SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 13. [NEW SERIES.] | NEW YORK, SEPTEMBER 25, 1875. | $3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED FLOODWAY FOR WAREHOUSES.

It is frequently the case, when small conflagrations break out in buildings, that the water thrown in to extinguish the fire does more damage than the flames themselves. Percolating through flooring, it deluges the apartments and their contents below, ruining plastering and soaking goods and furniture, often despite the efforts of the insurance patrol to save the latter from injury. The same takes place when, through freezing or other causes, the water pipes burst, in case of an overflow of tanks, basins, etc., or when bad leaks occur in the roof, necessitating considerable outlays for repairs or to cover the losses.

The invention illustrated in the annexed engraving has for its object the prevention of this flooding. It consists of a metallic pipe, A, leading continuously from the top floor of the building to the street sewer or drain. Metallic water ways or collecting basins are sunk in each floor at the point where the pipe passes through, and these communicate with the pipe by a suitable opening in the latter, which is covered with wire gauze in order to prevent the entrance of obstacles. Each basin is provided with a grated cover, as shown in Fig. 2, which, being flush with the floor, will enable the whole floor space to be occupied. If desired, the leader from the roof may be turned inward and also connected with the pipe (avoiding the use of an outside leader), extending the full hight of the building, and allowing the same to be built in the walls or otherwise, so as to be out of sight.

The use of the invention is graphically told by our large engraving. The water, instead of accumulating on the floor and finally making its way through, as is shown to be the case in the building on the right, runs into the basins and thence down the pipe. As many pipes as may be desired can be employed, suitable diagonal connections led across the cellar serving to attach their lower ends to the sewer conduit.

Fig. 3 illustrates a form of water way or basin which is provided with a swinging valve, A, to prevent back flow of air or water. The valve is rubber-lined at the edges.

The patentee, in his circular, gives the following information:

1. The object of this invention is to provide a means of preventing warehouses and other buildings from being flooded in case of fire, as is now commonly the case when a fire breaks out in any of the upper stories of a building and thereby to save a large amount of goods, which might otherwise be destroyed by water soaking through the floors to the rooms below, often, despite the efforts of the insurance patrol, exceeding the damage done by the fire itself, thereby reducing the risk to a considerable extent.

2. It is an auxiliary to the fire department, as firemen can more readily get at, handle, and safely dispose of goods and valuables, on the floor where the fire exists (without scuttling), at the same time rendering the covering of the goods, or the removal of the same from the floors below, in most cases entirely unnecessary, facilitating generally the saving of goods and valuables, as well as time and labor.

3. The invention also provides a means of escape for water in case of pipes bursting from frost or otherwise, which, if not checked immediately, would cause great damage both to building and property contained therein. And furthermore, the leader from the eaves may be turned inward, so as to conduct the water from the roof into the pipe or pipes, and thereby utilize them and save the additional cost of a full length leader, as ordinarily applied to the outside of buildings.

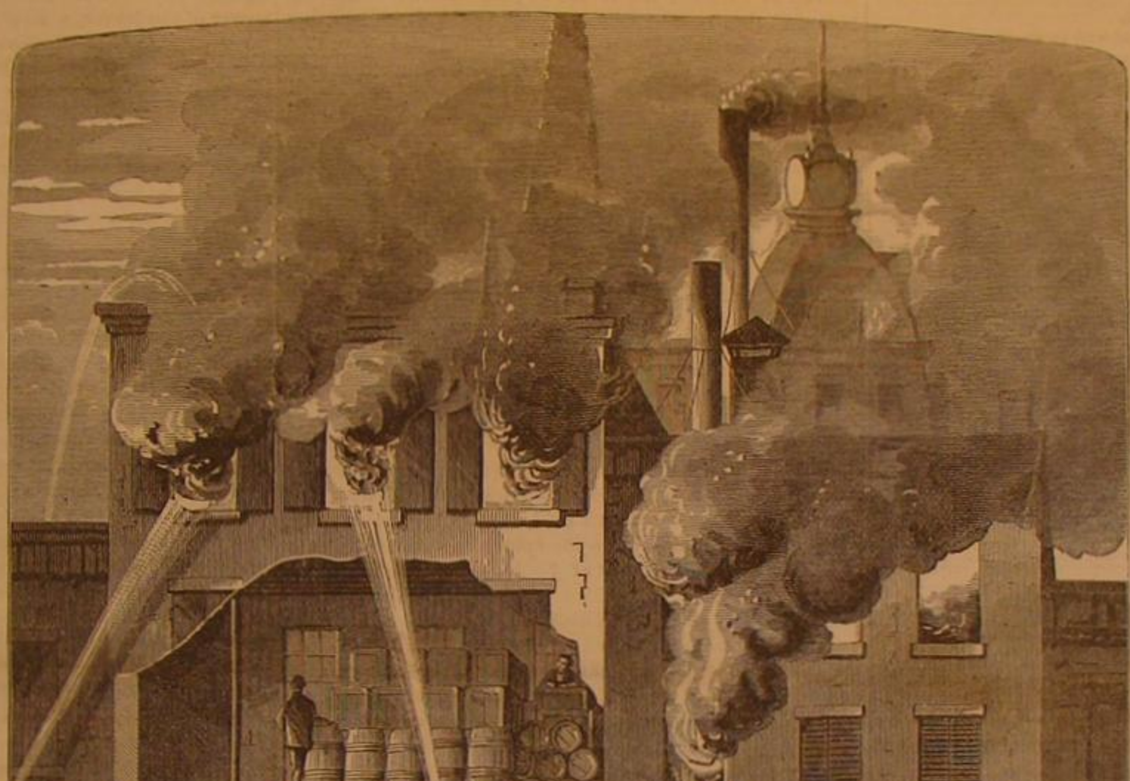
4. It is always ready for use without any personal aid, and requires but little or no attention in any building, whether occupied or not. The arrangement is such that no impure air can enter the building from the main pipe.

5. It also affords protection to expensive ceilings, valuable furniture, and other property, in case of an overflow of basins, tanks, etc. It is also a protection in case of bad leaks occurring in roofs

6. The apparatus is simple, complete, and effective, and can be applied to buildings of any description, old or new, in any part of the floors or walls, without the slightest injury, so that the whole can be occupied as though it did not exist. It simply has the appearance of a register, which can be made as ornamental as desired, at so small an expense, and with so little trouble, that property owners generally (both real and personal) should not fail to give it their immediate attention.

In short, it is the one thing substantially needed for the purposes herein set forth and described, principally in cases of fire. Architects, builders, insurance companies, and the public generally are respectfully invited to examine the same.

Patented through the Scientific American Patent Agency, July 6, 1875, by Mr. John H. Morrell. Patents have also been secured in Europe and Canada. For further particulars address or apply at The Morrell Storage and Safe Deposit Buildings, corner Fourth avenue and 32d street, New York city, where it can be seen in use.



MORRELL'S FLOODWAY FOR WAREHOUSES

Fig. 3.

Safety Valve Tests.

A committee appointed by the Board of Supervising Inspectors of Steam Vessels begin a test of steam boiler safety valves, at the Washington Navy Yard, on the 13th inst. All valves presented must have a uniform area of opening of five square inches, and will be submitted to the following trials (in competition):

1. Capability of discharging any excess of steam above a fixed working pressure.
2. The limits of pressure within which the valve will open and close.
3. Uniformity of action at different pressures.
4. Reliability of action under continued use.
5. Simplicity of arrangement and facility of management.

The valves will be tested at a pressure of not less than twenty nor more than eighty lbs. to the square inch, and are not required to be provided with an inclosing case. All valves must be operated by the pressure of the steam, and the greatest diameter of opening for double seated valves will be the same as for single seated valves. The flange for attaching to boiler must be eight inches diameter—flat face, without bolt holes.

THE French government is considering a project for constructing a canal, by which the vineyards of the Rhone may be flooded as a remedy for the phylloxera. The canal will cost twenty million dollars, but it will bring into fruitfulness 60,000 acres of vine lands, which will yield forty million dollars annually.

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

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Ten copies, one year, each $2 70, postage included............ $27 00
Over ten copies, same rate each, postage included............ 2 70

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VOLUME XXXIII., No. 13. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, SEPTEMBER 25, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

INSECT-EATING PLANTS.

The SCIENTIFIC AMERICAN for July 3, 1875, contained a page of engravings representing the principal plants which capture insects, with a summary of what had been published in regard to their strange habits. An immense addition to this new and marvelous department of knowledge has just been made in Mr. Darwin's "Insectivorous Plants," in which he sums up the results of some fifteen years of observation and experiment: a contribution to Science as noteworthy as his work on "The Fertilization of the Orchids," or that on "The Structure and Distribution of Coral Reefs," works which the most determined adversaries of Darwinism have not presumed to denounce as unscientific. More than half the volume, which comprises nearly five hundred closely printed pages, is devoted to the study of the common sundew of England, *drosera rotundifolia*. Six other species of drosera from various parts of the world were also brought under observation; also the Venus fly trap (*dionœa muscipula*) of North Carolina; the aquatic *aldrovanda vesiculosa*; the fly catcher of the Portuguese, *drosophyllum lusitanicum: roridula dentata*, from Cape of Good Hope; *byblis gigantea*, from Western Australia; several species of *pinguicula*, and a number of *urticularia*. The *nepenthes*, studied by Dr. Hooker, are merely noticed incidentally.

The characteristic feature of *drosera rotundifolia* is the abundance of gland-bearing filaments—tentacles, Mr. Darwin calls them, from their manner of acting—which cover the upper surface of its round leaves. There are on the average about two hundred of these tentacles to each leaf; and as their terminal glands are always surrounded by drops of extremely viscid secretion, which glitter in the sun like dew drops, the plant gets from them its poetical common name. It gets more—and that is its living; for its short and simple roots are capable only of absorbing water. It is by means of the secretion of the glands and the inward bending of the tentacles that its prey are caught, digested, and absorbed. The glands are wonderfully sensitive to pressure and repeated touching; and when excited, the tentacles bend inward to the center of the leaf and remain inflected over the captured object according to the amount of nutrition it affords. Extremely minute particles of glass, cinders, hair, thread, etc., when placed on the glands, cause the tentacles to bend; but the inflection is not so energetic nor so persistent as when the exciting substance is organic and soluble. So sensitive are the glands that a bit of human hair, exerting a pressure of not more than a millionth of a grain, suffices to induce a movement of the tentacles. The pressure of the delicate feet of gnats causes them to be quickly and securely embraced. The tentacles are indifferent, however, to single touches and even hard blows; also to the repeated blows of drops of rain; greatly to the plant's advantage, Mr. Darwin remarks, for it is thus saved from much useless movement. The absorption of animal matter and various fluids, heat, and galvanic action, also cause the tentacles to become inflated, the movement beginning in about ten seconds when a bit of raw meat is applied to a gland.

The bending of the tentacles is effected by a process of aggregation of the protoplasmic contents of the glands and tentacles. This aggregation is excited by all the stimulants which produce movement: the quickest and most energetic of the many stimulants tried being carbonate of ammonia, a dose of $\frac{1}{134400}$ of a grain sufficing. The process of aggregation goes on only as long as the protoplasm is in a living, vigorous, and oxygenated condition. Immersion in warm water causes the leaves to be inflected and increases their sensitiveness to the action of meat. Inflection is rapid at temperature between 115° and 125° Fah. Temporary paralysis ensues on exposure to 130°, but the leaves recover on being left for a time in cold water. Exposure to 150° causes death: so does prolonged exposure to 145°. Different leaves, however, and even separate cells in the same tentacle, differ considerably in their power of resisting heat.

By testing the leaves with various nitrogenous and non-nitrogenous fluids, Mr. Darwin found them able to detect with almost unerring certainty the presence of nitrogen. Results so obtained led to the enquiry whether the plant possessed the power of dissolving solid animal matter, that is, whether it really had the power of digestion like that that possessed by animals. Numerous experiments proved conclusively that the leaves of drosera are capable of true digestion, and that the glands absorb the digested matter: the most interesting, Mr. Darwin thinks, of all his observations on this remarkable plant, as no such power had previously been known to exist in the vegetable kingdom. The resemblance of drosera digestion to that of animals is singularly close. The digestive secretion is more copious in the presence of nutritive material, and is distinctly acid, like that of the animal stomach. It also contains a ferment closely analogous to or identical with the pepsin of animals, which is secreted only when the glands are excited by the absorption of already soluble animal matter. Albumen (hard-boiled egg), roast meat, fibrin, areolar tissue, cartilage, fibro-cartilage bone, milk, casein, legumin, and other substances were found to be acted on by the plant secretion precisely as by the gastric juice of animals. Fresh gluten was too strong for the plants; but after the starch was removed by treatment with weak hydrochloric acid, it was digested rapidly. Starch is indigestible, and so are epidermic substances, such as human nails, hair, quills of feathers, fibro-elastic tissue, mucine, pepsin, urea, chitine, chlorophyll, cellulose, gun cotton, fat, and oil: all of which are similarly unaffected by gastric juice, though some of them are acted on by other secretions of the animal alimentary canal. The plants are also, to a limited extent, vegetable feeders, having power to digest some parts of leaves, and to partially dissolve pollen and living seed. Like animals, too, these plants suffer grievously from dyspepsia, in case of surfeit, even of the most digestible substances.

The sensitiveness of the leaves to carbonate of ammonia has already been mentioned. Like effect, in varying degree, is produced by all the other salts of ammonia. The citrate is least, and the phosphate most, powerful. Of the latter, less than one twenty-millionth of a grain in solution, applied to a gland, is sufficient to cause the tentacles bearing the gland to bend to the center of the leaf. Many other salts were experimented with, the nature of the base proving, as in the case of animals, far more influential than that of the acid Nine salts of sodium all caused well marked inflection, and none were poisonous in small doses; whereas seven of the nine corresponding salts of potassium produced no effect, two causing slight inflection. Some of the potassium salts were poisonous. The so called earthy salts produced little effect; on the other hand, most of the metallic salts caused rapid and strong inflections, and were highly poisonous. To this rule there were some odd exceptions; for example, the chlorides of lead and zinc and two salts of barium did not cause inflection, and were not poisonous. Twenty-four acids were tried, much diluted: nineteen caused the tentacles to be more or less affected. Most of the acids were poisonous. Benzoic acid is very poisonous, though innocuous to animals. Many of the poisonous acids caused the secretion of an extraordinary amount of mucus, long ropes of it hanging from the leaves when they were lifted out of the solutions. Allied acids act very differently, formic acid, for instance, producing but slight effect, while acetic acid of the same strength i poisonous and acts powerfully.

A large number of vegetable alkaloids and other substances were experimented with, developing some very curious results. Substances like strychnin, nicotin, digitalin, and hydrocyanic acid, which act poisonously on the nervous system of animals, are also poisonous to drosera, but probably excite inflection by acting on elements in no way analogous to the nerve cells of animals. The poison of the cobra, so deadly to animals by paralysing their nerve centers, is harmless to these plants, though causing quick and strong inflection. The absence of nerve elements is made still more probable by the indifference of the plant to morphia, hyoscyamus, atropin, veratrin, dilute alcohol, and other substances which produce a marked effect upon the nervous systems of animals.

To summarise the physiology, so to speak, of the plant's sensitiveness, and the manner of its manifestation, would expand this article beyond limits. The structure and movements of six other species of drosera have been studied though less extensively than those of the common sundew. They are all insect-catchers, using very nearly the same means.

More wonderful in its adaptation to a carnivorous life is the Venus flytrap, found only in the eastern part of North Carolina. Its poorly developed roots, like those of drosera are capable only of absorbing water, so that, lacking its predaceous habit, it would soon cease to exist. Its manner of catching insects and general behavior have already been described in this paper in the observations of Mrs. Treat. Like the sundew, it is extremely sensitive to the touch of edible matter, yet indifferent to rain drops and gusts of wind. This is the more remarkable in the case of the Venus flytrap, since it captures its prey, not by means of a viscid secretion, but by a sudden shutting of its leaves, trap-fashion. The digestive power of this plant varies somewhat from that of drosera. The secretion from its glands dissolves albumen, gelatin, and meat, if too large pieces are not given. Fat and fibro-elastic tissue are not digested: nor is chemically prepared casein or ordinary cheese. The mechanism of the dionœa trap is such that minute insects escape, while the relatively large ones are retained: an arrangement which Mr. Darwin regards as very beneficial to the plant, inasmuch as it would manifestly be a great disadvantage to the plant to waste many days in remaining clasped over a minute insect, and several additional days or weeks in afterwards recovering its sensibility. The amount of nutriment would not compensate for the effort. There is evidently room, however, for further investigation in this direction, since, owing to the limited digestive power of the leaves, a single large insect is often too much for them. As in the drosera, the impulse which causes motion in the leaf travels in all directions through the cellular tissue, independently of the course of the vessels of the leaf. It was in this connection that Dr. Burden-Sanderson made his wonderful discovery that there exists a normal electric current in the blade and foot stalk of these leaves, and that, when the leaves are irritated, the current is disturbed in the same manner as during the contraction of the muscle of an animal.

The characteristics of the less known insectivorous plants will be summarized in another article.

COMPLETION OF THE HELL GATE EXCAVATIONS.

On July 4, 1876, the great explosion which is to shatter the submarine rocks at Hallett's Point and open a navigable channel for vessels of large draft, coming and going through Long Island Sound, to and from New York city will take place; such, at least, we understand to be the present intention of those in charge of the work. The excavations were completed about two months ago, and the operation now in progress consists in the boring of the holes in which the heavy charges of nitro-glycerin are to placed. These borings are about half finished, and will require the labor of two or three months longer, after which two months more will be occupied in inserting the charges.

The entire surface undermined measures 2½ acres, and the cuttings aggregate 7,542 feet in length, varying in hight from 8 to 22 feet, and in width from 12 to 13 feet. There is a roof ten feet thick between the mine and the water and the latter, at the outer edge of the excavation, is 26 feet deep at low tide. Between the headings and galleries heavy piers are left, which now sustain the immense weight of rock and water above. In each pier from ten to fifteen 2 and 3 inch holes are being drilled, and in the roof similar apertures are being made at intervals of 5 feet apart. All of these openings will be filled with nitro-glycerin, in charges of 8 and 10 pounds, and all will be connected together by gas pipe filled with the same explosive. This will be done during the cold weather, when the danger of hauling the nitro-glycerin is greatly diminished.

Previous to the explosion, the coffer dam will be broken away and the water allowed to fill the entire excavation, so that it will serve as a tamping. Then, by means of an electric fuse, the nitro-glycerin in the gas pipe will be fired, which will determine the blowing up of the whole affair. No fear is apprehended as to the result, since it has been determined that the explosion of half the charges will be sufficient to cave in the roof, and cause it to fall to the sunken floor, deepening the water at once to a proper depth, or necessitating but little dredging to complete the work.

The new operations at Flood Rock will involve still greater cuttings than at Hallett's Point. The shaft is now down to a depth of 50 feet. The Hallett's Point work has been under way since 1869, but has been greatly delayed by the failure of Congress to provide sufficient appropriations; if the same course is to be followed with reference to the Flood Rock excavations, it will be manifestly impossible to form any estimate of their time of completion.

DRUGGING HORSES.

There is a subject in connection with our four-footed servants, which is worth more attention than ordinarily is accorded it; and since it is an abuse, a remedy or means of prevention is needed. We allude to the drugging of horses, either to give them temporarily the appearance of being in fine condition, or to have the opposite effect, by making them ill to defeat their chances of success in a race. Both of these practices are cruel and inhuman, as well as criminally fraudulent, and hence commend themselves to the notice of societies for the prevention of cruelty to animals, while at the same time indicating a possible necessity for severe penalties.

An act of Parliament has recently been passed in England, the object of which is summarily to put a stop to these nefarious practices. It provides that if any one, other than a member of the Royal College of Veterinary Surgeons, shall give any animal any of the drugs contained in a given schedule without the consent of the owner, he shall be liable to fine or imprisonment. The drugs and preparations enumerated are as follows: Arsenic and its preparations, prussic acid cyanides of potassium and all metallic cyanides, strychnia and all poisonous vegetable alkaloids and their salts, aconite and its preparations, tartar emetic, corrosive sublimate, cantharides, savin and its oil, ergot of rye and its preparations, oxalic acid, chloroform, belladonna and its preparations, almond oil, opium with its preparations, sulphuric acid, nitric acid, hydrochloric acid, butter of antimony, sulphates of iron, of copper, and of zinc. Of these perhaps arsenic is the most commonly administered, since its effect upon the horse, in point of appearance, is to give an artificial plumpness and sleekness which might easily pass for fine condition. This all disappears, however, in a few days, leaving the animal wretched.

While some such law as the above might tend to mitigate present evils here, we doubt if such would be the case other than in very small proportions. Veterinary surgery in this country has not arisen to the hight of a special profession generally recognized, although there are plenty who are adepts in the art. It requires no license to practise; and until the same restrictions are thrown about its practitioners as are now about regular physcians, it would be difficult to designate who may and who may not administer mendicaments in the absence of the owner, with anything like the certainty expressed in the term "members of the Royal College," etc.

The matter lies exclusively in the hands of the societies above named and in those of horse owners. The former are already empowered to prevent cruelty, and drugging comes under that head. The latter, if their horses are in the charge of servants, can prevent the injury only by careful guardianship. A horse owner disposed to defraud cannot be prevented from doing so by any legislation; but if he tortures his animal, he comes under laws; and if he sells him under false representations, he becomes doubly liable. About the only enactment available in addition would be one imposing heavy penalties for selling doctored horses, in addition to those already mentioned in the statute books for the peculiar degree of fraud, and empowering local societies for the prevention of cruelty to sue for and collect the same, devoting the money to the furtherance of the objects of the said societies.

CELLULOID.

A destructive fire, attended by an explosion, recently occured at the celluloid works, Newark, N. J. One life was lost, several persons injured, and property to the extent of $150,000 destroyed. It is alleged that, when the fire was discovered, the engineer immediately turned on steam into the apartment, when an explosion instantly ensued, the inference being that the steam assisted the explosion. But this we think, is a mistaken inference.

Celluloid is a manufacturer's name given to a species of collodion, or dissolved and dried gun cotton. Common cotton, the refuse of cotton mills, and other vegetable fiber is dipped in a liquid composed of nitric acid and sulphuric acid; then drained, washed in water, and dried, when it is found to possess highly inflammable and explosive qualities, and is termed gun cotton, as it may be used as substitute for gunpowder; it has twice the power of the latter. This prepared cotton may be dissolved in ether and alcohol, when it forms a thick transparent liquid, known as collodion. This is the material used by photographers, who, in taking a portrait, spread a thin film of collodion liquid on a glass plate. The ether and alcohol soon evaporate, leaving the dissolved cotton to dry upon the glass in the form of a thin membrane or skin, which receives the silver compounds used in taking photo pictures. Collodion, when dried in any considerable mass, forms a tenacious, transparent substance, somewhat resembling horn. If whiting, zinc oxide, and other coloring substances are added to it while in the liquid state, and then dried, substances resembling ivory, hard rubber, bone, etc., result. All such forms are, however, very inflammable.

The use of alcohol and ether is expensive as a solvent, and the celluloid makers substitute camphor, the use of which forms the basis of their patent. By peculiar manipulation, involving the combined employment of heat and pressure, they are enabled to produce plates and blocks of dried collodion, of beautiful texture and color, possessing a certain degree of elasticity, with great strength and toughness, and little weight. From these plates and blocks, a great variety of merchantable articles are made, such as harness trimmings, jewelry, dental plates for artificial teeth, billiard balls, knife handles, etc. They are a complete substitute for hard rubber and ivory for many purposes, and considerably cheaper.

But not only is the manufacture of the crude celluloid dangerous, but even the most finished articles made from it will readily inflame. As a practical experiment, any one may take a strong and highly polished martingale ring of celluloid, which the strength of a horse could hardly break; apply to its surface a lighted match, and it will quickly ignite like a torch.

Celluloid factories must be classed among the extra hazardous risks, so far as fire insurance is concerned, and their presence in large cities is not desirable. The manufactories should be isolated; the finished goods should only be stored or exposed in small quantities in the shops.

STEAM BOILER PHENOMENA.

We recently took occasion, while giving an account of the work of the United States Commission on Steam Boiler Explosions, to explain the principles involved in such phenomena, and to indicate when danger might arise, and when explosion might not follow the introduction of the feed water. We have just received accounts of two cases of low water, neither of which resulted in explosion, and one of which gave such a striking example of a rare phenomenon (apparently contradicting our previously expressed views) that we place the case before our readers as we receive it, and trust that we shall learn the particulars of similar occurrences, should any have become known to them. We presume that the explanation is a perfectly simple one, but prefer to leave the point open to discussion by the correspondents of the SCIENTIFIC AMERICAN for the present.

In the first case, a plain cylinder boiler, nearly new, had been left, with the furnace door standing wide open, and with a very low fire on the grate. The boiler became absolutely dry, and heated up to a temperature which is estimated at somewhere between 600° and 1,000° Fahrenheit. When it became known that there was no water in the boiler, it was also found that steam pressure had fallen nearly or quite to zero by the gage. An independent feed pump, taking steam from a neighboring small boiler, was started and the boiler filled up without producing any apparent injury. Immediately after starting the pump, however, steam jumped to 190 lbs. pressure per square inch. The safety valve was found to be loaded to nearly 200 lbs. The shell of the boiler was subsequently carefully examined and appeared to be entirely uninjured; no worse symptom was discovered than the scorching of the paint on top of the shell. Even the valves remained tight; but an india rubber joint under the safety valve was melted, and a leak was produced there.

In the other case, the boiler was also of the plain cylindrical type, and the circumstances of the case were very similar. The fire was dull; the furnace door was open; the steam pressure had fallen very low, and the water seems to have entirely left the boiler. The temperature could apparently not have been far different in the two cases. In each, the boiler had been standing, as we are told, a half or three quarters of an hour with little or no water. In the second case, also, an independent pump was at hand and was put on with a full supply of feed. Here, however, to the astonishment of the attendants, steam rose to about 20 lbs. by the gage, and then as suddenly fell, the steam gage immediately indicating a complete or partial vacuum, the hand swinging quite past the zero mark, at which point there was no stop pin. So far as we have been able to judge, the general arrangement and conditions of these two cases were similar, as we have described them; the accounts are, we believe, accurate.

We shall hope to obtain particulars of other cases which may aid in explaining the facts. Meantime, we shall be glad to obtain light from our readers or from our friends of the steam boiler insurance companies, or from the United States Commission.

"STRAY IDEES."

"I got five hundred dollars for it, by Jove!"

We stopped writing, and, relinquishing our pen and with it an obscure argument the thread of which, doubly tangled by the lazy hot weather, we were laboriously endeavoring to follow, gazed resignedly at the speaker of the foregoing ejaculatory remark, as he threw himself into our solitary spare chair. He removed his hat, mopped his steaming brow with a capacious bandanna, dived into the pocket of the dustiest of dusters, and extracted a dirty bundle of papers Then he beamed on us benignantly over his spectacles, and banging his fist on our desk, emphatically observed: "Them's the documents. Want you to tell about it in the paper."

"Tell about what?"

"About the five hundred dollars. Why, man, I got it for just nothin', nothin'. There never was no such luck. Look here: you remember that ere patent you SCIENTIFIC AMERICAN people got out for me, nine year ago—one of a lot—'bout an ice masheen?"

As this agency had been instrumental in the obtaining of several thousand patents in the period mentioned, we naturally were unable to recal the special one alluded to by our visitor, and in reply hinted as much.

"Forgit it, hey? Wa'l, no matter, here it is," he said, hitching his chair close beside ours, and pointing with the stub of an amputated forefinger at a time-worn drawing. "You see, I was tinkerin' at ice masheens about that time, and patented a lot of them. One day, while I was fussin' at a model which wouldn't go, it kinder struck me that if I turned that ere pump over and changed round the valve, it would make a better pump out of it. I didn't know whether the thing would be worth anything or not. Any how I was busy at somethin' else then, and couldn't tend to it; but I thought to myself: Here I'm takin' out patents lively now; I might as well have one for this too. So I came to your people, and they got the papers for me, for the masheen as it then was, and a claim mixed in for the pump. Wa'l, after a time, I forgit all about it, didn't think it of no account, in fact, as I soon had a dozen bigger patents a goin'. I worked away, tryin' to get the masheens in the market, and was doin' pretty fair until the panic and the strikes came along, and them busted our company and left me poorer than Job's cat ever since.

"I went back to the iron works as foreman, and got along good enough to keep the pot a bilin' home; but—you see, I've got a boy. As lively and smart a young feller as ever handled a tool. Just oughter see him jump a lathe; yer oughter see him run—oh, wa'l, I'm his father; and fact is, now he's served his time, I made up my mind to send him to that 'ere Stevens Institoot, and have him learned to be a engineer. It was all well enough to decide he was to go; but the next question was stamps. I didn't have none laid by; and couldn't sell anythin' to raise enough money. I was thinkin' it over last night, blue enough I tell yer, when wife said a man at the door wanted to see me. I went down and after passin' the time of day, and all that, the feller asked if I ever patented a pump, which he kinder explained. First, I said no; but then I thought of the ice masheens, so I got the drawins, and told him to look and see if it was there. He went over them all, till he struck the one I've been tellin' yer about. 'That's it,' he says, quick, like; 'what'll yer take for it?' 'Why?' says I. 'Cause my boss wants it,' says he; 'he's got a big pumpin' masheen for mines and sich to be patented, and some of it has got to be like yours, and he wants ter buy yer out. What'll yer take? I'll give yer five hundred dollars cash.'

"It took about two seconds for me to settle that bargain. I came right down to York in the early train, had the papers all fixed in the office here, got my five hundred, which is thar" (slapping a plethoric wallet), "and now that boy makes a bee line for that Institoot this very day. Shake hands on it! Come and take somethin'? No? Wa'al; mebbe you'll write us a word to Professor What's-his-name at the Institoot, 'cause we're a goin' now."

We penned the desired note of introduction, accompanied our radiant visitor to the door; and as we watched him and his stalwart "boy" start blithely off toward Hoboken, we thought to ourselves that there was one man at least who had found out the value of "idees." He had caged a passing thought, deemed of no material importance, by the timely safeguard of a patent: and stored it away until its worthlessness had changed to worth. He had invested the evanescent product of his brain, just as he had invested the substantial products of his industry; but, the last, misfortune swept away from him, the first lay dormant for years, in the end to revive and aid him in his hour of necessity.

Certainly "idees" are worth keeping, and if so are worth guarding safely. Sickness may drive them from the brain, fraud may wrest them from carefully hidden memoranda, or ingenuity may fathom the secret even when concealed in cabalistic cypher; but to patent them is to lock them for years under the protection, not of oneself, nor of one's servants, who may betray their trust, but under the ward of a great government. Certainly it is best to cherish our ideas; but all are not equally valuable, and those that are so are often intermingled with many worthless and chimerical. Time and experience, however, will sift them away and reject them; but their worthlessness for the moment, so long as not based on opposition to the laws of Nature, should not determine us to throw them carelessly aside. It is better to remember that such stray ideas may some time, if inherently good, doubtless will prove valuable; it is well to remember also that, in order to originate, a man need not necessarily be a mechanic or practical worker in any branch of industry. The merest tyro in a casual stroll through a shop, or in his daily domestic experience, may light upon a "stray idee" which to men of almost unlimited skill has never occurred—a thought in which, in the future, if not now, he may find both fame and fortune.

THE NEW COMMISSIONER OF PATENTS.

The President has appointed to be Commissioner of Patents, vice Thacher, resigned, the Hon. R. Holland Duell, of Cortland Village, New York. Inventors will of course desire to know something of his history. He was born at Warren, 1824; received a common school and academic education; studied and practises law; was District Attorney of Cortland county from 1850 to 1855; was County Judge of the same county from 1855 to 1859; was Assessor of Internal Revenue for the twenty-third district of New York from 1869 to 1871; was elected to the Thirty-sixth, Thirty-seventh, and Forty-second Congresses, and was re-elected to the Forty-third Congress as a Republican. With all these important and extensive experiences he ought to make a good Commissioner, and under his administration we shall look for many improvements in the affairs of the Patent Office.

The Washington *Republican* says; "The appointment of the Hon. R. Holland Duell, of New York State, to the position of Commissioner of Patents gives, we are please to learn, universal satisfaction to all acquainted with his ability as a lawyer, whose large experience and valued practice in patent law so eminently fit him to fill the place so acceptably to all having business before that office. Judge Duell is one of those rare men whom position seeks, not they position—and probably no member of Congress ever gave more general satisfaction to his constituents than did Judge Duell during the four terms he served as such from his native State. Indeed, as some of our highest officials have justly remarked, there is no position under the government that Judge Duell is not qualified to fill; and when we consider that, to fine ability and large experience as a patent lawyer, Judge Duell brings the rare quality of an urbane sternness, so to speak, which enables a man to do stern, just things in a gentle manner, we can but congratulate the patent fraternity upon the prospects before them—the learned and experienced in that they will meet an equal, competent to grasp and dispose of their most intricate points, and the less educated and experienced in that in him they will find one who, whilst perhaps dispelling many a chimerical dream, will lift their minds encouragingly up to higher and grander accomplishments."

Disinfectants.

After an exhaustive series of practical tests of the various disinfectants sold in this city, embracing over fifty kinds, Professor Elwin Waller, of Columbia College, concludes that the best disinfectant is carbolic acid. About one per cent of the mixture should consist of carbolic acid. For prompt disinfection which is only temporary, strong oxydizing agents, as chlorine, potash permanganate, nitric acid, etc., should be used. Of these, the cheapest and most available is chloride of lime.

LIFE-SAVING APPARATUS.

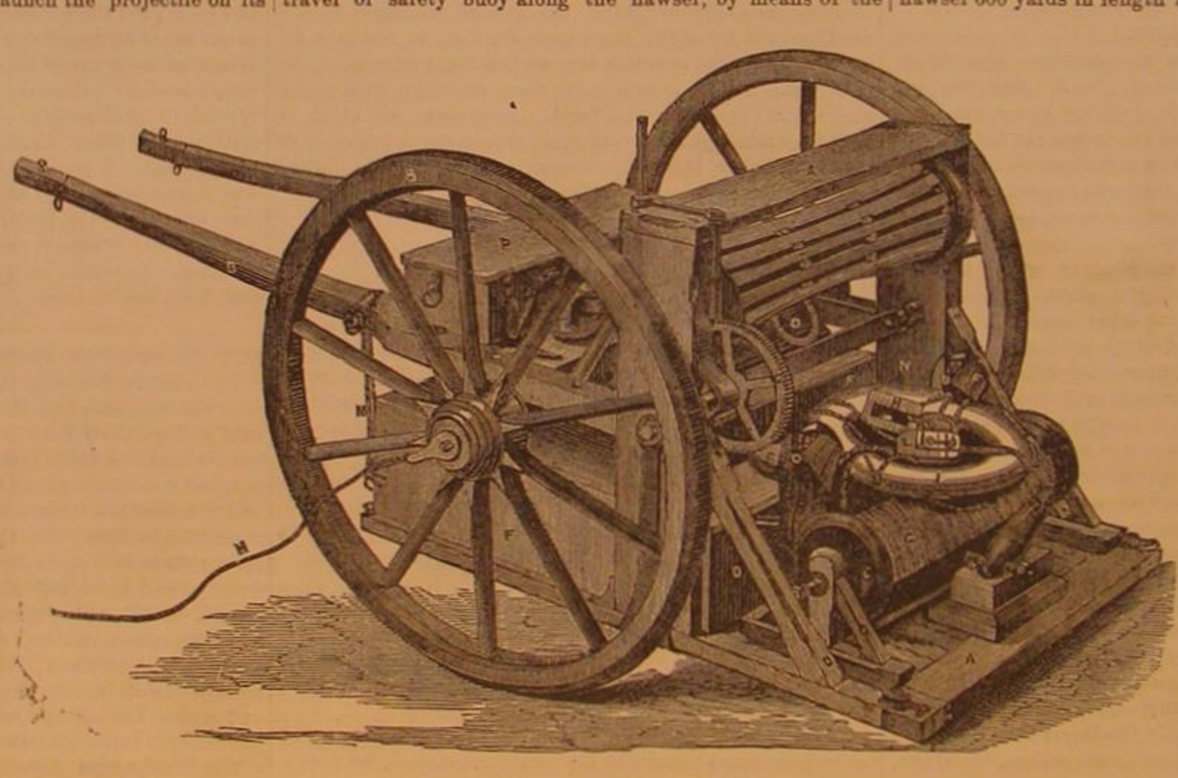
The life-saving apparatus and exhibits of the *Société de Sauvetage des Naufragés*, and of the British Board of Trade, at the International Maritime Exhibition at Paris—representing the official appliances for saving life from wrecks—may be regarded conjointly, and also in comparison with other means directed to the same good end.

ROGERS' LIFE-SAVING APPARATUS.—Fig. 1.

In relation to the lifeboat service, the French system is virtually identical with the English; and the same remark may be held to apply to the apparatus for effecting rope communication, which practically differ from each other only in the means employed to launch the projectile on its way. On this point the reasons assigned by the French Society for setting aside the Manby mortar and Boxer rocket are, namely, the former on account of the heavy powder charge, causing frequent rupture of the line, the latter for the uncertainty of its flight.

There appears to be a radical objection, common to both systems, namely, that, however successful they may be in casting a light line on the wreck, in mere contact, their success may perhaps be entirely neutralized by the fact that the persons endangered may be unable—from lack of knowledge, presence of mind, energy, or actual power, and from mere exhaustion—to render that essential aid without which all that has preceded must be so much waste labor and frustrated hope.

The subjoined statement appears in the catalogue of the British section, in the description given by the Board of Trade of their collective exhibits;



ROGERS' LIFE-SAVING APPARATUS.—Fig. 2.

"III. LIFE-SAVING APPARATUS—7. *Enameled Plates.*—In one: ase five men tied themselves on to the rocket line, and all were drowned except one." And it is exactly because this class of appliance is dependent, for its utility and success, so much on the mere chance that reliance can be placed on the possession by the shipwrecked mariners of the ability to avail themselves properly of the means placed within their reach—it is for this reason that system is to be regarded as far from being perfect or unsurpassed

Of course, the actual circumstances render it impossible to reduce to a certainty the saving of all lives endangered by wreck; but in the only complete apparatus of the kind which can be put in comparison with the two foregoing, namely, Rogers' system of rove-rope communication with wrecks, the right principle has been adopted primarily, by throwing a block and double line which can be worked from the shore, so as to effect as much as possible by the life-saving party on land, and make as little demand as possible on the aid and efforts of the poor sinking wretches struggling for bare life amid the horrors of shipwreck. Practically, this renders it possible to save life with the minimum of assistance from the mariners on board, limited to making fast the cone block. Conversely, when employed from on board ship, it is the most reliable method of getting a rove rope thrown at once on shore for direct communication. And finally, it may be remarked that it constitutes a valuable adjunct to a lifeboat, to facilitate the launching, and getting an offing, against storm and surf, without incurring the risks ordinarily attendant on that service, or wasting the strength of the lifeboat men, as frequently occurs.

Mr. Rogers' apparatus has undergone little modification and improvement in detail, since its introduction in 1868. The whole, as here exhibited," is exceedingly well devised, compact, and easy to transport, set up, and operate.

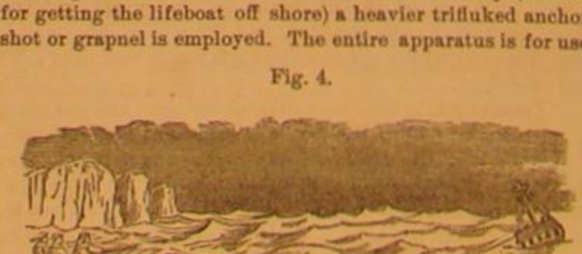
The annexed engravings, Figs. 1 and 2, show the general appearance and arrangement of the same as now submitted for the first time to the consideration of the seafaring interests: first, as packed at the station, ready for transport; and, secondly, as disposed for actual use *in situ*. A is the platform on which all gear is stowed, and which can be weighted, when in use, to gain stability; B, wheels and shafts, acting, when erected, as a derrick, thus giving elevation to keep the line, etc., as much as possible clear of rocks and surf; C, winch or windlass, for hauling in and out the rove rope, etc. D D are the large and small mortars, which can be used with or without the bed or carriage, as position will allow, for their respective services; E E*, the large and small cone block shot, for service with corresponding gun; E E, large anchor for launching service and use on board ship; F F*, pin boxes and tubs for coiled lines, J; G, the hawser, as used for setting up to run breeches block and buoy to and fro; G*, the reel and stand for carrying hawser on, which can be detached from the cart when in use, the bottom being formed sledge-shaped; H, the breeches block, used to suspend the buoy, I, from the hawser; K, the block and tackle for veering and hauling on, to take up slack and meet the motion of the line, so avoiding rupture of line by excessive strain; L. the snatch block, suspended to the shaft end to carry the hawser free and above obstacles; M, the guys to the derrick, serving also as drag ropes and suspending ropes in store or transit. N is the powder magazine; O, the medicine chest and means for resuscitation; P, the box of tools.

Briefly described, a small mortar, with a light powder charge, sends a cone block shot, carrying a sheave in its base through which a rope is rove, of which the two ends are coiled in pin boxes or tubs, so as to be carried out free from turns and ready for use, as we have actually seen and recorded; the projectile being also fitted with a tail, whereby it can be readily attached and made fast; which, being effected, the men on shore can, by means of the rove rope, haul out a hawser, and subsequently even a man or boat, if other means fail of getting the necessary attachments completed on board; the object being to establish the *va et-vient*, or to and-fro travel or safety buoy along the hawser, by means of the breeches block and whip line. The wheels and shafts are set up in lieu of the unstable triangle, and stayed to the platform by the guys, forming a derrick. In the inverse case of

Fig. 3.

effecting communication to the shore from the ship (as also for getting the lifeboat off shore) a heavier trifluked anchor shot or grapnel is employed. The entire apparatus is for use

Fig. 4.



when the wreck is lying within about a furlong of the shore. A greater distance, of 400 or 500 yards, a quarter of a mile or more, the inventor justly thinks the service is rather on for the lifeboat, than suitable for this particular class or appliance. The hawser and whip used by the *Société de Sauvetage des Naufragés*, and by the English Board of Trade, do not exceed a working length of 240 yards; and as regards ex-

Fig. 5.

perience, we learn that, during nine years' use on the French coast, the maximum distance at which their apparatus has been employed is 165 yards.

To throw the line, have the whip and hawser hauled out, send the traveling buoy on board, and bring a man ashore

Fig. 6.

from a suppositious wreck in four minutes, at a distance of 600 yards, necessarily implies the work of rope-hauling (four journeys) at the rate of 20½ miles per hour; and at 300 yards in one minute, the velocity requisite would be fifty-two miles per hour. Whereas it is clear that in the one case two, and in the other three, sets of whiplines and hawsers would have to be joined up and used; and moreover, to set up a taut hawser 600 yards in length is obviously preposterous, under such circumstances and for such a purpose.

As exhibited in Paris by Messrs. Rogers and Anderson, the apparatus contains two separate services, namely, for launching lifeboats, and for saving life from wreck by rope communication; either of which separately would be lighter than the conjoint system.

The two pairs of views, Figs. 3, 4, 5, 6, show the *modus operandi* of the systems which we have described; the first two of what may be called the contact system, and the last two of the rove rope system. Under the former the whip line has to be hauled out by those on board the wreck; but not so under the latter.

It will be seen, therefore, that, both with regard to what it does for the shipwrecked mariners, and what it relieves them from the necessity of doing, Messrs. Rogers and Anderson's apparatus is calculated to be more effective than the French or English systems previously used

Machine Builders at the Centennial.

According to the latest reports, applications for space in the machinery department of the Centennial are coming in fairly from all branches of mechanical industries, except from the mining tool, chemical apparatus, leather-dressing, embroidery, and jewelry-making machine manufacturers, and, strange to add, the boiler men. More boilers are wanted to supply the 500 horse power. The fact is remarkable, as there is no lack of excellent though different forms of boilers, and certainly no lack of competition between their makers. The iron and wood working people are sending in twice as many applications as any other class. Pumps and printing presses are likewise at the front. The locomotive interests are well looked after, but still are behind expectation. The latter is the case with the silk, cotton, woolen, rubber, and paper machines, only forty applications in these great classes of mechanism having been received. The shipbuilders are tardy; but there are indications of a good show of pleasure boats. Clock manufacturers are plentifully heard from. A Connecticut company is to supply a big electric clock with twenty-five dials. The Western Union Company, and President Orton especially, are taking great interest in the telegraphic display, so that in that department a fine exhibit may be looked for. From 20 to 25 per cent of the total space, it is estimated, will be occupied by foreign machinery

TO PRESERVE ice water, make a hat-shaped cover of two thicknesses of paper, with cotton batting, half an inch thick, between Place over the entire pitcher.

WATER PRESSURE ENGINE.

The engine herewith illustrated is designed chiefly as a substitute for manual labor, especially in localities where the use of steam power is either inadvisable or impracticable. The cylinder is oscillating and supported on its trunnions by fixed bearings cast in one solid piece with the re spective crank shaft bearings. The two double bearings are bolted upon a foundation plate, supporting also an air vessel on its after part. The bearings are further connected by stays,as shown. The cylinder is made,on both right and left sides, with flat faces, turned and adjusted truly rectantangular to the axis of its trunnions. Into these faces open the ports of the two water passages contained in the lower part of the cylinder body, communicating at their other ends with the bore of the cylinder. Adjusted truly to them, and so held up as to be easy but tight against the cylinder faces, are two boxes, one at each side,which receive the water from the conduits and distribute it by an admission port alternately to the two cylinder ports, and consequently fore and aft the piston. A fly wheel is provided to over ome the dead points which occur at each end of the stroke. The water which has performed its work is expelled by the returning piston back through its passage and enters the above named boxes through two separate ports to the right and left hand of the admission port, whence it flows through suitable conduits to the drain pipe into a cistern or other receptacle, whence it may be used again for other purposes. Screws are used for the purpose of setting and fixing the valve boxes in their proper positions in reference to the cylinder ports. By means of set screws, they are screwed slightly up to the cylinder to make a tight joint between their faces and still allow of free motion of the cylinder between the boxes. This adjustment can be done, on account of the tendency of the water pressure inside to separate the boxes from the cylinder, to such a nicety that the friction between the said faces is practically nothing.

In Zürich, Switzerland, the waɩer supply is elevated from the lake into reservoirs, partly by means of a water wheel placed within the principal pumping engine house, which is built upon piles in the middle of the river Limmat (the outlet of the lake of Zürich) but principally by means of large steam machinery in the same and other edifices.

At the present time 200 indicated horse power is employed, which raises 444,000 cubic feet of water per day, 55,00C cubic feet of which are consumed by water power engines. We are informed that,to such an extent have the advantages derived from the use of this water supply as a motive power been recognized, at the present time no fewer than 75 water power engines,of from $\frac{1}{4}$ to 2 horse power, are in daily operation, besides a great number of very small motors,used for driving sewing machines and similar light work.

Lithographers, printers, joiners, turners, piano manufacturers, machine makers, locksmiths, and kindred trades drive their lathes, saws, planing, drilling, boring, and molding machines, etc., with water engines. Butchers move their meat-cutting or pulping machines; weavers and lace makers operate their looms and winding machines, distillers their pumps, cutlers their grindstones and emery wheels, with them. These engines are also employed with hoists for stores, and for raising building material to buildings in construction. The inventors point out that their application, however, is not limited to town industries, but that it may be used advantageously in larger proportions for natural falls of water from 64 feet upwards, there being some engines at work with pressures up to 10 and 12 atmospheres. The only care required in using the mɩchines is that the water should not carry pebbles or sand, which in most cases can be prevented by allowing such substances to collect in a reservoir at the head of the fall.

These engines may also be used for raising and forcing liquids, sewage, etc., for cleaning pits, as fire pumps, or for contractors' purposes, by simply applying motive power to the crank shaft and converting the in and out let pipes into suction and delivery hoses respectively.

The city engineer of Zürich, Mr. Bürkle, we learn, has subjected one of these engines to a trial under the brake, with water pressures varying between 35 2 and 140·8 feet head, and under speeds from 0 6 to 2·4 revolutions per second. The average result obtained was 90·2 per cent. The highest duty was given out at speeds of from 1 to 2 revolutions per second. The particular engine in question was of the following principal dimensions: Diameter of cylinder, 3·5 inches; stroke of piston, 6·8 inches; diameter of water inlet pipe, 2 inches: and area of base plate, 32 inches long by 14 inches wide.

The power given off by 120 revolutions per minute, and 140·8 feet head, was 2·133 horse power. From these data it is plainly seen that the space required for the engine is very small in proportion to the power developed. Patented in the United States to the inventors, Messrs. Wyss and Studer, Technisches Bureau, Zeughausstrasse No. 9, Zürich, Switzerland, who may be addressed for further information relative to sale of patent, etc.

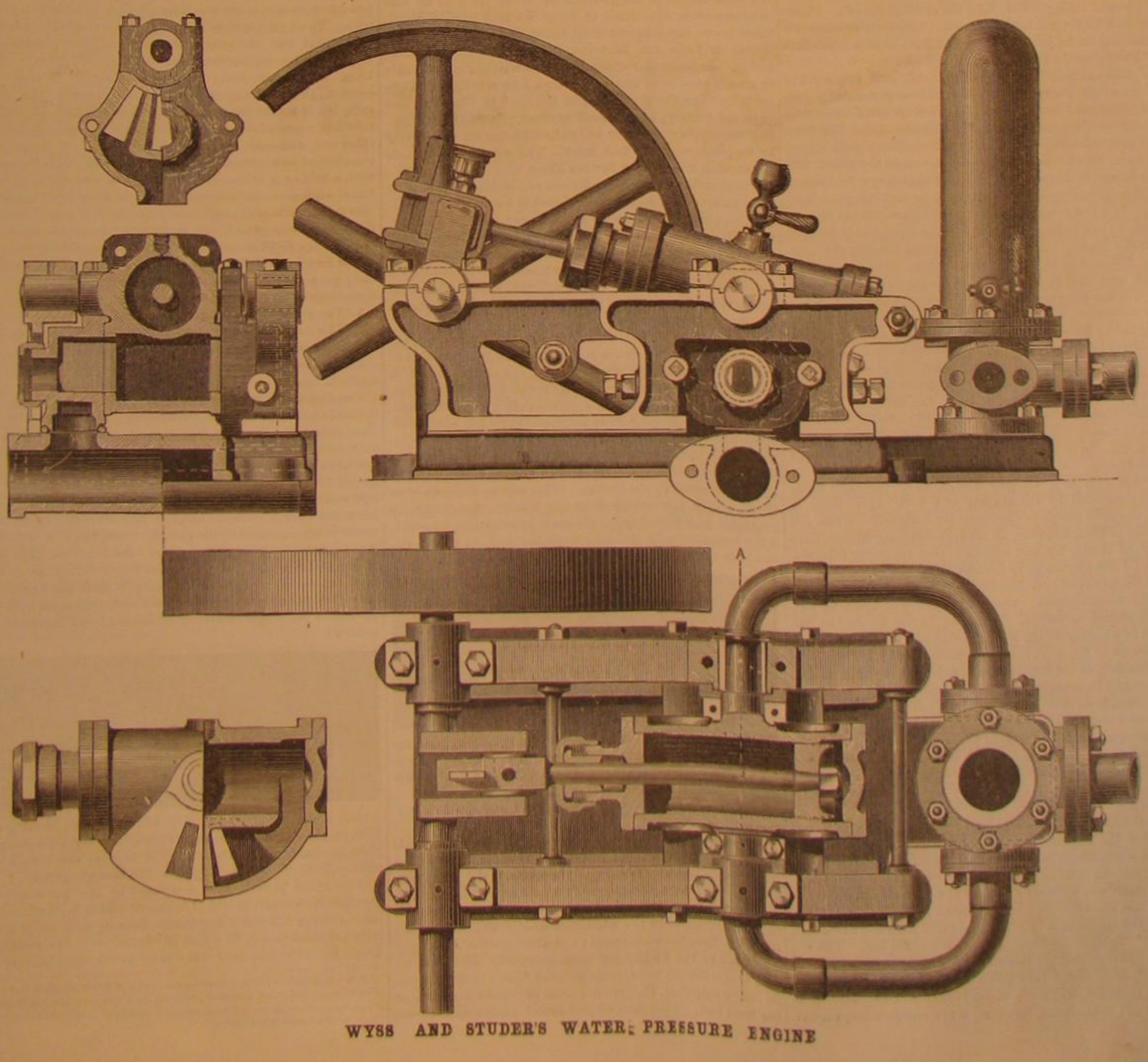
Interesting Torpedo Trials at Newport, R. I.

An extended series of torpedo experiments was recently made by the officers of the U. S. Naval Torpedo station at Newport, R. I., in the presence of the Secretary of the Navy and a large number of officials. The electrical instruments by which the torpedoes were fired were disposed on a lawn, or an elevated *plateau*, and were connected with batteries in the building. Among those instruments was an electric chronograph, invented and perfected by Farmer, worked by a pendulum driven by electricity, and designed so that it will fire from 1 to 120 torpedoes in as few seconds. By the side of this was an electric engine invented by Lieutenant Moore, which equals at best about twohorse power. The first item on the programme was a subaqueous salute to Secretary Robeson, of nineteen torpedoes, each charged with 10 lbs. of powder, arranged in line, south of the ferry landing. These were fired in the presence of the whole company by Lieutenant Manley, by the action of the pendulum of the chronograph above named, at intervals of six seconds, commencing southward. No better description can be given than by imagining a row of nineteen giant fountains, whose streams of water rise up in massives column to the average hight of 180 feet, each opening with a loud report and concussion.

The experiments were chiefly intended to show the utility of applying electricity under various conditions to the torpedo service, and thus, as a further illustration, Mr. Merrall next exploded a twenty-five pounder north of the ferry in deep water, to show the usefulness of Farmer's machine for boats.

Torpedo No. 3 consisted of 100 pounds of powder, placed east of the landing, and was fired by Farmer's machine for ships. This was in deep water. At the instant of the discharge it seemed as though 1,000 cannon had been fired under water. The spray flew up nearly 300 feet, deluging the persons in the nearest craft, and causing the water to seeth like a vast whirlpool.

Torpedo No. 4 was fired by the Lay torpedo boat against a



WYSS AND STUDER'S WATER PRESSURE ENGINE

raft at about 1,000 feet distance. The boat, having a five-pound torpedo fastened on the stern, was handled from the croquet lawn by Lieutenant Bradford. The boat is made almost in the shape of a cigar, with two pointed ends, and is almost totally submerged, the green outline appearing above the water being almost like a huge green fish. The boat is fitted inside with a small oscillating engine, driven and steered by carbonic acid gas, the steering being regulated through the electric machine, and by means of which it can be made to perform the most difficult evolutions so long as there is any gas left in the receiver. The object of this invention is to attack an enemy's vessel at a distance of two or two and a half miles, and, by means of immense torpedoes or charges of gunpowder or nitro-glycerin, destroy the enemy and the boat also. After a few fancy manœuvers, the deadly looking craft made right for the target, and in a few seconds the edge posts were shivered into atoms and thrown into the air a distance of twenty feet. Then the boat was sent on a cruise among the sailing boats and turned round and round with a rapidity that was astonishing, considering the distance.

Experiments were next made with the Ericsson torpedo boat. The engine was worked by compressed air, which was forced through an inch india rubber tube from the air box of a twenty-five horse power engine. The hose supplying the air is 800 feet long. The length used is also used to draw back the boat. The engine was started and the two propellers, which work in opposite directions, were set in motion. The air pressure was from seventy-five to a hundred pounds, and soon the tube, like an immense tail, began to run out after the boat.

In a few seconds the boat began to sink; and as the speed of the stationary engine, on the Nina, was increased, she sunk deeper and deeper, until the white disk on the ten-foot iron shaft on the upper portion of the boat was only three feet above the surface. Unlike the Lay boat, she made no ripple, and all that could be seen above water at 600 feet distance was the disk. The air is made to steer her through the tube that supplies her cylinder as effectually as the carbonic acid gas is made to govern the movements of the other boat. Great interest was manifested in this invention. As soon as the pressure is taken off, the boat rises to the surface; when speed is gained she sinks completely.

Next a group of torpedoes, six in number, were exploded north of the landing. They were in about six feet of water and charged with powder, from ten to forty pounds. These were fired by several ladies present. There was another row of startling water jets, which would have sent a small fleet to "Davy Jones' locker" in a few seconds.

A steam launch next appeared, with two seventy-five pounders rigged on spars at the bow. These were rapidly fired by Lieutenant Commander Wildes and several assistants. When the splash and splinters had cleared away, the Nina came past the stand with a 100-pound service torpedo rigged to a spar, which was exploded as she passed the stand. The torpedo used in this way is intended as a substitute for the ram which is attracting so much attention in modern naval warfare. In a few seconds, however, she returned to the charge, towing in her wake a "Harvey," which she quickly dragged against a floating raft and sent everything literally sky high. Now followed in rapid succession three fifteen pounders, which were fired by the contact of a small steam launch with buoys containing circuit losers of a peculiar construction.

In connection with these experiments the circuit indicator designed by Lieutenant Converse was used, which gives to the officer in charge absolute information as to the condition of his cables and torpedoes at all times. If a wire becomes defective or broken, it is signaled instantly by the ringing of a bell, which sound is kept up until the defect is repaired. It also enables him to fire the torpedo at will when the enemy's vessel does not come in contact with the circuit closer, and yet is near enough, in his judgment, to send her to the bottom. At the same time all the torpedoes can be rendered safe to a friendly vessel, their approach being merely signaled by the ringing of a bell, this being, in fact, the most complete apparatus yet designed. When one torpedo is fired, however, all others are thereby disconnected from the battery for half a minute, thus rendering it impossible for one torpedo to be fired by the action of another.

The next experiment was the simultaneous firing of seventy-nine dozen igniters. These were followed again by two extemporized torpedoes, the one in an old tin oil can, the other in a molasses jug, which rattled and thundered so that the whole of Newport must have been affected. These were constructed, at the request of the Secretary, by Messrs. Higginson and Davenport from the materials at hand. After the experiments on the east side of the island, Professor Hill created a commotion by exploding a hundred pounds of nitro-glycerin, placed to the west of the island, five feet from the surface of the water. The shock was quick and severe, and thousands of fish came instantly to the surface, apparently stunned, while many others were treated to a brief aerial voyage.

At the spot called Junction No. 12 by the experimenters, was effected the explosion of twenty-five pounds of dynamite under a raft which was floating on the surface of the water. This was the most splendid piece of work yet accomplished. The water was agitated a quarter of a mile distant from the raft, and the volume of water thrown in the air was laden with the splinters, which fell again into the water like match wood. The grandest spectacle of all was the last. The old coast survey schooner Bowditch lay quietly at anchor, 1,300 feet distant, under bare poles. Near her were a hundred little sailboats, which the steam launch was endeavoring to drive off; beneath her, however, was a terrific mine, consisting of three 100-pound gunpowder torpedoes and 250 pounds of dynamite in two others.

Mrs. Field, wife of Judge Field, of the Supreme Court, closed the circuit, and in an instant a vast column of water ascended about 300 hundred feet, followed by a roar and a concussion, and the timbers of the stately looking old craft were flying through the air. In the place where she had rested so placidly but a few seconds before a whirlpool was now seen spreading out its waves and receiving the falling *débris* as it descended, splash, splash, into the harbor; it was a complete annihilation. Not enough to make a doorpost, scarcely, was left whole. The hulk disappeared like a dream, for the instant the explosion took place she was crushed and carried up in the form of chips in the vast volume of water thrown by the force of the mine beneath.

Ballooning at Night.

M. Wilfrid de Fonvielle made a successful night ascent on August 1, for the purpose of observing meteorites. From 10 P. M. to 4 A. M., forty-two meteorites were observed between Rheims and Fontainebleau. Some of these emanated from *Cassiopeia*, others from *Perseus*, and as many as nine took a vertical direction, descending from the part of the heavens which was concealed by the balloon. None of these were very noteworthy, and it is probable that none would have been observed at the surface of the earth. Eight persons were in the car.

Correspondence.

What is the Electric Force?

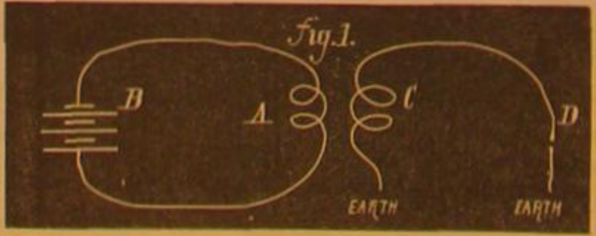
To the Editor of the Scientific American:

At the close of a life of patent research and experiment, it was the conclusion of Faraday that the electric force could not be defined; and it is almost universally conceded today that the nature and functional character of electricity must for ever remain one of the things unknowable. It is the purpose of the present article, in simple terms, to point out the partial fallacies of this proposition; and in order to arrive at a correct understanding of the subject, it is necessary that we frequently step aside from our subject to consider the bearings of other forces in respect of the electric force.

We may or may not accept at the outset a fact, susceptible of easy demonstration, that there is but one law regulating the transmission or continuation of force. It is of no sort of consequence what kind of force we may have in hand; there is one law inherent in all forces, and that law, in brief, is that no force can be transmitted except by molecular action. By molecular action I mean this: the first molecule or atomic particle of matter to which a force is imparted imparts that force to the next, and the next to the next, and so on indefinitely, in the same manner, generally speaking, that we topple over a row of bricks standing on end merely by toppling over the first brick. The correctness of this assumption will be seen further along.

The electric force is characterized as a subtle fluid flowing through or over a conductor. However subtle this "fluid" may be, it must therefore be a substance; and the fluid hypothesis assumes that it is a substance. The electric fluid is, therefore, something which, placed upon the terminal of a telegraph wire in New York, for instance, travels with inconceivable rapidity over or through that wire to the other terminal in Chicago. Let us note the facts which absolutely disprove this assumption.

We must first take into consideration the battery, or generator of electricity; and in so doing we are brought face to face with the question whether, when the electric circuit is established, any substance passes over or through the wire. In order that it may not be asserted that the fluid which leaves one pole of the battery returns to the other pole, thereby maintaining the equilibrium, we apply the battery to an induction coil, and for hours we discharge into the earth, from the secondary wire, a stream of brilliant sparks, the electricity generated by the battery. This will be understood as shown in Fig. 1, in which B is the battery, the electricity generated by which flows in the local primary coil, A; and C is the secondary coil, insulated from the coil, A, whose circuit is to the earth by way of the separated points, D.



We find an immense volume of electricity collecting at the points, D, and we know that the discharges cannot return to the battery. Therefore, if the electric force be a fluid or substance proceeding from the battery, the battery will in a certain period of time, have lost a certain quantity of its substance.

The battery is composed of certain metals, and chemicals in solution. By the action of the battery the nature of the metals and chemicals is changed, in precisely the same general manner that fire converts fuel into dust and gases, or water into steam. Now we have used our battery, we will say, for weeks, until the chemicals wholly, and the metals partially, have been converted; but although the electricity generated by the battery has been constantly given off, we find, if the battery be properly guarded from evaporation and its fumes collected, that not one atom of weight or substance has been lost. Therefore we can assert positively that the electricity generated by our battery, which has been constantly discharging in vivid sparks, not into the local circuit of the battery, but into the secondary earth circuit, is not a fluid or substance; that nothing leaves the battery and passes through the wire; that nothing passes through the wire, in the sense of substance; for this we do know, that, however subtle a "fluid" electricity may be argued to be, if it really be a fluid or substance flowing from the battery, there must inevitably be a loss in the weight of the substances comprising the battery, which we know there is not. There can be nothing more positive than these facts; and in view of them it cannot be argued that electricity is a substance, or a fluid, or a subtle fluid.*

Having gained this much, it will presently be seen that we have gained a great deal. What, then, is electricity?

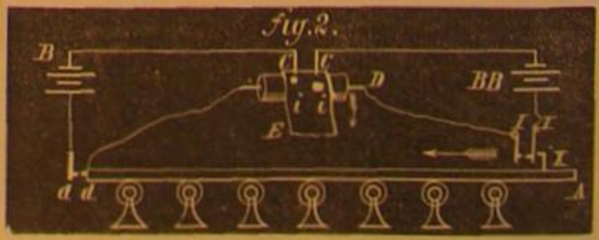
First, it is clearly a force. Secondly, it is transmissible.

Being a force and being transmissible, it is like all other forces (all of which are transmissible) in its transmissibility. Like all other forces, electricity exists in a certain condition of the molecular or atomic structure of substances. It is no more a subtle fluid, nor is its transmission any more singular, than the force of traction is a subtle fluid or its transmission singular. And it is proposed to adduce the most striking facts to prove that the electric force differs from other forces only in the character of the molecular action in which the forces exist, without entering into a discussion of the ultimates of matter and force, for we can never have knowledge of these ultimates. We know there are matter and force; but when we arrive at a studious questioning, we find it impossible to distinguish between matter and force, to decide whether matter is an attribute of force, or force an attribute of matter; and finally we might carry the thing so far as to wonder whether force is not everything and everything is nothing.

It may be confidently asserted that in the transmission of any force whatever, from the transmission of force through a simple lever to the transmission of electricity and light there is but one law, which is perhaps best exemplified in the toppling over of a row of bricks, as herein before mentioned. In this example, each brick crudely stands in the position of a molecule of matter, and acts upon the next brick in precisely the same manner (that is, as to imparting of force) that one molecule of matter acts upon another. If you blow a quantity of air into one end of a long tube, the same quantity of air will emerge from the other end; but you know that it is not the same air that is blown into the tube. The first impelled quantity of air yields its impulse to the next, and the next to the next, and so on indefinitely So if you take, with proper shape, a tube of water a mile long, for instance, and pour a certain quantity of water into one end, the same quantity will be displaced at the other end; but it would not be said that the water poured into the tube had traveled the length of the tube and emerged at the other end, although the effect is the same as though the quantity of water poured in had so traveled. It is the same with a belt or a lever; if you impart to one end a certain force, each atom or molecule of the belt or lever imparts that force to the next until finally the force is manifested at the distant end. And if the medium of transmission could be perfectly rigid or unyielding, the force applied at one end would be manifested almost instantaneously at the distant end; yet no one is astonished in witnessing the three general operations of an ordinary lever, namely:

1. The application of force at one end.
2. The transmission of that force to the other end by the molecular action of the matter composing the lever.
3. The manifestation, at the distant end, of the force applied.

The first and third operations, are visible; the second is invisible, but apparently instantaneous. I say apparently instantaneous, for I have made several experiments with a view to determining the speed of transmission of this force, and have ascertained that a reasonable period of time is required for the transmission of force through a rigid bar of iron as short as fifty feet in length. My first experiments led me to approximate the speed of this transmission to the speed of transmission of the electric force, but I have found that it varies with temperature and kind of metal. The bar of iron which I used, and which was fifty feet long, gave the best results. It was placed horizontally upon eight pulleys, with platinum contact points at each end, connected with an automatic telegraph recording instrument and batteries as follows:



Here are shown the bar A, fifty feet in length, running on pulleys, and the electrical connections, X being a projecting piece fixed to the bar, whose duty is to close the circuit of battery, B B, by forcing together the contact points, I I. The circuit of battery, B, is completed by the bar bringing together the contact points, *d d*, one of which is fixed to the bar. C C are the recording points, bearing upon the chemically prepared paper, E, which is carried over the metallic drum, D. It will be seen that a blow struck upon the end of

* It is a singular fact that, whenever something appears which is not capable of ready definition, instead of seeking for a solution, and suspending judgment until a solution is found, refuge is taken in hypothetical subtle fluids, or synonymous somethings.

the bar at A, to move it in the direction of the arrow, will close both circuits by bringing together the contact points, *d d* and I I, and that a discoloration of the chemical paper under the recording points, C C, will take place at the instant of such contact. Therefore, if the force applied at A be instantaneously transmitted through the bar, the points of chemical discoloration will be side by side on the paper E, moving in the direction of the arrow; whereas they really stand with relation to each other as shown at *i i*, the first mark made being that caused by the closing of the circuit at I I, where the blow is struck, and the second being that caused by the closing of the circuit at *d d*, which closing of circuit will not take place until the force applied at A shall have been transmitted to the other end of the bar by the action of the atomic particles of the bar.

In my experiment, the length of chemical paper carried beneath the recording points was 90 inches per second, any greater speed occasioning a break, and the dots caused by the contacts were $\frac{1}{40}$ of an inch apart; that is $\frac{1}{40}$ of an inch from the line they would have observed had the contacts been simultaneous. Therefore the time required for the transmission of the force applied from one end of the bar to the other was the $\frac{1}{3600}$ part of a second, or at the rate of 2,045 miles per minute. These results, however, were probably far from accurate. The speed of transmission may not only be much greater than attained in my experiments, but the process of determining it by chemical decomposition is faulty in many particulars. I do not claim that it does more than show a remarkable speed of transmission of ordinary force, and that not only this transmission could not have taken place without the molecular action of the metal, but that the molecular action of the metal alone accounts for the difference in time between the imparting of the force at one end of the bar and its manifestation at the other end. And I doubt whether any one, witnessing this phenomenon, would attempt to account for this transmission of force by urging the passing through the bar of a subtle fluid, generated by the bone, flesh, and blood of the person applying the force: yet we have in electricity the selfsame principle in the molecular action in which the electric force exists and by which it is transmitted.

The sun emits light. Now we know that this light has sufficient force, falling upon a surface properly placed, to impart motion to that surface. Therefore a ray of light must either consist of a solid projected from the sun, traveling through space and falling upon that surface, or it must be a certain condition of the molecular or atomic structure pervading everything, which condition is propagated, with inconceivable rapidity, from one atom to another, until, finally, the atomic light condition of the sun, though in less intensity, is reproduced at the earth. Now it is not only beyond all reason and hopelessly absurd to suppose that an atom of matter is projected from a burning body through a resisting medium at the rate of 192,000 miles a second, as, for instance, a ray from a feeble candle frame traveling through atmosphere and glass; but such a supposition is controverted by all the phenomena of forces. All forces—light, heat, sound, expansion, gravity, electricity—are transmitted in a similar manner to the transmission of force through a tube of water or air, as related; and as this is the fact, so all forces must reside in a certain condition of the atomic or molecular structure of matter. Primarily, there must be a normal condition of the molecules of matter as to shape and state of motion or quiescence. What that normal condition is, whether in shape the atomic particles are round, square, or otherwise, whether their motion is vibratory or circular, whether a certain motion attracts and another repels, we can of course never accurately determine, although we may theoretically approximate some of the conditions, as, for instance, the conditions necessary to the expansion of a metal by heat.

Washington, D. C. W. E. SAWYER.

Salycilic Acid for the Preservation of Infusions, etc.

"The wonderful reports of the conservative properties of salycilic acid led me some time ago to commence a series of experiments to determine the proportions of acid necessary to add to infusions, etc., in order to keep them a reasonable length of time without change. The results I have obtained are not quite as satisfactory as I had anticipated, but probably they will not on that account be less interesting to pharmacists in general.

Before experimenting with the infusions, I sought a suitable solvent for the acid, and several weeks ago found that solution of borax was its best solvent; but this does not take up a sufficient quantity to allow of its being added to medicinal preparations for the purpose of preservation. Boiling water dissolves the acid in proportions sufficiently large for the purpose, and does not deposit it again on cooling; therefore I made the infusions, etc., upon which I experimented, with water in which I had previously dissolved the requisite proportion of the salycilic acid. The following are the results of the investigation:

Infusion of cascarilla, without acid, kept two days; with acid (five grains to pint), kept five days. Another infusion made of double strength, with water containing ten grains of acid to the pint, has now kept over a fortnight and is perfectly fresh.

Infusion of quassia.—A quart of concentrated infusion (one to seven) was prepared, having forty grains of the acid dissolved in it: this has kept now over a month, and is as nice as when first made. One part of it was diluted with seven of water and kept for comparison with a simple infusion; the latter was unfit for use on the fourth day, whereas the former kept for six days.

Infusion of orange, made with water containing five grains of the acid to the pint, kept perfectly bright and fresh for eleven days, but then gradually became turbid.

Infusion of calumba went bad in three days, and a sample with three grains of acid to the pint only kept four days. A stronger infusion, with ten grains to the pint, was put into an uncovered beaker, and was clear and good at the end of the week; but spots of mold then began to form upon its surface though it still remained bright.

Infusion of senna with eight grains of acid to the pint kept seven days, being four days longer than one without acid.

Infusion of malt (two ounces to pint).—A simple infusion was quite sour in three days; but with eight grains of the acid to the pint, a portion of the same infusion retained its odor upwards of fourteen days, and even now, at the expiration of twenty-one days, the odor might be distinguished.

Tragacanth mucilage.—The addition of acid, in the proportion of eight grains to the twenty ounces, causes this to keep for a length of time, a sample prepared nearly a month ago being quite fresh, while a mucilage without this addition had acquired a repulsive odor in about eleven days.

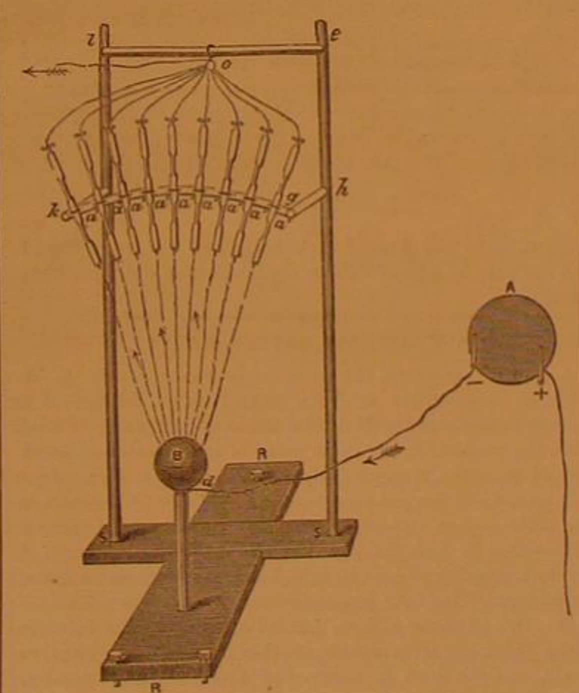
Mucilage of acacia also appears to keep well with this addition.

Lemon juice will retain its odor for weeks, and will not turn moldy, even if kept in an uncovered vessel, if five grains of salycilic acid are added to each pint.

Having read that this acid would keep leeches healthy and prevent the water in which they were kept becoming foul, I added ten ounces of acid solution (eight grains to pint) to half a gallon of water into which fifty leeches were put. Previous to this addition, we had found two or three dead leeches every week when the water was changed; but since, we have not lost a single leech, and the water keeps fresh for weeks. I forgot to note that, by adding ten grains of acid to each pint of sirups of red and white poppies, violets, etc., fermentation is effectually prevented. The addition of a little yeast to several of the samples produced no effect."—*J. C. Thresh, in Pharmaceutical Journal.*

AN EXPERIMENTAL AURORA.

M. Lynström, of the University of Helsingfors, has sent to the Geographical Exhibition, Paris, an interesting instrument invented by him to demonstrate that auroræ are produced by electrical currents passing through the atmosphere in the polar regions. Our illustration will give an idea of the apparatus.



A is an electrical machine, the negative pole being connected with a copper sphere and the positive with the earth. S S' are of ebonite, as well as R R *d d*, so that B is quite isolated as the earth in the space. B is surrounded by the atmosphere. *a' a' a' a' a'* are a series of Geissler tubes with copper ends above and below. All the upper ends are connected with a wire which goes to the earth, consequently a current runs in the direction of the arrows through the air, and the Geissler tubes become luminous when the electrical machine is set in operation. These Geissler tubes represent the upper part of the atmosphere, which becomes luminous when the aurora borealis is observed in the northern hemisphere. The phenomena produced by the Lynström apparatus are quite consistent with the theory, advocated by Swedish observers, that electrical currents emanating from the earth and penetrating into the upper regions produce auroræ in both hemispheres. The experiment, says *Nature*, differs from the apparatus of M. De la Rive, who placed his current *in vacuo*, and did not show the property of ordinary atmospheric air of allowing to pass unobserved, at the pressure of 2 feet 6½ inches, a stream of electricity which illuminates a rarified atmosphere. The experiment was most attractive, and hundreds of persons witnessed it every day.

A board of engineers is now in session in this city, examining Captain Eads' plan for the improvement of the mouth of the Mississippi river. The recommendations thus far carry the total length of the east jetty to 12,700 feet, or 300 feet beyond the west jetty, and fix upon 1,000 feet as the space to be left for the current between the two artificial walls.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE BARNACLES ON THE GREAT EASTERN.

Mr. Henry Lee describes in *Land and Water* a recent examination of the bottom of the Great Eastern, made by him in search of new barnacles and other marine animals. His labors were unrewarded with much of novelty; but among other interesting facts remarked, he notes that the portion of the hull usually submerged was clad with an enormous multitude of mussels, extending over a surface of 52,000 square feet of iron plates, and in some parts six inches thick. The average weight of the mussels was from 12 to 13 pounds per square foot, so that the vessel was cumbered with fully 300 tuns of living marine animals, enough to load, with full cargoes, two ordinary collier brigs.

ANOTHER NEW ANTISEPTIC.

Among the benzol group, all of which are derived from coal tar, are (besides the phenol or carbolic acid (C_6H_6O) and its many compounds) the cresol (C_7H_8O), the phlorol ($C_8H_{10}O_2$), and the phynol. The latter, of which the composition is $C_{10}H_{14}O$, is also found in the volatile oil of thyme, together with thymene, $C_{10}H_{16}$, and cymene, $C_{10}H_{14}$; but the cheapest source of its production is coal tar. Several compounds of the phynol were studied by chemists long ago; but it was reserved for Lewin, of Berlin, to discover that it is a powerful antiseptic. When pure, it consists of transparent crystals of a very agreeable and strongly aromatic odor: while it is so powerful that a single grain in thirteen ounces of hot water is a sufficiently strong mixture for all purposes. Comparative experiments have shown that it possesses a much greater power to arrest fermentation and putrefaction than either carbolic or salicylic acid. Added to a solution of sugar, with yeast, it arrested fermentation; added to milk, it arrested coagulation till 20 days later than is usual, and after 40 days there was no vegetation visible. Albumen of eggs did not show putrefaction at the end of 11 weeks, and the peculiar aromatic smell was still prevalent at that time. Even in bony substances, otherwise so ready to start decomposition and putrefaction, it was able to arrest all putrefactive change for not less than 35 days.

It appears thus that the benzol series contains the best disinfectants, and that carbolic acid, which has hitherto enjoyed the highest reputation, is by no means the best in the series; and that it will be superseded by the fragrant thymol, until perhaps some better antiseptic is discovered.

A NEW OLEAGINOUS SEED.

The commission of the permanent Exposition of the French Colonies has lately called the attention of Marseilles soap makers to a new source of oil, found in the seed of the carapa, which is a tree abounding in immense forests in French Guiana. Twice a year the tree produces an abundant harvest of seeds, which at certain times cover the earth to a depth of four or five inches. These, immediately subjected to pressure, give 35 per cent of their weight in an excellent soap-making or illuminating oil.

NATIONAL TREE PROTECTION.

By a United States statute of March 3, 1875, a penalty of $200 or six months' imprisonment is attached to permitting cattle to run on national lands, and to break down trees and hedges. The unlawful cutting or wanton destruction or injury of "any timber tree or any shade or ornamental tree, or any other kind of tree" on the lands of the United States is punishable by $500 fine or a year's imprisonment.

A Shower of Hay.

Dr. Hawtrey Benson, of Dublin, writing in the Dublin *Daily Express* under date July 27, describes a remarkable shower of small pieces of hay which he witnessed at Monkstown that morning. It appeared in the form of "a number of dark flocculent bodies floating slowly down through the air from a great hight, appearing as if falling from a very heavy dark cloud, which hung over the house." The pieces of hay picked up were wet, "as if a very heavy dew had been deposited on it. The average weight of the larger flocks was probably not more than one or two ounces, and, from that, all sizes were perceptible down to a simple blade. The air was very calm, with a gentle under current from S. E.; the clouds were moving in an upper current from S. S. W." The air was tolerably warm and dry, and the phenomenon is thus accounted for by Dr. J. W. Moore: "The coincidence of a hot sun and two air currents probably caused the development of a whirlwind some distance to the south of Monkstown. By it the hay was raised into the air, to fall, as already described, over Monkstown and the adjoining districts."

A similar shower of hay fell near Wrexham, England, July 25.

Collodion.

Few bodies are more easily electrified than collodion. With the least friction by the hand, the membrane adheres to the fingers. If a collodion sheet be fixed, like a flag, to a glass tube, and waved in dry and hot air, it is electrified. Other uses of collodion sheets, here mentioned, are in experiments on polarization of light, on colors of thin films, on diathermancy, on vibrations in acoustics. M. Gripon prepares these sheets by dissolving 1·5 to 1·7 grains gun cotton in a mixture of 50 grains alcohol and 50 grains ether. The collodion is poured on a glass plate after the latter has been breathed upon so as to receive a coating of moisture. When—after some hours—the collodion is dry, the plate is put in water; and a sheet of paper having been applied and attached to the collodion by the edges, the film is drawn off with the paper.

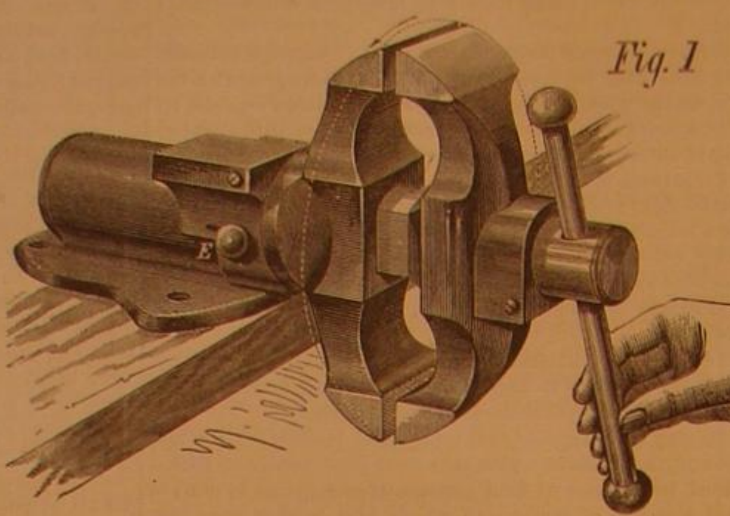
IMPROVED VISE.

We illustrate herewith a novel form of vise, of simple and strong construction, and possessing double jaws, which may be adjusted so as to hold an object at any desired angle with great firmness. This arrangement offers considerable advantages to the operator, since he can thus place his work in whatever position is best suited to his convenience. A perspective view of the invention is given in Fig. 1, and sectional views in Figs. 2 and 3.

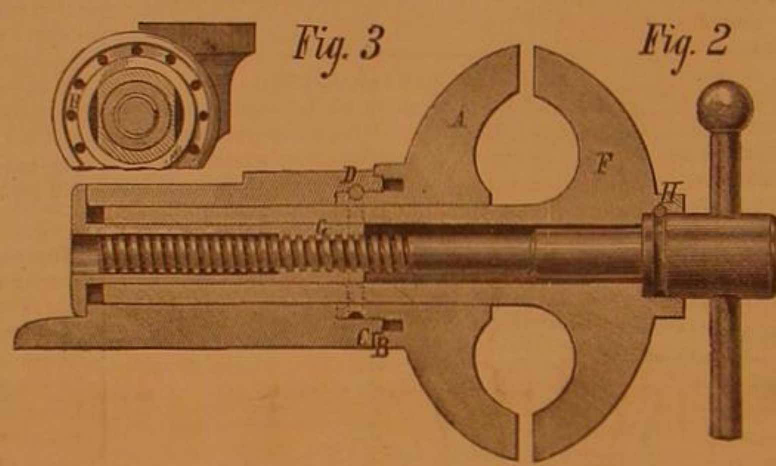
The fixed jaw, A, is grooved at B, Fig. 3, to receive an annular projecting portion of the standard, C, and also has a shank which enters into a socket in said standard. To hold the jaw in its place, a score is cut around the shank, and a similar score is made above in the socket. Into the aperture thus formed a hardened steel pin, D, is placed. This pin prevents the jaw, A, from being drawn out, while it does not interfere with the rotating of said jaw in the direction of the arrow, and as indicated by the dotted lines in Fig. 1. Fig. 3 shows the rear face of the jaw, A, and exhibits in the groove, B, a number of holes. On the standard is a spring bolt, shown at E, Fig. 1, which, when it is desired to adjust the jaws at an angle, is drawn back, and, when the jaw is set, is slipped into one of the apertures, holding it firmly. The movable jaw, F, has a hollow shank which enters the jaw, A, and the standard. Into the end of said shank is placed the flanged nut, G, into which passes the vise screw. The latter is held in place in the movable jaw by a pin, H, arranged in similar manner, to the pin, D, already described. It will be seen, from the shape of the shank of the movable jaw, that that jaw turns with jaw, A, and is held with the latter. The gripping of the jaws is effected by turning the handle in the usual manner, the screw acting in the nut and drawing the parts together very tightly. All parts of the vise are made to gage, so that, when any portion becomes broken, it can be replaced by sending number and size of jaw to the manufacturer.

The faces of one pair of jaws are roughened, and those of the other pair left smooth, to suit different kinds of work. The general construction is such as to prevent any dirt entering the working parts. The pins, H and D, present a novel and ingenious mode of securing the jaws; and although of hardened steel, they sustain but very little of the thrust, and hence are not likely to wear out. They are easily removed, admitting of the implement being taken apart for oiling, etc. A screw thread cut on one end, engaging in a similar thread made in the jaw for pin, H, and in the standard for pin, D, holds each pin firmly in place.

Patented January 26, 1875. For further information address the manufacturer, Elmore Penfield, Middletown, Conn.



PENFIELD'S IMPROVED VISE.



FOX'S REVERSIBLE CAP.

Mr. Morris Fox, of New York city, has recently invented

Fig. 1.

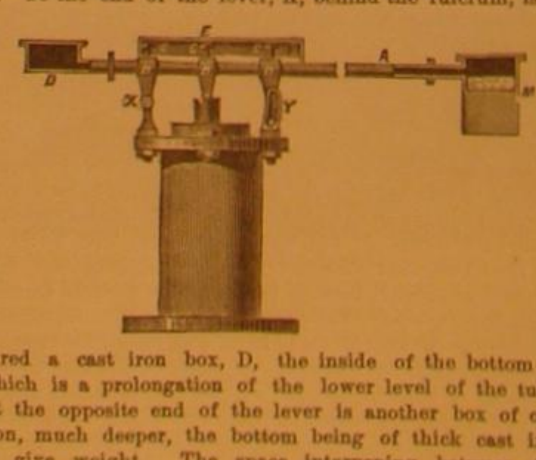
a new form of cap for the use of car drivers and others exposed in winter, by their occupations, to the inclemency of

Fig. 2.

the weather. It has a double back section, marked B, in Fig. 1, over the crown of the head, and a double front section, E, Fig. 1, over the front of the head. The front piece, D, is also made double. By detaching loops by which the the sections are fastened when the cap is worn as shown in Fig. 1, the folded rear part, B, may be reversed and extended down to the neck, as shown in Fig. 2; the supplementary crown section, E, is then swung over the front, below the chin, to cover the ears and front part of the neck, and the upper front is thrown over the lower part of the front piece, D, forming a head covering which is claimed to be perfectly waterproof in the roughest weather. The inventor proposes to make one side of each section of fur, as in Fig. 1, and the reverse side of rubber cloth or other waterproof material.

A MERCURIAL SAFETY VALVE.

A new safety valve, the patented invention of Mr. E. W. Colls, is in operation at Erith, near London, and is said to answer exceedingly well. The action of the valve is such that, the moment it begins to move in consequence of an excess of pressure, it opens fully, so as to allow a free escape of steam until the pressure becomes sufficiently reduced in the boiler, when the valve closes as quickly as it opened. This action is brought about in the following manner: A lever, A, consists of a metal tube, having at each end a closed metal box. This tube passes through eyes in the pillars, B B B. One of these pillars, jointed at X, forms the fulcrum upon which the lever works; another presses upon the valve itself, and the third is unattached at its lower extremity, where it has a stud which works up and down in the curved slot, Y. This slot acts as a guide preventing the valve from being forced out of its seat. The screws, C C C, passing through the pillars at the top, press upon and hold the lever, A. To the end of the lever, A, behind the fulcrum, is secured a cast iron box, D, the inside of the bottom of which is a prolongation of the lower level of the tube. At the opposite end of the lever is another box of cast iron, much deeper, the bottom being of thick cast iron to give weight. The space intervening between the floor of this box and the lower level of the tube is filled with mercury, M. The pressure upon the valve is regulated by setting this weighted end of the lever at a proportionate distance from the fulcrum. For this purpose, the lever is duly adjusted, and then secured in its place by the screws, C. When once the lever is adjusted by the engineer or other responsible person, it may be secured from being altered by the man in charge of the boiler by sliding over



the head of the screws, C, a tubular cap, E, having a slot formed along it at the bottom for the stems of the screws to pass through. The cap is closed at one end, and at the other is provided with a cover which is applied to it when the cap has been slipped over the heads of the screws. The cap is then secured by a padlock, and all access to the screws is thus prevented

When the maxim um pressure of steam at which the valve is set is attained, the valve proceeds to lift slightly, as if constructed in the ordinary way; but the moment this takes place the lever is thrown out of its horizontal position, and the mercury from the weight box begins to flow through the tube into the box behind the fulcrum. The weight of the mercury is thereby displaced from the end of the lever and acts as a lifting force by being transferred to the rear of the fulcrum. Thus the valve is no longer loaded to the same extent as before, and opens freely for the escape of steam. When the boiler has been relieved of pressure to the extent of two or three pounds, the lever weight is sufficiently heavy to close the valve, and the mercury returns to its original position, thereby preventing the valve from opening again until the maximum pressure is once more attained. As used at the Erith oil works, the steam blows off at a pressure of 35 lbs., and closes when it falls to 32½ lbs. The valve is easily set to a pressure ranging from 10 lbs. to 100 lbs., on the square inch.

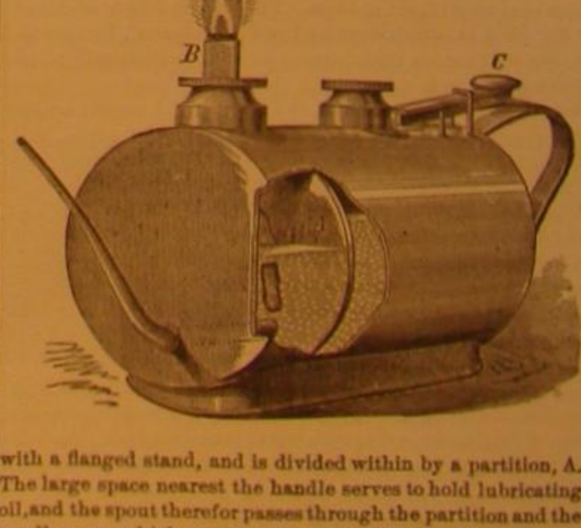
Japanese Variegated Foil.

Professor Liclegg, of Japan, writes to Europe to describe a process used by the Japanese in the production of a metal leaf used for decorative purposes. Thirty or forty thin plates, of gold, silver, copper, and various alloys, are laid one over the other in a given order, and soldered together at the edges, so that the whole forms a stout plate of metal. Punches of various shapes, conical, pyramidal, with triangular, square, or pentagonal sides, are now used to make a pattern of perforated figures, which exhibit on their inner sides concentric circles, triangles, and other forms corresponding to the punches used. The plate so prepared is hammered and rolled until it has become quite thin, the holes disappear, and the figures have spread out, preserving, however, their parallelism. A number of broken, straight, and curved lines are thus produced, their effect being further enriched by the use of acids to modify the colors. Thin plates prepared in this way have an extremely flexible nature admitting relief, with stamped or engraved designs; and, capable of receiving the most varied colors and forms, will have many uses in decorative art.

ROBERTS' COMBINED LAMP AND OIL CAN.

A simple little invention is illustrated in the annexed engraving, which, we think, will prove of considerable convenience to engineers. Any one who has ever attempted to oil out-of-the-way machinery in the dark, and especially in the confined limits of a steamboat's hold, will understand that keeping one's self clear of the moving parts, while both hands are occupied, the one with a lamp, the other with an oil can, is certainly not an easy, and is in some respects a perilous, operation. The present device, which combines lamp and oil can in one, allows one hand to be free, so that the user can steady and support himself, and in addition a further advantage is offered in having a light so placed as to illuminate the darkest recesses of the machine, which it otherwise might be difficult to light up sufficiently to enable oil cups to be readily found.

As shown in the engraving, a cylindrical vessel is provided



with a flanged stand, and is divided within by a partition, A. The large space nearest the handle serves to hold lubricating oil, and the spout therefor passes through the partition and the small space, which contains lamp oil, and extends in a nozzle outside the can in the usual manner. The lamp oil space is filled through the aperture, at B, in the cover of which a lamp burner is arranged carrying the usual wick. The flow of lubricating oil is regulated by a spring lever, C, by which a small air hole is closed or opened at will.

Patented through the Scientific American Patent Agency

June 22, 1875. For further particulars regarding sale of rights, etc., address the inventor, Mr. William Roberts, Quincy, Adams county, Ill.

THE CENTENNIAL BUILDINGS.

We have already published complete views of three of the buildings now being erected for the purposes of the Centennial Exposition to be held in Philadelphia next year; and we now add a representation of the large structure to be devoted to the agricultural show. It will stand north of the Horticultural Building, and on the eastern side of Belmont avenue, Fairmount Park. It will illustrate a novel combination of materials, and is capable of erection in a few months. Its materials are wood and glass. It consists of a long nave crossed by three transepts, both nave and transept being composed of Howe truss arches of a gothic form. The nave is 820 feet in length by 125 feet in width, with a hight of 75 feet from the floor to the point of the arch. The central transept is of the same hight, and has a breadth of 100 feet, the two end transepts being 70 feet high and 80 feet wide.

The four courts inclosed between the nave and transepts, and also the four spaces at the corners of the building, having the nave and end transepts for two of their sides, will be roofed to form valuable spaces for exhibits. Thus the ground plan of the building will be a parallelogram of 540 by 820 feet, covering a space of above ten acres. In its immediate vicinity will be the stock yards for the exhibition of horses, cattle, sheep, swine, poultry, etc.

Several foreign countries will erect buildings, more or less important in size and appearance, in the park. These will add importantly to the appearance of the whole, and many of them will be attractive specimens of modern architecture. Altogether, the Commission must be congratulated on their success in obtaining the necessary buildings for the Exposition.

1776 AGRICULTURAL BUILDING. 1876

Progress of Engineering.

At the meeting of the British Association for the Advancement of Science, which took place at Bristol on the 25th ult. Sir John Hawkshaw delivered the address, devoting himself especially to the history and progress of engineering. "Inventions," he said, "were lost and found again. The art of casting bronze over iron was known to the Assyrians, though it has only lately been introduced into modern metallurgy; and patents were granted in 1609 for processes connected with the manufacture of glass which had been practised centuries before. An inventor in the reign of Tiberius devised a method of producing flexible glass, but the manufactory of the artist was totally destroyed in order to prevent the manufacture of copper, silver and gold from becoming depreciated.

ANCIENT ENGINEERING.

A high tribute to the wonderful engineering capacities of the Romans was paid by Sir John. Wars, with all their attendant evils, often indirectly benefited mankind, as when, under the Romans or Napoleon, great systems of roads and bridges were instituted for military purposes. Roads followed the tracks of Rome's legions into the most distant provinces of the empire. Three hundred and seventy-two great roads are enumerated, together more than 48,000 miles in length, according to the itinerary of Antoninus. The water supply of Rome during the first century of our own era would suffice for a population of 7,000,000, supplied at the rate at which the present population of London is supplied. A rapid glance was taken at the progress of mechanical skill in the manufacture of textile fabrics and the immense growth of steam traffic on the ocean, traffic which a distinguished member of the association had said, at one of its meetings, forty years ago, was impossible. Similar advancement has been recorded in the department of telegraphy; and what a splendid success had not the railroads proved! The railways in the British islands now produce, or rather save to the nation, a much larger sum annually than the gross amount of all the dividends payable to the proprietors, without at all taking into account the benefit arising from the saving in time. The benefits under that head defy calculation, and cannot with any accuracy be put into money: but it would not be at all overestimating this question to say that in time and money the nation gains at least what is equivalent to 10 per cent on all the capital expended on railways. It follows that, whenever a railway can be made at a cost to yield the ordinary interest of money, it is in the national interest that it should be made.

COMPARATIVE SAFETY OF RAILWAYS.

Speaking of accidents on railways, Sir John said that they were fewer now than they had been; indeed, that there is only one passenger injured in every 4,000,000 miles traveled, or that, on an average, a person may travel 100,000 miles each year for forty years, and the chances be slightly in his favor of his not receiving the slightest injury.

TEXTILE INDUSTRIES.

More ingenuity and creative mechanical genius is perhaps displayed in machines used for the manufacture of textile fabrics than by those used in any other industry. It was not until late in historical times that the manufacture of such fabrics became established on a large scale in Europe. Although in China man was clothed in silk long ago, and although Confucius, in a work written 2,300 years ago, orders with the greatest minuteness the rules to be observed in the production and manufacture of silk, yet it was worth nearly its weight in gold in Europe in the time of Aurelian, whose empress had to forego the luxury of a silk gown on account of its cost.

Until 1738, in which year the improvements in spinning machinery were begun, each thread of worsted or cotton wool had been spun between the fingers in this and all other countries. Wyatt, in 1738, invented spinning by rollers instead of fingers, and his invention was further improved by Arkwright. In 1770 Hargreaves patented the spinning jenny, and Crompton the mule in 1775, a machine which combined the advantages of the frames of both Hargreaves and Arkwright. In less than a century after the first invention by Wyatt, double mules were working in Manchester, with over 2,000 spindles. Improvements in machines for weaving were begun at an earlier date. In 1579 a ribbon loom is said to have been invented at Dantzic, by which from four to six pieces could be woven at one time, but the machine was destroyed and the inventor lost his life. In 1800 Jacquard's most ingenious invention was brought into use, which, by a simple mechanical operation, determines the movements of the threads which form the pattern in weaving. But the greatest discovery in the art of weaving was wrought by Cartwright's discovery (in 1784) of the power loom, which led eventually to the substitution of steam for manual labor, and enabled a boy with a steam loom to do fifteen times the work of a man with a hand loom.

For complex ingenuity few machines will compare with those used in the manufacture of lace and bobbin net. Hammond, in 1768, attempted to adapt the stocking frame to this manufacture, which had hitherto been conducted by hand. It remained for John Heathcoat to complete the adaptation in 1809, and to revolutionize this branch of industry, reducing the cost of its produce to one fortieth of what the cost had been before Heathcoat's improvements were effected.

TELEGRAPHY.

There is no more remarkable instance, of the rapid utilization of what was in the first instance regarded by most men as a mere scientific idea, than the adoption and extension of the electric telegraph.

The first useful telegraph was constructed upon the Blackwall Railway in 1838, Messrs. Wheatstone's and Cooke's instruments being employed. From that time to this the progress of the electric telegraph has been so rapid that, at the present time, including land lines and submarine cables, there are in use in different parts of the world not less than 400,000 miles of telegraph.

Among the numerous inventions of late years, the automatic telegraph of Mr. Alexander Bain, of Dr. Werner Siemens, and of Sir Charles Wheatstone are especially worthy of notice. Mr. Bain's machine is chiefly used in the United States, that of Dr. Werner Siemens in Germany. In Great Britain the machine invented by Sir Charles Wheatstone, to whom telegraphy owes so much, is chiefly employed. By his machine, after the message has been punched out in a paper ribbon by one machine, on a system analogous to the dot and dash of Morse, the sequence of the currents requisite to transmit the message along the wire is automatically determined in a second machine by the perforated ribbon The second operation is analogous to that by which, in Jacquard's loom, the motions of the threads requisite to produce the pattern are determined by perforated cards. By Wheatstone's machine, errors inseparable from manual labor are avoided; and what is of even more importance in a commercial point of view, the time during which the wire is occupied in the transmission of a message is considerably diminished.

By the application of these automatic systems to telegraphy, the speed of transmission has been wonderfully accelerated, being equal to 200 words a minute, that is, faster than a shorthand writer can transcribe; and, in fact, words can now be passed along the wires of land lines with a velocity greater than can be dealt with by the human agency at either end.

Owing partly to the retarded effects of induction and other causes, the speed of transmission by long submarine cables is much smaller. With the cable of 1858 only $2\frac{1}{4}$ words per minute were got through. The average with the Atlantic cable, Dr. C. W. Siemens informs me, is now 17 words, but 24 words per minute can be read."

Steam at 500 lbs. Pressure.

For several years the successful experiments of Mr. Loftus Perkins, in England, in the use of steam at enormous pressures, rising as high as 500 lbs. per square inch, have been known, but the explanations for the delay in the manufacture have not until now been made public. It appears, from the law proceedings in a suit lately brought by Mr. Perkins against the Yorkshire Engine Company, that Mr. Perkins assigned the exclusive license under his patents to the Company, they in turn agreeing to proceed with the building of the new engines and boilers forthwith. But this the Company failed to do, and so the invention became as it were locked up, and Mr. Perkins was compelled to appeal to the courts for relief. The case recently came on before Justice Fields, Nisi Prius Court, Leeds, when the following interesting explanation was elicited:

In opening the case, Mr. Wills said that his client, Mr Loftus Perkins, was a civil engineer, who resided in London. He was the inventor and constructor of various devices for the improvement of boilers and engines, which were the subject of several patents; and the defendants were the Yorkshire Engine Company, Limited, which company traded principally in the manufacture of locomotive engines, and carried on their business in the neighborhood of Sheffield. The action was brought upon an agreement entered into between the plaintiff and the defendants on the 31st of March, 1872. The great object, or rather the principle, which lay at the root of the various improvements invented by Mr. Perkins were, in the first place, the use of extremely high pressure steam; and in the second place, the use of fresh soft water distilled over and over again with the minimum of loss, so that, practically, there was but little replenishing of the original supply necessary. The investigation of the profitable application to mechanical purposes of extremely high pressure steam was a matter which had been hereditary in the family of Mr. Perkins, for his grandfather was the inventor of what was scarcely more than a toy—an extremely ingenious toy, which was well known thirty or forty years ago, and which he (Mr. Wills) recollected seeing in his boyhood, and which some of the jury might have seen, exhibited in the Polytechnic, in London—Perkins' steam gun—in which by high pressure of steam, the result which was ordinarily got from the explosion of compounds was secured. Mr. Perkins had followed in the footsteps of his grandfather and father, and he became convinced many years ago that great economy would result both in wear and tear, and that there would be great economy of fuel, by the use of high pressure steam—steam with many times the amount of pressure that was ordinarily used in high pressure engines. The first thing which became necessary was to construct a totally new kind of boiler, because it was obvious that boilers of the ordinary construction never could stand such pressure as Mr. Perkins wished to put upon them, namely, from 200 to 300, and even up to 500 lbs. per square inch. Accordingly, Mr. Perkins conceived the notion of making these boilers tubular, and making them tubular in exactly the inverse sense in which we generally understand a tubular boiler. In an ordinary tubular boiler the tubes which carried the heated air passed through the boiler and were surrounded by the water which was to be turned into steam. By Mr Perkins' process this was reversed. The heated air was carried outside the tubes, and the water to be turned into steam was placed within the tubes. Mr. Perkins constructed tubes with a diameter of three inches, and with tubes of that diameter the necessary strength was practically attainable. The tubes were tested by hydraulic power up to 3,000 lbs. per square inch, and no tube was used which did not undergo that pressure. Mr Perkins thus over came one difficulty, and he was thus able to get the means of obtaining safely, within the walls of iron, the water which was necessary to produce this very high pressure. That idea once grasped, a great practical difficulty occurred, namely, that of fastening tubes of this sort into plates which must hold them, and maintain the necessary connection between these tubes in such a manner as to be as strong as the tubes themselves. The first patent which formed the subject of agreement in this case was taken out on the 27th of April, 1868, and was for improved means of fastening these tubes—connecting them together and fastening them in the plates, which would also hold them. Mr. Wills went on to explain the method by which the tubes were fixed to the plates, and then said the next difficulty was a very formidable one. Steam at that pressure had a temperature of something like 450 or 500 degrees Fah., within a few degrees of the temperature at which metal became red hot, and a cylinder into which the steam was to be introduced must be worked without any vegetable matter about it, or it would have been impossible to work it. This difficulty was overcome by the construction of a double cylinder, of the form of which the jury could have an idea if they thought of a fig drum with a large marmalade pot on the top of it. The upper cylinder, represented by the marmalade pot, had no communication with the external air. The upper cylinder needed no stuffing box. The bottom of it was always filled up by the piston. The steam at 500 lbs. pressure, or the water that was to be let into the upper cylinder there, did its duty at that high pressure, never finding its way at all into the lower cylinder. As soon as it did its work the steam was let out by a system of mechanical valves into a larger cylinder, and arrived there at greatly diminished pressure, which it was safe to use with the ordinary mechanical appliances for stuffing boxes. The upper cylinder was the only part in which the high pressure steam was introduced.

His Lordship—What did it do, there?

Mr. Wills—It pushed the piston down, but never did the up stroke. After the steam had done its work at a pressure of, say, from 50 lbs. to 70 lbs. per square inch in the larger cylinder, it went, by virtue of an arrangement which was not new, which Mr. Perkins laid no claim to, but which was called the compound engine system, to another cylinder larger still, where the pressure was from 20 lbs. to 25 lbs. per square inch. After doing the work there, the steam was taken away in the ordinary course of things into the condenser. The condenser, again, was a peculiarity of Mr. Perkins' invention. By this system the condensing of the steam was effected in tubes just as in the boiler, the result being that it absolutely prevented all chance of the admixture of water, and also prevented the escape of steam, so that it could be used over and over again with an amount of waste which was incredibly small. By means of this system marine engines which had to use salt water could be supplied with fresh water, a few tubs being amply sufficient to supply the waste in long voyages. There was also an enormous economy in the consumption of fuel, Mr. Perkins being able to construct the largest engines so as to consume only about 1½ lbs. of fuel per horse power per hour. That was one source of economy. The consequence of using the same water over and over again in this way was that they could start with distilled water—the purest water that could be got—and grit or impurities, which became elements of danger in boilers, were prevented from getting in. In the case of marine boilers and engines this was a very important result. It rendered it absolutely unnecessary to depend upon salt water for the supply of the boiler, salt water being a source of enormous loss, because, from the moment it got into the circulating cistern to the moment it left it, it was a source of attack upon the integrity of the metal. Wherever it got, it corroded and ate away the boiler. It also worked in another way, because it gave a great deposit of saline matter, which became incrusted at the bottom of the boiler, and did great mischief by forming an impervious non-conducting coating inside the boiler. The incrustation became as thick as the boiler plate itself, and made the application of the fire heat to be effected under circumstances of enormous disadvantage. The practical result of that was that the life of an ordinary seagoing steam boiler, in large steamers, was from five to seven years, but there might be exceptional cases in which it lasted ten years. Boilers made by Mr. Perkins had been submitted to the most rigid test by officers of the Admiralty, and it was satisfactorily proved that they had been thirteen years in use without repair or alteration of any kind. Mr. Perkins having invented and perfected this arrangement, and having had it satisfactorily used in 1868, he took out the first patent. Mr. Perkins was not a man of boundless means. He was a gentleman who, in company with his father, was carrying on a profitable business in supplying apparatus for heating private houses and churches, in which this new tubular principle had been brought to bear. He had constructed five or six of these engines for himself, one of which was placed in a steam tug, and had been working ever since. But it was impossible for him to construct these engines at a price which would make them a commercial success, and he looked about him for a person who was possessed of the necessary capital. He was introduced to persons connected with the Yorkshire Engine Company, Limited—a company well adapted for his purposes if they had faithfully carried out their promise. They had large premises, and turned out a locomotive a week, which meant a turnover of $750,000 a year at least. They had a capital of $1,000,000, and had power to increase that capital to $2,500,000, therefore it was no imprudent step if he was deluded into the belief that the company would make the invention a success. Accordingly, on the 31st of March, 1872, after six months' preliminary investigation, during which these gentlemen had full opportunity of satisfying themselves of everything connected with the practical character of the invention, a deed was entered into, and it was upon that that Mr. Perkins' complaints were founded. Under that deed Mr. Perkins agreed to give these gentlemen an exclusive license to work his patent, and shut himself out from the possibility of working with other people. They covenanted that he should have 10 per cent royalty upon all articles manufactured and sold by them under the patent. They covenanted to proceed with the manufacture of engines and to set up such extra machinery as might be necessary for the purpose of executing orders. The very first thing that was necessary was to construct sample engines. They agreed that before September, 1872, they would construct two traction engines—one single and the other double. They also agreed, before the 1st January, 1873, to construct a marine engine, of 250 horse power nominal, suitable for a steamer. The first of these engines, a single traction engine, was constructed many months after the reasonable period allowed for its construction, being finished in December, 1873. But it would not work. It never has been worked, and it was broken up, and sold for old iron. The company proposed that, instead of constructing a double traction engine, they should construct instead a locomotive with tram-car attached, suitable for trams in England or abroad. Mr. Perkins assented, but with a strong remonstrance. The engine had never been completed. It had never been put upon the stocks, not a sixpence had been spent upon it, and no attempt had been made to carry it out. With regard to the construction of the marine engine. Mr. Sacre, the manager of the company, wrote to Mr. Perkins on the 10th of July, 1872, three months after the contract should have been begun to be carried out, in which he stated that he had endeavored in every possible way to arrange for a ship to fit the engines to, but without success. The engines would require a steamer of 2,000 tons burden, and as steamers of that burden carried a large number of passengers, an objection was raised as to trying engines of such an experimental character. They proposed to construct an engine of 120 horse power, and they undertook to supply a steamer as well as the engine. Mr. Perkins accept the modification, but complained of the loss of time in carrying out the agreement.

His Lordship (interrupting) asked what was the case for the defence.

Mr. Seymour said their case was that everything that could reasonably be expected had been done, and that difficulties arose——

His Lordship said there was a clear breach in point of time. It was a very valuable invention, and this agreement was made in 1872; we were now in 1875, and nothing had been done.

Mr. Seymour said his Lordship had not heard the history of the difficulties they had had to meet; at one time difficulties with regard to Board of Trade certificates for ships; at another time difficulties with regard to packing, in which Mr. Perkins had himself shared. The packing under this high pressure was exposed to a great strain, and some new invention must be perfected, and it was not till January, 1875, that that difficulty was finally overcome, by a simple but grand discovery on the part of Mr. Perkins and Mr. Sacre. They had now an order from the Admiralty for marine engines, which were being made, and Mr. Perkins wrote a letter speaking of the Admiralty order as putting this machinery on its trial, and the result would be to satisfy the Government as well as the public of the great value of the invention.

His Lordship asked if they could not meet together and arrange the matter amicably?

Mr. Wills said that if the defendants would relieve the plaintiff of the exclusive license they would have a license on most favorable terms. But the plaintiff would do nothing unless he got rid of that exclusive license. He was still in the hands of the Yorkshire Engine Company.

After some further conversation,

His Lordship suggested that counsel should speak to him privately, saying 14 years was the life of an inventor, and three and a half had gone already.

Some further conversation took place, and afterwards his Lordship and the counsel retired. Subsequently it appeared that the Company agreed to a new arrangement, satisfactory to the court and the plaintiff.

The New Jetties at the Mouth of the Mississippi River.

The Board of Engineers, appointed under the act of Congress to promote the improvement of the mouth of the Mississippi river, recently held several important sessions in this city, during which the plans of Captain Eads, of St. Louis, were carefully discussed and in the main adopted. The plan involves the construction of extensive lines of jetties along the courses of the moving water, the jetties being simply dykes or levees under water, which are intended to act as banks to the river, to prevent its expanding and diffusing itself as it enters the sea. It is a notable fact, he says, that where the banks of a river extend boldly out into the sea, no bar is formed at the entrance. It is where the banks are absent, as is the case in delta-forming rivers, that the bar is an invariable feature. The bar results from the diffusion of the stream, as it spreads out, fan-like, in entering the sea. The diffusion of the river being the cause, the remedy lies in contracting the stream or in preventing the diffusion. A glance at the map of the Southwest Pass reveals the narrow and uniform width of the pass until it is within about 7½ miles of the bar, which is three miles beyond the Land's End. In this 7½ miles, the river is building up and extending its own banks into the sea at the rate of eight inches per day. Its jetties are completed by its own forces, and Captain Eads thinks they will probably never change their location, although every time the stream overflows there fresh deposits will raise them still higher. He points, therefore, to the fact that the river itself is continually employing the jetty system, and that Nature makes parallel not converging, jetties. At 7½ miles above the bar of the Southwest Pass, the natural jetties are finished, and narrowed to their normal width of 1,250 feet, and there the Pass is 60 feet deep in consequence. Captain Eads thinks that the bar was once unquestionably where this depth of 60 feet now exists. From this point the river gradually widens out to the sea, and the current gradually diminishes from 4½ feet to about 3 feet per second at the bar, and to zero some twenty miles beyond in the Gulf. Since man has known the Mississippi, this distance between the bar and the narrow banks of the Pass above has been the same, 7½ miles. For 11 miles above, the Pass presents the same narrowness and depth. The bar, says Captain Eads, has marshalled the way through ages past to the Gulf, and the natural jetties have been built up at exactly the same rate of speed, and have constantly kept the bar 7½ miles in advance. As the natural jetties advance, the bar is slowly eroded away.

Now, says Captain Eads, suppose that, by artificial means, these natural jetties could be suddenly extended 7½ miles out to the bar. The volume of water would be almost if not exactly the same, and so would be the current. Instead of passing over the bar as it now does at three feet per second, it would pass out between these artificial jetties at the rate of over four feet per second. The question is, could the bar re-form again afterward, nearer than 7½ miles from the end of these artificial jetties? Suppose there were no litoral current or Gulf Stream to carry away the sediment, the bar would certainly form again, but at the rate it has been going for the last 40 years it would take the river 65,000 days or 178 years to extend its jetties from the place where they are finished out to the present crest of the bar. If man, therefore, should do in three or four years what will require the river 178 years to do, it will be after the lapse of centuries when the bar can reappear, because it must be located at least seven miles beyond the artificial jetties. This argument was made as to the Southwest Pass, but applies with equal force to the South Pass, where he is building the jetties.

Captain Eads further stated that the permanence of these jetties will depend mainly on the skill and experience of the engineers. The river itself is daily showing that it is able to construct jetties of sedimentary matters which it transports, which are imperishable and constantly increasing in strength. On its banks are found millions of young willows and poplars, which, properly formed into fascines and securely interwoven in large masses, and sunk with stone in the line of the proposed jetties, and securely held in position by huge blocks of concrete, will soon become filled with sedimentary deposit, and form artificial banks, indestructible as those Nature is daily building at the passes.

The following is a table of the increase of depth in 18 rivers in Europe where jetties have been effective ;

Names of rivers.	Country.	Original depth, feet.	Present depth feet.
Danube	Roumania (Turkey)	7 to 11	20½ to 21½
Maas	Holland		17 to 18
Trave	Prussia	7	18
Oder	Prussia	7	23 to 24
Warne	Prussia	6	13
Wipper	Prussia	4	13
Persante	Prussia	4	15
Pregel	Prussia	12	20
Stolpe	Prussia	4	14
Niemen	Prussia	10	23 to 24
Loban	Russia	6	16
Dvina	Russia	6	18
Wendora	Russia	4	9
Pernan	Russia	3	12
Nissa	Sweden	5	12
Konno	Sweden	6	9
Altra	Sweden	6	9
Grenaa	Denmark	5	13

A Model Scientist.

The late W. F. Henwood, F.R.S., the distinguished mining geologist, who died at Penzance recently in his seventy-first year, was originally a clerk in the employment of Messrs. Fox, of Falmouth, to whose counsel he was considerably indebted in his early scientific work. By very great industry and careful observation he acquired an unsurpassed knowledge of the mineral deposits of Cornwall and Devon; and after fulfilling a succession of important mining appointments, he became assay master of tin to the Duchy of Cornwall. This post being abolished, Mr. Henwood's great experience was utilized in reporting upon and developing a number of mining districts in South America, Canada, etc.; and after the cessation of his travels, he lived at Penzance in comparative retirement. His great works are the fifth and eighth volumes of the "Transactions of the Royal Geological Society of Cornwall," devoted respectively to the metalliferous deposits of Cornwall and Devon, and to those of the foreign countries he had visited. But his scientific writings besides these were very numerous; a list of them occupies seven columns in the *Bibliotheca Cornubiensis.*

As a scientific man Mr. Henwood was characterized by indefatigable labor, great caution, love of accuracy, and moderation of expression. In his publications he scarcely ever mentions a fact of any kind which had not come under his own experience, without giving the authority for it. Thus many of his writings are marvels of copious reference. He persisted in doing everything with this extraordinary amount of labor and care up to the last, notwithstanding that he suffered for many years from a very painful heart disease. His scientific work ceased only with his death. So long as he could sustain even an hour's intellectual effort during the day, that was devoted to the arrangement of his stores of facts and observations. Scarcely one of his cherished objects in this respect remains unfulfilled.

In personal character Mr. Henwood won the high regard of all who knew him intimately. His acquaintance with men and manners was so great and varied, his memory so retentive, and his conversational style so simple and lucid, that to talk with him was one of the most delightful and instructive of intellectual recreations. His estimate of his own labors and merits was unaffectedly modest, although he would resist, if possible, any unfair representation of his work.

In the spring of the present year the Murchison Medal of the Geological Society was awarded to Mr. Henwood.—*Nature.*

Edible Birds' Nests.

Edible birds' nests are found for the most part in the Southern Archipelago. The chief region of supply is that comprising Java, Borneo, Celebes, and the Sulu Islands. The bird which produces the nests is a little swallow, *hirundo esculenta*. This salangan swallow, as it is called, is slightly bigger than a blue tit; it has a brown back; but the under surface of its body, as also the extremities of the feathers in its forked tail, are white. It flies with wonderful speed and precision; and on the Java coast, where the surge breaks wildly against the precipitous and caverned walls of rock, the little birds may be seen in swarms darting hither and thither through the spray. They probably feed on fragments of molluscs and other small animals which abound on those coasts. As you watch the surface of the water rising and falling, you notice how the holes in the rock are now concealed, now open again; and the little creatures, watching their opportunity, dart in and out with lightning speed. Their nests are fixed to the arched roof of these caverns.

What sort of a thing, then, is the edible bird's nest that ministers to the taste of the luxurious Chinese? It is that portion of the fabric which serves as a sort of bracket on which the nest itself (made of grass, seaweed, fibers, small leaves, etc.) is built. There are two forms of this support, one flat like an oyster shell, the other deep and spoon-shaped. It is a transparent mass, somewhat like isinglass, mother-of-pearl, or white horn, and is of animal origin. It was formerly supposed that this gelatin-like mass might be prepared in the bird's crop, from seaweed and other marine plants. This, however, is a mistake. If one opens the animal's stomach about the time of building, it is found to contain insects, but no vegetable matter; moreover, in all species of the family of swifts, the crop is wanting. Dr. Bernstein has found that at that season the salivary glands under the tongue are enormously developed. On opening the bill, they are seen as two large swellings, one on either side, and these chiefly supply the material in question. They secrete a viscid mucous substance, like a concentrated solution of gum arabic, which can be drawn out of the mouth in long threads; and in the air, it soon dries, and is found to be the same (even microscopically) as the bracket material.

When one of the little birds wishes to begin building, it flies repeatedly against the selected spot, pressing each time a little saliva aginst the rock with the tip of its tongue. This it will do from ten to twenty times, moving away not more than a few yards in the intervals. It then alights, and arranges the material in semicircular or horseshoe form on the rock, continuing to add saliva; and by the motions of its body from side to side, the yet soft saliva is forced out over the harder parts, producing those peculiar undulatory bands which give the nest a stratified appearance. It is thought not unlikely that part of the secretion used by the bird comes from the largely developed glands in its stomach; also, that gelatinous matters picked up in the surge are employed in the construction of its nest. The salangan never uses the same nest more than once, and that for only a month; and after the young brood is flown, the nest soon decays and falls to pieces.

We have now to consider the adventurous work of gathering the nests. The plucker, with nothing on but a cloth round his loins, and with a knife and a netted bag at his side, takes his place on a stage (of two crossbars) fastened to the end of a rope, and is let down against the face of the precipitous rock. With the left hand he grasps the rope; in the right, he has a rod, with which he holds himself as far as possible from the rock. Thus he descends, often several hundred feet, amid the roar of the breakers and the swarming of innumerable birds. When he has come opposite a salangan hole, he makes a signal, and the lowering is stopped. He now sets himself swinging—and here follows the most dangerous part of the operation—gradually increasing his width of swing, till he thinks he will be able to leap off into the hole, and find foothold on a part of the rock which he has previously noted. Should the venture fail, death is certain. The man has generally a thin cord fastened round his body, and connected with the rope, so as to enable him to pull the stage to himself again. Sometimes, though rarely, this breaks, and then there is nothing for it but to make a bold spring out towards the dangling stage. But so fearless and practised are the men that they generally accomplish this fearful leap successfully, even when laden with their booty. When the plucker has got safely into the hole, he cuts off the nests with his knife, and puts them in his bag; for those high up, he uses the rod with the knife fixed to the end of it. The operation demands great address; the slippery rock, perhaps, hardly affords standing ground, and the man will cling with hand and feet to the little cracks or projections; while the alarmed birds flit to and fro in the gloom, and the tumultuous water beneath flashes with phosphorescence. The plucker, however knows his work; and when he is sufficiently laden, he draws the stage towards himself, mounts it, and is pulled up by his companions. Thereupon, another repeats the operation.

As the method just described is both a dangerous and a slow one, the natives adopt, when possible, another, which consists in fixing a rope ladder from the top of the rock down to the cavern, and also a sort of hanging bridge of rope within the cavern, either running round the wall or passing across. The internal surface of the cavern is often greatly pitted by the action of the weather, presenting a spongy appearance, so that it is not difficult to find points for attachment of the ropes. All the young birds and eggs found are cruelly thrown into the sea. The best harvest is in the months of July and August; the next best, in November and December; the worst, in April and May. The collected nests are cleaned and assorted; they are first packed in bags of bamboo fiber or palm bast, and the merchants again pack them for the market (after a second assortment) in cases containing a half picul, or seventy pounds.

China is the only considerable recipient of these cases; the few cases which are brought as a curiosity to Europe and America are hardly worth mention. The greatest trade in birds' nests is done with Canton, the entire import there being reckoned at 168,000 lbs. We may reckon on fifty nests to the pound, so that altogether 8,400,000 nests, or, from three pluckings, the products of 2,800,000 pair of birds, are annually introduced into China. There are, principally, two kinds of nests distinguished in Canton—the mandarin nests, and the ordinary; of the former or perfectly white kind, each pound costs in China twenty to thirty dollars, a quite exorbitant price, compared with that which the salangan pluckers themselves receive for the dangerous work, and which is, at the most, only ten to twelve per cent of the market value. The second quality of nests are sold at half that price. The nests are dissolved in water or broth, and so taken as soup. It is highly spiced with minor substances. This forms an *entrée* which is rarely wanting on the tables of the wealthy Chinese, and never from that of the imperial court of Peking. The Chinese set a high value upon it, considering it one of the best stimulants; but for this opinion there seems to be little or no ground. The most recent analysis of the nests we owe to Professor Troschel of Bonn. He finds that the material does not consist of specially nourishing or stimulating substances, but is quite similar in constitution to any animal saliva. Thus the Chinese pay dearly for what has really no intrinsic value.—*Chambers' Journal.*

The Water Shell.

A correspondent writing from Okehampton, England, where some artillery experiments have recently been made, states that the trials have been successful in proving the great value of the new water shell, which will at once be adopted as a service weapon. The effects of this novel instrument of warfare surpass in destructive power the renowned Shrapnel shell; and in one experiment when a battery of the Royal Horse Artillery was in action, as many as fifty-one hits were recorded with the new shell, against twenty-eight made by the Shrapnel, fitted with time fuses. The wooden dummies, which represented the enemy drawn up in loose order, one pace apart, in the manner of an advancing army, were struck again and again by the minute fragments of the water shells, which, according to our correspondent, inflicted wounds of a far more dangerous nature than those made by the Shrapnel or common shell.

The nature of the water shell may be explained in a few words. It is not a projectile of special construction, but simply a common shell or cast iron cylinder filled with water, into which is fitted a small cylinder containing a quarter or, at the most, half an ounce of gun cotton; it is then hermetically sealed; a few grains of fulminate of mercury is placed between the gun cotton and the fuse, and, as soon as the latter is fitted, the shell is ready firing.

The charge of gunpowder used in the same sized shell is sixteen ounces, the explosion of which breaks the shell up into 3 or 4 pieces, whereas the one charged with half an ounce of gun cotton flies into a hundred or more fragments. The reason is this: The gunpowder explodes comparatively slowly, and breaks up the shell at its weak points, while the gun cotton detonates with a sudden and terrible force, which, being communicated to a non-compressible body (water), bursts the shell instantly into minute fragments, the energy being exerted equally on all sides. So rapid and terrible is the force generated by the gun cotton that the iron shell is sometimes pulverized, the fragments of metal being so minute as scarcely to be visible.

The idea of this terrible shell is due to Professor Abel, the scientific referee of the English war department, who is also the patentee of a process to manufacture gun cotton, by which process, it appears from our correspondent's letter, the gun cotton is rendered the safest as well as one of the most powerful of all known explosives; being kept always in a wet state, preventing accident without diminishing its efficiency. The English, German, and French governments have adopted this new form of gun cotton for torpedoes and shells, as well as for military engineering and submarine mining.

Appreciation.

The following are samples of letters frequently received at this office. It would occupy too much space to publish a small fraction of them, but we occasionally, as an acknowledgment to the writers of all such letters that we are not unmindful of their good words, make public one or two of these unsolicited expressions of appreciation. They are mementoes treasured by the recipients, and act as a lubricant to machinery, smoothing the way, and making light the work incident to active professional pursuits:

MESSRS. MUNN & CO.—

GENTLEMEN: Letters patent have been received for our tyre tightener. Allow us to return our thanks for the able manner in which you have conducted our business, in securing our letters patent. And in the future we will remember you to others who may need assistance in securing patents.

Very truly yours, HORTON & HAYES.

McKinney, Texas, August 27, 1875.

RESULT OF AN ADVERTISEMENT.

On the day that the above was received at this office, the following letter, from Senator Randolph, of New Jersey, came to hand:

O. D. MUNN, ESQ.:

It is due to you to say that, of over 300 enquiries about the Ditcher since June, 75 per cent refer to the advertisement of it in the SCIENTIFIC AMERICAN. We have advertised largely in other directions with little success. The single advertisement in the SCIENTIFIC has brought us applications from every State and Territory of the United States, and from Canada, England, France, Belgium, Australia, Brazil, and Buenos Ayres. These are hard, dull times; and I cannot present you with a Ditcher, but can make you feel that, despite the times, people read and heed your good paper.

Yours truly, THEO. F. RANDOLPH.

New York, September 3, 1875.

Opening of the American Institute Fair.

The annual exhibition of the American Institute of this city is now open, and presents a most interesting and attractive display of industrial productions. We shall take occasion to report whatever is new and of interest in the exhibition when order reigns within the building.

THE Chinese alloy called *pakfong* is made by fusing together 10 parts copper shavings and 4 parts arsenic, arranged in alternate layers in a covered crucible, with a layer of common salt on the mixture.

DECISIONS OF THE COURTS.

United States Circuit Court.—Northern District of New York.

THE GOULDS MANUFACTURING COMPANY vs. JOHN F. COWING et al.—PATENT PUMP.

[In equity.—Before Mr. Justice HUNT.—July, 1874.]

This was a suit in equity, brought upon letters patent for an "improvement in gas pumps," granted to the complainants on the 8th day of August, 1871, as the assignees of William H. Pollard, the inventor. The case came up on exceptions to the master's report, to whom under a previous decree had been sent for an accounting.

The rule is settled that, when the patent is for an improvement upon a machine, the damages for the infringement of such patent are confined to the profits made by the use of the improvement only, and not by the manufacture of the whole instrument.

The complainants, at the accounting, proved the expenses of making and selling the infringing pumps; that they were prepared and ready to fill the orders taken by the defendants, and the prices at which the pumps were sold by the defendants, and the master took the difference between such expenses and such prices (being $47.71 on each pump) as the measure of damages: Held, that as the patent invention was merely an improvement in pumps, being only a special construction of the side chamber, whereby the same is adapted to use with the valve casings bolted on the outside, and constituting but a small part of the aggregate mechanism, this rule was erroneous, and that the damages could not exceed the profits upon such improvement.

The burden of proof, to show the amount of damages or profits, is upon the plaintiff. Where he fails to show the profits or damages arising from the use of the patented improvement, as distinguished from the profits on the entire machine, nominal damages only can be recovered.

[*J. B. Perkins*, for complainants.
Elisha Foote, for defendants.]

Supreme Court of the District of Columbia.

[In General Term.]

FREDERICK G. AND WILLIAM F. NIEDRINGHAUS.—APPEAL.—WHAT CONSTITUTES A DESIGN PATENT.

[In the matter of the application of Frederick G. and William F. Niedringhaus for a patent for a "Design for Ornament for Enameled Iron Ware," filed June 3, 1874.—Appeal from the Decision of the Commissioner of Patents.]

A beautiful appearance is not of itself entitled to a design patent. The design must also be new and original, and the result of invention and genius.

Mere exhibition of skill on the part of workers in enamel, in giving beautiful forms and colors to their productions, when they are the common efforts of persons ordinarily skilled in the art, is not the invention which is protected by the law.

The use of an old design is clearly excluded from patent by the statute, and mere change or "double use" cannot receive its protection.

The same degree of originality is required in both design and functional patents—that is, the claim must not comprehend what is already in existence.

A design consisting in a mere mottled appearance to be given to enameled iron ware is not patentable.

Mr. Justice MCARTHUR delivered the opinion of the court:

This is an appeal from the decision of the Commissioner of Patents refusing a design patent in enameled iron ware to Frederick G. Niedringhaus and William F. Niedringhaus. The statute in regard to design patents reads as follows:

"Any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, may, upon payment of the fee prescribed, and other due proceedings had the same as in cases of inventions and discoveries, obtain a patent therefor." (Sec. 4929 United States Revised Statutes.)

In their specification, the applicants claim to have invented and produced a new and original design of ornament or pattern, to be printed, painted, or otherwise placed on, or marked into, the various articles of enameled iron ware which they make and sell. A photograph is annexed to illustrate the outline. They also say that "the article itself, however, when completed, presents to the eye a beautifully mottled appearance, resembling granite in color, which the illustration fails to exhibit. It is this peculiar mottled appearance which constitutes the chief merit of our design, and it is on this we place most importance."

The Primary Examiner, the Examiners-in-Chief, and the Commissioner have all concurred in refusing the application for the patent. The Commissioner, in his decision, says:

"I concur in the opinion of the Examiners-in-Chief, so far as want of patentability in the general subject matter embraced by the application is concerned. The so-called design is effected by printing, painting, or in any other way placing upon iron ware a peculiarly mixed color. The enameling of iron ware in various colors is an art well known. If applicant has achieved anything new, it is to be found in the mixing of colors, by which he produces a mottled appearance having the effect of granite coloring. If he has in this way obtained a new paint, it may or may not be patentable; but the application of such a paint in an ordinary way does not constitute the subject matter of a design patent, even under the most liberal construction of the statute."

The court are unanimously of the opinion that the decision of the Commissioner ought to be affirmed. The art of enameling has been practised for many centuries, and the different kinds of enamel have been produced in every variety of shade and color. The materials used for the purpose of coloring, and the process by which they are fused, have been known so long that, to change them, requires only the taste and skill of one engaged in the business. The appellants, of course, do not mean to claim any exclusive title to what is so well known. But their specification certainly seems to suggest that the change of color "resembling granite" imparts great value to their invention. They say "the mottled appearance which constitutes the chief merit of our design, and it is on this we place the most importance." The specimen of enameled iron ware exhibited by counsel on the argument was of a color resembling granite, and was marked by spots of different shades darker than granite. The enamel and coloring substances are manifestly liquefied by intense heat, such as enamelers use, until they are completely fused, and they are laid upon the iron ware while in this condition. The spots are then formed at random, in larger and smaller patches, without regard to regularity or design of any kind. No two of the articles are alike, except in color and general appearance. It is undoubtedly ornamental to the article, and has a pleasing effect on the eye. This is equally true of the hundreds of objects upon which this art is employed. Ornamental work in great variety, and paintings that never lose their freshness, are executed in enamel. Indeed, the primary object of this art is to impart greater luster and beauty to every article of luxury or utility to which it is applied. A beautiful appearance is not in itself patentable. The design must be new and original, and the work of invention and genius. The ingenuity and taste of workers in enamel are quite wonderful to all but those employed in it; but no one would imagine that these exhibitions of skill, in giving beautiful forms or colors to their productions, was the kind of invention to be protected by the law. They are the common efforts of persons ordinarily skilled in the art. The appellants contend in their brief that "it matters not if the design has been previously used, if now combined with an 'object' with which it has not been hitherto combined; and if, as a result of such association, a new and distinctive aspect is given to such object, the law is complied with," and refers to former decisions by the Commissioner of Patents as cases in point. We cannot concur in this view. The thing provided for in the law is, in express language, "any new and original design for a manufacture;" "any new and original design for printing;" "any new and original impression;" "any new, useful, and original shape;" "the same not having been known or used by others before his invention or production thereof." The use of an old design upon an old object is clearly excluded by the statute, and mere changes or "double use" cannot receive its protection.

Besides, it is now well understood that the same degree of originality is required in both design and functional patents. That is, the claim must not be for a copy or imitation of what is already in existence. If, for instance, the applicants should manufacture their iron ware with a figure of the statue of the Three Graces, it might improve the appearance of the article, but would scarcely entitle them to the benefits of a patent. To manufacture it with enamel is a change of the same kind, for the same thing has been performed on metals from time immemorial. To give the enamel any particular color is a matter of ordinary skill and taste. The coloring substances have always been fused with the enamel in the heat of the furnace. We can, therefore, observe nothing in the present specification to which the term invention can be applied.

I am aware that the Supreme Court of the United States, in Gorham Company *vs.* White, 14 Wall., 524, have said, in regard to design patents, that "they contemplate not so much utility as appearance, and that not an abstract impression, but an aspect given to those objects mentioned in the acts."

That was an action brought for the infringement of a design patent for the handles of tablespoons and forks. The design consisted in the configuration of the spoon and the ornamentation of the handle. The outline and all the details of the design were new, and invariable in each spoon alike. No question was discussed as to the originality of the patent, for it had never been known before, and the court decided that the article manufactured and sold by the defendant did not differ substantially from plaintiff's, and that it was therefore an infringement. But the whole tenor of the decision is to the effect that the appearance or aspect of the object must be of a design that is new and original. Indeed, no other view is admissible, for such is the express requirement of the law.

The decision of the Commissioner is affirmed.

[*Charles M. Moody*, for appellant.
Wm. H. Doolittle, for the Commissioner.]

United States Circuit Court--- District of Massachusetts.

PATENT BOTTLE FASTENER.—HENRY W. PUTNAM *vs.* E. D. WEATHERBEE *et al.*

[In equity.—Before Shepley, J.—May, 1875.]

Where a patent has been a long time in existence, has been renewed by the Patent Office after the expiration of the original term and in the face of opposition, and has been sustained by the adjudications of several of the federal courts, the patentee is entitled to protection by a preliminary injunction, at least until the adjudication of some tribunal shall decide the patent invalid.

Where a motion for an injunction was heard outside the district where the suit was pending, the order withheld until the court should be sitting within the district.

The bottle stopper fastening covered by the Putnam reissue of January 19, 1864, which consists of a piece of wire of U-form with the ends returned and connected to the bottle (in order that the pressure on the cork or stopper may cause the fastener to hold more securely), is not anticipated by the sheet metal U-shaped yoke of the Allender fastening of 1855.

The wire embeds in the cork, under pressure from within, and thus prevents the fastener from tripping; it also presents a change of form which permits the fastener to be pressed off without injury to the thumbs of the operator or to the cork.

Consideration given to the fact that the Commissioner of Patents, in both granting and extending the patent, was aware of the nature of the Allender device, but held that the Putnam fastener contained something more than the mere substitution of a wire U-shaped yoke for a sheet metal U-shaped yoke.

[This was a suit in equity brought for an alleged infringement of reissued letters patent granted to Henry W. Putnam, January 19, 1864, for an "Improvement in Bottle Stopper Fastenings." The invention will be found illustrated in the reported case of Putnam *vs.* Hickey (5 Fisher, 334).

[*W. H. Clifford* and *Thomas H. Dodge*, for complainants.
Benj. J. Thurston, for defendants.]

NEW BOOKS AND PUBLICATIONS.

The Shoe and Leather Reporter, devoted to the Trade in Leather, Boots and Shoes, Findings, Hides, Skins, Wool, Furs, Tanning Materials, etc. Edited and Published by Isaac H. Bailey. New York city: 17 Spruce street.

This paper, which is devoted to the shoe and leather interests of not only this city but of the whole country, has changed proprietorship. Isaac H. Bailey, Esq., a gentleman well known to the leather trade in this city, has become its owner. Mr. Bailey was for many years a merchant, and has an extensive acquaintance among our business men, both in the "Swamp" and out of it; and if there is any writer that can make the subjects of leather and boots and shoes interesting to the public, that man is the present editor and proprietor of the *Shoe and Leather Reporter*. Published weekly. Price, including, postage, $3.50 a year.

The Mechanic's Friend, a Collection of Receipts and Practical Suggestions. By William E. A. Axon, M. R. S. L. With 300 Illustrations. 12mo, cloth. Price $1.50. Copies sent free by mail on receipt of price. New York: D. Van Nostrand, 23 Murray and 27 Warren streets.

This work consists of extracts from the pages of *The English Mechanic*, the nature and scope of which periodical are well known to our readers. The ideas and suggestions are practical and, in many cases, original; and artisans of every class will find much that is useful in its pages.

National Hymn and Tune Book, for Congregations, Schools, and the Home. Price 40 cents. Boston, Mass.: Ditson & Co.

The music in this work is that with which every young person should become familiar, since it includes the tunes, old and new, that will be used during the next life-time in public assemblies. The arrangement into four simple parts has an educational value, and either one, two, three, or four parts may be practised and sung. There are more than 200 tunes, with 340 accompanying hymns.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From July 7 to August 23, 1875, inclusive.

Breech-Loading Fire Arm.—N. King, Hartford, Conn.
Casting Metals.—C. Grasser, Somerville, Mass.
Chain Cable.—C. A. Chamberlin, Camden, N. J.
Compressing Fluids.—T. S. Disston, Philadelphia, Pa.
Dental Plates.—V. Smith, Schenectady, N. Y.
Discharging Grain, etc.—C. W. Mills, Montclair, N. J.
Electro-Magnet.—W. L. Powleson, San Francisco, Cal.
Fulling Mill.—W. B. Lodge, Danbury, Conn.
Liquid Meter.—E. Marsland, Sing Sing, N. Y.
Loom.—J. Fish, New York city.
Making Button Holes.—A. H. Cramp (of New York city), London, Eng.
Motor.—J. G. Lane, Millbrook, N. Y.
Over-Sewing Machine.—J. L. Boone *et al.*, San Francisco, Cal.
Playing Cards.—I. Levy (of New York city), London, England.
Printing Press Feed.—F. Deming, Waterbury, Conn.
Revolving Pistol.—E. Remington & Sons, Ilion, N. Y.
Spinning Ring, etc.—H. A. Chapin, Springfield, Mass.
Steam Engine.—G. B. Dixwell, Mass.
Umbrella Frame.—J. Horton *et al.*, New York city.
Winding Up Lifts, etc.—V. W. Mason, Providence R. I.

Recent American and Foreign Patents.

Improved Dust Brush.

Henry B. Conant, Geneva Lake, Wis.—The brush portion of the duster, which may be made of feathers, hair, silk, or any suitable material, is attached to springs in bunches, and the springs are connected together so as to form a mutual support for each other, and keep the brush in place.

Improved Claw Bar.

Andrew Shaw, Petroleum, W. Va.—This is a bar for drawing spikes from railroad ties, and for drawing spikes or nails in other places, so made as to allow the clutch jaw to be raised and the leverage obtained, diminished after the spike has been partly extracted, so as to draw the spike clear out.

Improved Car Brake.

Alfred T. Riley, Halleck, Mo.—A lateral band spring of suitable power is seated in side supports near the central bottom part of the car frame, and connected by a rod to the brake-operating lever that is connected to the front drawhead, and to the brake wheel on the tender or locomotive. The drawhead or spring controls jointly the operations of the brakes of all the wheels. When the car is in a state of rest, so that no strain is exerted on the spring and front drawhead, the brakes are all, by the action of the spring on the lever and brake rods, tightly applied to the wheels; but when the cars are coupled and drawn forward, the front drawhead slides forward and releases the brakes by the strain on the spring.

Improved Ironing Board.

Orlando S. Pride, Yonkers, N. Y., assignor to himself and John E. Woodruff, same place.—In using the device, the board is passed into the shirt, and the neck band is turned down into a notch. Portion of a frame is then placed in the said notch to confine the said neck band, and the rear part of the board is raised, and its rear edge is placed against the inner edge of a rear cross bar. The shirt bosom is then drawn straight and smooth, and the frame and the rear part of the board are pressed down. In this way the shirt bosom will be held straight, smooth, and firmly, so that it can be quickly ironed.

Improved Grain Separator.

William E. Torley, Milwaukee, Wis.—The cockle and small wheat pass off from a fine screen to the indented concave sides of a drum for the cockle to fall into the indentations, which will not hold the wheat, because of the elongated form of the grains, so that the wheat will pass off first when the sides turn down with the drum. At the point where the wheat will naturally slide off the plates is a chute, to receive and conduct it into the hopper. A brush in front of the drum brushes back any of the cockle on the front edge of the indented sides liable to slide off with the wheat and throw it back into the pockets.

Improved Corn Sheller.

Solomon Williams, Tehuacana, Tex.—This is an attachment for corn shellers, consisting of a block having a conical cavity with ribs or teeth on the inside, and arranged upon the extended end of a cylinder journal. Its object is to remove the small kernels from the end of the ear, or nub it, before it is put into the sheller.

Improved Horseshoe.

Arthur C. Snowden, South Norwalk, Conn.—This horse overshoe consists of two plates of metal, which are hinged together near the toe, so that the shoe will open and close. The interior plates cover the under part of the foot, but not the frog, for which they are shaped to leave space, and are lapped or shut past each other. Hook flanges on each plate fasten the overshoe to the shoe on the horse. The hinged parts are spread by means of a screw, so that the hooks on the plates will tightly embrace and hold the overshoe to the shoe on the horse.

Improved Welding Compound.

John Scott, Jr., and Amos S. Scott, Coatesville, Pa.—This is an improved welding compound, to be used in the manufacture of iron and steel, and it consists of a mixture of kaolin and sand.

Improved Hat and Coat Hook.

Charles Schoenbein, Brooklyn, N. Y.—This invention consist of a horizontal supporting arm with forked levers pivoted thereto, of which the upper one is weighted at the rear end to bear on the lower lever and open the front ends, which close like jaws on the coat or other article suspended from the lower lever. When the coat is removed, the jaws open instantly by the action of the weighted lever, and are ready for repeated use.

Improved Sharpening Machine.

Andrus S. Weaver, Joy, N. Y.—A reaper knife is fastened to the adjustable table by a cam lever. The table is adjusted by the two eccentric levers and by a spring. The grinding stone is moved back and forth on the knife by a bar and rack and pinion to grind the teeth to the proper level after the knife table has been properly adjusted. A crane is hinged to the plate on which the bar rests, so as to readily move forward and back. The forearm is hinged to the top of the crane. The grinding stone, as well as the reaper knife, may be adjusted to almost any position.

Improved Wind Wheel.

Horace J. Brimhall, Jr., of Millington, Ill., assignor to himself and Samuel E. Foster, same place.—This invention consists of fans shaped like the arc of a circle, and pivoted at the middle of the top and bottom to horizontal arms projecting from the shaft, so that they may swing into radial, or nearly radial, positions to take the wind, and into a circle to close, so that the wheel will not be turned by the wind. The buckets are connected to a slider on the shaft, which is moved by a lever to open and close them for starting and stopping the machine.

Improved Safety Center Pinion for Watches.

Charles R. Bacon and Leuthold C. Brown, San Francisco, Cal., assignors to Cornell Watch Company, same place.—This consists of a center wheel with detachable pinion, having projecting teeth that inclose a spring secured by a spring at one end to a perforation of the center wheel, while the opposite free end of the spring binds pinion and center wheel to revolve in the usual manner, while it turns freely without the center wheel in opposite direction.

Improved Ice Breaker.

Joseph T. Martin, Newark, N. J.—This ice breaker consists of a shaft carrying radial arms. Said arms are rigidly secured to said shaft, and are provided at their outer ends with ax or wedge shaped heads. The whole is mounted in a suitable frame, adapted to be secured to a vessel, and operated so as to cut a passage before the vessel through ice.

Improved Hose Nozzle.

Charles Oyston, Little Falls, N. Y.—This is a hose nozzle for extinguishing fires, so constructed as to divide up the stream of water into a fine spray. A plate, in which are formed a number of annular openings, is connected with three arms, the outer ends of which are connected with the flaring middle part of the shell of the nozzle. A series of concentric ring wedges also are connected together by three arms, and in the outer surface of the outer ring is cut a screw thread to screw into the shell. The ring wedges and arms are cast in one piece, and the said ring wedges are so arranged that their edges may be directly opposite the annular openings in the plate, so as to divide up the ring sheets of water.

Improved Glazier's Diamond.

Philip Sinss, Baltimore, Md.—The object of this invention is to obviate the difficulty experienced by unskilled persons in securing the right inclination of a glazier's diamond to produce the best cutting effect. It consists in a broad-faced instrument, having at one end a diamond and at the other a guide roller, which latter forms with the diamond the supports of the instrument upon the glass, and keeps the sharp angle of the diamond in proper position for cutting. In between the guide roller and the diamond are different sized notches, which are cut into the face of the metal for the purpose of breaking off the cut portion of the glass.

Improved Steam Boiler.

John E. Jerrold, Meadville, Pa.—The ends of the boiler tubes are flared or spread outward into grooves, and the inwardly projecting edge of the metal around the opening (in the tube sheet) is bent or turned down over the end of said tube, thereby clamping or confining it in place and forming a tight joint, and preventing rapid injury from heat.

Improved Boot and Shoe Calk.

Rufus D. Guilford, St. Charles, Mich.—This calk is formed from a rectangular piece of sheet steel, struck up in suitable dies, whereby its corners are bent or turned down to form spurs.

Improved Indicator for Steam Engines.

Joseph W. Thompson, Salem, Ohio.—The indicator is designed to register the relative amounts of steam pressure exerted on the piston at each portion of its stroke. It is in part an improvement upon the automatic recording indicator for which letters patent of the United States were granted to C. B. Richards, March 24, 1863. The object of the invention is chiefly to reduce the number and weight of the parts composing the recording mechanism proper, and thus correspondingly reduce their momentum when in action, to the end of securing a more perfect record of the several steam pressures existing in the engine cylinder during a given stroke or strokes of the piston.

Improved Injector.

Samuel Fowden, Philadelphia, Pa.—The steam is admitted through an annular opening formed by a water tube and a mixing tube, while the water is admitted through a central tube, the opening through which is regulated by an adjustable spindle. The apparatus for lifting the water consists of valves with hollow stem, steam pipe, and jet.

Improved Middlings Purifier.

Richard W. Gunter, Carrollton, Mo.—The invention comprises a series of flat inclined laterally and longitudinally shaking sieves, placed one above another, with a fan blowing into and through the space under each, to carry off the light matters. Valves are provided to regulate the blasts, and a conveyer is placed under the bottom sieve. There are inclined close bottoms to the sieves, descending toward the fans to carry the middlings back. These have openings at certain intervals for discharging to the fans below. In front are wind breakers to prevent the wind from blowing the middlings back up the bottoms.

Improved Sugar Cooling and Draining Apparatus.

Joseph H. Hynson, Alexandria, La.—This consists of an oblong cooling vessel, with bottom inclined from both sides toward the center, where a longitudinal slot connects with a slotted revolving draining tube, fitting tightly to the under side of the central bottom part of the vessel. When, after the striking is finished, the sugar in the cooler has sufficiently granulated, the process of drainage is commenced by turning the crank until the slotted part of the tube opens gradually toward the bottom slot of the cooler. If the sugar is still warm, the molasses drains rapidly through the narrow crevice without allowing any of the grains of sugar to pass; but if the sugar has cooled and become firmer, the opening between tube and bottom slot may be opened wider for the readier draining of the molasses which has collected by granulation at the central bottom part of the cooler. The molasses may in this manner be drained off more or less rapidly, according to the degree of heat in the sugar.

Improved Car Starter.

Anthony A. Jones, Utica, N. Y.—A ratchet wheel is fixed on the front axle of the car, and a long pawl lever is arranged to operate it. When it is desired to start the car, the front (free) end of the lever is depressed by the driver applying his weight thereto (through the medium of a rod projecting up through the platform) which causes the ratchet wheel to revolve the front axle and thereby the car wheels.

Improved Cotton Sweep.

Manfred Call, Richmond, Va.—The invention consists in a cotton sweep with sharp cutting wings on both sides of a nose or point, inclined with their lower edges in advance, and attached by bolts to the standard as well as the nose flange.

Improved Vehicle Spring.

Henry Jeffrey, Seymour, Ind.—V-shaped bearing springs are interposed between the ends of the flat top and bottom tension springs. Both the flat tension and V-shaped bearing springs are made of semi-elliptic shape, and joined at the outer ends by being bent around the bolts of the clips, to which they are connected. The clips are set into casings of the carriage body and frame. The bearing springs are seated against a solid central shoe part, and retained by crosspins connected by outer links passing sideways.

Improved Shingle Machine.

John J. Kendall, Greensborough, N. C.—The reciprocating driving heads carry two knives and work alongside of stationary heads, against each side of which a bolt is to be held on the table by an attendant. Spring clamps behind the cutters receive the blanks cut off from the bolts between them and the side of the head, to hold them ready for the feeders, which consist of the swinging dogs placed on vertical oscillating shafts. The feeders catch in the sides of the blanks by thin notched and pointed ends, and push them along stationary guides, between shaving cutters, so that when they pass off from the riving heads they drop in front of their ends, to be pushed by them through the shaving cutters. These cutters are open when the blanks are pushed in by the feeders; one closes on the blank just before it begins to be pushed along, and continues to move it toward the other cutter. An eccentric opens the cutters again just before the feeder works, ready for receiving another blank; and immediately after the feeder works, the riving head comes against the blank fed into the cutters, and pushes it forward. The throw of the eccentric may be changed to open and close the shaving cutters more or less, according to the required thickness of the shingles.

Improved Shot Charger for Shot Pouches.

John S. Long, Elkville, Ill.—This is a steel cutting valve with a cleaning ring at the lower end, working through a chamber, which is enlarged on one side of the valve, so as to give clearance to the shot as they are divided without pinching on the blade. Also a series of slots in the upper portion of the barrel, for gaging different charges, are arranged radially to the pivot hole of the lever, to which the valve is connected.

Improved Butt Hinge.

A. H. Isham, Avon, N. Y.—This invention consists in providing each wing with an inclined notch near the upper end and the rising spindle with a doubly inclined lug, so that the spindle will always be drawn down by the action of the wing.

Notes & Queries

A. K. will find directions for polishing meerschaum on p. 155, vol. 31.—A. J. B. will find directions for cleansing greasy waste on p. 202, vol. 31. —R. J. will find directions for gilding picture frames on p. 90, vol. 30.—F. J. will find directions for adjusting a level on p. 218, vol 31.—J. N. will find a recipe for sulpho-cyanide of potassium on p. 219, vol. 31.

(1) G. F. asks: How is telegraph wire galvanized? A. Galvanized wire is simply a wire covered with a coating of zinc. The wire is first immersed in acid, and then run through a vat of melted zinc.

(2) W. H. G. asks: How many cells of the Callaud battery will it take to run a small foot lathe on light work, with an engine to match? A. It depends upon how much power you require. You can get 1/10 of a horse power by using 100 cells of very large size.

(3) A. J. asks: Can I get porous cups made at a pottery? A. Yes. 2. Would a gallon battery, consisting of a jar with copper cylinder, inside of which is a porous cup with zinc, the inside jar being filled with sulphuric acid and water, and the porous cup being filled with salt water, do for plating watches? A. It would not be a very good battery.

(4) H. P. R. asks: Does the conductibility of a lightning rod depend upon the surface of the rod or the cross section, that is, will a rod ½ inch in diameter, round, be as good a conductor as the same amount of metal, flat and with a large surface? A. It depends upon the quantity of metal, irrespective of the shape.

(5) M. L. B. says: I propose to construct a burglar alarm (to be attached to doors and windows of my house) as follows: I use line wire No. 20, of copper, put up on brick work with shingle nails, the wires being 4 inches apart; longest circuit is 120 feet; bell magnet has No. 23 wire, to be operated by one cell of Léclanché battery. The wire is to be put up before the plastering, and is, of course, covered by the plasterer. The wire is common copper wire not insulated, but all joints are to be soldered. Will it work? A. Use copper wire insulated with gutta percha or kerite.

(6) E. E. R asks: Has any person discovered the properties of lightning? A. Franklin discovered the identity of lightning and electricity. Its properties are the production of heat, magnetism, chemical decomposition, shocks, light, and polarization.

(7) D. B. B. asks: 1. Where can I get a hard rubber plate for a Holtz electrical machine? A. At the rubber factories. 2. Would the ordinary hard rubber in sheets answer the purpose? A. Yes. 3. Is the effectiveness of a machine increased by a higher polish of the rubber? Yes.

(8) V. F. P. M. C. asks: How large a flue ought we to have in a stack 75 feet high, other things being in proportion and the surroundings favorable, for a boiler 5 feet×13 feet, with seventy-one 3½ inch flues, in order to get the greatest benefit of fuel used? A. Make the area of the flue about the same as the collective cross area of the tubes.

(9) L. H. M. asks: What fluid would be the best to use for changing the weight from one end of a tube to the other at will, in a certain stated time, by letting it pass slowly through a small opening, the same as in an hour glass? A. Dry sand, such as is sold by stationers, will answer. Perhaps mercury would be better. We could not tell without knowing more particulars.

(10) J. C. says: My steam gage points to 5 lbs. when everything is cold. Is it reliable? A Possibly it has water pressure on it. You should have it tested, however, as soon as possible.

(11) J. R. N. asks: If there is an iron vessel of sufficient strength to stand a pressure of 250 lbs. to the square inch, and of sufficient capacity to hold 1 gallon of cold water, can there be any more water forced into the vessel? A. Yes, since water is slightly compressible.

(12) J. T. R. asks: 1. How can I inflate a cotton balloon with hot air? A. Soak a sponge in alcohol, set fire to it, and hold it under the balloon. It is well to put the sponge in a barrel or deep vessel. 2. Please give a recipe for varnishing cotton balloons. A. See p. 136, vol. 28.

(13) W. B. asks: Has the screw ever been applied to car brakes instead of the chain, as a means whereby to work them? A. Yes.

Does any substance projected into space return with the same velocity as that with which it ascended? A. No, if your question refers to initial and final velocities.

(14) M. M. says: 1. Some of our engineers use old india rubber hose to make joints on the hand hole plates of their boilers; they claim that it makes a tighter joint than hemp and white lead, but I think the gum corrodes the iron around the joint. Am I correct? A. No. The practice is very common, and generally approved. 2. Please give a rule for putting gage cocks in locomotive boilers. A. Place one 3 or 4 inches above crown sheet, and the others the same distance apart over it.

(15) C. T. O. says: I have been making some tests of a plain slide valve engine. I have taken the following data every half hour: Revolutions, indicator card, pressure of steam and atmosphere, and the temperature of outside of engine and in boiler room, injected water, and steam. I put a plug in the steam dome and in the water pipe, and filled it with mercury; but I do not get within 20° of the temperature due to that pressure. Could you tell me the reason? A. It would seem that either your pressure gage or thermometer is incorrect; but you do not send enough data to enable us to form a very definite opinion. We would be glad to receive from you an account of the trial, giving data and results, with description of manner of conducting the experiment. You need not be afraid of making it too full.

(16) N. C. F. Sr., says: I wish to build a small steamship about 3 feet long after the model of the Cunarders, to be driven by a screw. How large an engine would be required to move it rapidly? A. Make everything about on the scale of the original. We imagine that in Boston you can pick up more in a ship yard, in a short time, than you can learn from the most elaborate treatises.

(17) A. M. Z asks: Will a flat bottomed boat, 15 feet long, 28 inches wide, and 12 inches deep, sail as fast and stand as much as a round bottomed boat of the same dimensions? A. With a center board, it will do very well.

(18) A. D. H. says: 1. I am building a boat 25 feet long by 6 feet beam, drawing 2 feet of water. I wish to put in an engine 4×4 inches, and a boiler 2 feet in diameter by 4 feet high, having 28 two inch tubes. Will boiler and cylinder be in proportion, and will they be large enough for the boat? A. The machinery will answer very well. 2. What size of screw should I use, and what pitch? A. Use a propeller 2 feet in diameter, and of 3 feet pitch.

(19) C. R. says: Suppose we are standing on the upper side of the globe; when it has made a half revolution, and we are then standing with our heads downward, why are we not conscious of it? A. We are, to a considerable extent, if we take account of such incidents as sunrise and sunset.

(20) J. M. L. asks: 1. Is any advantage likely to be derived from attempting to bleach or clarify crude mineral oils, by bringing them in contact with bleaching gases, such as sulphurous acid or chlorine, or even only by hot air or steam, by some process similar to that used in Louisiana for bleaching sugar cane juice? A. No. Agitate the oil with one sixth of its bulk of oil of vitriol for some time; wash with water, and repeat the acid treatment a second time if necessary. 2. Could not chlorine be made at such a low price as to allow of using it instead of sulphurous acid in bleaching sugars? A. Chlorine gas may be obtained cheaply and in large quantities from chloride of lime (bleaching powder) by treating it with a little oil of vitriol.

(21) H. asks: What kind of acid is used to frost glass? A. Hydrofluoric acid is used for this purpose, and is obtained in the gaseous form by subjecting powdered fluorspar to the action of strong oil of vitriol in a leaden tray. This should be placed in a warm place, and the glass to be frosted placed over it as a cover. The sand blast has lately been substituted for this tedious and expensive process, with very satisfactory results.

(22) J. F. G. asks: 1. What material is best to coat paper with to render it waterproof? A. Dissolve 8 ozs. of alum and 3¾ ozs. of white soap in 4 pints of water: in another vessel dissolve 2 ozs. of gum arabic and 4 ozs. of glue in 4 pints of water. Mix the two solutions and make the mixture hot. Immerse the paper in the mixture, and hang it up to dry, or pass it between steam-heated cylinders. 2. Is it practicable to coat paper with porcelain enamel, such as pots and kettles are lined with? A. It is not possible to enamel paper with a silicate.

(23) R. L. asks: Can you explain the fact that flies, resting on the wall, or any perpendicular fixture or furniture, if alive will rest with their heads downwards? If dead, they will be found with the heads upwards. A. Our observations do not sustain yours. We find that, of flies resting upon the wall, etc., some have their heads pointing upwards and some downwards.

(24) C. M. says: 1. I am told by good authority that muriate of soda will prevent coal oil from exploding. Will it do it? A. No, if we understand your question. 2. What is the reason that, the moment you place a chimney over a smoking lamp it ceases to smoke, the lamp wick being at same hight in both cases? A. The shape of the chimney causes a greater supply of air to the flame, and consequently of oxygen; and the result is simply a more perfect combustion.

(25) C. B. H. asks: 1. How can I get rid of the peach borer in peach trees? A. The following plan, proposed by Harris, has been found very successful: Remove the earth around the base of the tree, crush and destroy the cocoons and borers which may be found in it and under the bark, cover the wounded parts with common clay composition, and surround the trunk with a strip of sheathing paper eight or nine inches wide, which should extend two inches below the level of the soil and be secured with strings of matting above. Fresh mortar should then be placed around the root, so as to confine the paper and prevent access beneath it, and the remaining cavity may be filled with new or unexhausted loam. This operation should be performed in the spring, or during the month of June. In the winter the strings may be removed, and in the following spring the trees should again be examined for any borers that may have escaped search before, and the protecting applications should be renewed. 2. Will boiling water around the roots kill the trees? A. Yes.

(26) H. R. asks: 1. Is an engine 2 x 4 inches large enough to run a boat 20 feet long? A. The engine is too small to give much speed. 2. Please give me the proportions of a boiler suitable for this engine to work at 200 lbs. pressure. A. Make an upright boiler with about 50 square feet of heating surface. 3. Please tell me the proper diameter and pitch of screw. A. Use a propeller 20 inches in diameter, and of 28 or 30 inches pitch. 4. How fast will she run? A. Ascertain this by experiment.

(27) R. L. S. asks: Will cold-blooded animals, such as fish, alligators, and snakes, live for years, grow, and fatten, without food? A. No.

1. Are any of those stones known as Indian arrow points found in Europe, or anywhere else than America? A. In Europe. Consult *Harper's Magazine* of June and July, 1875, on an article entitled "The Stone Age in Europe." 2. Were they in use by the Indians in America when it was discovered, or since? A. Before.

(28) C. J. G. asks: 1. Will phosphorus shine in the dark when put into a hermetically closed bottle? A. Yes, if the bottle contain air. 2. Will it consume itself therein? A. If not ignited by friction or otherwise, it will not. 3. Must it be put in water, even when hermetically closed? A. Yes.

(29) E. F. asks: 1. How would you advise me to use cotton seed as a food for cattle? A. You should remove as much of the oil as possible first. 2. In what condition should it be given, raw or cooked? A. Either way will answer; but with regard to the latter method, we find no account of it having been prepared. 3. Should it be given alone, or mixed with other food? A. The latter is perhaps the better method. 4. Will it give an oily taste to the meat? A. No. 5. Will cotton seed answer the purpose as well as corn, etc.? A. No

(30) J. T. asks: 1. What is the exact quantity of the ordinary commercial sulphuric acid required to decompose a given amount of protosulphide of iron? A. Ten pounds of Fe S will require 11·24 lbs. of H_2SO_4. 2. What is the amount of sulphuretted hydrogen and sulphate of iron thereby formed? A. This reaction will give you 3·8 lbs. of H_2S and 17·4 lbs. of $FeSO_4$.

(31) P. and B. say: We occupy a business room which is roofed with tin from each end to center, with gutter in the middle, through which the water from five other rooms passes. This gutter occasions us a great deal of trouble by leakage. The contraction opens the seams in the tin, especially during cold weather. If we put in a gutter of one continuous sheet of tin the whole length, will the contraction be sufficient to break it? A. You do not say how long the gutter is; but in any case you will not be able to find a sheet of tin long enough to make the whole gutter in one piece. If you take galvanized sheet iron, and make in it some slight corrugations crossing it at right angles to its length, there would be no danger of its breaking from contraction; and the corrugations would make no material impediment to the flow of the water.

(32) C. T. H. asks: Will worn-out printer's type make good Babbitt metal? A. No.

(33) R. G. says: 1. We have a stream of water here (the Wabash river) which is estimated to furnish 10,560 cubic feet of water per minute, having 10 feet fall. I estimate the power at 160 horse power; other parties who ought to know put it at less than 100. Will you give me your estimate? A. About 200 horse power could be obtained from the water if all the power were utilized. 2. What percentage of the water could be raised 80 feet by using the remainder as power? A. With good apparatus, you might expect to obtain an efficiency of from 60 to 70 per cent of the power of the water, from which it will be easy to determine the proportion of water raised to any hight.

(34) H. A. asks: At how many revolutions per minute must I run an engine, cylinder 4×4 inches, to obtain 4 or 5 horse power, with boiler pressure at 80 lbs., and a boiler large enough to generate all the steam required? A. From 400 to 450.

(35) P. H. W. says: A steamer is 42½ feet long by 7 feet 5 inches beam, and 2 feet 10 inches deep below guard. The engine is 5½ inches in diameter by 7 inches stroke. The screw is of 38 inches diameter, 12 inches width of blade at point, and 5 feet pitch. The engine makes 200 revolutions per minute, with 80 lbs. pressure. We make about 10 miles per hour. We have run 22 miles (conveying 18 passengers) in 2¼ hours, steam pressure averaging 87 lbs. With a view of increasing speed, I put on a steel plated screw of similar dimensions to the old one, except that the blades are 18 inches wide at point, tapering back to center. Each screw had two blades. With this screw the engine made 225 revolutions per minute; but it required 45 minutes to make 7 miles, which with the old screw would take 40 minutes. How much more power will I require? A. More than double the power used at present.

(36) F. L. B. asks: Can you make clear the workings of what is known as planchette? A. It never works, if no one touches it, as far as we have heard. "A word to the wise is sufficient."

(37) J. McC. says: Let a body of air be compressed in a cylinder, and let it remain so until it cools. Then, if allowed to expand, it will be minus a force equal to the heat it has lost. If, now, the same air be immediately recompressed into the same space, it will not, according to my idea, lose any more heat, and therefore give back as much power as it receives, except what is lost in friction. Am I right? A. This is what will take place

If the air, on being compressed, is allowed to cool, its pressure will be decreased. Then, if it expands, and does work, its temperature will fall: and if it is recompressed, without loss from radiation, its temperature and pressure will again be increased. All this is expressed in the simple statement that, if there is no loss of heat by conduction or radiation, the air that is compressed is capable of exerting as much power, in expanding, as was employed to compress it.

(38) A. A. P. says: Suppose I take a cylinder of iron that will hold a gallon of water, more or less: Can I increase the power of a press in using all the water at once, without introducing the water gradually into the cylinder? A. Yes.

(39) S. B. asks: How long can a man live in a submerged boat, the air capacity of which is 200 gallons? A. With proper arrangements, the vessel would contain a supply of air sufficient for between 1 and 2 hours.

(40) G. W. S. says: I tried to extract potash from corn cobs by burning the cobs to ashes, and leaching them with water. I then boiled the leachings to dryness, and the potash which was the result would attract moisture from the atmosphere and turn to a strong lye. How can I prevent this? A. The product you obtained was, undoubtedly, pearlash, an impure carbonate of potash. This should be calcined in a suitable furnace and packed in airtight casks, as it is very hygroscopic.

(41) C. M. R. asks: How can I coat some small castings, made of Babbitt metal or pewter, with tin or some white metal to keep them white? A. Make your castings of Babbitt metal; and they will wear well and keep as clean and bright as tin would.

(42) G. A. M. L. asks: What is the composition and process of manufacture of common white shirt buttons? A. Some varieties of these buttons are made as follows: Finely powdered steatite is saturated with soluble glass, dried, and repulverized, and the powder thus obtained is pressed into molds by suitable machinery. They are then baked or fired in ovens, again dipped in solution of soluble glass, and subjected a second time to the firing process. When cool, they are polished by being placed in a rotating cask with water, dried, and again polished by rotation in a similar cask with soapstone powder.

(43) J. A. H. asks: Where is the Pennsylvanian soapstone dug or quarried? A. At Texas, Nottingham, Unionville; in South Mountain, ten miles from Carlisle; and at Chestnut Hill, on the Schuylkill.

(44) A. L. S. asks: How can I perfume soft wood in pieces three inches long? A. The wood might doubtless be impregnated, by means of hydraulic pressure, with any of the essential oils, etc., but we know of no substance the perfume of which might be considered as permanent or inexhaustible.

(45) A. C. W. asks: What preparation will make gutta percha stick to wood? A. Melt together equal parts of pitch and gutta percha. Apply hot.

(46) E. H. asks: 1. What influence has vegetable charcoal on the system? The dose is a teaspoonful in water. A. Its antiseptic properties render it a valuable medicine in some affections. Is there any cure for catarrh of the throat and nose? A. The following has been highly recommended: Carbolic acid 10 drops, tincture of iodine and chloroform, each 7·5 drops. A few drops of the mixture should be heated over a spirit lamp in a small test tube, the mouth of which should be applied to the nostrils as volatilization is effected. The operation should be repeated in about two minutes, when, after the patient sneezes a number of times, the troublesome symptoms rapidly disappear.

How can I make paraffin varnish? A. Paraffin is soluble in benzine, benzole, bisulphide of carbon, etc., and may be recovered from such solutions on evaporation of the solvent.

(47) W. H. W. asks: How is compressed yeast made? A. It consists usually of beer lees, flour moistened with beer, and other fermented matter, the superfluous moisture having been removed by pressure. As a general rule, however, the recipes for the so-called yeast cakes, etc., are not made public.

(48) E. D. R. says: J. D. can clarify his cider by adding to each barrel of it 1 pint boiling milk; if the cider contains enough free acid to coagulate the milk, the coagulum, in precipitating, carries down with it all impurities held in suspension in the cider; this process has the effect of decolorizing the cider in some degree.

(49) S. S. S. says: I have been experimenting for 10 years on gums, trying to bleach them. I have succeeded with shellac, sandarac, copal, etc., but have not yet been able to bleach a solution of dark gum arabic. Do you know of any process by which gum arabic in solution may be bleached, without injuring the adhesiveness of the mucilage? A. Try filtering the dilute solution through a stratum of animal charcoal: and then concentrate by evaporation over a water bath. This, we think, will render your mucilage perfectly clear.

(50) H. C. asks: How long does it take the moon to make a revolution around the earth? A. The moon makes the tour of the heavens in a mean or average period of 27d., 5h., 43m., 11·5s., returning, in that time, to a position among the stars nearly coincident with that it had before.

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 Qualities of Sounds. By W. J. S.
On Industrial Expedients. By ——.
On Fog Signals. By W. D. T.
On Aerial Navigation. By E. M. B.
On Northern Lights. By L. B.
On a Solar Chronometer. By H. C. P.
On Advice to Engineers. By C. C. J.
On Repairing Bells. By J. E. E., and by J. H. B.

Also inquiries and answers from the following:

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

HINTS TO CORRESPONDENTS.

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

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

Hundreds of inquiries analogous to the following are sent: "Who sells the best photographic chemicals? Who makes the best brick-pressing machine? Who sells piano wire, in lengths of a mile and upwards? Whose is the best printing press for illustrated book work?" 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.]

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August 24, 1875.

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DESIGNS PATENTED.

8,572, 8,573.—EMBROIDERY.—E. Crisand, New Haven, Ct.
8,574.—FRAMES.—A. B. Dimmet, Bloomington, Ill.
8,575.—VASE HANDLE.—J. W. Fiske, New York city.
8,576.—FAN.—J. F. Langworthy, New York city.
8,577.—FINGER RING.—A. R. Lender, Washington, D. C.
8,578 to 8,580.—FANS.—S. L. Barinds, Memphis, Tenn.
8,581.—MEDAL.—J. C. Deming, Norfolk, Va.
8,582.—DANCE PROGRAMME.—P. Hake, Hoboken, N. J.

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA August 26 to 30, 1875.

5,115.—J. Roy, St. Jean Baptiste, P. Q. Chair for sick persons. August 26, 1875.
5,116.—L. Payette, Montreal, P. Q. Pontoon for raising sunken vessels. August 27, 1875.
5,117.—J. N. C. McIntosh et al., Ypsilanti, Mich., U. S. Shaft support. August 30, 1875.
5,118.—O. J. Sickles et al., Canton, N. Y., U. S. Milk cooler. August 30, 1875.
5,119.—J. D. Heebner, Norritonville, Pa., U. S., et al. Governor for horse powers. August 30, 1875.
5,120.—E. G. Scovil, Simonds, N. B., et al. Piling iron. August 30, 1875.
5,121, 5122.—G. N. Sanders, Jr., New York city. Spike. August 30, 1875.

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