenson........ 169,124
Marble, artificial, W. C. A. Roettger........ 169.294
Marking wheel, H. Holt (r)........ 6,714
Mashing and cooling, G. E. Ellenberger........ 169.156
Match safe, E. H. Whitney........ 169,129
Match sticks, cutting, J. S. Fagley........ 169,246
Millstone spindle trammer, A. Eshelman........ 169,157
Mop and brush holder, A. P. Seymour (r)........ 6,719
Mowing machine, D. H. Gage........ 169,162
Oar, W. Lyman........ 169.277
Oil, apparatus for reducing crude, W. C. Parker. 169,189
Oiler, S. S. Newton........ 169,187
Ore, treating quicksilver, J. P. Sieveking........ 169,198
Organ, octave coupler, S. J. Crockett........ 169,089
Packing box and crate, H. M. Simons........ 169,303
Packing, piston, C. R. James........ 169,174
Padlock, B. Wallmann........ 169,211
Pan, cake, F. G. High........ 169.264
Paper tube machine, N. Keely........ 169,107
Pencil, colored copying, G. Schwanhausser........ 169,195
Planter, corn, B. King........ 169,176
Planter, corn, A. M. Southard........ 169,370
Planter, seed, J. W. Simpson........ 169,122
Plastering safety plate, G. A. Thurston........ 169,128
Plow attachment, G. M. Todd........ 169,313
Plowshare die, etc., W. M. Watson........ 169.213
Postage stamp, C. F. Steel........ 169,125
Power, motive, Brettel & Lindsey........ 169,233
Press, cotton, D. S. McBryde........ 169,183
Press, cotton, McMeekin & Hunt........ 169,184
Printing press, C. Wells........ 169,321
Printing press bearing, Potter & Hubbard........ 169,191
Propeller wheel, N. A. Patterson........ 169,287
Pulley or gear wheel, J. B. Mason........ 169,114
Pump box, J. Dillon........ 169,092
Pump bucket, E. J. Dunbar........ 169,155
Purifier, middlings, M. Sower........ 169,3.8
Railway, elevated, J. Westcott........ 169,322
Railway joint fastening, L. Chilson........ 169,237
Railway rail joint, G. E. Dering........ 169,239
Railway rail joint, W. H. Hornum........ 169,266
Railway rail joint, W. H. Robinson........ 169,293
Railway switch, W. L. Lamborn........ 169,274
Ratchet wheels, click for, E. H. Perry........ 169,190
Refrigerator, E. S Bitner........ 169,078
Refrigerators, E. B. Smith........ 169,305, 169,306
Revolvers, safety catch for, C. W. Hopkins (r).. 6,715
Saddles, stirrup for riding, J. C. Wagstaff........ 169,209
Sash fastener, C. L. Alexander........ 169,222
Saw set, W. Burgess........ 169,144
Sawing machine N. M. Miller........ 169,282
Scaffold, traversing, D. R. Kelly........ 169,270
Screw taps, machine for cutting, H. Boyd........ 169,080
Scythe snaths, bending, Russel & Birner........ 169,120
Seed and guano distributer, A. H. Simms........ 169.199
Sewing button holes, J. T. Jones........ 169,106
Sewing machine caster, T. B. Garretson........ 169,097
Sewing machine, bag, H. P. Garland........ 169,163
Sewing machine table, R. H. St. John........ 169,310
Sewing machine driver, J. Bolton........ 169,079
Shirt, C. M. and J. C. Ball........ 169,133
Skins, dressing, R. Hart........ 169,102
Smoke stack heating apparatus, T. B. Field...... 169,093
Smut machine, D. Pease........ 169,289
Socket coupling, A. S. Wadleigh........ 169,208
Soldering process, M. A. Richardson........ 169,192
Sole fastenings, nail for, L. Goddu........ 169,257
Spinning machine, J. P. Hillard........ 169,170
Spirit level, and straight edge, J. G. Ralph...... 169,290
Spoon holder, Babbitt & Beach........ 169,224
Stair for fire escapes, folding, T. Garrick........ 169,096
Stamp, perforating, W. G. Brown........ 169,143
Stench trap, dry, J. H. Boschen........ 169,232
Stone, artificial, W. H. Whittemore........ 169,218
Stove, H. E. Spurrier........ 169,205
Stove and furnace, P. Klotz........ 169,273
Stove bracket, wire, Randall & Newton........ 169,118
Stove, heating, Z. Hunt........ 169,172
Stove, heating, W. F. Ross........ 169,298
Stove, heating, J. Van........ 169,317
Stove pipe shelf, J. Christy........ 169,147
Stove, reservoir cooking, E. Card........ 169,086
Sugar cooling and draining, J. G. Angell........ 169,223
Suspender, S. K. Ellis........ 169,245
Syringe, W. P. Clotworthy........ 169,238
Telegraph, fire alarm, S. Chester........ 169,087
Tire upsetting machine, W. Holdsworth........ 169,265
Tobacco hanger, T. B. Garr........ 169,095
Track clearer, J Doman........ 169,241
Tray for beer glasses, etc., J. Novinsky........ 169,188
Trunk, A. V. Romadka........ 169,296
Turbine wheel, T. H. Clark........ 169,148
Type casting and setting, C. S. Westcott..169,215, 169,216
Umbrella runner, J. M. Burkert........ 169,081
Vehicle axle, G. Beck........ 169,226
Vehicle runner, attachable, I. & W. G. Pettis... 169,116
Vehicle springs, S. Gilzinger........ 169,254, 169,255
Vehicle rubber tyre, G. A. Greene........ 169,100
Velocipede, F. S. Seagrave........ 169,302
Ventilating buildings, L. R. Satterlee........ 169,300
Wagon, dumping, D. E. Davis........ 169,153
Wagon, dumping, A. A. Hoch........ 169,171
Wagon, infant's parlor, B. J. Harrison........ 169,168
Wagon spring, W. F. Whitney........ 169,323
Wash tub wringer, A. W. Caldwell........ 169,146
Washer, steam, M. Howe........ 169,104
Washers, machine for spring, J. W. Grover........ 169,260
Washing machine, P. A. Downer........ 169,242
Washing machine, P. Lieber........ 169,111
Water wheel, A. W. Haag........ 169,165
Water wheel, reversible, A. W. Lindley........ 169,112
Wind wheel, A. J. Beckley........ 169,227
Windlass, J. P. Manton........ 169,182
Window screen H. B. Walbridge........ 169,2.0
Wire feeding mechanism, R. L. Brewer........ 169,081
Yarns, tufted, H. Bottomley........ 169,139

DESIGNS PATENTED.

8,747.—CARPETS.—J. Barrett, New York city.
8,748.—GASELIERS.—C. Herter, New York city.
8,749 to 8,752.—EMBROIDERY PATTERNS.—W. Steinhaus, New York city.
8,753 and 8,754.—CROCHET PATTERNS.—W. Steinhaus, New York city.
8,755.—INKSTANDS.—S. J. Van Stavoren, Philadelphia, Pa.
8,756 to 8,758.—SHIRT STUDS.—L. S. Beals, Astoria, N. Y.
8,759.—DOOR PLATE.—J. Capron, New York city.
8,760.—BOOT WEBBING.—J. A. Greene, North Kingstown R. I.
8,761.—SHOE FRONTS.—C. Merritt, South Weymouth, Mass.
8,762.—SHELF BRACKETS.—E. J. Steele, Westville, Conn.
8,763.—ALBUM COVER.—W. Wallach, New York city.

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 for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

October 30 to November 2, 1875.

5,297.—J. B. Slichter, Kalamazoo, Mich., U. S. Elastic paint compound. Oct. 30, 1875.
5,298.—J. B. Slichter, Kalamazoo, Mich., U. S. Fire-proof roofing cement. Oct. 30, 1875.
5,299.—J. B. Slichter, Kalamazoo, Mich., U. S. Fire-proof paint compounds. Oct. 30, 1875.
5,300.—J. H. Tackabery, East Tilbury, Ont. Spring buggy top. Oct. 30, 1875.
5,301.—W. C. Peel *et al.*, Springfield, Ohio, U. S. Dash boards for vehicles. Oct. 30, 1875.
5,302.—F. J. Wallace, Waterloo, Iowa, U. S. Mill dam. Oct. 30, 1875.
5,303.—W. D. Bartlett, Amesbury, Mass., U. S. Heater furnace. Oct. 30, 1875.
5,304.—W. Goodwin, Liverpool, Eng. Machine for the transfer of grain, etc. Oct. 30, 1875.
5,305.—J. J. Catling, London, Ont. Draft stops for bottoms of doors. Oct. 30, 1875.
5,306.—I. R. Venners *et al.*, Cumberland, Md., U. S. Machine for rolling tapered bars. Oct. 30, 1875.
5,307.—R. Winder, Bolton, Eng. Type-composing machinery. Oct. 30, 1875.
5,308.—D. C. Taylor *et al.*, Brooklyn, N. Y., U. S. Water meter. Oct. 30, 1875.
5,309.—J. W. Branch, St. Louis, Mo., U. S. Fitting diamonds in holders, for working in stone. Oct. 30, 1875.
5,310.—G. D. Belcher, Springfield, Mass., U. S., *et al.* Boat-detaching apparatus. Oct 30, 1875.
5,311.—J. B. Dixwell, Boston, Mass., U. S. Steam engine. Oct. 30, 1875.
5,312.—J. C. Spencer *et al.*, Montreal, P. Q. Stench trap. Oct. 30, 1875.
5,313.—A. Oat, Oswego, N. Y., U. S. Churn. Oct. 30, 1875.
5,314.—W. A. Stephens, Succasuna Plains, N. J., U. S. Making wrought iron direct from the ore. Oct. 30, 1875.
5,315.—T. Thornton, Saltburn, Eng. Door and gate closer. Oct. 30, 1875.
5,316.—S. Wallace, Seaforth, Ont. Double cheese box. Oct. 30, 1875.
5,317.—G. P. Reeves, Helena, Mon. Ter., U. S. Lacer. Oct. 30, 1875.
5,318.—G. M. Fuller, Holyoke, Mass., U. S. Machine for making water, gas, and sewer pipes. Oct. 30, 1875.
5,319.—R. Gill, Antwerp, N. Y., U. S. Fence post. Oct. 30, 1875.
5,320.—C. A. Chamberlin, Camden, N. J., U. S. Chain cable. Oct. 30, 1875.
5,321.—J. Smale, Exeter, Ont. Seamless shoe. Nov. 2, 1875.
5,322.—R. Sutherland, Shelburne, Ont. Machine for churning. Nov. 2, 1875.
5,323.—E. E. Hargreaves, Sarnia, Ont. Exhaust fan. Nov. 2, 1875.
5,324.—J. W. Lefferts, Baltimore, Md., U. S. Shoe-sole edge trimmer. Nov. 2, 1875.
5,325.—C. E. Hill, New York city, U. S. Structure for piers, wharves, foundations, etc. Nov. 2, 1875.
5,326.—D. M. Richardson, Detroit, Mich., U. S. Machine for scouring wheat, etc. Nov. 2, 1875.
5,327.—H. Fowler, Detroit, Mich., U. S. Machine for cutting hoops. Nov. 2, 1875.
5,328.—W. H. Seymour, Johnstown, N. Y., U. S. Scaffold clamp. Nov. 2, 1875.
5,329.—G. B. Thurber, Upton Station, P. Q. Oscillating water and air pump. Nov. 2, 1875.
5,330.—W. D. S. Moncrieff, Glasgow, Scotland. Locomotive car for tramways. Nov. 2, 1875.
5,331.—W. H. Milliken, Sacramento, Cal., U. S. Traction engine. Nov. 2, 1875.
5,332.—J. Elliott, Kittering, Eng. Sewing machine needle. Nov. 2, 1875.
5,333.—W. P. Widdifield, Siloam, Ont. Car brake. Nov. 2, 1875.
5,334.—P. Fitzgibbons, Oswego, N. Y., U. S. Tube expander. Nov. 2, 1875.
5,335.—A. Crosby, New York city, U. S. Machine for cleaning flues. Nov. 2, 1875.
5,336.—P. Cook, Detroit, Mich., U. S. Machine for cutting hoops. Nov. 2, 1875.
5,337.—F. W. Bartlett, Buffalo, N. Y., U. S. Generating and purifying ozone. Nov. 2, 1875.
5,338.—C. A. Henmicke, Mitchell, Ont. Bending stuff for making swell side cutters. Nov. 2, 1875.
5,339.—D. Cameron *et al.*, Galt, Ont. Rotary bed wood planing machine. Nov. 2, 1875.
5,340.—J. H. Connor, Brockville, Ont. Washing machine. Nov. 2, 1875.
5,341.—F. J. Chubb, Guelph, Ont. Lime kiln. Nov. 2, 1875.
5,342.—R. M. Eames, Albany, N. Y., U. S. Process for the reduction of ores.
5,343.—E. E. O. Warner *et al.*, De Kalb, Ill., U. S. Baking pans. Nov. 2, 1875.
5,344.—T. Booth, Toronto, Ont. Pipe wrench. Nov. 2, 1875.
5,345.—W. Burrows, New York city, U. S. Ornamental stoves. Nov. 2, 1875.
5,346.—J. Yocom, Dunville, Ont. Combination wrought iron plow beam. Nov. 2, 1875.

WANTED—We desire in every city and county an agent for the exclusive sales of a staple article in the grocery line. Energetic men with little capital may make $5,000 per annum. Address, with stamp, EUREKA M'F'G CO., 260 Washington St., New York.

CENTENNIAL DRILL CHUCK— Warranted perfect and durable. Holds 1-64 to 1-2 in. Sent by mail on receipt of price, $4.25. Send for new reduced List of Chucks. A. F. CUSHMAN, Hartford, Conn.

CARPENTER'S MANUAL.

A practical guide to use of all tools and all operations of the trade; also drawing for carpenters, forms of contracts, specifications, plans, &c., with plain instructions for beginners, and full glossary of terms used in the trade. Illustrated, 50 cts. of booksellers, or by mail. JESSE HANEY & CO., 119 Nassau St., N. Y.

PAINTER'S MANUAL.

House and sign painting, graining, varnishing, polishing, kalsomining, papering, lettering, staining, gilding, &c., 50 cts. Book of Alphabets, 50c. Scrolls and Ornaments, $1. Watchmaker and Jeweler, 50c. Soapmaker, 25c. Taxidermist, 50c. Hunter and Trapper's Guide, 20c. Dog Training, 25c. Of booksellers, or by mail. JESSE HANEY & CO., 119 Nassau St., New York.

"Goodrich's" Sewing Machine Attachments pay an agent better than any thing in the market. EASTERN OFFICE, 103 N. 10th St., Phila., Pa.

AGAIN to the front with the best business for AGENTS

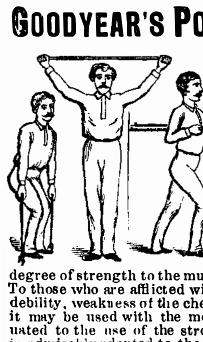
LAST SEASON our Agency business surpassed all others. It amounted to a quarter million of dollars. Many Agents laid up from two to three thousand dollars each, in a few months. The reason: new features, embracing several large additional profits unusual in this kind of work.

THIS SEASON the money-making chances are doubly improved! To show our good faith we guarantee Agents against all losses. Not one cent is risked. Lose quick. Send two 3c. stamps for valuable specimens, liberal terms, &c. Address: THE ILLUSTRATED WEEKLY New York, Boston, Chicago, or Atlanta, Ga.

NEW & SECOND HAND WOOD WORKING Machinery, Floorers, Planers and Matchers, Single and Double Surfacers, Moulding Machines, Scroll Saws, Suction and Blast Fans for Shavings, etc. D. J. LATTIMORE, 31st and Chestnut St., Philadelphia, Pa.

MANUFACTURER OF FIRST CLASS TAPS, Pawtucket, R. I.

GOODYEAR'S POCKET GYMNASIUM.



The Most Complete System OF PHYSICAL EXERCISE Ever Devised for Home Practice.

The following are a few of the advantages derived from the use of the Pocket Gymnasium: It calls into direct action all the muscles in the upper part of the body, and chiefly those which are generally neglected by persons of sedentary habits. It corrects the stooping posture so frequently noticed in young persons, and imparts a uniform degree of strength to the muscles supporting the spinal column. To those who are afflicted with dyspepsia, indigestion, nervous debility, weakness of the chest, lung and liver complaints, etc., it may be used with the most gratifying results. It is graduated to the use of the strongest man or the weakest child; is admirably adapted to the use of invalids and convalescents, where gentle exercise is desirable. To ladies and children especially, the exercise will be found of the most invigorating character. It is highly recommended by leading physicians and all those who have made the subject of physical exercise a study.

PRICE LIST.

No. 1. For Children 4 to 6 years, $1.00. No. 2. For Children 6 to 8, $1.10. No. 3. For Children 8 to 10, $1.20. No. 4. For Children 10 to 14, $1.30. No. 5. For Ladies and Children 14 years and upward, $1.40. No. 6. For Gentlemen of moderate strength, $1.50. No. 7, $2.00. Complete set of seven, $9.00. No. 7 is fitted with a screw-eye and hook to attach to the wall or floor. Two of this size properly arranged make a Complete Gymnasium. Sent post-paid upon receipt of price. Address,

GOODYEAR RUBBER CURLER CO.,
P. O. Box 5,156. 697 Broadway, New York.

Hoosac Tunnel Machinery FOR SALE.

Steam Engines and Boilers, Burleigh Compressors and Rock Drills, Hoisting Machinery suitable for Mines, Flange Pipe various sizes, from 12 to 3 inches dia., Cornish & Steam Pumps, one Contractor's Locomotive, Lathes, Drills, Planers, and Bolt Cutters. Rubber Hose Drill Steel, &c. Address THOS. ROSS, Rutland, Vt.

THE Bigelow Engine,

The Cheapest and Best Portable Engine offered to the Public.

Price, 4 Horse Power........$300
" 6 " " 400
" 7 " " 475
" 8½ " " 540
" 12 " " 725
" 15 " " 800

Price of Stationary Engines:

4 Horse Power............$150
6 " " 175
7 to 8½ Horse Power........ 225
12 to 15 " " 300

Send for Illustrated Circular and Price List.

H. B. BIGELOW & CO., New Haven, Conn.

WANTED, BY COMPETENT MECHANICAL Draughtsman, accustomed to marine and general work, re-engagement. Address CHS. ROHN, Edge Moor Iron Works, Wilmington, Delaware.

The HOADLEY PORTABLE STEAM ENGINE. WITH AUTOMATICAL CUT OFF REGULATOR AND BALANCED VALVE

STATE WHERE YOU SAW THIS

THE BEST AND MOST ECONOMICAL ENGINE MADE
SEND FOR CIRCULAR
THE J.C.HOADLEY CO. LAWRENCE, MASS.

CLARK & COMPANY'S PATENT SELF-COILING, REVOLVING STEEL SHUTTERS

Can be readily fitted to Store Fronts, Rear Windows or other openings, making them FIRE AND BURGLAR PROOF, and affording absolute protection; also, WOOD SHUTTERS in various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions. Clark's shutters are self-acting, require no machinery or balance weights, and cannot get out of order. They are handsome in appearance, and are the best and cheapest shutters in the world. Are fitted to the new *Tribune* Building, Delaware and Hudson Canal Building, Manhattan Building, Lenox Library Building. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the leading architects of the world. JAMES G. WILSON, Manager, 218 West 26th St., New York, AGENTS WANTED. and at London, Paris, Vienna, Berlin, Melbourne, &c., &c.

$5 to $20 per day at home. Samples worth $1 free. STINSON & Co. Portland, Maine.

The TOLL-GATE! Prize Picture sent free! An ingenious gem! 50 objects to find! Address with stamp, E. C. ABBEY, Buffalo, N. Y.

Brainard Milling Machines all styles and sizes. A new *Universal* Milling Machine for $200. Also Brown's Pat. SCREW MACHINES, and our new Brainard STEEL BAR VISE. B. M. M. CO., 131 Milk St., Boston, Mass.

PATENT SCROLL SAWS.

Our specialty is Scroll and Band Saws. Over 300 Machines in use. SUPERIOR TO ALL AND LESS PRICE. CORDESMAN, EGAN & CO., Cor. 2nd & Central Ave., Cincinnati, O.

VINEGAR HOW MADE IN 10 HOURS from Cider, Wine or Molasses, without using drugs. Address F. I. SAGE, Vinegar Maker, Springfield, Mass.

GARDINER'S PATENT Centring AND Squaring Attachment, FOR LATHES. Address, R. E. STATE, SPRINGFIELD, O. SEND FOR CIRCULAR AND PRICE-LIST.

DISTINS BAND INSTRUMENTS— BOOSEY & CO., Sole Agents, 32 East 14th Street, New York.

TO ENGINEERS, MACHINERY MANUFACTURERS, Tool Makers, Patentees and others—The undersigned influential and well established firm, carrying on business in Melbourne, the principal of which has had over 20 years' experience in the Australian Colonies, and which has a large and extended connection, is willing to undertake the sole agency in the above Colonies for the sale of all classes of Engines, Agricultural Machinery, Engineers' Tools, Mechanical Inventions and Patents, and also to transact every description of business in this class. Highest references given. DAVID MUNRO & CO., 154 Queen Street, Melbourne.

$250 A MONTH—Agents wanted everywhere. Business honorable and first class. Particulars sent free. Address J. WORTH & CO., St. Louis, Mo.

$10 to $500 INVESTED in Wall Street often leads to fortune. A 72 page book, explaining everything, and copy of the Wall Street Review. SENT FREE. JOHN HICKLING & Co., Bankers and Brokers, 72 Broadway, N.Y.

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa. 190 S. Canal Street, Chicago, Ill.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA, & FITZ, Boston, Mass. GEO. PLACE & CO., 121 Chambers St., N.Y. PIERCE & WHALING, Milwaukee, Wis.

Boult's Patent Reverse Motion Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of mould in the solid wood with neatness and dispatch. Is a first class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuffs. *Simple, Durable, and Efficient.*

☞ Send for Pamphlet and Sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the B. C. MACHINERY CO., Battle Creek, Mich.

E. M. MAYO'S PATENT BOLT CUTTER. ☞ Send for Illustrated Circular, Cincinnati, Ohio.

FINE TOOLS

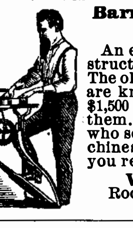
For Machinists, Jewelers, Engravers, Watchmakers, Amateurs, and others. Also, a fine assortment of File and Steel Wire Supplies, at FRASSE & CO.'S, 62 Chatham Street, New York.

PATENT Planing and Matching

and Molding Machines, Gray and Wood's Planers, Self-oiling Saw Arbors, and other wood-working machinery. S. A. WOOD'S MACHINE CO., { 91 Liberty St., N. Y. Send for Circulars, etc. { 67 Sudbury St., Boston.

10 DECALCOMANIE, or TRANSFER PICTURES, with book of 24 pp., giving full instructions in this new and beautiful art, sent post-paid for 10 cts. 100 ass'td pictures, 50 cts. They are Heads, Landscapes, Animals, Birds, Insects, Flowers, Autumn Leaves, Comic Figures, &c. They can be easily transferred to any article so as to imitate the most beautiful painting. Also, 5 beautiful GEM CHROMOS for 10 cts.; 50 for 50 cts. Agents wanted. Address J. L. PATTEN & CO., 162 William Street, New York.

IMPORTANT FOR ALL CORPORATIONS AND MANF'G CONCERNS.—Buerk's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular. J. E. BUERK, P. O. Box 979, Boston, Mass. N. B.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 10, 1874. Proceedings have been commenced against Imhaeuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law.



Barnes' Foot-power Scroll Saws and Lathe.

An entire REVOLUTION in the construction of foot-power machines! The old style thrown aside when these are known! Thousands now in use! $1,500 to $2,000 per year made using them. One person out of every three who send for catalogues of these machines buys one. Say what paper you read this in, and address W. F. & J. BARNES, Rockford, Winnebago Co., Ill., Box 2044.

STEEL NAME STAMPS—Post paid for 15c. per letter STEEL STAMP WORKS, 218 Chapel St., New Haven, Ct

Amateur Workers in FANCY WOODS

Can be supplied with the following HARD and RARE WOODS, planed ready for use: ⅛, 3-16, ¼, ⅜ inch and upward Cash to accompany orders. Rosewood, Satinwood, Holly, Walnut, Mahogany, Ebony, Red and White Cedar, Bird's-eye Maple, &c.

Geo. W. Read & Co.,

186 to 200 Lewis St., foot of 5th & 6th Sts., E.R., N.Y.

☞ Orders by mail will have prompt and careful attention. Inclose stamp for Catalogue and Price-List.

WASHINGTON, D. C., Sept. 13, 1875.

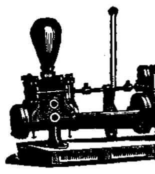
JNO. MAYHER, Treas. Valley Machine Co., East Hampton, Mass.

Dear Sir: The "Wright Bucket Plunger Steam Pump" you built for the Government "works like a top." Am sure it has never had its equal in any of the Departments, and I have no hesitancy in recommending this Pump to any one in want of a first class, noiseless Steam Pump. Very respectfully, J. THOS. MILLER, Chief Engineer U. S. House of Representatives.

Send to us for Catalogue. V. M. COMPANY.

The Myers Portable Engine, 4, 5, 6, 8 h.p. Something new. Best for price. Circulars.

SECOND-HAND IRON AND WOOD WORKING MACHINERY. CH[illegible] PLACE. 103 Reade Street, New York.



8,000 in Use Blake's STEAM PUMPS for every possible duty. Send for Illustrated Catalogue. GEO. F. BLAKE M'F'G CO. 86 & 88 Liberty Street, New York, Cor. Causeway and Friend Sts., Boston, Mass. | 50 and 52 South Cana St., Chicago, Ill.

Patent Friction Pulleys Friction Clutches for V-Pulleys.

For connecting shafting and gearing, BEAN'S CLUTCH is the most effective known, and is furnished for less than any other of merit. We make a specialty of FRICTION-CLUTCH COUNTER-SHAFTS. Our HOISTING ENGINES with this clutch for Pile Driving, can strike three blows to one using ordinary clutch. Hoisting machinery, upon application to D. FRISBIE & CO., New Haven, Conn.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa.— The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph, address Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

Call at Fair American Institute and See NEW DRAWING PRESS & OTHER TOOLS. STILES & PARKER PRESS CO., Middletown, Ct. ☞ Will meet parties by appointment.

OPIUM and Morphine habit absolutely and speedily cured. Painless: no publicity. Send stamp for particulars. Dr. Carlton, 187 Washington St., Chicago, Ill.

WITHERBY, RUGG & RICHARDSON, Manufacturers of Woodworth Planing, Tongueing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally, 26 Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.) L. B. WITHERBY. G. J. RUGG. S. M. RICHARDSON.

$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

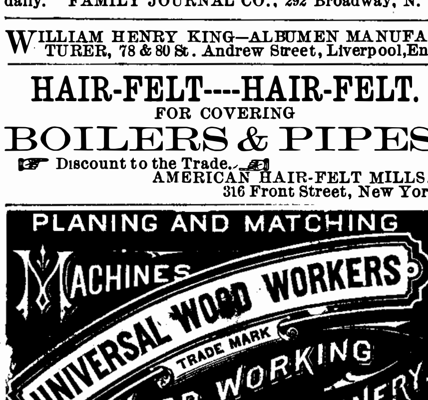
$500 IN GOLD GIVEN AWAY, also 50 per cent Commission. You can make from $10 to $20 daily. FAMILY JOURNAL CO., 292 Broadway, N. Y.

WILLIAM HENRY KING—ALBUMEN MANUFACTURER, 78 & 80 St. Andrew Street, Liverpool, Eng.

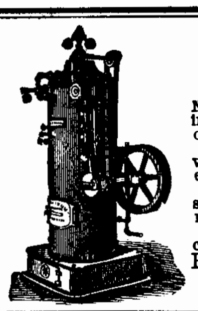
HAIR-FELT----HAIR-FELT. FOR COVERING BOILERS & PIPES.

☞ Discount to the Trade. AMERICAN HAIR-FELT MILLS, 316 Front Street, New York

PLANING AND MATCHING



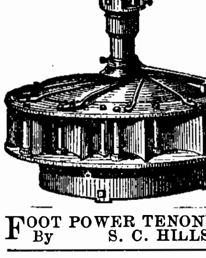
BENTEL, MARGEDANT & CO. HAMILTON, OHIO. Send for Catalogue and Price List.



THE TRADE ENGINE.

Noiseless in operation—Perfect in workmanship—all light parts of Cast Steel. Every Engine indicated, and valve corrected to give the highest attainable results. Warranted superior to any semi-portable Engine in the market. Send for Price List and Circular. HERRMAN & HERCHELRODE M'F'G. CO., Dayton, Ohio.

INDIA RUBBER, For Inventors and the Trade, made into any pattern at short notice, by F. H. HOLTON, 45 Gold St., New York. Established in 1860.



Water Wheels.

More than four times as many of Jas. Leffel's Improved Double Turbine Water Wheels in operation than any other kind. 24 sizes made, ranging from 5⅜ to 96 in. diam., under heads from 1 to 240 ft. Successful for every purpose. Large new pamphlet, the finest ever published, containing over 30 fine illustrations, sent free to parties interested in water power. JAS. LEFFEL & CO., Springfield, O., & 109 Liberty St., New York City.

FOOT POWER TENONING MACHINES FOR SALE, By S. C. HILLS, 51 Cortlandt St., New York.

IMPROVED MACHINERY for STAVE Heading, Shingle and Handles, Cabinet Maker's Machinery, Bailey Gauge Lathe, Durkee's Automatic Saw Mill (Improved), Key Seat Cutting, Pulley Boring, and Milling Machines, Radial Drills, Steam Engines, and Bailey's Veneering Machines, Cable and Sheaves for transmitting Power etc. T. R. BAILEY & VAIL, Lockport, N.Y.

Ladies Can make $5 a day in their own City or Town. Address ELLIS M'F'G Co., Waltham, Mass.

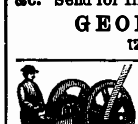
EXCELSIOR Printing Presses. "*Lowest Priced and BEST.*" Do Your Own Printing! $3 Press for cards, labels, envelopes, etc. Larger sizes for larger work. Business Men do their printing and advertising, save money and increase trade. Pleasure and profit in Amateur Printing. The Girls or Boys have great fun and make money fast at printing. Send two stamps for full catalogue of presses, type, etc., to the Manufacturers, KELSEY & CO., Meriden, Conn.

MACHINERY

IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.

Cold Rolled Shafting.

HANGERS, PULLEYS, COUPLINGS, BELTING, & &c. Send for Illustrated Catalogue and Price List. GEORGE PLACE, 121 Chambers & 103 Reade Sts. N. Y. City.



BLAKE'S PATENT Stone and Ore Breaker

Crushes all hard and brittle substances to any required size. Also, any kind of STONE for ROADS and for CONCRETE, &c. Address BLAKE CRUSHER CO., New Haven, Conn.

$77 A WEEK to Agents, Old & Young, Male & Female, in their locality. Terms & OUTFIT FREE. Address P. O. VICKERY & CO., Augusta, Me.

EAGLE FOOT LATHES,

With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish Low Prices. Our new Catalogue describes these and every tool necessary for the Amateur or Artizan. Send for it. WM. L. CHASE & CO., 95 & 97 Liberty St., New York.

Planing & Matching,

Moulding, Re-sawing and Tenoning Machines. Scrol Saws and General Wood-Working Machinery. JOHN B. SCHENCK'S SONS { Matteawan, N. Y. Send for Catalogue. { 118 Liberty St., N.Y. city

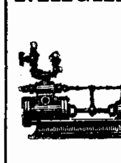
Bradley's Cushioned Hammer

has larger capacity, is more durable, takes up less room, does more and better work with less expense for power and repairs than any other Hammer in use. Guaranteed as recommended. Address BRADLEY Manufacturing Company, SYRACUSE, N. Y.

Machinists' Tools, All sizes at low prices. E. GOULD, Newark, N. J.

THIS MOUSTACHE produced by the use of DYKES BEARD ELIXIR without injury, or will forfeit $100. Safe and sure. With full direct'ns postpaid, 25c. A. L. SMITH & Co., Ag'ts, Palatine Ill. N. B. For a HEAVY GROWTH use this preparation. Mention this paper.

THE IMPROVED NIAGARA STEAM PUMP,



93 to 97 *Pearl St., Brooklyn, N.Y.* Agency at 40 John St., New York. Hubbard & Aller, SOLE MANUFACTURERS, ENGINES AND BOILERS, *Pulleys, Shafting and Hangers a Specialty.*

WHIPPLE'S Patent Door Knob.

Awarded a Bronze Medal at the American Institute Fair for 1874. The Judges say: "We consider this method of fastening DOOR KNOBS a great improvement over anything yet invented for the purpose, as it obviates the use of side screws and washers, and can be regulated to suit any thickness of Doors." Send for Circular. THE PARKER & WHIPPLE COMPANY, West Meriden, Conn., or 97 Chambers St., N. Y.

OTIS' SAFETY HOISTING Machinery. OTIS, BROS. & CO., No. 348 BROADWAY, NEW YORK.

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.

Engine, Spindle, & Cylinder Oil. E. H. KELLOGG, 17 Cedar St., N.Y., manufactures the best. Established '58.

Knife Polisher, Can Opener, Sharpener. Agents wanted. Centennial Novelty 651 N. 7th St. Phila. Pa.

NO FILES ARE USED ON HOE'S CHISEL TOOTH SAWS. No swaging, no gumming, no rounding, nor side set to perplex the sawyer. They run straight, and are fifty per cent cheaper to use than the solid saw.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty St., New York. Wheels and Rope for conveying power long distances. Send for Circular.

and Shaped Diamond Carbon Points, indispensable for Turning Emery Wheels, Grindstones, also Trueing up Hardened Steel and Paper Calender Rollers, etc. Address J. DICKINSON, Patentee, 64 Nassau St., N.Y.

THE EXCELSIOR DRY LEVEL, valuable to every Mechanic. Plumb and Level combined. No glass to break, no cement to shrink. Warranted correct. Graduated for angles and measurements. H. S. TARR & SON, 710 Green St., Philadelphia, Pa.

NICKELPLATING BATTERIES, SALTS, etc., constantly supplied by L. FEUCHTWANGER & CO., 180 Fulton St., N.Y.

FREE

100 page Book and samples of Rubber Roofing. *Complete* materials for new roof, 4½c. a ft. Fire-proof, durable, cheap. Easily applied with positive satisfaction. Write at once and save money. **N. Y. Slate Roofing Co.** CEDAR ST., N. Y.

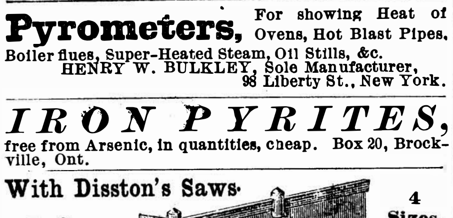
State where you saw this notice.

Pyrometers, For showing Heat of Ovens, Hot Blast Pipes, Boiler flues, Super-Heated Steam, Oil Stills, &c. HENRY W. BULKLEY, Sole Manufacturer, 98 Liberty St., New York.

IRON PYRITES,

free from Arsenic, in quantities, cheap. Box 20, Brockville, Ont.

With Disston's Saws. 4 Sizes.



Sold by Hardware Trade.
LANGDON MITRE BOX CO., *Millers Falls, Mass.* Send for Circular.

EXPERIENCED MILL MEN, who are using R. HOE & CO.'S New Patent Saws, concur in saying that the Chisel tooth is very superior, and will soon supersede all other circular saws, for cutting logs and timber.

ENGINES & BOILERS, new & 2d h'd. perfect condition. Very cheap. Address BINGHAM & RICH, Oil City, Pa.

Corrugated Iron

Iron Buildings, Roofs, Shutters, Doors, etc. MOSELY IRON BRIDGE AND ROOF CO., Office 5 Dey St., New York. Send for circulars.

THE CHRISTIAN UNION.

REV. HENRY WARD BEECHER, Editor.

Ellinwood's *author zed* verbatim reports each week of Mr. Beecher's

Sermons in Plymouth Church.

All his literary productions, including the characteristic "STAR PAPERS," will be given. Serial Stories by

REV. EDWARD EVERETT HALE, D.D., (Author of a "Man without a Country," &c.)

HON. ALBION W. TOURGEE, Judge of the Superior Court of North Carolina, (Author of "Toinette," &c.)

MRS. HARRIET BEECHER STOWE, (Author of "Uncle Tom's Cabin, &c).

A Comprehensive Family Religious Newspaper. Terms $3.20 per year, postage prepaid.

New and Unusual Terms to Agents.

Cash Commissions and Competitive Premiums in Cash.

$2,000 Given Away!

Send for particulars.

HENRY M. CLEVELAND, *Publisher.*
HORATIO C. KING, *Ass't Publisher.*
27 Park Place, New York.

R. HOE & CO.'S CHISEL TOOTH SAWS ARE run with *thirty per cent* less power than the average of saws. A dull set of teeth may be removed and sharp ones inserted in five minutes. Cost, three cents per tooth.

NOYE'S

Mill Furnishing Works

are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue. J. T. NOYE & SON. Buffalo, N. Y.

Just Out.

WRINKLES AND RECIPES,

COMPILED FROM THE

Scientific American

An Illustrated Hand-Book of Practical Hints and Suggestions for Mechanics, Engineers, Farmers, Housekeepers, and Workmen generally.

EDITED BY PARK BENJAMIN.

Contents.

DEPARTMENT OF MECHANICS.

Master-Tools, accurately represented. How to make and use them. Valuable suggestions for management of Machine Tools. Hints for Casting, Forging, Tempering, etc. *Trade Secrets and Wrinkles.* The whole supervised by JOSHUA ROSE.

DEPARTMENT OF ENGINEERING.

The management, construction, and repair of Boilers, Engines, Valves, Shafts, Belts, Pulleys, and Hangers. Brief rules for practice, etc., prepared by Mr. R. H. BUEL. Also, New Paper on Testing Metal, expressly written by PROF. R. H. THURSTON, C.E., who also supervises the entire Department.

DEPARTMENT OF PRACTICAL TECHNOLOGY.

Supervised by PROF. P. H. VANDER WEYDE, M.D. Metallurgical Operations; Cements and Glues; Painting and Varnishing; Making simple Instrument., etc., etc. Hundreds of Recipes for every variety of Industrial Work.

DEPARTMENT OF THE FARM.

How to construct Farm Buildings. The Dairy. Hints for care of Stock, about Manures, Plants, Vegetables, Trees, Farm Machinery, etc., etc.

DEPARTMENT of the HOUSEHOLD.

Cleansing Processes of all kinds. Window Gardens. Destruction of Vermin. Care of China, Glass, and Furniture. Papering Walls. Simple Remedies, etc., etc.

The volume comprises 250 pages, is printed on fine paper, with gilt edges, and is of large pocket-book form, flexible covers, neatly ornamented.

Mailed, post paid, on receipt of $1.50.

1 copy Scientific American, 1 year, and 1 copy **Wrinkles and Recipes** **$4.20**

Address

H. N. MUNN,

PUBLISHER,
P. O. BOX 772,
37 Park Row, New York City.

HARTFORD STEAM BOILER Inspection & Insurance COMPANY.

W. B. FRANKLIN, V. P't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec.
HARTFORD, CONN.

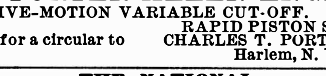
The PORTER-ALLEN ENGINE.

POSITIVE-MOTION VARIABLE CUT-OFF. RAPID PISTON SPEED.
Send for a circular to CHARLES T. PORTER, Harlem, N. Y. City.

THE NATIONAL

Steel Tube Cleaner.

PATENTED JULY 28 1874.



Adopted and in use by U. S. Navy. For sale by dealers. Send for Circular. THE CHALMERS SPENCE CO. foot E. 9th Street, N. Y., Agents for the U. S.

NON-COMBUSTIBLE STEAM BOILER & PIPE

COVERING

WITH AIR SPACE IMPROVEMENT. Saves 10 to 20 per cent. CHALMERS SPENCE CO., foot E. 9th St., N.Y.; 1202 N. 2nd St., St. Louis, Mo.

W. C. DUYCKINCK,

IMPORTER, MANUFACTURER, AND DEALER IN

Railway, Machinists' and Engineers' Supplies,

50 AND 52 JOHN STREET,
P. O. Box 4101. NEW YORK.

REYNOLDS & CO.,

145 EAST ST., NEW HAVEN, CT.,
MANUFACTURE

Iron and Steel Set Screws, Round, Square, and Hexagon Head; Machine and Cap Screws; Piano, Knob, and Lock Screws; Machine, Bridge, and Roof Bolts, Bolt Ends, Blanks, Nuts, Washers, etc., of every description, Send for Price List.

THE TANITE COMPANY
Emery Wheels — TANITE — Emery Grinders
STROUDSBURG MONROE Co. PA.

PURE EMERY, guaranteed equal to any in the market at prices lower than any other first class emery.

Schlenker's Stationary AND Revolving - Die Bolt Cutters,

MANUFACTURED BY THE

HOWARD IRON WORKS,

BUFFALO, N. Y.
Send for Circular.

TRADE MARK. GENUINE CONCORD AXLES

The Standard—Best Stock—Finest Finish.

MANUFACTURED ONLY BY
D. ARTHUR BROWN & CO., Fisherville, N.H.

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACH & CO., 246 Canal St., New York. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

DITCHING and EXCAVATION.

RANDOLPH'S DITCHER AND EXCAVATOR: Simple, strong, and adapted to all soils reasonably free from stumps or large stones. Will do the labor of 100 men, *steadily*, at the cost of ten. Machines of all sizes, cutting from three inches wide, three feet deep, to 36 inches wide, four feet deep. Extra sizes made to order. Circulars, &c., sent on application to RANDOLPH BRO'S, 111 Broadway, New York.

TO DYERS AND MANUFACTURERS. Thomas's Fluid Tannic Acid, or Black Color Base, for Coloring Hats, Carpets, and all Felt Goods, and Textile Fabrics, and for making Ink. Price 8c. per lb. Address N. SPENCER THOMAS, Elmira, N. Y.

THE BEST INJECTOR

For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe

Throws more and hotter water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order

NATHAN & DREYFUS, Sole Manufacturers, **108 Liberty St., New York.** Send for Catalogue.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind. Send for book on Boiler Incrustation.

Portland Cement,

From the best London Manufacturers. For sale by JAMES BRAND, 55 Cliff St., N. Y.
A Practical Treatise on Cement furnished for 25 cents.

"Lowest Priced and BEST."

Excelsior Portable Printing Presses

Do Your Own Printing

$3 Press for cards, labels, envelopes, etc. Larger sizes for larger work. **Business Men** do their printing and advertising, save money and increase trade. **Amateur Printing**, delight ful pastime for spare hours. **BOYS** have great fun and make money fast at printing. Send two stamps for full catalogue presses type etc to the Mfrs KELSEY & CO., Meriden, Conn.

THE SOUTHERN STATES AGRICULTURAL AND INDUSTRIAL

EXPOSITION

Will be Held on the Fair Grounds, at New Orleans, Commencing February 26, 1876, and Continuing Ten Days.

L. N. MARKS, PRESIDENT.
SAMUEL MULLEN, GENERAL SUPERINTENDENT.

Executive Committee.

A. BALDWIN, Chairman;
JAMES I. DAY, W. B. SCHMIDT,
COLONEL J. D. HILL, JOHN G. FLEMING.

It is the aim of the Board of Commissioners to make it a thorough Exposition of the Agricultural and Mechanical Products of the Southern States, Mexico, and Central America; but it will be open to competitors throughout the country, and the general premium list will embrace all articles comprehended in the general design of an Agricultural and Industrial Exposition, including special premiums for strictly Southern products.

The Mechanical Department has been devised with great care and on the most extensive scale. The Premium List will be ready for distribution November 20th.

Ample arrangements have been perfected for the transportation of goods and visitors from every section at reduced rates. For detailed information, address SAMUEL MULLEN, GEN'L SUP'T, No. 80 Camp St., New Orleans.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty Street, New York.

Machinery of Improved Styles for making

SHINGLES, HEADING AND STAVES.

Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars, address TREVOR & CO., Lockport, N.Y.

DAMPER REGULATORS **BEST** AND LEVER GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.

IRON PLANERS,

ENGINE LATHES, DRILLS, &c. Send for Price List.
NEW HAVEN MANUFACTURING CO., New Haven. Conn

PORTLAND CEMENT

For Walks, Cisterns, Foundations, Stables, Cellars, Bridges, Reservoirs, Breweries, etc. Remit 6 cents postage for Practical Treatise on Cements. S. L. MERCHANT & Co., 76 South St., New York.

THOMAS'S FLUID TANNATE OF SODA—Never fails to remove Scale from any Steam Boiler, using any kind of water. It is in Barrels 500 lb., ½ Bbls. 250 lb., ¼ Bbls. 125 lb. Price only 10c. per lb. Address N. SPENCER THOMAS, Elmira, N. Y.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

T. V. Carpenter, Advertising Agent. Address Box 773, New York city.

Munn & Co.'s Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-EIGHT YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world

They employ as their assistants a corps of the most experienced men as examiners, specification writers, and draughtsmen that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions, confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th Streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences give written opinions on matters of infringement, furnish copies of patents: in fact attend to every branch of patent business both in this and in foreign countries.

Patents obtained in Canada, England, France, Belgium Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted.

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1

A copy of the claims of any patent issued since 1836 will be furnished for $1

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

A pamphlet of 110 pages, containing the laws and full directions for obtaining United States patents, also a circular pertaining exclusively to Foreign Patents, stating costs in each country, time granted, etc., sent free. Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN
37 Park Row, N. Y.
BRANCH OFFICE—**Corner F and 7th Streets,** Washington, D. C.

PROSPECTUS

OF THE

SCIENTIFIC AMERICAN,

FOR 1875.
THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THIRTIETH YEAR

VOLUME XXXIII.—NEW SERIES

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the third day of July 1875, a new volume commenced. It will continue to be the aim of the publishers to render the contents of the new volume more attractive and useful than any of its predecessors.

To the Mechanic and Manufacturer.

No person engaged in any of the mechanical pursuits should think of doing without the SCIENTIFIC AMERICAN. Every number contains from six to ten engravings of new machines and inventions which cannot be found in any other publication.

The SCIENTIFIC AMERICAN is devoted to the interests of Popular Science, the Mechanic Arts, Manufactures, Inventions, Agriculture, Commerce, and the industrial pursuits generally; and it is valuable and instructive not only in the Workshop and Manufactory, but also in the Household, the Library, and the Reading Room.

TERMS.

One copy, one year (postage included) **$3.20**
One copy, six months (postage included) **1.60**
One copy, three months (postage included) .. **1.00**
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress" **10.00**
One copy of Scientific American for one year, and one copy of "Science Record" for 1875 .... **5.20**

Remit by postal order, draft, or express.

Address all letters and make all Post Office orders and drafts payable to

MUNN & CO.

37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia and 59 Gold St., New York