

SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 5.
[NEW SERIES.]

NEW YORK, JULY 31, 1875.

\$3.20 per Annum,
[POSTAGE PREPAID.]

IMPROVED BOILER AND FEED WATER HEATER.

We publish herewith illustrations of a boiler designed expressly to economize fuel. We select them from the pages of *Iron*, which journal accompanies them with some sensible remarks, the gist of which is as follows:

If there is one department of engineering receiving more attention than any other at present, it is that of economy of fuel. And this is very justly so, since, like a horse, the expense of boiler or engine power does not lie in its first cost, but in what it afterwards consumes. We take it, as a rough calculation, that an ordinary land boiler will burn its own value in coals about every six or nine months, according to its efficiency and economy.

There is, undoubtedly, very wide margin for improvement in our present construction of boilers and engines. It is well known that only about one tenth of the theoretical value of the motive power of fuel is utilized in ordinary boilers and engines. What a fearful waste this nine tenths of the whole fuel used represents! Money thrown away; our natural resources more rapidly impoverished; the atmosphere laden with carbonic acid and other impurities; and our buildings and edifices disfigured with our wasted coal, or soot.

A considerable portion of this waste of power lies with the mechanical arrangements of the engine. It is comparatively lately that the true principles of obtaining the full work from the steam used has been fully and generally understood. Unrestricted radiation from cylinders, boilers, and pipes, poor expansion, and throttling in the steam pipes are to be thanked for much of this waste. Probably, however, much more is to be attributed to the wasteful use of fuel in boilers. This may be occasioned in many ways, but the sum total of the matter will always amount to the fact that so much of the whole fuel and heat goes out of the chimney unutilized. It is thus that such a very striking saving in fuel may, with the best arrangements, be effected.

It is a difficult matter to decide immediately what description of boiler should be best for economy, or in what direction the most economy may be effected. If a user of steam power be inclined to invest in the best boiler he can obtain for the highest economy of fuel, he would very soon be bewildered by the very contradictory statements that he might hear on the subject. He will hear, in one direction, that he must use a multitubular boiler for economy, although he sees that it is open to the grave defects of complexity, difficult to clean, liability to wear out in the tubes, and so on. On the other hand, he will hear it stoutly maintained, and very fairly borne out by facts, that the old Cornish boiler, properly used, cannot be beaten for economy of fuel, and gives at the same time the utmost solidity, facility for cleaning, and the greatest durability.

Some engineers will be found to rely most for economy on special grate arrangements—patent fire doors, automatic stokers, fire bars, etc. Others will laugh these to scorn, and say that they are useless new-fangled notions, and simply are a further expense and trouble. It is probable that there is some truth in all the various opinions, and the varying practical results are achieved according to the special circumstances of each case.

We only propose to consider the action and waste of the hot gases of combustion in being allowed to pass freely into the open air. It is at once seen that the comparison between the temperature in the fire box and in the chimney will give us one of the best tests as to the economy with which the boiler is working, and that for perfect economy the escaping heat should not be greater than that of the steam. The question is, how is this effect to be obtained? And, if obtained, will it answer, practically?

To reply to the last query first: It would not answer, practically, to reduce the temperature of the escaping hot gases to that of steam, for, in that case, the draft would be too materially checked, and the fire would only smolder, and might even be put out. For whatever causes would tend to reduce the temperature of the escaping gases so low must be a constant cause always in operation. We therefore see

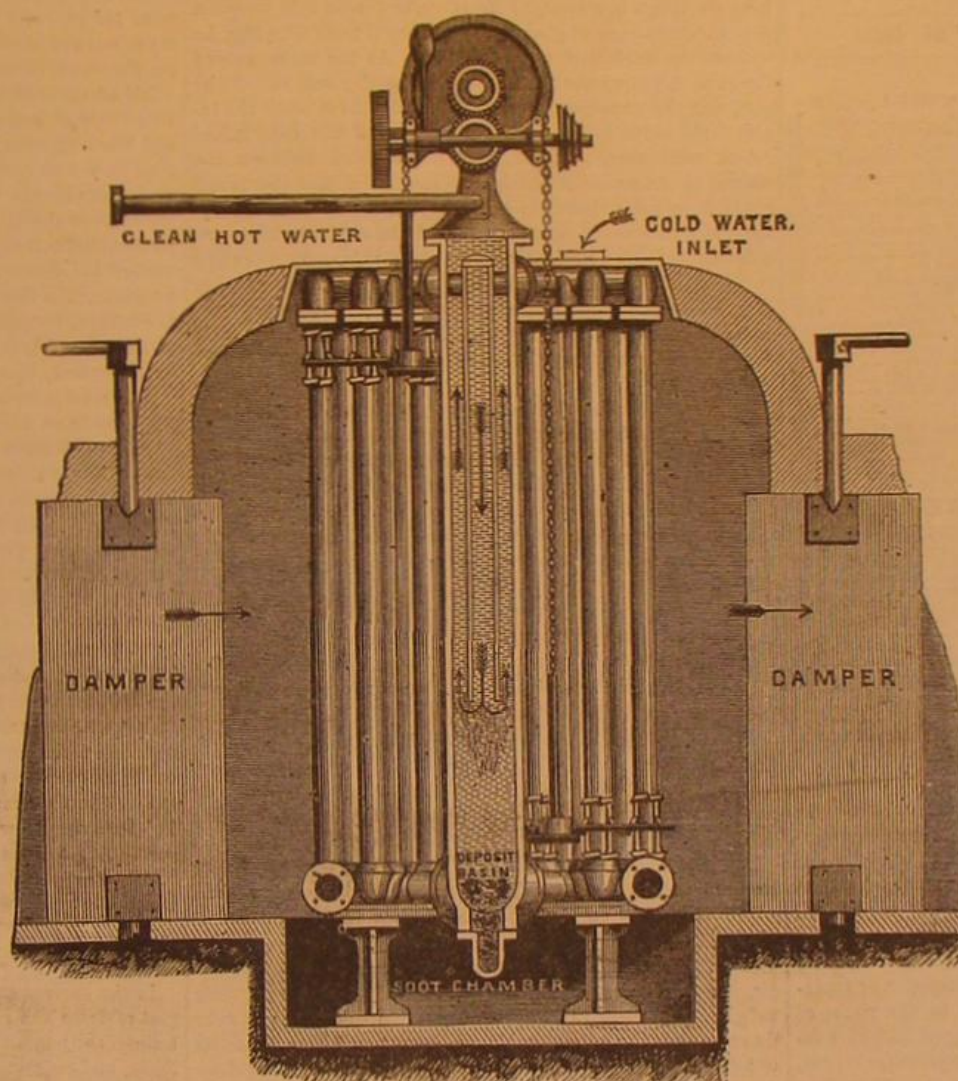
300° Fah. This is sufficient to effect a gain of from 15 per cent to 30 per cent on the former consumption of fuel, depending upon the amount of heat formerly going to waste in the different instances. The broad principle on which such considerable economy may be effected is easily seen when we consider that, if the whole of the water evaporated is raised from 60° to 300° before going into the boiler, this represents some 20 or 25 per cent of the whole heat required to vaporize the water into steam.

Referring to our illustration, we see a circular arrangement of the pipes of the economizer, which admits of a very convenient attachment in the center of his latest patented improvement, namely, the feed water filter. The sectional view, Fig. 1, shows this useful addition to the feed water heater. The hot water, after having ascended to the top of the outside set of pipes, and having been thus raised to its highest temperature, is then ready to precipitate and part with its suspended matter. This is effected by diverting the stream downwards through a central pipe in the filter into the deposit basin below, the clean feed water ascending again around the descending tube, and being thence taken to the boiler. The suspended sediment becomes separated from the water by the abrupt reversal of the current, and thus collects in the basin provided for that purpose at the bottom of the filter. This deposit basin is fitted with a door or cover, from which the sediment can be removed as it collects.

The importance that should be always attached to the prevention of incrustation upon the heating surfaces of boilers is now becoming more thoroughly appreciated. The advantages derived from keeping boilers clean are three-fold; first, greater safety against explosion, since the falling of plates is frequently due to their overheating or burning from deposit; second, much greater economy in the evaporation of water, as calcareous sediment is a very bad conductor of heat; third, considerable economy in the cost of boiler repairs, as the plates, being always exposed to the water, are less likely to become leaky. The inventor uses quadruple scrapers, which insure perfect cleanness of his tubes from soot. The raising and lowering action in our illustration is very simple and compact, and a considerable improvement over former arrangements. An advantage in the way in which the tubes are connected at the top and bottom consists in their connections being separate circular pipes—the best form to resist pressure—rather than a flat-sided box. The arrangement also admits of very easy withdrawal and replacing of any one of the tubes when required, the bottom joint being made on a slightly tapered face. The joints are all made metal to metal, and will, therefore, stand any amount of heat. This boiler and heater is the invention of Mr. Joseph Twibill, of Hulme, near Manchester, England.

New Electro-Magnetic Clock.

Messrs. T. Cooke and Sons, of York, England, have completed the erection of an electric motor and clock dial in the telegraph gallery of the new buildings of the General Post Office, London, which, in some points is novel and interesting. The hands of the large dial, which are driven by the motor, are at a distance of about forty-five feet from it, and are connected to it by means of iron rods and several pair of bevel wheels for turning the bends. The dial itself is six feet in diameter, and such is the sensitiveness and power of the motor that the connecting rods, bevel-wheel work, and hands, are driven by a single Lelanché cell of small size, the current from which is transmitted by the standard clock in the gallery. The motor consists simply of a polarized pendulum vibrating between two pairs of electro magnets, carrying a double ratchet at the upper end, the pointer of which is worked by a vane at the top of the buildings.



TWIBILL'S FUEL ECONOMIZER.

that it can only be permitted to reduce the temperature of the escaping products to a degree which shall not interfere with the draft or the brightness of the fire.

In a very large proportion of boilers at present in use, the temperature of the escaping gases is probably very much higher than is compatible with economical working. To render useful this hitherto large proportion of wasted heat is the object of the feed water heater which we herewith illustrate.

that it can only be permitted to reduce the temperature of the escaping products to a degree which shall not interfere with the draft or the brightness of the fire.

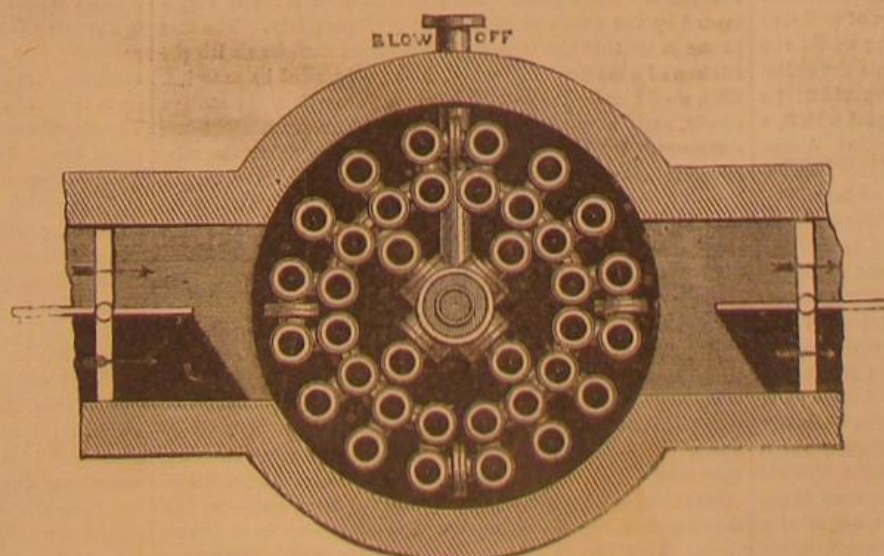


FIG. 2.

A very large additional heating surface is thus added to the boiler, which materially aids in absorbing the heat from the gases of combustion. The absorbed heat, which would otherwise have passed up the chimney and have been wasted, is thus utilized in heating the feed water to about 250° or

by the standard clock in the gallery. The motor consists simply of a polarized pendulum vibrating between two pairs of electro magnets, carrying a double ratchet at the upper end, the pointer of which is worked by a vane at the top of the buildings.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 87 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BRACH.

TERMS.

One copy, one year, postage included.....\$3 00
One copy, six months, postage included.....1 00

CIRCULARS.

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

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

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

VOLUME XXXIII, No. 5. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, JULY 31, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Air reservoir, improved.....	66
American Institute fair, the.....	67
Answers to correspondents.....	68
Apparatus.....	69
Athletic contests, university.....	70
Awl, improved.....	71
Battery, a charcoal.....	72
Bearing roller, improved.....	73
Blackboards, damp (14).....	74
Blind slot holder.....	75
Bolter and feed water heater.....	76
Bolters and engines, small (25).....	77
Building, cooperation in.....	78
Business and personal.....	79
Butter, Philadelphia.....	80
Calcium phosphate, reduction (3).....	81
Camera lucida (15).....	82
Chloral drinking, dangers of.....	83
Chloral hydrate in neuritis.....	84
Citrate of magnesia (19).....	85
City 180,000 years old, a.....	86
Coal, burning soft (34).....	87
Coal, heavy (21).....	88
Corn, growth of.....	89
Corn-husking implement.....	90
Cycads, the.....	91
Dissolution, a theory of.....	92
Dull times in Great Britain.....	93
Electric light, cheap (39).....	94
Electro-magnetic clock.....	95
Equine ingenuity.....	96
Fleas, the.....	97
Filter, chemical.....	98
Fireproof construction.....	99
Foreman, the.....	100
Frictionless joint, a.....	101
Gas wells of Pennsylvania.....	102
Glass, pounded (15).....	103
Glass tubes, to cut (18).....	104
Gold fields, the Japanese.....	105
Grasshoppers, utilizing the.....	106
Horses, protecting device for.....	107
Human remains (3).....	108
Ink, aniline marking.....	109
Ink, faded, restoring (5).....	110
Ink, freezing (14).....	111
Insects, the strength of.....	112
Inventions patented in England.....	113
Iron in railway bridges.....	114
Lenses, achromatic (7).....	115
Lenses for photography (1).....	116
Lighting rods (5).....	117
Linseed oil stains (4).....	118
Magnet, the Jamieson.....	119
Manners, cultivate good.....	120
Microscope, cheap (9).....	121
Milking tubes, improved.....	122
New books and publications.....	123
New York dock department.....	124
Patent decisions, recent.....	125
Patents, American and foreign.....	126
Patents, list of Canadian.....	127
Patents, official list of.....	128
Patents, searches for (25).....	129
Photographs, toning (6).....	130
Plague, new.....	131
Potato disease, the.....	132
Pot plants, management of.....	133
Pottery, etc., glaze for (16).....	134
Pumping water (15).....	135
Races, collegiate.....	136
Rapid transit in New York.....	137
Rat plague, a.....	138
Rate, concrete to exclude.....	139
Recipes, useful.....	140
Sawing machine, treadle.....	141
Science on the Pacific slope.....	142
Shafting accidents, preventing.....	143
Silver plates, printing on (22).....	144
Slide valve calculator, new.....	145
Solar radiation.....	146
Soldering, improvements in.....	147
Spider's web, the.....	148
Steam, utilizing exhaust (23).....	149
Thermoscope, clinical.....	150
Thunder clouds, altitude of.....	151
Tube trophy, a lap-welded.....	152
Water by steam, raising (36).....	153
Water, pressure of (27).....	154

THE STRENGTH OF INSECTS.

It is said that he is a philosopher who can accept the inevitable without repining. There are times in our lives when the most unpleasant things are forced upon our attention, and we fail with our best efforts to rid ourselves of them. As warm weather advances, we need no argument to convince us that the insects which destroy our vegetation, offend us with their presence, and even without permission cause our own blood to course through their veins, are among the inevitables. To accept these without complaint or repining would surely give us undisputed title to the name of philosophers; and if we could find anything of pleasure instead of annoyance in our involuntary contemplation of them, we would be doubly worthy of the appellation. That they all serve some useful purpose, cannot be denied; and if we knew their whole history we should doubtless be fully convinced of this. Some of our greatest pests, as flies and mosquitoes, have already been shown quite clearly to be our friends rather than our enemies.

Besides their practical benefit, there is no little interest in noticing the great physical force which they exert. We call a man, a horse, a lion, or an elephant strong; but it is very easy to see that, proportionally, insects are the strongest animals that live. They manifest their strength in running, leaping, flying, and sometimes in other ways. Some insects have been known to run so rapidly that, if a man of ordinary size should make as good time, proportionally, he would run more than twenty miles per minute, or sixty times the ordinary rate of a railroad train. A locust with the aid of its wings will leap 200 times its own length; to equal which, a man would need to leap nearly a quarter of a mile. A flea, without wings, will leap the same relative distance; and it has been estimated that, if a horse should jump as far in proportion to its weight, it would scale the Rocky Mountains in a single leap. Most insects jump by means of their hind legs and the latter part of the hind body; but one family of beetles—the *claterids* or spring beetles—leap vertically when on their backs, by use of a spine on the hinder part of the thorax which fits into a cavity behind it, and which, when forcibly closed and acting like a spring, throws the beetle several inches into the air. While in the very act of writing this, one of this family pays me a visit, and shows its power by making several springs at least six inches in height, which is about twelve times its own length. Some dragon flies are among the strongest on the wing. They can be seen flying about pools of water after smaller insects for hours at a time, turning, wheeling, going sideways, and in nearly every conceivable direction, and never seem to think of being tired. And, what is very remarkable, they have the power of changing at right angles the direction of their flight, and so suddenly that one can hardly ever be quick enough to hit or capture them. The *Entomological Magazine* speaks of one of these that flew on a vessel at sea when the nearest land was

the coast of Africa, 500 miles away. A humble bee has been seen to follow a rail car going twenty miles per hour, against a strong wind, for a considerable distance; and it even went faster than the car, as it flew to and fro and in various zig-zags around the vehicle. Some beetles have a flight swifter, considering their size, than any bird; and Linnaeus mentions a butterfly that sometimes travels more than a hundred miles on the wing at one flight; he also says that an elephant having the force of a horn beetle would be able to move a mountain. All have doubtless seen a beetle move a candlestick or lamp in his efforts to escape from underneath it; and he has been compared to a prisoner in Newgate shaking the building with his back. Pliny said, long ago, that, if we compare the loads of ants with the size of their bodies, "it must be allowed that no other animal is endowed with such strength in proportion."

Some interesting and ingenious experiments for measuring the strength of insects have lately been made by a Belgian naturalist named Plateau. He first tested their power of raising weights while walking on a level surface. His novel method of doing this was to harness the insect by a horizontal thread running over an easily-moving pulley, at the other end of which was attached a scale pan for holding sand. To keep the insect in a straight direction, he fenced it in between two parallel strips of glass; and to keep it from slipping, he covered its track with coarse muslin. As the insect moved forward, it pulled the thread over the pulley and raised the pan, and the experimenter poured sand into it until the insect could move no longer. The insect and the sand it had raised were then weighed, and the relation between the weight of the two was obtained. He found that the insect could raise forty times its own weight; while by a similar method a man could raise only five sixths of his weight, and a horse only one half or two thirds of his. By repeating each experiment three times and employing a vast number of insects of various sizes, and comparing his results, he came to the conclusion that the smaller insects in the same group invariably raise the greater weight in proportion to their own weight.

He then tried their leaping power, by fastening the wings and elytra, and by suspending under the thorax (by a thread) bits of lead set in wax. He increased the weight till the insect could no longer raise it. Then, by his determinations as before, he found that, while the largest crickets could raise in this way only about one and a half times their own weight, the smaller ones could raise three or four times theirs.

To test the pushing power of insects, he placed some of them in a long cardboard tube blackened on the inside and admitting light only by a transparent glass at one end. To this glass was attached a lever which drew the scale pan over the pulley, as in the first experiment. The insect, in its endeavors to escape, pushed against the glass, moved the lever, and thus raised the weight. As results of these experiments, he found that, in inverse ratio to their weight, the pushing power varied from three or four to eighty or ninety times the insect's weight.

The power of flight possessed by insects was tested by fixing weights to the body in the same way as in leaping. He found that they employ much less force in flying than in other efforts of strength; perhaps this is because, unlike birds, they are not intended to carry weights through the air. Beetles raise in flight from one sixth to twice their weight; flies, three times their weight. A drone weighs four times as much as a bee, and drags less than fifteen times its weight, while the bee drags twenty-three or twenty-four times her weight. But in flying, the bee raises nearly her own weight, while the drone raises a weight equal to only half its own.

By these experiments, he found that his law applies equally well, whether the strength is exerted in walking, leaping, pushing, or flying. He finds that it also applies, in a measure, to the entire class of insects taken together, as well as to the same group of insects taken by themselves. There are some exceptions to this, however, which are probably due to differences of structure. By dividing all the insects into three groups—lightest, medium, and heaviest—he finds that the law holds good. Then the relative force is represented by the numbers 26, 19, and 9 respectively. The fact seems to be that the strength of an insect increases with the surface of a section, and not with the volume of its muscles. This would make the weight increase faster than the motive power, and be consistent with the law that the smallest are strongest. It takes but a moment's reflection to see the wisdom of this arrangement. Of course the hardness of the soil, the weight of the grains of sand, and all the resistance to be overcome are equally great to the small as to the large insects, and it needs greater relative strength to give the small ones a fair chance in the "struggle for existence" with their larger associates.

But these facts and conclusions give rise to other questions which are not so easily answered. Since insects are stronger than other animals, on what food do these small Caesars feed that they are grown so strong? Is their physical organization formed on different mechanical principles? Have they power of creating or utilizing greater force from the food they eat? Their food, being animal and vegetable, does not seem to differ materially from the food of other animals; and they seem to use the same mechanical powers in their motions. They are, in the perfect state (in which state they manifest their great strength), as a rule, very small feeders, and some eat even nothing. As their strength must come from the food they eat, the question as to how so much can come from so little is as interesting as it is difficult. So far as we know, no attempt has ever been made to determine the laws of the relations between the amount of food consumed

and the strength which it generates. The difficulties are perhaps not insurmountable; but one great disturbing element would probably appear in the fact that insects may store up force in their earlier stages which they use in the perfect state.

RAPID TRANSIT IN NEW YORK.

A commission, appointed by virtue of a recent law of the State legislature, is now holding sessions in this city to determine upon the best plans for city steam railways. Formerly it was considered that the underground method was by far the best for a narrow and crowded city like New York, as it occupies no portion of the street surface, is out of sight, occasions no disturbance by its operation, and furnishes the most abundant accommodations for speed and the largest traffic. In those days the proud New Yorker had determined to have the best and most substantial railway works that could be built. But that was prior to the Tweed and other robberies, before the debt of the city had been swelled to over a hundred millions of dollars. Cheaper structures, it is now supposed, will answer, and on this account the elevated plan has come to be looked upon with special favor.

At a recent sitting of the Commissioners, no less than thirty different plans for rapid transit were presented, all of which were for elevated tracks except one, the latter being for a canal railway between the buildings, with bridges or tunnels for the street crossings.

All of these elevated plans involve the placing of bridge structures of some sort, in several of the principal streets; and there appears to be a peculiar unanimity among the citizens on the subject. Nearly every person is in favor of such roads, but no one wants it to run in his street or in front of his store or dwelling. The Sixth avenue people think that an elevated railway is greatly needed, and will do their share toward its construction, provided it is erected on Seventh avenue. The Seventh avenue people are equally in favor of the bridge, but are ready to rise in arms if their magnificent thoroughfare is disfigured with it; they are clearly of opinion, however, that Eighth avenue is the proper place for it.

The road must also cross the town somewhere, and those who reside on 42d, a fine broad street, are in its favor, provided it is erected on their neighbors' premises, a quarter of a mile distant, say, on 37th street; and they are of opinion that the constant passing of cars and locomotives in front of the second story windows of their friends down there will improve their prospects and healths, which now suffer by reason of too much quietude and seclusion.

To satisfy the public will be an apparently difficult task for the new Commissioners; but we wish them success. They will doubtless find out, before their labors are finished, that the building and equipping a first class substantial railway for rapid transit, capacities being equal, is just as expensive on the elevated as on the underground plan.

In the neighboring city of Brooklyn, the projected elevated street railway is also accepted with pleasure by the people. "But when the route of the proposed road is mentioned there is," says the *New York Herald*, "at once a persistent and screeching dissent. Property holders on Myrtle avenue come forward and scream against building the road on that avenue."

A CITY ONE HUNDRED AND EIGHTY THOUSAND YEARS OLD.

In the current number of the *Overland*, a Californian geologist reviews the geological evidence of the antiquity of a human settlement near the present town of Cherokee in that State, and estimates the age of that most ancient of discovered towns to be not less than 180,000 years!

The data for all such calculations are necessarily uncertain, as they are derived from the present motions of the continents and present rates of erosion; still, from the changes that have taken place since the pioneers of prehistoric California left their traces on its ancient sea shore, there can be no doubt that thousands of centuries must have come and gone.

The traces in question are numerous stone mortars, found in undisturbed white and yellow gravel of a subaqueous formation, not fluvial, underlying the vast sheets of volcanic rock of which Table Mountain is a part. In one instance a mortar was found standing upright, with the pestle in it, apparently just as it had been left by its owner. In some cases the mortars have been found at the depth of forty feet from the surface of the gravel underlying Table Mountain. The distribution of the mortars is such as to indicate with great positiveness the former existence of a human settlement on that ancient beach when the water stood near the level at which they occur: a time anterior to the volcanic outpouring which Table Mountain records, and anterior to the glacial epoch.

The recent geological history of that region may be briefly summed as follows:

Previous to the placing of the mortars in the position in which they have been found, the early and middle tertiary sea level had receded to the position of the coal beds underlying Table Mountain, fully one thousand feet below the level of Cherokee. Subsequently, in the pliocene period, there was a further subsidence of about fifteen hundred feet, something like six hundred feet occurring after the mortars had been abandoned. All this, as has been noticed, took place before the volcanic outflows which covered up all the ancient *detritus* of the region, including that of the ancient rivers (whose gravels have furnished so much of the gold of California). The geological age of the river period was determined by Lesquereux from specimens of vegetation, now extinct, collected in the survey of the ancient rivers: specimens indicating a flora of the pliocene age, retaining some characteristic miocene forms.

After the volcanic period, the land rose again, the time of emergence embracing the glacial period and the new eroding period in the sierra, during which the slates, and the hard metamorphic greenstones, and the granites were slashed with cañons three thousand feet deep by the action of ice and running water. Taking the rates of continental movement determined by Lyell, our geologist calculates that the time required for the changes thus outlined could not have been less than eighteen hundred centuries. For a period so long preceding the glacial epoch as the time when ancient Cherokee was buried by the waters of the advancing sea, his estimate is certainly not extravagant, though it does transcend so enormously the time men have been accustomed to allow for man's residence on earth.

APPARITIONS.

From time to time, as there was occasion, we have referred to the so-called revelations of modern spiritualism, to the discovery of gross imposture in connection with the same, and to the strange hallucinations, in regard to this subject, which have overtaken even men who have no mean pretensions to the name of scientists. We have just seen a *resumé* of the history and theories of supernatural appearances and influences, in the second volume of the new edition of the *Encyclopedia Britannica*, a work which is generally regarded as an unusually high authority. The article to which we refer traces the origin of and reasons for superstitious beliefs, considers the evidence for the reputed appearance of ghosts, and concludes with the principal arguments for and against the creed of the spiritualists. The writer of the article evidently considers the strength of the argument, in favor of spiritualism, to consist in the character of a few of its supporters, men like Mr. Wallace and Mr. Crookes in England, and Robert Dale Owen in this country. Reference is made to the experience of Mr. Crookes, who not only saw a spirit, but clasped it in his arms, and thus demonstrated its substantial existence; and the conclusion to the whole matter is that spiritualism, even if its principles are not fully proven, is still a fair subject for scientific investigation, with a reasonable presumption in its favor.

We have referred to this article in the *Encyclopedia Britannica* because an opinion, such as that cited above, in a publication of such high standing, is worthy of more than passing notice. No matter how wonderful the events that are related by the fanatics who generally make up the congregation of spiritualists, their revelations have little effect on any one outside the circle of their immediate followers; but let a man of some scientific attainments, and, moreover, a member of the Royal Society, add his testimony to the truth of these events, and we see that he may deceive even the very elect. It was generally understood, when the last edition of the *Encyclopedia Britannica* was announced, that it was to be scientific in the best sense of the term, and, while giving due weight to popular beliefs and superstitions, that it would endeavor to sift away the chaff with which many of them are enveloped, and reveal their real character. We are to understand, then, from the article under consideration, that such investigations as have been made by some of the more distinguished converts to spiritualism can properly be classed under the head of scientific experiments, which, while not perhaps absolutely conclusive, leave the matter *sub judice*. When we remember the character of the evidence on which all the modern miracles depends, the difficulty if not impossibility of making a thorough investigation with the facilities afforded at a *séance*, and the complete exposure of all the notorious cases of spiritual visions, our readers will probably venture to doubt whether the treatise on "Apparitions" in the *Encyclopedia Britannica* either gives a clear understanding of the actual facts connected with spiritualism, or represents in any sense the views of scientists generally in regard to the matter. No mention is made, for instance, of the exposure of the Katie King fraud in this country, while the vision of this airy being, produced in England under the auspices of the same mediums, is given as one of the strong arguments for allowing spiritualism to have a standing among scientific men. For our part, we can say that we have never heard of any event at a spiritualistic *séance* that at all approached the movements of the wonderful Psycho, in London, whose *rationale* escaped detection for months, with exhibitions in open day, and with apparently every facility for investigation that could be desired.

PROSPECTS OF SCIENCE ON THE PACIFIC SLOPE.

The conditions for the advancement of Science beyond the Rocky Mountains are peculiarly favorable. The country itself presents an exhaustless field of research in every department of the physical and vital history of the world. Its records of continental upheaval and subsidence, of ancient rivers and vanished seas, of vast volcanic outpourings and vaster scenes of erosion, are wonderfully full and legible. In the beds of its tertiary lakes are the remains of multitudes of the progenitors of recent forms of animal and vegetable life—inexhaustible mines of material for the solution of the great problems of evolution. On the shores of those lakes and rivers dwelt the most ancient races of men that geology has furnished glimpses of. Already abundant traces of them have been discovered in and beneath the later tertiary strata, and it is not unreasonable to hope that future observation may connect them with the post-glacial founders of the civilizations which grew up along the valley of the Colorado, before that strange river had sunk its channel a mile below the surface of the plain it once watered, probably before the Nile spread its first layer of fertile soil over the foundation sands of ancient Egypt. Chemical geology has already been immensely furthered by the knowledge gained through the mining operations of the interior and the investigations they

have inspired; while the demands for men of scientific training, incident to a country so largely given to mining, have secured to the Pacific Slope a proportion of scientific observers unequalled in any other country.

In older communities, Science and scientific thinking have to contend with the conservatism of custom and the traditions of scholastic culture; in the far west, where scientific training has been at a premium from the first, where public prosperity rests so largely on scientific operations, Science is likely to get more than its fair share of encouragement, rather than less.

In proof of this, it is necessary only to contrast the financial condition of the California Academy of Sciences with that of our eastern societies of like character. It is true that something more than money is needed for productive investigation: the natural and social conditions must be favorable, and there must be no lack of men of proper zeal and training to undertake the work. In this respect, as already noted, the Pacific Slope is as greatly favored as in its abundance of wealth; and only the grossest mismanagement of their means and opportunities can prevent the richest harvest of scientific achievement by the Pacific scientists, whether independent or connected with the California Academy.

The magnificent scope and execution of Mr. Bancroft's research, in connection with the native races of the Pacific coast, afford at once an illustration of the western way of working, and a model of thorough scientific investigation. We shall be greatly disappointed if Mr. Bancroft's work does not prove to be the first of a long series of correspondingly valuable researches in other departments of knowledge, undertaken by the scientific workers of the west. Hitherto their work has of necessity been chiefly of a practical, money-making sort. It has given them the best possible training for the conduct of investigations of broader scope and remoter profit. The work lies ready at hand; and it is safe to predict its prosecution with true western vigor and thoroughness.

DANGERS OF CHLORAL DRINKING.

Blessed be the man that invented sleep, said the immortal Sancho Panza. When the primary physiological effect of chloral was first made known, thousands called down equal blessings on the man who discovered that simple and seemingly harmless sleep compeller. No matter what cares made life a burden, no matter what excitements or excesses made a stranger of "tired Nature's sweet restorer," here was a painless key to the soothing realm of Morpheus, with no apparent penalties to pay for the invasion. It is not surprising, therefore, that chloral soon came to be employed, without medical direction, to a greater extent than had ever been the case with any other sedative.

But experience has not justified the implicit confidence reposed in it. Its apparent harmlessness only made the insidious effects of its daily use the more dangerous. Though it might not kill directly, it too frequently enabled death to take place from causes that would not have been immediately fatal without the sedative influence of the drug on processes needful for life; and not infrequently the machinery of life came to a stand under its influence when no other disturbing cause could be detected: more frequently, perhaps, the *Lancet* avers, than with the use of any other sedative except chloroform, with which it has many chemical and a few physiological relations. The danger of premature death, however, is not the gravest consequence of chloral drinking; and the *Lancet* editorially predicts that some day, when the punishment for the misuse of the drug falls upon some sensitive temperament and gifted intellect, we shall have the "Confessions of a Chloral Drinker," to take its place beside De Quincy's "Confessions of an Opium Eater."

There seem to be two sources of danger attending the habitual use of chloral. The most obvious arises from the fact that the sleeplessness which it is employed to remove is the result of improper living. The proper cure for the distressing symptom is a return to right living, which will never be done so long as the penalty is masked. Instead of curing the disease, chloral simply hauls down the danger signal and permits the wrong doer to hurry on to complete destruction. It is thus a delusion and a snare.

But this is not the worst. Chloral is itself a serious disturber of the vital economy, though its action is very slow. Healthy life is the attendant, if not the effect, of a properly balanced and correctly working organism. Any tampering with our physiological machinery, more especially if habitual, is of necessity mischievous; and the practice of chloral drinking is such an interference. We see its immediate effect in the phenomena of sleep; and there is an analogy, as the *Lancet* points out, between the temporary effect of a single dose, and the permanent effect of its habitual use.

"In sleep, the sensory recipient and lower motor centers are separated from those of consciousness and will with which, during the waking state, they are in close connection. This separation can take place only under certain conditions, which vary much in different individuals. Chloral introduces an artificial influence, and separates forcibly those functions of the nervous system which would otherwise have been linked together. It stills unpleasant emotion—removes disagreeable sensation—paralyzes the will. This can hardly occur repeatedly without some permanent effect. Each region of its influence presents an example of perverted action. The will becomes weakened, emotional manifestations are in the chloral drinker more easily produced; the evidence of the senses is perverted, and their action is no longer under the same control of associated impressions. All influences of a depressing character are felt more keenly. The sufferer becomes more 'nervous,' emotional, hysterical. Neuralgia and other sensory disturbances become frequent, and with them various

paretic phenomena depending chiefly on defective will. Ultimately still graver consequences may result. Delirium, imbecility, and paralysis of the pharynx and œsophagus are among the symptoms which have occurred in recorded cases, and which have ceased when the habitual dose was discontinued. All the time the supposed need for sedatives increases, the craving therefor may become as intolerable as for opium—the patient moaning for chloral which he can hardly swallow—while sleep gradually becomes impossible, except under artificial influence."

This is a serious showing for a drug popularly believed to be absolutely safe and harmless. And when we add, to its direct injuries to the nervous system, its indirect influence in perpetuating the unsanitary conditions and habits which lead to a resort to it, the need of caution in its use and the propriety of abstaining from its use except under medical advice must be apparent to the dullest.

COLLEGIATE RACES.

Now that the excitement of the intercollegiate regatta has waned, there will, we think, occur to many some sober second thoughts, regarding that and all similar competitions, which deserve more than a passing consideration. Physical pluck and endurance will always command admiration; but whether such qualities are to be considered superior to others which involve the higher attributes of the mind, so as to warrant their cultivation in lieu of or to the detriment of the latter, is a question which quickly suggests itself in view of the relative importance popularly accorded to the recent display of physical strength and to the several college commencement exercises which lately have occurred. If the columns of the daily press are to be taken as an index, the meager space allowed to the reports of the latter exercises, and the almost unlimited enterprise exhibited in securing the most trivial particulars relative to the boat race and its participants, show plainly on which side popular interest is enlisted. Are we then to infer that superiority at the oar, or on the race course, is by the friends of education, as well as by the people generally, ranked higher than superiority in mental attainments? We hope not—we believe not—but then, are we not tacitly at least encouraging such a conclusion in the minds of the young men who fill our colleges?

There can be no gainsaying the fact that a certain amount of physical culture is a necessary concomitant to good health. A well balanced and healthy brain is rarely found in a weak and decrepit body. *Mens sana in corpore sano* is a wretchedly trite proverb, but none the less true; and certainly there is no class to whom its precept is more important than to those who in youth undertake a four years' course of study. But physical culture carried to excess is as bad as no culture at all, or even worse, since it may leave behind it, after severe exertion, injuries which are ineradicable: or Nature, strained beyond endurance, may give way in the hour of trial, and, as in the case of Renforth the oarsman, death may triumph in the midst of the contest. Every account of the recent regatta and the subsequent foot races agrees in stating that, in very many cases, the marks of over training were apparent, facts abundantly proved by the fainting of some of the most muscular rowers, and by the pitiable condition in which, it is reported, several of apparently the strongest of the pedestrians concluded their efforts.

While it cannot be expected that young men will fail to be carried away by their own and by the intense popular enthusiasm manifested in these competitions, and thus rush to extremes both in the matter of physical exercise and in neglect of other duties, it is not to be supposed that the older and wiser heads of college authorities and of parents will countenance proceedings fraught with bad results. To the former, especially, the public looks for a wise guidance of those under their charge; and it is certainly as much their duty to impress upon their students the laws which govern health and correct living as those which underlie any department of knowledge. It certainly is their office to point out how far physical culture is beneficial as it is to show that its neglect is hurtful—to check it in one case as to encourage it in the other.

We are very much disposed to question the expediency of such contests as those now ended, and from another and different standpoint from that above taken. Their only advantages are an increase of *esprit de corps* among the students and the bringing of our educational institutions prominently to public notice. These, however, are more than compensated for by the highly demoralizing effect which they possess, in common with all races or chance occurrences upon which gambling can be based. It certainly is demoralizing for any body of men to be reduced to the level of the race horse or the dice box; and the fact that betting is not only indulged in freely by the students themselves, but freely countenanced by the alumni, is not at all calculated to improve the moral tone of the institutions in which young men are supposed to obtain the foundations for their subsequent careers.

The New York Dock Department.

George S. Greene, Jr., C. E., has recently been appointed Chief Engineer of the Dock Department of the city of New York, General Charles K. Graham having resigned. Mr. Greene, although comparatively young, is an indefatigable worker, a thoroughly practical, experienced engineer, and a man of spotless character. The appointment reflects credit upon the Commissioners by whom the selection was made. The administration of the Dock Department devolves upon a board of three Commissioners, namely, Salem H. Wales, formerly of the *Scientific American*, President, Jacob A. Westervelt, and Henry F. Dimock, all of whom are leading and influential citizens.

IMPROVED AIR RESERVOIR.

M. A. Galibert, of Paris, France, has recently patented in this country respiratory apparatus, consisting of an air reservoir made of a skin, india rubber, or any other airtight material, in which pipes are suitably arranged for inspiring and expiring the air from and into said reservoir.

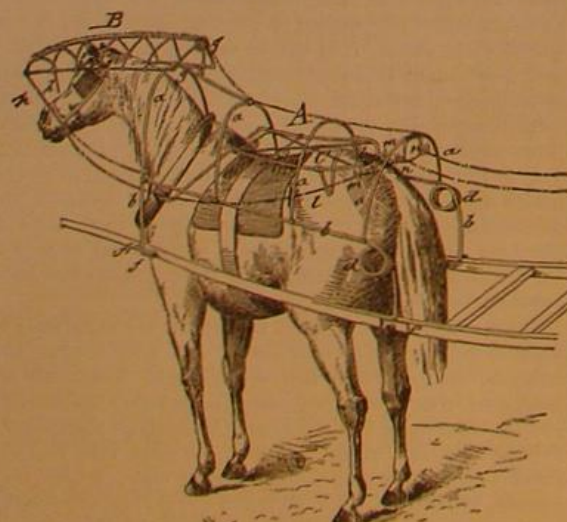
The apparatus is intended for furnishing pure air for breathing in localities where vitiated air, smoke, etc., render the atmosphere unfit to sustain life. The engraving represents the airtight bag. Two rubber or other flexible pipes penetrate to the inside of the air bag—one fastened near the top and the other dropping to a point near the bottom. These pipes, after passing to the outside a certain distance, are fastened to the mouthpiece, which is so shaped as to fit inside of the mouth, to be held by the help of the teeth and lips. Two straps are fastened to the air bag, and by them it is carried by the bearer.



In use the air bag is inflated with bellows. When full, the tubes are stopped by a pressure with the fingers, or by twisting them so as to arrest the escape of air from the bag. The bag is now strapped to the back, the nose stopped with spring pinchers or otherwise, the mouthpiece is inserted between the lips, the pipes relieved from pressure, and the apparatus is now ready for use.

DEVICE FOR PROTECTING HORSES.

Mr. R. P. Lawton, of Oramel, N. Y., has recently patented, through the Scientific American Patent Agency, a horse protector, the object of which is to allow the head piece of



the same to be used in place of the check rein, and be thrown out of the way on detaching it, while the body of the protector is so applied to the thills that the horse may be readily unhitched without being hindered thereby. The reins are guided and supported in such a manner that no entangling of the tail with the same is possible.

In the engraving, A represents the main part or body of the horse protector, which is constructed in the usual manner of lateral bent wires, a, applied to longitudinal supporting wires, b. The net, blanket, or other article used for protecting the horse against flies, storms, sun, etc., is placed over the main frame, A, and supported by the same and suitable stiffening wires, which are stretched to connect diagonally over the bent pieces, a. The longitudinal supporting pieces, b, are bent at their rear ends into coiled springs, d, and firmly attached by means of socket slots and clamp screws, c, to the thills. The front ends of the side pieces, b, are bent under right angles toward the thills, and applied by end hooks, f, to loops or staples, f', of the thill. The action of the spiral springs, d, carries instantly the main part, A, in upward direction, as soon as the front ends of the supporting pieces

are detached from the thills, so that the horse can be unhitched without being interfered with by the supporting frame. The head piece, B, is attached to the upper part of the front wires, a, in some suitable manner, the connecting wire piece, g, being provided with a spiral spring, g', which has the tendency to throw the head piece back on the body, A, unless connected to the bridle. Light wire rods, h, connect the front part of the head piece, B, with the bridle, and take thereby the place of the check rein for holding up the head of the horse. The spring connection of head piece and body gives sufficient freedom to the head of the horse, that this check arrangement is not onerous to the same. The reins are supported, for the purpose of not getting entangled with the protector or tail, on a separate wire frame, C, which is also in yielding manner applied either to clamps of the harness or attached to the main part, A. The reins first pass along a lateral V-shaped wire, l, of frame, C, placed laterally across and resting on the back of the horse, then over rear guide hooks, m, of the same, and finally over hooks or eyes, n, of the bent rear wire, a, of the main frame, A, to the driver, who is thereby enabled to retain full control of the horse. The protector may be constructed of steel wire of sufficient lightness to form a neat and practical attachment to the thills. In using the protector with a double team, in which case the thills are not available, it is necessary to support the same on a standard attached to the hip and back straps, the front ends being fastened into a slot or socket of the hames. The head piece is applied in the same manner in both cases.

NEW CLINICAL THERMOSCOPE.

Dr. E. Seguin, of 17 East 21st street, New York city, has recently invented a clinical instrument for the detection of anomalies in the condition as to heat of the human body. It is a very simple device of merely nominal cost, and is the most sensitive indicator of changes in temperature which we have ever seen. The inventor calls it the clinical thermoscope; and it consists of a glass tube, of a quarter of a line bore, seven inches long, closed at one end by a bulb nine lines in diameter, and flared at the other end. To make it ready for use, the bulb is heated over a lamp or fire, or more readily in a bowl of hot water; and when the air contained in the bulb is heated to a few degrees above the atmospheric temperature, the open end is quickly plunged an inch deep into, and quickly withdrawn from, a bowl of cold water. The drop or two which will have then entered the mouth is seen to run up the tube. If it stops near the bulb, it will be the index of the thermoscope. If it stops sooner, say two or three inches from the mouth, or if it runs into the bulb, the latter was too cold or too hot, and we have to jerk away that drop of water and recommence; three or four trials, to obtain a good water index, take hardly a minute.

In this condition, the air contained behind the water index makes itself isothermal to the ordinary temperature, and the thermoscope is ready.

It is applied to any spot where an anomaly of calorificity is known or suspected. Its place by preference is in the closed hand. In five to ten seconds the index has attained the maximum height or fall; and to read it, we note the distance the index drop of water travels, and the time in seconds it takes to reach it. To take more exact observations, a movable scale is attached to the stem, so as to put its lowest figure on a level with the head of the water index; so that the thermoscope is always correct—"which," says Dr. Seguin, "is more than can be said of most of our clinical thermometers."

But with or without a scale, it gives indications of the thermal condition at the start (a), and of the volume of heat escaping by radiation (b); while by gently blowing on the bulb, it shows the degree of combustion which takes place in the lungs; and other phenomena of heat may be diagnosed by its use.

Without using a scale, an attendant can tell, by application to the affected part of a patient's body, at what hour the index rose quicker and higher, or quicker only, and not so high, etc. Without a scale, too, a physician who well knows his case, and is short of time, can, in less than ten seconds, decide upon the dynamic conditions of the next twelve or twenty-four hours, dependent on the waste of calorificity by radiation—that is to say, life itself in many cases—and prescribe accordingly.

Dr. Seguin recently communicated to the New York State Medical Society the following interesting case, in which the value of his instrument was made apparent:

"Called to a man fallen from a three-story hatchway, I found a compound fracture of one leg and a fracture of the skull; and the patient, rather insensible to pain, had full consciousness, with jactitation, with a speck of erotism; his pulse was confused, temperature 98.5° Fah., in other terms, at the point of perfect health. Was it delusion? No, it was a compound temperature whose component elements escaped the fever thermometer.

"I tried the thermoscope. Put in the hand, it rose, in the axilla it rose more, below the sternum it rose less, in the inner angle of the eye it fell rapidly. The thermoscope had discovered the point where extravasated blood was coagulating, at the base of the brain. Thus it became comprehensible that a temperature of 98.5° Fah., the thermal point of perfect health, may in a dying man be a compound temperature, whose composition could be approximated by these

figures: 100.3° Fah. of general pyrexia, balanced by 96.7° Fah. of hemorrhagic apyrexia, equals 98.5° Fah. This thermoscopic analysis saved the man further painful manipulations, and he died, as predicted, inside of three hours.

"The thermoscope in contact with the living shows the activity of their calorificity; and in contact with the dead, it ceases to indicate heat only as organic combustion becomes progressively extinct. As thousands have been buried alive, the invention of a true necrometer excites a deep interest, increased, if possible, since cremation was mooted. For some have knocked at their coffins and re-entered the world; but of what use would it be to knock for help inside the furnace? The proof of death is wanted now more than ever, and, if I am not mistaken, the thermoscope gives it.

"I give this simple and costless instrument to my confrères, begging them to try it in the spirit of candor which made Biot say: 'We must not shun the humblest contrivances, when they can improve or supplement the medical senses.'"

IMPROVED TREADLE SAWING MACHINE.

We illustrate herewith a sawing machine operated by a treadle, in the engraving of which A represents a sawhorse



of the common construction, with side standards and lateral cross pieces of suitable strength, for supporting the weight of the body and the additional parts attached thereto. A platform treadle, B, is pivoted by a cross rod, a, to suitable bearings, a', of the side standards above the lateral bottom piece of the same, and made of concavo-convex shape, for giving a firmer hold to the feet of the person operating the machine, and preventing, also, the contact of the under side with the ground. The treadle, B, is extended to one side to project beyond the horse standard, and provided with an inclined lever arm, C, which is rigidly braced to the treadle, and connected by its curved extension, C', with the bifurcated end of the saw frame, D. The rear part of extension, C', is connected to a pivoted lever rod, b, with a crank wheel shaft, d', and balance wheel, e, at the opposite side of the saw horse, with shaft, d', turning in suitable bearings of the same. The balance wheel is weighted at one side for the purpose of carrying the crank wheel into position to be readily moved by the treadle and arm, avoiding the position of the same on one of the dead points for starting. The forked end of said frame, D, is adjustably pivoted to the rear end of the extension, C', and reciprocating motion imparted to it by the arm and extension, C C'. Said frame, D, is made in a curved shape, in any approved manner, with a saw blade cutting in both directions, clamped adjustably and detachably therein. A rear extending arm, E, is bolted to the upper part of the sawhorse, A, serving for guiding the saw frame along the same, it being held in forward position for the sawing by a pin, f, of the same, and in rearward position, when thrown back for adjusting the log, by a spring hook, g, near the outermost end of the arm, E. A V-shaped piece, F, corresponds in shape with the upper legs of the sawhorse, A, and slides by a groove, h, on the main cross piece of the sawhorse, and by a sleeve-shaped perforation, h', in a lateral guide rod, h', of the upper part of the saw horse. Crotch or piece, F, serves to support sticks or logs of lesser width than the sawhorse, by being carried between the side standards into the required position.

The machine is operated by rocking the treadle platform with the feet, pressing with one hand the upper part of the saw frame, and feeding with the other hand the sticks to the saw.

Mr. John M. Linnell, of Monticello, Iowa, is the inventor, and the invention was patented through the Scientific American Patent Agency.

CHEMICAL FILTER.—Place inside of the glass funnel used a small filter of parchment paper pierced at the bottom with a fine needle; afterwards place the ordinary filter in the funnel, and filter as usual. Such cones of parchment paper can be used in any required size, are easily obtained, and may be applied to almost all purposes where the more expensive platinum cones have hitherto been used.

CHLORIDE OF BARIUM, as a remedy for boiler incrustations, gives general dissatisfaction.

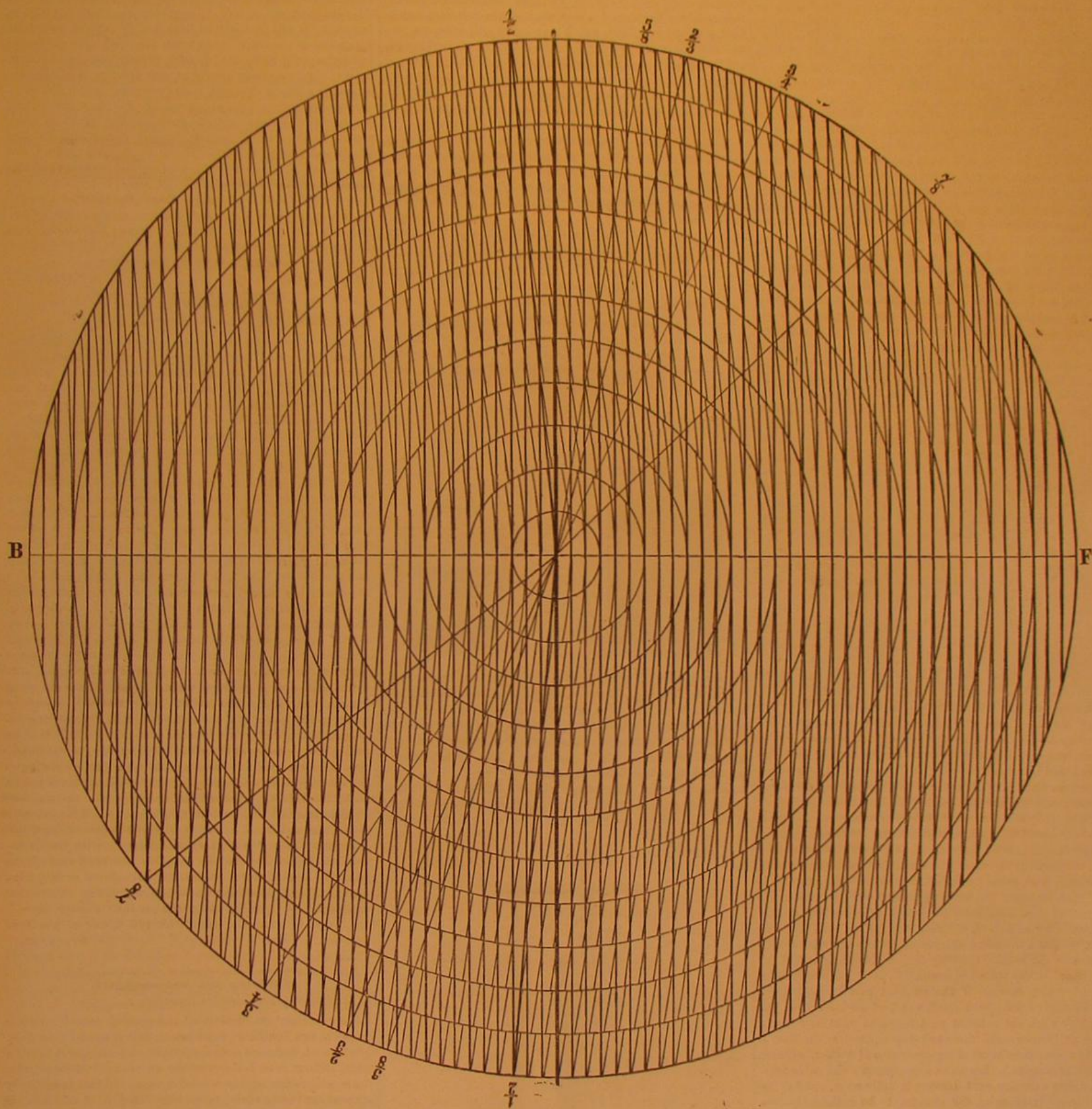
IMPROVED SLIDE VALVE CALCULATOR.

There was privately circulated, at the last exhibition held by the Franklin Institute in Philadelphia, a copy and description of a device by which all slide valve calculations are delineated on a diagram. The application of the graphic method to these intricate calculations is very ingenious, and

the next vertical line on the calculator, toward F; then, theoretically, the valve has opened the steam port $\frac{1}{4}$ of an inch. When, still moving the template in the same direction, the mark on the template has got round to the line, B F, the steam port is fully open, and the crank pin has made one half of a stroke or one quarter of a revolution. The position

2, and 3, of the stroke circle represents 1 inch of piston movement.

Moving the template farther round, the mark returns; and when the next vertical line is reached, the steam port is closed to the amount of $\frac{1}{4}$ of an inch, the port gradually closing as the template is moved forward until, on the mark be-



A valve constructed thus would read:

Travel of valve.....	2 inches
Cut off.....	0 "
Exhaust from end of stroke.....	0 "
Expansion.....	0 "
Cushion.....	0 "
Lap.....	0 "
Steam port opens.....	1 "
Exhaust port opens.....	1 "
Lead.....	0 "

In other words, our example has been upon a valve without either excess of travel, steam lap, or exhaust lap or lead.

We will now give an example of the use of the calculator for valves having lap:

Diameter of cylinder is 12 inches, stroke 24 inches, ports 12 x 12, which is equal to one tenth of the piston area. Steam supply to the cylinder is to be cut off at $\frac{1}{2}$ of the stroke, and the exhaust is to commence when the piston has traveled to within 3 inches of the end of the stroke. Travel of valve is $2\frac{1}{2}$ inches, the cushion being a result to be determined. Commencing, then, when the valve is on the dead center line, B F, and (as before) on the B end of it, the valve has to be moved ahead to allow for the lap and give steam when the crank pin is in that position. This is done by making the mark, T, on the template in advance, to the amount of the lap from the thick line toward the F end of the line, B F. If we had not known the requisite amount of lap required to cut off at $\frac{1}{2}$ of the stroke, we would have to try, say, $\frac{1}{2}$ of an inch, and alter it more or less as we found it to cut off too early or too late; but in our experimental case, $\frac{1}{2}$ plus $\frac{1}{2}$ of an inch is the requisite lap, and we accordingly make our mark on the template that much in advance toward the F end of the line, B F, of the thick line. If the template be now turned, it will be found that the steam port is opened $\frac{1}{2}$ of an inch; and when the mark has arrived at the identical spot it started from (but on the under side of the line, B F), it will be found that the crank pin stands at the $\frac{1}{2}$ line, and the piston has proceeded $\frac{1}{2}$ of its stroke. The exact distance in inches can be found by counting the curved lines, from F back to the crank pin, along the stroke circle, each space representing 1 inch. It will be found that there are 8 of them, and 8 inches is the distance the piston is from the end of the stroke.

The proper way to find the inside lap is to move the mark around $\frac{1}{2}$ of an inch at a time, and at each movement stop and examine the position of the crank pin to see if it is near the desired exhausting point. In this case, $\frac{1}{2}$ of an inch would bring the mark to within $\frac{1}{2}$ of an inch of the fourth line from the thick one, and the crank pin is some distance yet from the third inch from the end of the stroke (the exhausting point). This shows that $\frac{1}{2}$ of an inch inside lap is not sufficient. We then try the addition of another $\frac{1}{2}$ of an inch inside lap, and find that the mark is within $\frac{1}{2}$ of an inch of the third line, and still the crank pin is not at the desired spot. We therefore try the addition of another $\frac{1}{2}$ of an inch, and examine, and then another, in all $\frac{1}{2}$ of an inch, and find that the crank pin wants a little yet; but by moving the mark another $\frac{1}{2}$ of an inch, we find, by counting as before, that the crank pin has arrived at 3 inches from the end of the stroke. Now it is evident that further movement of the mark will result in opening the exhaust. When it has arrived at the line, B F, the exhaust will be fully open; and when it arrives at the same line again (but on the upper side of the line, B F), the exhaust will be closed. We proceed to move it accordingly, but we may as well observe how much said port is open when the piston is at the end of the stroke. By proceeding as before, counting one $\frac{1}{2}$ of an inch after another, we find 6 of them are passed before the piston is at the end of the stroke, showing that the exhaust is $\frac{1}{2}$ of an inch open by the time the crank pin is on the dead center line. We may now see if the exhaust port is going to be fully opened or not. The mark was $\frac{1}{2}$ of an inch from the thick line when the exhaust port began to open, and it will not be fully open until the mark has arrived at the line, B F. Now the space intervening measures $1\frac{1}{2}$ inches, whereas the port is only $1\frac{1}{2}$ inches wide, consequently the valve travels not only over the port, leaving it fully open, but $\frac{1}{2}$ of an inch beyond it, showing the exhaust to be sufficiently free.

Now by moving the mark round to the line corresponding to the opening of the exhaust, namely, $\frac{1}{2}$ of an inch from the thick line, we find that the crank pin stands at $1\frac{1}{2}$ inches from the end of the stroke, as the curved lines show $1\frac{1}{2}$ inches; this, then, is the amount of the cushion. If more cushion is desired, we go over the same ground, after having added a little more inside lap; but this amount, with slight lead, would run well at a piston speed of 300 or 400 feet per minute. Lead would have the effect of opening the exhaust sooner, and of reducing the amount of cushion; but what was lost in this way would be compensated for, so far as the cushioning was concerned, by the admission of live steam, permitted by the lead before the piston had arrived at the end of the stroke, and when the crank pin was consequently on the dead center. The result given by our last experiment would read as follows:

BACK AND FRONT.		B	F
Travel of valve.....	2 1-4 inches	2 1-4 inches	
Steam lap.....	21-32 "	21-32 "	
Cut off.....	8 "	10 "	
Exhaust lap.....	17-32 "	17-32 "	
Exhausts at.....	3 "	4 "	
Expansion.....	5 "	6 "	
Cushions.....	1 3-4 "	1 1-2 "	
Steam port opens.....	7-16 inch	7-16 inch	
Exhaust opened at end of stroke.....	3-4 "	3-4 "	
Exhaust port opens.....	Full plus 1-8 "	Full plus 1-8 "	

The B column denotes the back end of the cylinder, and the F the front end; the latter is found in the same way, only the calculator is turned so that the letters B and F will read upside down.

If it is desired to ascertain what effect lead, obtained by moving the eccentric ahead, will have on the engine, we proceed as before; but when the mark, T, has moved forward to the amount of lead required, we move the template no further until we have made a new mark on the template coincident with the line, B F, which new mark will represent the new relation of the crank pin to the old mark; then throughout the operation we employ this new crank pin in place of the old one. By moving the template back to its old position, that is, till the old crank pin is on the line, B F, the new crank pin will denote just how far the piston is from the end of the stroke when the lead commences to act.

By the aid of our illustrations and the given examples in the method of using it, the calculator cannot fail to be understood and appreciated by those who may require to either ascertain what results are being given by the valve of an existing engine, or the proper proportions of a valve for an engine about to be built.

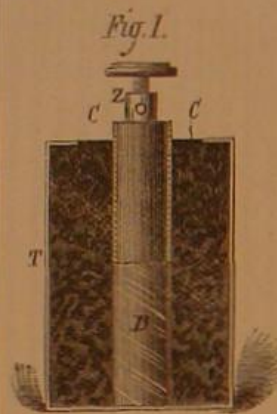
JOSHUA ROSE.

Correspondence.

A Charcoal Battery.

To the Editor of the Scientific American:

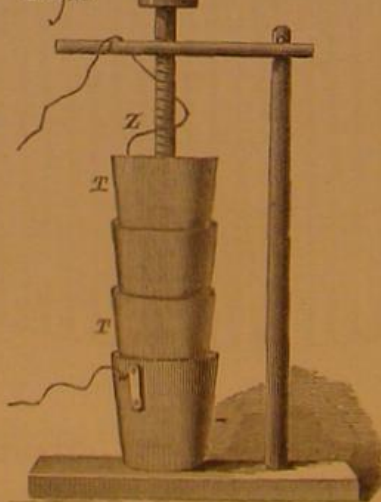
I enclose a sketch of a cheap and durable form of battery of considerable power; and for many purposes of experiment this battery may be used to advantage. The current is steady, and there are no unpleasant fumes given off, as in many acid batteries. In Fig. 1, the containing vessel, T, is made of tin,



into which a rod of zinc, Z, wrapped in canvas, shown at B, is placed. The space between the tin and zinc is then tightly packed with small pieces of hardwood charcoal, C. These cells are charged with a strong solution of potash made in hot water. In making up this battery, the zinc of one cell is connected with the tin of the next. This battery should be placed on an insulating substance.

Another form of this battery is shown in Fig. 2, and a section of two cells in Fig. 3. The containing vessels are made of tin, T T, which are filled with charcoal, A A, to a depth

Fig. 2.



of one or two inches. A piece of canvas, C C, is spread over the charcoal, and on this a plate of zinc, Z Z, is placed. The blocks of wood, B B, are placed on the zinc; a strip of the latter is bent over the blocks so as to connect the zinc of one cell with the tin of the next. In charging these cells, shown in Figs. 2 and 3, the fluid of one cell must not come in contact with the tin of the next; if it be so, the electromotive force would only be that of one cell. The fluid is kept concentrated by placing on the zinc plate of each cell a quantity of potash.

JOHN J. BLAIR.

Ardrea, Ontario, C. W.

The Spider's Web.

To the Editor of the Scientific American:

In your issue of July 3, the question is asked: "How does a spider make its web, the lines of which, crossing at the center, are carried, some of them to the surrounding objects, while others are fastened to an outer circular line, made evidently before the outer circular lines of the web are formed?" Also: "Where does the spider place itself when it ejects the lines which form the spokes of the wheel?"

The extreme outer line surrounding the web, to which the spokes are fastened, is by no means always circular: this de-

pends upon the position of the surrounding objects to which the web is fastened. The spider first extends lines from one point to another by the shortest route possible, inclosing a sufficient space to build its web; then he extends a line across where he intends to have the center of his web. He next fixes the center by fastening a line thereto on the central line, and, carrying the line at right angles or nearly so to the first line, hitches it to the nearest object, whether that be the outer line of the web, or anything to which the web is fastened. It will be observed here that the spider ejects all the spokes of the wheel (except the first line across the center of the web) from the intended center, placing the first lines at right angles or nearly so, and dividing the distance each time a line is extended from the center until a sufficient number are put up, always stretching the lines alternately in opposite directions until the spokes of the wheel are complete. He then places his left forefoot on the center of the wheel, and hitches the first end of the circular line of the web to one of the spokes of the wheel, and moves round the center, fastening his thread to every spoke as he goes along, measuring the distance from one line to the other by stretching his right hind foot to secure the web to the spoke, with his left fore foot one line toward the center and moving spirally along from one spoke to the other, until he gets his web sufficiently large for his purpose.

Batavia, Ill.

A. M. SPENCER.

The Potato Disease.

To the Editor of the Scientific American:

Having given the potato disease—blight or rot—considerable attention, and made microscopic examinations of the fungus known as the *peronospora infestans* (Berkeley called it *botrytis infestans*), I find that lime is the best cure and preventive. My attention was arrested by the article on page 277, volume XXXII, headed "A Remedy for Potato Blight," referring to the communication of Mr. Lyman Reed, and the process of the action of microscopic parasites attacking the tubers.

It strikes me that Mr. Francis Gerry Fairfield has things a little mixed up. He carefully cleaned the specimens procured by him, and subjected them to heat for 96 hours or more, before he examined them. He finds the ova of the insects on the interior layer of the cuticle of the tubers, and says: "I have no doubt that they commence that histolytic process that ends in the destruction of the tuber; but I doubt whether there is any genetic connection between the fungi developed on the stalks in the course of the degeneration, and the larvae in which the degeneration primarily starts." The truth of the matter is that these microscopic animalcules are a secondary product arising in the diseased matter of the tuber. Certain fungi have a nitrogenous substance analogous to diastase, which transforms the starch to dextrin, and finally into sugar, like a ferment, especially under moisture and an elevated temperature, inducing decomposition, forming a *nidus* for the animalcules. Had he used his microscope to trace the parasitic fungus, he would have discovered the fine threads of the mycelium extending to the tubers, which induces a ferment or gangrenous putrid mass that, like any other animal and vegetable matter, will breed animalcules in less time than 96 hours. This is easily proved and well known to any one who has given the subject attention. Consequently, his sage advice "to dip the potato, just before planting, in the solution" (carbolic acid), is, to my mind, all nonsense. When the animalcules or fungi infest the tuber, it is neither fit for use or planting. However, I may err, and it might be well to see the "copious notes," and "always give Mr. Reed the full honor of the first discovery."

Lancaster, Pa.

Utilizing the Grasshoppers.

To the Editor of the Scientific American:

The grasshoppers, desiccated and ground, would of course be useful as a fertilizer; but when in this prepared condition, they would form an excellent food for all insect-feeding birds. There is no better food for all young domestic fowls. Containing silicic acid in a soluble state, they seem specially adapted for young birds, promoting the growth of feathers. The young prairie chicken flies when only eight days old. The sharp-tailed grouse and the cock of the plains subsist entirely on grasshoppers up to their maturity; and after that, they prefer grasshoppers to other food. I have found in the depth of winter, at the foot of the Rocky Mountains, the gizzard and stomach of the sharp-tailed grouse filled with grasshoppers, when they had to find the dead bodies of them under six inches of snow.

There exists, in fact, no beast or bird of prey on the western plains which would not partake freely of them, whenever they are to be procured. I found, in the season when grasshoppers were plentiful, the stomach of the prairie wolf, the stomach of the little kit fox (*canis cinereo-argenteus*), and the gizzards of all *falconidae* and owls filled with grasshoppers. Even by man they have been and are used as food. The inhabitants of the interior of Africa use them extensively, and the Pau-Eutaws or Digger Indians of our own country find them very palatable. I do not, however, suggest them for the latter purpose.

E. WERNICK.

A Theory of Dissolution.

To the Editor of the Scientific American:

The reason given that a solid will be dissolved by a liquid is that the adhesion between the atoms of the solid and liquid is greater than the cohesion of the atoms of the solid.

The reason the adhesion is greater than the cohesion is that the weight or specific gravity of the atom of the solid is less than the specific gravity of the atom of the liquid; and

when the specific gravity of the atom of the solid is greater than the specific gravity of the atom of the liquid, the solid will not dissolve; and when the specific gravity of the atom of the solid is but a little greater than that of the liquid, it will require continual shaking to make it dissolve, or, when dissolved, to keep it from settling to the bottom. The reason that the solid sinks when placed in the liquid is that there are as many more atoms in a given space of the solid than in the same space of the liquid as the weight of an atom of the solid is less than the weight of an atom of the liquid.

It will be noticed that the bulk of the solid that will be dissolved is much less than the bulk of the liquid; which proves that there are a greater number of atoms in a given space of the solid than in the same space of the liquid; for each atom of the solid must come in contact with each atom of the liquid, to make a saturated solution.

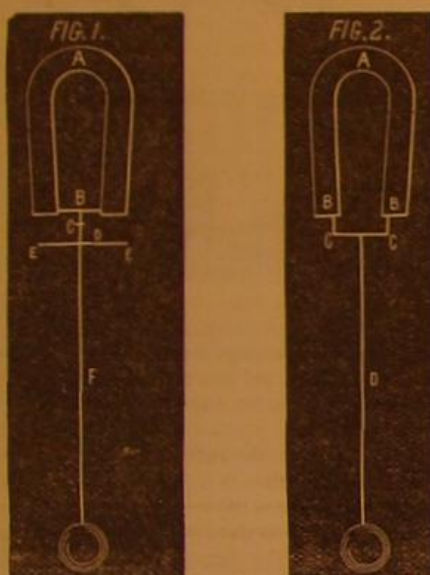
WM. L. DUDLEY.

A Frictionless Joint.

To the Editor of the Scientific American:

Is not the following application of an old principle new, as presenting a minimum of friction?

A, Fig. 1, is a horseshoe magnet, having a brass crossbar, B, between the poles, with a short extension, C, in the end of which is fixed an ordinary watch jewel. F is a pendulum, with crossbar, E E, for an armature, terminating in a needle point, D, resting up against the jewel, C. The weight of the pendulum must be just within the power of the magnet; and as gravity is barely overcome, the needle point only touches the jewel, and the friction is infinitesimal.



However, as pendulums left free to vibrate make a revolution in direction in twenty-four hours, it is possible that, when vibrating from side to side, the magnet would hold the crossbar, etc. This would be obviated in part by making the armature, E E, of a circular plate, and would be entirely so by using the following arrangement:

A, Fig. 2, is the magnet, B B jewels in each pole, C C are the needle points, and D the pendulum. The whole is to be placed under a receiver, and in both cases to vibrate to and from the observer, not from side to side.

Waterloo, Ill.

HENRY TALBOTT, JR.

Altitude of Thunder Clouds.

To the Editor of the Scientific American:

In your issue of June 30, Mr. David Brooks of Philadelphia has given an interesting little essay on thunder clouds and lightning. Without assenting to his theory of the manner in which the latent electricity is evolved and discharged, as being at all complete or satisfactory, I am indebted to the writer for recalling to my mind some measurements made by me in 1840-43, by way of attempting to determine the height of thunder clouds. My results were so great as to keep me in doubt as to the reliability of my method. I repeatedly measured clouds of 6 and 8 miles in altitude, and more than once got 10 miles as my result; and in a single instance I measured the altitude of what turned out to be a terrific thunder and hail storm of 13+ miles in height. I published an account of this one in the *Concordia Intelligencer*, printed at Vidalia, La. Its limited circulation protected me, as I afterwards congratulated myself, from severe scientific criticism. I now believe it was a reliable result, and the method legitimate. Let me state it that others may test the method, which I do not believe is generally, if ever, used by any other observer.

As the cloud developed eastward of my position, and I had a clear horizon, its great altitude began to be remarkable before its companions (usually found touching at the base and ultimately confluent) had fairly established themselves. The rain was visibly discharging at the center of the base when the thunder began. Both head and base were well defined; and I applied my sextant, when above 45° height were read. The cloud continued to rise and the electricity to be discharged with rapidity; and the rain descended from both sides when nearly 60° were reached. The defined bases merged into the horizon, and I could no longer depend upon my results. The storm, of course, moved from me, as all clouds of great altitude move eastward in this latitude. I took the dew point, and ascertained the altitude of the base of all the clouds (approximately) by imputing 100 yards for every degree Fahrenheit of difference between the air temperature and the point of condensation, by the wet bulb.

This gave about 1,600 yards. At 4°, the elevation of the base of the cloud before me, the sine of the angle of elevation, gave about 40,000 feet for the distance of the center of the thunder cloud; and 60° elevation to its summit gave about 70,000 feet, or 13½ miles. Subtracting the elevation of the base, 3,000 feet, we find some 67,000 feet, or nearly 13 miles, for the cloud height. Subsequent information proved the storm to have been terrific. Its width was but a mile or two in starting, but it spread as it advanced, and did much damage by floods and wind, and many trees were struck by lightning.

If observers will keep a sextant and thermometer at hand, they will find frequent opportunity during summer of testing the height of isolated clouds, which pierce and pass far above the cirrus clouds, whose elevation is at the base of the permanent southwest upper current—the reciprocal of the trade winds. The development of the thunder clouds lies along that region, and their heads are always borne off to the northeast by its drift. Hence all tornados, hailstorms, and thunder clouds of considerable magnitude travel towards the northeast in these latitudes, 29° to 33° N. C. G. FORSHEY. New Orleans, La.

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

To test the soundness of a piece of timber, apply the ear to the middle of one of the ends, while another person strikes upon the opposite extremity. If the wood is sound and of good quality, the blow is very distinctly heard, however long the beam may be. If the wood is disintegrated by decay or otherwise, the sound will be for the most part destroyed.

Paper prepared after the following recipe is said to render the use of the razor strap unnecessary. By merely wiping the razor on the paper to remove the lather after shaving, a keen edge is maintained without further trouble. The razor must be well sharpened at the outset. First, procure oxide of iron (by the addition of carbonate of soda to a solution of persulphate of iron), well wash the precipitate, and finally leave it of the consistence of cream. Spread this over soft paper very thinly with a soft brush. Cut the paper in pieces two inches square, dry, and it is ready for use.

Photographers will find the following a useful glass-cleaning preparation: Water 1 pint, sulphuric acid ½ oz., bichromate of potash ½ oz. The glass plates, varnished or otherwise, are left for 10 or 12 hours, or as much longer as desired. In this solution, then rinsed in clean water and wiped dry with soft white paper. The liquid quickly removes silver stains from the skin without any of the attendant dangers of cyanide of potassium.

Adhesive fly paper is made by boiling linseed oil to which a little rosin has been added, until a viscid mass is formed. The latter is then spread evenly upon the paper.

A good red or blue ink, suitable for use with stamps, can be made by rubbing Prussian blue or drop lake with fine clay into a thick paste with water.

A tablespoonful of black pepper put in the first water in which gray and buff linens are washed will keep them from spotting. It will also generally keep the colors of black or colored cambrics or muslins from running, and does not harden the water.

Lime slaked just before application and sown by hand is said to be an infallible protection against fly in turnips.

A whitewash made of quicklime and wood ashes will destroy moss on trees.

A mixture of tallow 3 parts, tar 1 part, applied to the bark while hot, will protect fruit trees against mice.

A cubic yard of sand or earth weighs about 30 cwt; mud 25 cwt; marl 26 cwt; clay 31 cwt; chalk 36 cwt; sandstone 39 cwt; shale 40 cwt; quartz 41 cwt; granite 42 cwt; trap 42 cwt; slate 43 cwt.

In small blasts, 1 pound of powder will loosen about 4½ tons of rock. In large blasts, 1 pound of powder will loosen 2½ tons. Fifty or sixty pounds of powder enclosed in a bag and hung against a barrier will demolish any ordinary structure. One man can bore with a bit 1 inch in diameter from 50 to 60 inches per day of 10 hours in granite, or 300 to 400 inches per day in limestone. Two strikers and a holder can bore with a bit 2 inches in diameter 10 feet per day in rock of medium hardness.

A 4 horse team will haul from 25 to 36 cubic feet of limestone at each load.

About 270 cubic feet of new meadow hay, or from 216 to 243 cubic feet of hay from old stacks, or from 297 to 324 cubic feet of dry clover, weigh one ton.

To compute the number of tons an ice house will contain, calculate the number of cubic feet in the house and divide by 35; this gives the number of tons if closely packed.

To determine the weight of live cattle, measure in inches the girth around the breast just behind the shoulder blade, and the length of the back from the tail to the fore part of the shoulder blade. Multiply the girth by the length and divide by 144. If the girth is less than 3 feet, multiply the quotient by 11. If between 3 and 5 feet, multiply by 16; if between 5 and 7 feet, by 23, or if between 7 and 9 feet, by 31. If the animal is lean, deduct ¼ of the result and the answer is the weight in pounds; this multiplied by 0.605 gives the net weight.

To make a glue which will resist fire, mix a handful of quicklime in 4 ounces of linseed oil and boil to a good thickness; then spread on tin plates in the shade. It will become exceedingly hard, but may be easily dissolved over the fire and used as ordinary glue.

The following are good non-poisonous glazes for common earthenware (1) Silicate of soda at 50° B. 100 parts; powdered quartz 15 parts; chalk 15 parts. (2) The same with the addition of 10 parts borax.

Artificial grapes are blown from melted resin and afterwards dusted with a colored powder.

The best homemade fireproof safe is a hole in the ground, well lined with brick and cement.

To restore the color of a marble mantelpiece which has become stained, mix up a quantity of the strongest soap lyes with quicklime to the consistence of milk, and lay it on the stone for twenty-four hours. Clean afterwards with soap and water.

Plaster of Paris mixed with a saturated solution of alum, baked in an oven, pulverized, and lastly mixed with water, is an excellent cement for marble.

Slaked lime, placed loosely on a board inside a furnace during the summer, will take up the moisture and prevent rusting.

Iron in Railway Bridges.

Mr. W. Kent, of the Stevens Institute of Technology, has made some analyses of the rapid corrosion of iron in railway bridges. It has frequently been noticed that iron, exposed to the smoke, steam, and heated gases escaping from passing locomotives, shows a greater tendency to corrode than iron in situations not so exposed. A qualitative chemical analysis of iron rust that was taken from a bridge on the Pennsylvania Railroad showed the presence (in a water solution of the rust) of iron, ammonia, sulphuric acid, and traces of sulphurous acid and chlorine. A separate portion of the rust was tested for carbonic acid, which was found in considerable quantities. The escaping gases from the locomotive contain carbonic acid, carbonic oxide, moisture, and, if there is sulphur in the coal, sulphurous and sulphuric acid. The presence of these acids, no matter in how small quantity, is sufficient to promote rapid corrosion.

New Phenomena of Solar Radiation.

M. Desains has recently examined the variations which the calorific solar rays undergo at the same time in point of intensity and with reference to their transmissibility through water. He expresses the results reached in tables which show the quantity of heat arising at noon during one minute, and at different periods of the year, on an area of 1.6 square inches. The numbers vary very slightly, ranging from 1 to 1.3. The minimum was observed in January, 1875, and the maximum in June, 1874. Another table shows how the quantity of solar heat varies in traversing 0.32 inch of water in a minute, at noon. On April 25th last, the sky being clear, sixty-three per cent of the radiation was transmitted. In June and July, 1874, the proportion reached seventy-two per cent. M. Desains deduces from his results the curious fact that an increased transmissibility of the radiations is related to the presence of greater or smaller quantities of watery vapor in the high atmospheric regions. Facile transmissibility indicates cloudy weather on the following day; and on the other hand, when the reverse is the case, permanently fair weather may be expected.

Aniline Black Marking Ink.

To prepare this ink the following solutions are required: (1) Dissolve in 60 grammes of water 8.25 grammes crystalline chloride of copper, 10.65 grammes chlorate of soda, and 5.35 grammes chloride of ammonium. (2) Dissolve 20 grammes hydrochlorate of aniline in 30 grammes of distilled water, and add 20 grammes solution of gum arabic (1 part of gum to 2 of water), and 10 grammes glycerin. If 4 parts of the aniline liquid are mixed in the cold with 1 part of the copper solution, we obtain a greenish liquid, which may be used at once for marking linen; but as it decomposes in a few days, it is better to preserve the two solutions separately. The writing is at first greenish, but is blackened by exposure to steam (for example, by being held over the spout of a boiling kettle). A dry heat renders the tissue brittle.—Dr. Jacobsen.

A Preventive for Shafting Accidents.

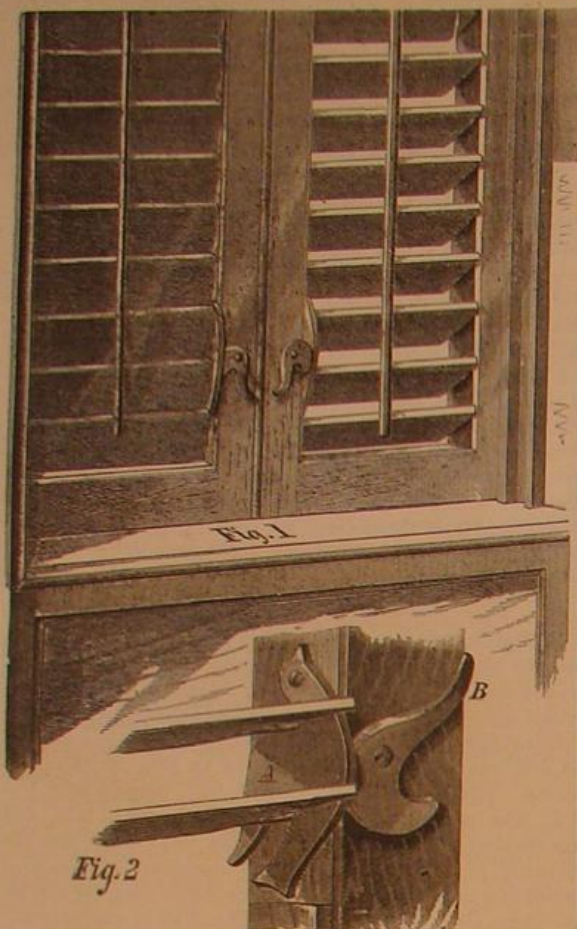
There are no accidents more common in large manufactories, and few more fatal, than those caused by the engagement of some portion of a workman's garments with a swiftly rotating shaft. The loose dresses of female operatives are especially liable to become entangled in countershafts placed near the floor, or in the revolving shafting of the machines which they may be attending. There is a very simple way of rendering these casualties impossible, and this without necessitating the usual plan of constructing a railing or fender about the moving piece. It is simply to cover the shaft with a loose sleeve along its whole length. The sleeve may be of tin or zinc and made so as to be removable if desired. The friction between it and the shaft would be sufficient to cause its rotation with the latter, but of course, in event of a fabric becoming wrapped around it, it would quickly stop, and allow of the easy extrication of the same. The sleeve should be lined with leather both within and at the ends in order to prevent noise.

The same idea in the shape of loose covers might readily be applied to cog wheels or pulleys, and thus prove a valuable safeguard against loss of life or limb.

In describing the fireproof houses now in process of construction in Chicago, Ill. (see *SCIENTIFIC AMERICAN* of June 19), we noted especially the improved method of plastering which has been adopted—the system involving the use of concrete and other materials, supported by galvanized iron wire. Mr. James John, of La Salle, Ill., we should have stated, is the inventor of the system, which has been patented. Mr. John is therefore entitled to the credit of the invention, which appears to be one of considerable value.

STELLER'S BLIND SLAT HOLDER.

We illustrate herewith a novel and simple device designed to hold the slats of a blind in any desired position. Owing to the shrinkage of the wood, and wear, slats as a rule become loose, so that it is impossible to place them so that a gust of wind will not alter their position. In summer it is always desirable to tilt the slats so as to shut out the sun, or to open them so as to admit currents of air; while in winter, the slats, tightly closed, are an additional protection against the cold.



The invention, which is shown attached to the blinds in Fig. 1, and enlarged in Fig. 2, consists of a plate of metal, A, fastened to the stile, and between the latter and the slats, by means of a single screw at its upper extremity. This screw holds it loosely so that it may easily be pushed outward and jammed against the edges of the slats by the cam button, B, after said slats are adjusted as desired. The slats are thus firmly held and cannot be moved or opened from the outside.

There are no springs or other mechanism to get out of order. The device is subject to no hard wear, is ornamental, and is easily affixed to the blind frame.

For further particulars in regard to agencies for selling the invention, address the patentee, Mr. C. E. Steller, 352 East Water street, Milwaukee, Wis.

SMITH'S IMPROVED AWL.

We illustrate herewith a novel improvement in shoemakers' awls, whereby the usual bristles on the waxed ends are rendered unnecessary. The instrument is made with a notch, A, inclined toward the point, and a notch, B, inclined in the opposite direction. The thread has one end inserted in the notch, A, and is pushed through the leather with the awl. Before withdrawing the latter, the other end of the thread is placed in notch, B, and the instrument is retracted. The effect is to form a stitch precisely the same as that made with the waxed ends and bristles, while the cost of the latter is saved. The sewing, we are also informed, is accomplished much more rapidly. The end of the tool is made flat, and the adjacent edges ground sharp, so as to facilitate penetration. The inventor states that he has had this awl in practical use for some time, and that its operation is uniformly successful.

Patented through the Scientific American Patent Agency, March 30, 1875. For further particulars address the inventor, Mr. Sylvester A. Smith, Letts, Louisa

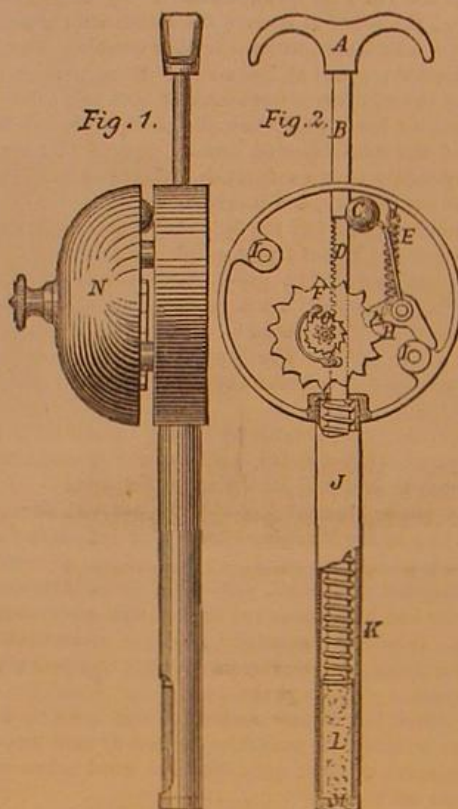
county, Iowa.

The Gas Wells of Pennsylvania.

The *National Oil Journal* says: "There is little doubt that the gas escaping constantly from oil wells is of nearly or quite as much value as the oil itself; and it is a matter of wonder that means have not long since been adopted to utilize this immense product of the earth. No estimate can be made of the quantity of this gas, which has for years been allowed to pass away into the air uselessly; but the yield of a few gas wells which have been tubed and their product utilized indicates that it is enormous. A gas well near Sarversville, in the Butler oil region, flows with a pressure of 300 lbs. to the square inch, and is roughly estimated to yield a million cubic feet of gas every 24 hours; and this is only one of quite a number of large gas wells, and almost numberless small ones, for it must be remembered that every well which produces oil also yields gas. A survey has just been completed for a line of pipe from Sarversville to Pittsburgh, a distance of about 17 miles. It is proposed to lay a six-inch pipe between the points named, and to supply the gas to manufacturing establishments as a substitute for coal for fuel in Pittsburgh."

ALLEY'S BEARING FEELER.

We subjoin an engraving of a very useful instrument designed and constructed by Mr. Stephen Alley, of Glasgow, Scotland, for giving a prompt indication of a hot bearing. The apparatus consists simply of a brass tube, J, which is placed in a hole bored in the cap of the bearing to receive it, the bottom of the tube touching the shaft. At one side, near the bottom, the tube, J, is partly cut away so as to admit of the ready insertion of a cylindrical plug, L, formed of a hard grease, or of a composition which will melt at the temperature at which it is desired that the alarm should be given. To insert the plug, L, the handle, A, is pulled so as to draw up the spindle, B, and thus by compressing the spring, K, making room between the bottom of the spindle and the bottom of the tube for the plug to be inserted. If the bearing becomes heated, the plug, L, begins to melt, and escapes



drop by drop through the hole, M. As this melting takes place, the spring, K, forces down the spindle, B, and in so doing gives motion by the rack, D, to the pinion, G, and thence by the ratchet, O, to the striking wheel, F. This wheel, as it revolves, operates upon the pallet, H, and alternately draws back and releases the hammer, C, which, when released, is made to strike the interior of the bell, N, by the action of the spring, F.

The instrument, says *Engineering*, gives a number of clear and distinct signals as the composition melts, and can scarcely fail to call the attention of the engineer. It is, moreover, a very simple apparatus, and there is nothing about it likely to get out of order.

The American Institute Fair.

The usual announcement of the coming American Institute Fair will be found in our advertising columns. The Institute's building on Third Avenue and 63d street will be open for the reception of machinery on August 15. Other goods will be received after August 29. The exhibition will be made public on September 9.

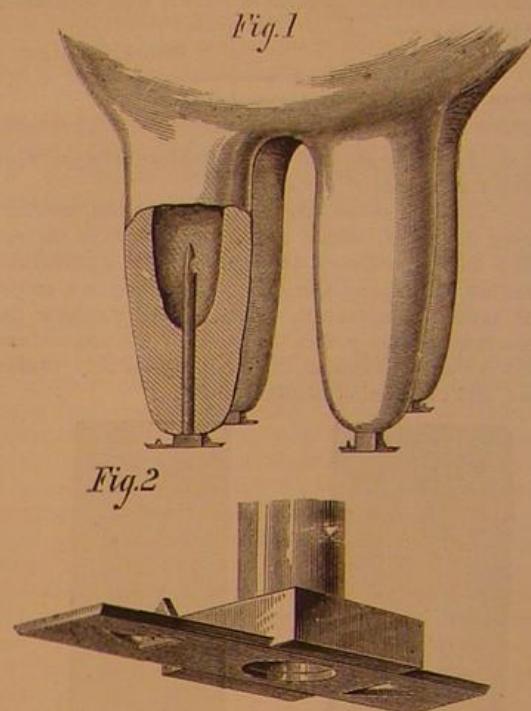
We have come to regard the day, officially fixed, as that on which the Fair is supposed to be complete and ready for public inspection, as a mild species of fiction never by any chance realized. As for the show being then fit for examination or anywise approaching such condition, we have never found it so, and therefore expect no departure from the usual practice this year. The managers lay the blame on the exhibitors, and *vice versa*. The public cares not a straw for the quarrel, but it certainly has a right to demand a respectable exhibition in return for its money; and it justly objects to being deluded into paying fifty cents admission fee, for the privilege of gazing on a muddle of packing boxes, amid the din of hammering and saws.

We counsel intending exhibitors to apply for space at once; and at the same time take this early opportunity to commend the foregoing hint to the Fair managers, assuring them that it would, on the other hand, afford us a lively satisfaction to be enabled to chronicle that the forty-fourth annual exhibition of the American Institute, unlike its predecessors, was submitted to the public on the appointed day, complete.

IMPROVED MILKING TUBES.

Mr. Sylvester A. Smith, of Letts, Louisa county, Iowa, has patented (May 25, 1875) through the Scientific American Patent Agency, a new mode of extracting milk from the udders of a cow or other animal, which consists in inserting into each teat a tube, open at the upper but closed by a valve at the lower end. The annexed engraving shows the construction of the device, which is represented in position on the teat in Fig. 1.

An aperture in the end allows of the entrance of the milk, which escapes beneath and runs into the pail when the simple sliding valve, shown enlarged in Fig. 2, is opened. The tubes do not annoy the animal, which speedily becomes accustomed to their insertion. They are claimed to save all the labor of milking, and to accomplish that operation with



greater rapidity, since the usual squeezing process by the hands is done away with, and to extract every drop of milk which may be contained in the udder. The tubes are neatly made of German silver.

For further particulars, the inventor may be addressed as above.

Ingenuity of the Esquimaux.

The Esquimaux have been credited for having considerable inventive and constructive skill. Their boats are ingeniously made, and their ice huts are arched on correct mathematical principles. A recent writer describes a cruel but novel method in use among them for killing bears. They sharpen the ends of a piece of whalebone a foot or more long, then bend it double, and wrap it closely in fat meat, which is exposed to the air till it freezes. These treacherous pellets are thrown to the bear, who bolts them down. They thaw in his stomach; the bent whalebone straightens, and the sharp points pierce his vitals, when he is readily captured.

CAVENDER AND DALLAS' CORN HUSKING IMPLEMENT

Messrs. William T. Cavender and John T. Dallas, of Auburn, Kansas, have recently invented a corn husker, which consists in an iron or steel rod, bent to adjust itself to the hand and wrist, and provided with a curved end, whereby the husks are stripped by thrusting the curved end through them.

In the engraving, A is the husker proper, formed from a small rod of iron or steel, bent as shown, so that, when the husker is placed between the forefinger and thumb of the right hand, the end, a, of the husker will rest at the under side of the junction of the hand with the wrist; and thence it extends upward, parallel with the thumb, until the end is curved in a spiral form, terminating in a point, b. The husker has fitted to it a strap, B, one end of this strap being confined to it in any desirable way, and the other end being provided with a metallic loop, c, which hooks into the hook, d, at the end, a, of the husker. The husker is operated by seizing the ear of corn in the left or right hand, the husker being attached to the other hand in the manner above mentioned; the corn is thrust through the husks, stripping the husk from the ear in a rapid manner and without injury.

According to Professor Le Conte, the rate of growth of corals in the Gulf of Mexico is from 8½ to 4 inches per annum.

THE CYCADS.

The *macrozamia plumosa* is certainly one of the most graceful of all cycadaceous plants for general decorative purposes, its green feathery leafage possessing all the freshness and beauty that belong to the most elegant of ferns, combined with the permanence and stately aspect of some of the palms. This fine cycad grows well in a moderately warm greenhouse or conservatory, where, intermixed with other plants, it will prove to be of the utmost service. It has been recently imported from Queensland into England by Mr. William Bull. From a small ovate stem, the scales of which are woolly, rise the erect spirally twisted leaves, which are from 2 to 2½ feet long, and have a flattened petiole. These leaves are furnished nearly to the base with narrow linear leaflets, which are set at intervals of about a quarter of an inch, and are from 6 to 8 inches long. The plant is remarkable for its distinct and elegant character, and will be admired by all our readers.

Improvement in Soldering.

Dr. A. W. Hoffman thinks it possible that oxygen blowpipes or apparatus might be invented, whereby the soldering of metals, without alloys, can be done. He says: "It would be useful to turn our attention to the autogenous soldering of metals with the aid of the oxyhydrogen flame, a principle which has achieved such signal triumphs in the treatment of two essentially different metals. Should it not be possible, by the same means, to solder every metal and every alloy with itself, as tin with tin, copper with copper, brass with brass, silver with silver, gold with gold, and even iron with iron, just as we already solder lead with lead, and platinum with platinum? The probability is present, and the advantages of such a procedure are manifest. Let us try to conceive the neatness of a workshop in which soldering is performed, not as heretofore, with the soldering iron or at the forge, but with a light, elegant gas burner. Imagine the artisan no longer annoyed by radiant heat and by the fumes of charcoal, and able to produce in a moment any temperature required, even the very highest, and again to put an end to it by simply turning a cock. Conceive the solidity of the soldering which no longer depends on cementing two pieces of metal with a foreign matter, but on an actual interfusion of two portions of one and the same metal, and which involves the utmost economy of materials and dispenses with all subsequent work, such as trimming the soldered place with a file. Such evident advantages must overcome every prejudice, and prompt us most urgently to commence a thorough experimental investigation of the question."

THE FICARIA.

The common *ficaria* of our woods, with its myriads of polished golden flowers in spring, is well worthy of garden culture. Still finer, however, inasmuch as it is twice as large, is the as yet uncommon *ficaria* or *caltha grandiflora*. This fine species is a native of southern France, and was introduced some years ago by a gardener, who gave some plants to Mr. Parker, of the Exotic Nursery, Tooting, England, who has since increased it abundantly, and cultivated it with success as a border flower. It is quite hardy, and thrives to perfection in ordinary open border soil. It is, according to a writer of the *Revue Horticole*, as valuable a plant as the spring adonis (*a. vernalis*). Mr. Parker's plants were, during the past spring, 15 inches high, and densely covered with large showy polished golden flowers.

Dull Times in Great Britain.

The English manufacturers are greatly alarmed at the sluggishness of trade generally. The hardware trade, as well as the iron manufacture, seems to be very slack throughout England, and some of the newspaper writers, in complaining of the lack of orders from the United States, warn their manufacturers against expecting as many orders from this side of the water as formerly, and suggest that they find new markets for their products. One of our English contemporaries mentions Japan as a good market for their hardware, remarking that the Germans and French now monopolize most of that trade. "In Staffordshire," says one of our exchanges, "the market possesses an element which militates against its general healthiness. In many branches makers are experiencing very keen competition from foreigners. The United States is a formidable business antagonist. By Pennsylvania, padlock and currycomb makers in particular are very hotly pressed, and transatlantic firms are underselling us in bright-headed bolts and nuts to the tune of 20 to 25 per cent. By Belgium we are being undersold in railway spikes to the enormous extent of \$25 to \$40; and Barcelona (Spain) makers are turning out door locks and hinges at rates which, on this side,

seem mythical. And the competition we experience is not restricted to other countries. As in the minor industries, so likewise in the heavier trades, sharp rivalry is seen. Notably, the steam and boiler tube makers are being hard pressed by those of Scotland."

The Foreman.

The duties of the foreman are (like the busy housewife's work) never done. If he is alive to the interests of his em-

ployees, the success of the manufacturing portion of the business devolves wholly upon the foreman. Not only is he held strictly accountable for the superiority of the work, but he must ever tire his never resting brain in producing fresh novelties; novelties which will bring the work to a greater state of perfection, and novelties which will cheapen the production, without lessening the wages of the operatives. If it becomes necessary to reduce force, to the foreman belongs the unpleasant task of saying: "We will have to dispense with your services." If a reduction of wages be determined upon, the foreman becomes the agent for promulgating the same, and if he is not possessed of the necessary amount of tact and eloquence to present the same in such a phase as to prevent the immediate withdrawal of a part or the whole of the operatives employed, his fate is anathema.

To become a thorough foreman does not necessarily imply that he should be a thoroughly practical mechanic, or thoroughly skilled in that branch of handiwork over which he is to preside. That he must have a thorough theoretical knowledge of the same is absolutely necessary. He must be intelligent, affable, and favored with an even-tempered disposition. In fact, he must be so favored with all the features that make up the character of man, which will allow him at once to be the engineer, general preceptor, counsellor, judge, spiritual adviser, and friend. He must be above temptation of every kind. His disposition must be such as will allow him to chide a man gently for any fault unwittingly done. He must have firmness enough to demand that justice be done his employers, and courage enough to defend his subordinates against encroachments by his employers. He must be generous enough to advance others' claims or inventions, without coveting them or stealing them. He must be wise enough to know right from wrong, and impartial enough to deal justly by friend or foe. He must be frank in all things, and liberal in all his expressions, and must be humble enough to be as courteous to his most humble subordinates as he is to his employer. Such are the duties and attributes which belong to a foreman. How many have them must be determined by others than ourselves.—*The Carriage Monthly*.

Management of Pot Plants.

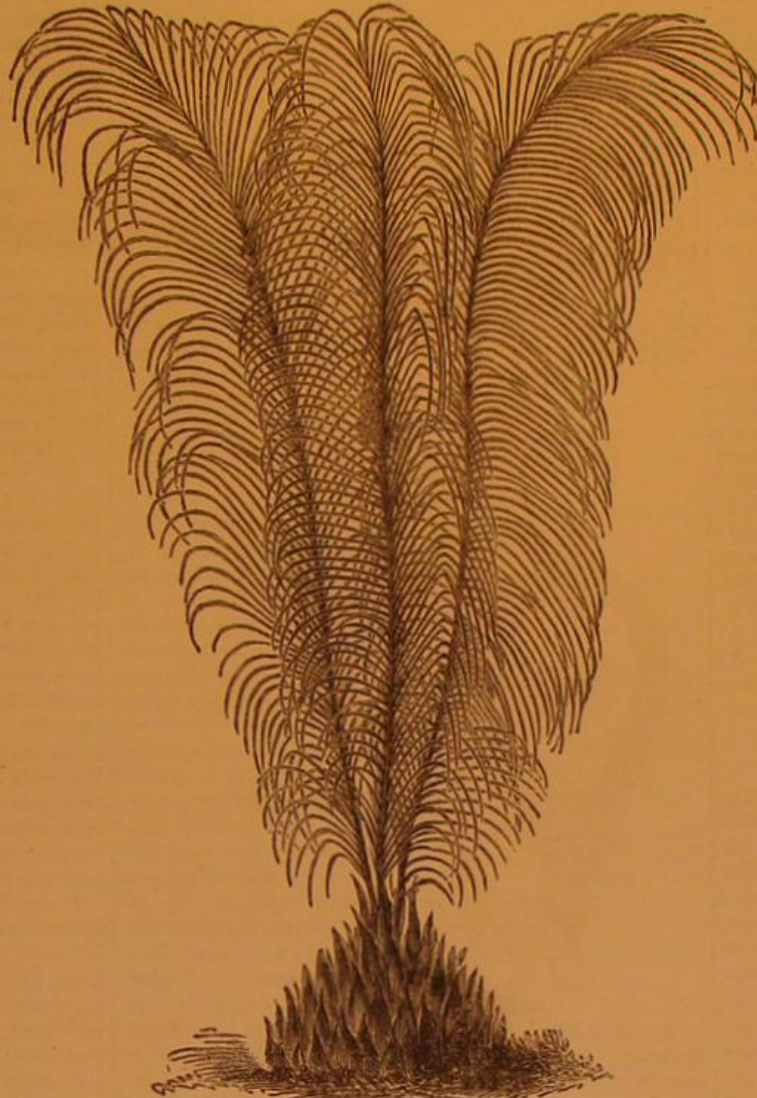
The best directions for potting plants we have ever seen published are found in the *Western Rural*:

Amateurs are apt, in repotting plants, to make the soil too rich, under the impression that, because the roots are confined within a small compass, necessarily the soil must be very fat. Such is not the fact. Flowering plants should not have the soil over rich. They do better in pure soil, free from an excessive quantity of manure. What is used should be the most thoroughly digested compost. The successful florist understands that the soil requires only to be in the normal state to insure perfect and continuous growth; and therefore, instead of making the soil in the pots over rich, he depends upon stimulating, when wanted, by means of liquid manure.

A mistake generally made in shifting from one pot to another is the use of too large pots as the plants increase in size. In changing, use pots only one size larger than the plant was in before. To do this in the best manner, put some drainage in the bottom of the pots, say half an inch of broken flower pots for four inch size, being careful to close the hole in the bottom by laying a piece thereon; on this place a little rich compost mixed with one half its bulk of sharp sand. Then place a pot one size less than the one containing the plant to be moved. Fill in around this with the same material pretty finely packed. Lift out the pot and fill with soil, just so that the ball of earth in which the plant is contained will reach to about half an inch of the rim of the new pot. Now set the plant in and cave the earth about it from the sides, and fill up level with more soil.

Chloral Hydrate in Neuralgia.

The intimate mixture of equal parts of chloral hydrate and camphor will, it is said, produce a clear fluid which is of the greatest value as a local application in neuralgia. Dr. Lenox Browne states, in one of the English medical journals, that he has employed it in his practice, and induced others to do so, and that in every case it has afforded great and in some instances instantaneous relief. Its success, he says, does not appear to be at all dependent on the nerve affected, it being efficacious in neuralgia of the sciatia as of the trigeminus; it is of the greatest service in neuralgia of the larynx, and in relieving spasmodic cough of a nervous or hysterical character. It is only necessary to paint the mixture lightly over the painful part, and allow it to dry. It never blisters, though it may occasion a tingling sensation of the skin. For headache it is also found an excellent application.



THE MACROZAMIA PLUMOSA.

ployers, he is not the last man in the factory in the morning, neither is he the first one out at night. To him belongs the duty of knowing that every operative is at his work in the morning. To him belongs the duty of knowing that every operative renders unto his employer a just and equitable day's labor. To him belongs the duty of knowing that every operative performs his work to standard perfection. To him belongs the duty of arbitrating justly and fairly between employer and employed, and not unfrequently does it become incumbent upon him to settle various disputes between operatives; in fact, he is or must be, as nearly as possible, an



FICARIA GRANDIFLORA.

omnipresent *factotum*. He knows of all the little domestic troubles of his subordinates, and has to advise and suggest means of bringing about (amicably) the marital relations of more than one of those under his control; not sufficiently burdened with his own troubles, he carries the troubles and secrets of subordinates securely locked within his own breast. If any of the operatives in his department meet with reverses, he is the first one appealed to; he is the first to add his name to the subscription list for a certain amount; no matter whether he is prepared or not, he must, to prevent calumny, subscribe. Thus we might speak of him on this subject for years, and fill volumes without end, and then not finish this portion of our story.

All employers or factors are not practical men. In such

SCIENTIFIC AND PRACTICAL INFORMATION.

CONCRETE TO EXCLUDE RATS.

A correspondent of the *Building News* says: "Nothing can be better to exclude rats than to concrete the surface of the ground beneath wood floors; not only for this, but also to prevent the growth of vegetable matter, and to prevent, as well, damp rising. All ground floors, whether wood, paved, or tiled, should have a layer of concrete, 3 inches to 4 inches thick, between them and the soil. I have been in the habit of doing this for years, and all such houses have dry floors, and are vermin-proof, as far as the latter are concerned, as rats cannot disturb well made concrete. The concrete should be made of moderately fine gravel (broken flint or glass added to it is an improvement), mixed with Portland cement, in the proportion of 1 of cement to 7 of gravel. Not too much water should be used, but the cement must be thoroughly mixed with gravel, and, when deposited in place, well trodden or beaten with a grass beater. Three or four inches, at most, is sufficient in thickness."

A RAT PLAGUE.

Strange news comes from the Hill Districts of Burmah. The English authorities—commissioners and chaplains of Rangoon and others—have sent out a pitiful appeal for help. Ten thousand villagers are starving. It is not drought, as in Bengal, protracted cold and untimely rains, as in Asia Minor, nor grasshoppers, as in Kansas, that has brought so many people to dire necessity. It is rats. An area of six thousand square miles has been overrun with these "British vermin," which have spared nothing in their widespread devastation. The appeal declares that the people are entirely destitute; their accumulations have been exhausted, and they have no occupation but husbandry to depend on for daily food. With rats so numerous as to eat up everything, nothing short of aid from without can keep the people alive. As nothing is said about subsisting on the enemy, it is to be presumed that the up-country Burmese are, like the lately afflicted Bengali, confirmed vegetarians, and would sooner starve than eat flesh.

THE JAPANESE GOLD FIELDS.

We are indebted to Professor Henry S. Munroe of the Imperial College, in Tokio, Japan, for a recent report prepared by him upon the gold fields of the Island of Jesso. The results obtained give very little promise of the precious metal being mined to any great extent, since the highest average value, per cubic yard of the gravel examined in any one field, reaches but 3.77 cents. In the large majority of cases, this value is greatly lessened, being reduced to as low as some hundredths of a mill. The poorest gravel worked in California by the hydraulic process yields from five to ten cents per cubic yard, while the average is said to be from twenty-five to thirty-five cents. These are thick gravel deposits, and thin places, like the Toshibetsu field, which gives the high average above mentioned, are usually much richer. The upper valley portion of this Toshibetsu field, Professor Munroe thinks, might be profitably worked, as it yields 5.66 cents per cubic yard; but this view is again rendered questionable by the enumeration of obstacles in the shape of the dense vegetable overgrowth, and the inefficiency of the laborers.

NEW PLANETS.

During the month of June last, three new planets were discovered, two by Professor C. H. Peters, Nos. 144 and 145, respectively of the 11th and 12th magnitude, and one by M. Borelly, at Marseilles, No. 146, 11th magnitude.

THE JAMIN MAGNET.

There are no phenomena in physical science of which the cause is less understood than the phenomena of magnetism. That there are relations existing between the latter and the phenomena of electricity is well known; the one produces the other, and reciprocally. But as to what takes place within a magnetized body—what changes occur in its interior constitution at the instant when the magnetization begins or ends—no one has yet been able to adduce a certain and definite explanation. To the very lack of this last may be ascribed the slow progress which has been made in improving the construction of the magnets themselves. The nature of the steel, its degree of temper, the number and dimensions of the plates, their form, the area of the polar portions in contact with the armature, the dimensions of the armature itself, all are important elements to be taken into consideration; but the sum of our knowledge, as to the selections to be made under these divers conditions, results in an assemblage of empirical recipes rather than in a logical and connecting series of scientific rules.

For some four years past we have had frequent occasion to allude to the discoveries and investigations of M. Jamin, a distinguished French physicist, who has succeeded in establishing a large number of important facts, thus realizing advances of great value in the construction of magnets. While it would be impossible, in the space here at our disposal, to review M. Jamin's work in detail, a few of his more salient discoveries may be profitably recalled. At the outset the investigator found himself obliged to invent a method of study. The ordinary way of determining the power of a magnet consisted in applying an armature and measuring the amount of weight which, attached thereto, the magnet would sustain. This plan, besides being crude, frequently involved error, since it may easily happen that one magnet, in reality better than another, will yield to a less weight, while a very slight modification of the polar faces often results in very great differences in the total weight which a magnet is capable of supporting. M. Jamin's device for overcoming these difficulties consists simply of a nail suspended by a string from the arm of a balance. The nail, presented at various points

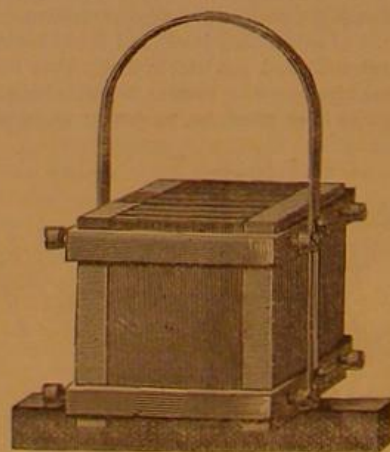
of a magnetized bar or at corresponding points of several bars, is attracted, and the degree of attraction is noted by the balance, so that it is obviously easy thus to measure the magnetism of different localities, and to compare several magnetized plates with each other. If several magnetized bars are superposed, it has been found that the attraction (measured at the extremity of the assemblage by means of the nail) augments with the number of bars, and then becomes stationary. To illustrate, one bar or plate attracts the nail with a certain force, say 750 grains; two plates, superposed, exercise a force of 875 grains; three, 1,425 grains; four, 1,575; and five, either the same as four, or perhaps 15 grains more. The fifth plate, therefore, adds nothing, or nearly nothing, although it has been magnetized in the same manner as the others, and when tested singly is as powerful as any one of them. This, however, is not all; if the plates be separated and re-examined, it is found that they are less powerful than before, and that their union has resulted in loss. They have, in other words, acted upon each other unfavorably.

While the facts contained in the foregoing paragraph are not novel, having already been pointed out by Coulomb, it has been reserved for M. Jamin to discover that they are not exceptional or fortuitous, but absolutely constant and regular, and also to find a means of preventing this tendency of the superposed plates toward mutual deterioration. This means is simply the attaching, to the ends of the bundle of plates, of pieces of soft iron which partake of the magnetism of the extremities. If, under these new conditions, the experiment above described be repeated, the fifth plate is found to add as much as its predecessors, and the number of plates may be largely augmented before the effects, which in the former case are noticeable manifest themselves. Finally, with a certain number of plates, 20 for example, the soft iron pieces become saturated with magnetism, and further additions are of no value or are mutually injurious. If, instead of employing bars, thin ribbons of steel be used, superposed as above explained, the magnet invented by M. Jamin, and represented in Fig. 1, is obtained. The plates are curved, and the poles, brought near together, are separated by a piece of brass to which they are firmly screwed. The various advantages gained by this form, apart from those mentioned above, we have already discussed in detail in back issues of this journal. Perhaps the most important is the facility with which the magnet may be taken apart and put together, or with which the number of plates, and consequently the degree of magnetism, may be varied.

The latest form of magnet devised by M. Jamin is represented in Fig. 2. The plates are curved, and the poles, brought near together, are separated by a piece of brass to which they are firmly screwed. The various advantages gained by this form, apart from those mentioned above, we have already discussed in detail in back issues of this journal. Perhaps the most important is the facility with which the magnet may be taken apart and put together, or with which the number of plates, and consequently the degree of magnetism, may be varied.

The latest form of magnet devised by M. Jamin is represented in Fig. 2.

Fig. 2.



sented in Fig. 2 (which, with the former illustration, we extract from *La Nature*). The poles are of soft iron and are applied to the extremities of several steel leaves, which are made broad in proportion to their length. Singly the plates support but very small weights; but when combined with the iron end pieces, the latter absorb the magnetism, rendering the assemblage sufficiently powerful to carry twice or three times its own weight.

A very remarkable peculiarity of this magnet, which is not clearly explained, is that neither pole, when tested separately, has any very marked attractive force; but when the armature is applied simultaneously to both poles, it is very strongly held, and yet the attraction does not seem to act over any appreciable distance. It appears, in fact, that the magnetic current must be completed before the maximum force is developed.

Co-operation in Building.

Hon. Josiah Quincy, in a letter printed in the *Boston Advertiser*, says: A number of Germans who were accustomed in their own country to a system of co-operation, purchased a tract of land in Dedham. Ten of them erected houses for their own use. A separate mortgage for about \$2,000 was taken on each house to secure a joint and several bond signed by the ten owners, by which they agreed to pay \$6 a week into a savings bank to the credit of the mortgagee and trust

tee. One half of each deposit is enough to pay the interest semi-annually at seven per cent, and the other half goes on on interest, with a certainty that in a few years it will pay the principal and leave the houses unincumbered. On the first days of January and July, the mortgagors have sent their deposit books to the trustee and mortgagee, who has drawn the semi-annual interest and returned the books with their accumulations to the owners, every payment increasing his security, and the association taking only the risk that every holder of real estate takes who leases his property. Ten or more industrious and temperate men, who had confidence in one another, might form such an association with peculiar advantages. They might choose their locality either together or separately, giving an excellent security that they would pay their interest semi-annually, and the principal in a fixed time.

The Secrets of Philadelphia Butter.

Every one has doubtless heard of the celebrated Philadelphia butter, the delicious flavor of which renders it a delicacy which, in markets outside of its place of manufacture, brings prices which sometimes range as high as a dollar a pound. How it is made is told in a new and excellent little work, recently written by Mr. X. A. Willard, editor of the dairy department of Moore's *Rural New Yorker*, and entitled "Willard's Practical Butter Book." A notice of the volume will be found elsewhere. On the subject of Philadelphia butter, we take from its pages the following:

The celebrated Philadelphia butter comes mainly from Chester, Lancaster, and Delaware counties, Pennsylvania. The spring house is about 18 feet by 24 feet, built of stone, with its foundation set deeply in the hillside, the floor being about four feet below the level of the ground at the downhill side. The floor is of oak, laid on sand or gravel; this is flowed with spring water to the depth of three inches, and at this height the flowing water passes out into a tank at the lower side of the spring house. The milk, when drawn from the cow, is strained into deep pans which are set in the water upon the oaken floor. Raised platforms or walks are provided in the room for convenience in handling the milk. The walls of the spring house are about ten feet high, and at the top on each side are windows covered with wire cloth for ventilation. The depth of the milk in the pans is about three inches, and the flowing water which surrounds the pans maintains a temperature of about 58° Fah.

The milk is skimmed after standing 24 hours, and the cream is put into deep vessels having a capacity of about 12 gallons. It is kept at a temperature of 58 degrees to 59 degrees, until it acquires a slightly acid taste, when it goes to the churn. The churn is a barrel revolving on a journal in each head, and driven by horse power. The churning occupies about an hour; and after the buttermilk is drawn off, cold water is added, and a few turns given the churn, and the water then drawn off. This is repeated until the water as it is drawn is nearly free from milkiness. The butter is worked with butter workers, a dampened cloth meanwhile being pressed upon it to absorb the moisture and free it of buttermilk. The cloth is frequently dipped in cold water and wrung dry during the process of "wiping the butter." It is next salted at the rate of an ounce of salt to three pounds of butter, thoroughly and evenly incorporated by means of the butter worker. It is then removed to a table, where it is weighed out and put into pound prints. After this it goes into large tin trays, and is set in the water to harden, remaining until next morning, when it is wrapped in damp cloths and placed upon shelves, one above another, in the tin-lined cedar tubs, with ice in the compartments at the ends, and then goes immediately to market. Matting is drawn over the tub, and it is surrounded again by oilcloth so as to keep out the hot air and dust, and the butter arrives in prime condition, commanding from seventy-five cents to one dollar per pound.

Mr. Isaac A. Calvert, who markets his butter at those high prices at Philadelphia, attributes his success to three points:—1. The food of his cows. 2. Temperature. 3. Neatness and dainty refinement at every step, from the moment the milk flows from the udder till the dollar in currency is paid for the pound of butter. He says: "I have found that I make my best butter when I feed on white clover and early mown meadow hay. I cut fine, moisten, and mix in both corn meal and wheaten shorts. Next to meal I regard shorts, and prefer to mix them together. I feed often, and not much at a time. I do not use roots, unless it be carrots. My pastures and meadows are quite free from weeds. I cannot make this grade of butter from foul pastures or low grade hay."

"Temperature.—This I regard as a matter of prime importance in making butter that commands a high price. Summer and winter I do not permit my milk room to vary much from 58°. In summer I secure the requisite coolness by spring water of the temperature of 55° Fah., flowing over stone or gravel floor in the milk house. This can be accomplished without water in a shaded cellar ten feet deep. As good butter can be made without water as with, but the milk and cream must be kept at all times a little below 60°."

"We skim very clean, stir the cream pot whenever a skimming is poured in, and churn but once a week, summer and winter. Just before the butter gathers, we throw into the churn a bucket of ice cold water. This hardens the butter in small particles and makes a finer grain. In the hot months this practice is unvarying."

"In working, we get out all the buttermilk, but do not apply the hand. A better way is to absorb the drops with a linen cloth wrung from cold water. The first working takes out all the milk; at the second we handle delicately, with

fingers as cool as may be. The salt is less than an ounce to a pound; but not generally much less. The balls each weigh one pound, and receive a uniform stamp. On packing for market, each ball is wrapped in a linen cloth, with the name and stall of the marketman written upon it. Our tubs are made of cedar plank, 1½ to 2 inches thick, and lined with tin. On the inner face are projections, on which the shelves rest. The balls are not bruised or pressed at all, and pass into the hands of the customers as firm, as perfect in outline, and as spotless as when they left the spring house.

"We find uniformity to be a prime virtue in the butter-maker. We produce the same article whether the cows stand knee-deep in white clover blooms, or sun themselves on the lee side of the barn in February.

"There is a small ice chamber at the end of the oblong butter tub which we use in summer, so that in dogdays the heat within the tub does not get higher than 60° Fahrenheit. I need not add that we observe a scrupulous, a religious neatness in every act and in every utensil of the dairy. Milk which, upon leaving the udder, passes through an atmosphere loaded with stable fumes will never make butter for which we can get a dollar per pound. No milk sours upon the floor of the milk room; none is permitted to decompose in the crevices of the milk pans; the churn is scoured and scalded till no smell can be detected but the smell of white cedar.

"Our customers take the napkins with the prints, wash, iron, and return them when they come to the stand on market day. These are generally Wednesdays and Saturdays. With these prices we have no difficulty in making a cow pay for herself twice a year; if she cost \$60, we sell \$120 worth of butter from her in twelve months."

It may be remarked that the sour milk is employed by the Philadelphia butter makers as food for swine. It is estimated that such milk will make 100 pounds of pork per cow.

The cows in the district where the Philadelphia butter is made are well sprinkled with the Jersey or Alderney blood, and about a pound per day from each cow is considered a fair average for the best dairies.

The University Athletic Contests.

The annual regatta of the American Universities took place on Saratoga Lake, N. Y., on the 15th of July. An immense concourse of spectators was present. The distance, three miles, was accomplished by the respective crews in the following time and order:

Place.	Time.
1. Cornell.....	16 53¼
2. Columbia.....	17 04¼
3. Harvard.....	17 05¼
4. Dartmouth.....	17 10¼
5. Wesleyan.....	17 13¼
6. Yale.....	17 14¼
7. Amherst.....	17 20¼
8. Brown.....	17 33¼
9. Williams.....	17 43¼
10. Bowdoin.....	17 50¼
11. Hamilton.....	Not taken
12. Union.....	Not taken
13. Princeton.....	Not taken

The victory of the Cornell crew gave great satisfaction to all except the losers.

During the foot races, which took place on July 16, some remarkably rapid walking and running was accomplished. The first trial was a one mile run, in which Messrs. Copeland, of Cornell, Barber, of Amherst, Fort, of Wesleyan, and Shute, of Williams, took part. The Amherst representative won the race in 4m. 44½s., coming in about a yard ahead of the Cornell man. The others withdrew during the contest.

Cornell, Williams, Wesleyan, Princeton, and Harvard contested the one mile walk. Mr. Platt, of Williams, won in 7m. 50s. Times of others not given.

The quarter mile run was won by Mr. Culver, of Union, who reached the goal in 55½ seconds, closely followed by Yale and Cornell. The severest contest was the seven mile walk. The record is as follows: Mr. Taylor, of Harvard, won in 65m. 5½s., Mr. Driscoll, of Williams, second—fainted at end; Mr. Boyd, of Columbia, third. The Dartmouth and Wesleyan representatives broke down and withdrew. The half mile run was gained by Mr. Trumbull, of Yale, in 2m. 6½s., against one competitor (Amherst), who came in 50 feet behind. The three mile walk was easily won by Mr. Taylor, of Harvard, in 25m. 23s. Mr. Platt, of Williams, came in second, in 26m. 16½s.; the third competitor (Brown) broke down. Mr. Culver, of Union, won the 100 yard dash in 10½s., Williams second, and Yale third. An exciting three mile run was won by Mr. Morell, of Amherst, in 14m. 17s., the Wesleyan and Columbia competitors withdrawing before the finish. Mr. Maxwell, of Yale, won the hurdle race against three others; no time given. The graduates' seven mile run was gained by Mr. Eustis, of Wesleyan, over Mr. Gunster, of Williams, by ten feet; time 69m. 49½s. Suitable prizes were awarded to the various winners by ex-Governor Hoffman.

Cultivate Good Manners.

It is one of the laws of our being that every inward disposition is strengthened by the outward expression which represents it. Besides this, so much of human happiness is dependent upon the manners that no truly benevolent person, if thoughtful, can disregard them. We have all experienced the charm of gentle and courteous conduct; we have all been drawn irresistibly to those who are obliging, affable, and sympathetic in their demeanor. The friendly grasp, the warm welcome, the cheery tone, the encouraging word, the respectful manner, bear no small share in creating the joy of life; while the austere tone, the stern rebuke, the sharp and

acid remark, the cold and indifferent manner, the curt and disrespectful air, the supercilious and scornful bearing, are responsible for more of human distress, despair, and woe than their transient nature might seem to warrant.

Whether we aim at self-improvement or the well-being of others, success is largely dependent on our outward demeanor. No one can alight it with impunity. It has many counterfeits and shams which are truly despicable; but where pure motives are supreme, and the aims of life are worthy, the culture of manners is an essential means of progress, conferring dignity and grace upon every noble endeavor.—*Philadelphia Ledger.*

At the recent Bunker Hill Celebration in Boston, the National Tube Works Company was represented by some fine specimens of lap-welded wrought iron tubing, drawn by six large black horses on a wagon tastefully draped with bunting. The tubing, some of the specimens of which were very large, was effectively arranged to represent a cannon on a gun carriage. The carriage was made of tubing, six sections on a side, the cannon being represented by a section of lap-welded tubing twelve inches in diameter, said to be the largest manufactured in the world. On each of the tubes of which the carriage is composed is the name of one of the original thirteen States, and on the large tube representing the big gun was inscribed:

"Massachusetts, 1775—Our Union Welded—1875."

To remove fruit stains from napkins, etc., wet the spots with chlorine water.

DECISIONS OF THE COURTS.

United States Circuit Court—District of Massachusetts.

DAVID M. WESTON *et al.* vs. NATHANIEL C. NASH *et al.*—PATENT SUGAR MACHINE.

[In equity.—Before SHEPLEY, J.—Decided April, 1875.]

The fifth claim of released patent of David M. Weston for "Improvement in Centrifugal Machines for Draining Sugar, etc.," dated January 14, 1869, (original dated April 9, 1867), namely, "the construction of the openings, I, in the bottom of the cylinder in such machines, and the valve, J, for the purpose of closing the same, substantially as described"—is not limited to such centrifugal machines only as are constructed in all respects like those described in these specifications.

The term "such machines" in this claim means such centrifugal machines as are so constructed as to admit of the application and operation of the claimed devices in substantially the described mode and by substantially the described means.

The unauthorized use of complainants' openings and valves would be an infringement if used in centrifugal machines, to which they could be usefully applied by reason of there being an unobstructed space at the bottom of the machine, into which the sugar could fall, although the cylinders were not suspended as shown in the patent.

The Western invention is not anticipated by the device shown in the British patent of Hardman, of 1858, in which the openings in the bottom plate of the rotary cylinder are closed by a disk or plate held up against them while the machine is in operation by a nut and spring, and simply lowered, without being removed, so as to leave a free and unobstructed space, when the sugar is to be discharged.

Nor by the Allott machine, described in English patent of February 2, 1851, in which the bearings of the shaft and its foundations are directly under the cylinder, so as to render impossible a free and unobstructed space below the cylinder into which the sugar may be discharged.

Although the defendants' valve is operated by turning on the shaft, and, in this respect, may be an improvement upon the valve of the patent, which moves up and down on the shaft, this is not a substantial difference. It is but another form of the same device, with the same mode of operation, so far as the operation is concerned to which the whole device relates—that of discharging through the bottom of the cylinder the purged contents of the charge.

[George L. Roberts, for complainants.]

James B. Robb, for defendants.]

United States Circuit Court—Southern District of New York.

WILLIAM WICKES vs. HENRY and BARBARA KLEINKNECHT.

[In equity.—Before BLATCHFORD, J.—December, 1874.]

Where a machine was licensed for use in a particular territory: *Held*, that the use of it, by subsequent purchasers, in territory other than that for which it was licensed, was unlawful.

The mere fact that the agent of the patentee, after the transfer of the machine to the unlicensed territory, demanded of the purchasers the back royalties due upon it, conferred no right to use it outside the territory named in the license.

[This was an action brought by the complainant, as assignee of certain territory under the patent of George Wickes, granted to the latter June 16, 1863, for a box-nailing machine. The facts were as follows: The complainant, by assignment, acquired the exclusive right under said patent for the State of New York. The remaining territory was owned by the original patentee, but the complainant was his attorney authorized to collect royalties and grant licenses for said territory. Under this power of attorney he licensed one Opel to use one of the patented machines in Newark, N. J. Opel sold this machine to the defendants, who took the same to New York, and there used it. Suit was brought, and defendants pleaded an implied license, which they claim they derived from the complainant through his demand on them for payment of certain royalties due from Opel at the time he sold the machine.]

The evidence in this case leaves no doubt that the plaintiff is entitled to a decree. By the purchase by one of the defendants from Opel of the machine in question, and by the transfer from Opel to said defendants of the rights of Opel under the written license given by George Wickes to Opel, neither of the defendants acquired any right to use such machine in the territory belonging to the plaintiff under the patent.

The plaintiff was the agent of George Wickes in respect to the license to Opel, and he never demanded any license fee from either of the defendants, in respect of any other use of the machine than a use of it under and in accordance with the terms of the license to Opel, which did not embrace a use of it in territory owned by the plaintiff.

Opel had no right to use the machine in the plaintiff's territory, and could convey none. The plaintiff has given no license, direct or indirect, express or implied, to either of the defendants to use the machine in his territory.

[A. V. Briesen, for complainant.]

J. Van Santvoord and F. Forbes, for defendants.]

NEW BOOKS AND PUBLICATIONS.

WILLARD'S PRACTICAL BUTTER BOOK—A Complete Treatise on Butter Making. By X. A. Willard, M. A. Illustrated. Price \$1.60. New York city: Rural Publishing Company.

Mr. Willard has long been known to dairymen and agriculturists as President of the New York Dairyman's Association, as editor of the dairy department of Moore's *Rural New Yorker*, and in general as a practical butter maker of considerable experience. Hence in the work before us—which we believe is the first ever published devoted wholly to the subject of butter and its manufacture—the advice, practical hints, and suggestions and discussions given emanate from one certainly conversant with his subject in all its branches. The book is, in fact, a complete repository of information for farmers and dairymen, as it treats of everything relating to butter, from the selection, management, and raising of the stock, to the planning of dairies and the merits of the various patented inventions which have been made to facilitate dairy processes. Its low price places it within the reach of every farmer.

HOW TO TEACH CHEMISTRY: Hints to Science Teachers and Students, being the Substance of Six Lectures, delivered at the Royal College of Chemistry, in June, 1872. By Edward Frankland, D.C.L., F.R.S., Professor of Chemistry in the Royal School of Mines. Price \$1.25. Philadelphia, Pa.: Lindsay and Blakiston, 25 South 6th street.

The teachers of physical science are largely indebted to Dr. Frankland for this book, which is an admirable and concise treatise on all the methods of exemplifying the action of the chemical forces. It commences with the very simplest experiments, and does not quit its subject until the most elaborate apparatus and its manipulation are fully described. By careful study of this little volume, lecturers and teachers can learn the whole art of illustrating their discourses.

ELECTRICITY, ITS THEORY, SOURCES, AND APPLICATIONS. By John T. Sprague, Member of the Society of Telegraphic Engineers. New York city: E. & F. N. Spon, 446 Broome street.

Mr. Sprague is well known as a writer of authoritative papers on electric subjects, and many articles from his pen have been printed in our columns. In collecting the most elaborate of these papers into a volume, he has given us a text book of the greatest value, a manual complete, exhaustive, and practical. The chapter on electrolysis is worthy of special commendation and the section devoted to electro-metallurgy is a complete compendium of the art. The book is handsomely illustrated.

THE CONE AND ITS SECTIONS TREATED GEOMETRICALLY. By S. A. Renshaw, of Nottingham, England. Price 12s. 6d. (3s. gold). London: Hamilton, Adams, & Co., Paternoster Row.

This is an admirable treatise on the properties of the cone and the great importance of those properties to the art of mensuration. The primary properties of the sections are derived from the cone itself, the author following the example of Hamilton in reverting to the method of Apollonius of Perga, whose treatise on conic sections laid the foundation of the science, and whose system has not been superseded by the thousands of books which have since been written on the subject. Mr. Renshaw has reduced all his theories and problems into propositions of the most orthodox form, and has naturally succeeded in imparting comprehensibility and logical demonstration to a complex subject. He has produced a very interesting volume, and enriched it with illustrations of great value.

POPULAR RESORTS, AND HOW TO REACH THEM, combining a Brief Description of the Principal Summer Retreats in the United States and the Routes of Travel Leading to Them. By John B. Bachelder, Author of "The Illustrated Tourist's Guide," etc. Illustrated with One Hundred and Fifty-Two Engravings. Price \$2.00. Boston, Mass.: John B. Bachelder, 41 Franklin street.

The desire to travel is universal; and the favorite recreation of all classes, be their leisure hours few or many, is found either in visiting the haunts of men, to observe the changes in social life and manners, or in fleeing from cities to view the works of Nature. Mr. John B. Bachelder, whose numerous works on the topography of the battlefield of Gettysburg are widely known, has collected, in the volume now before us, a vast amount of information on nearly all the pleasure grounds of the United States, and has placed it before his readers in a most attractive and readable form. The illustrations are especially commendable, and the work is sure to have a large sale at the present time, to which its intrinsic merits fully entitle it.

HANDBOOK OF LAND AND MARINE ENGINES, including the Modeling, Construction, Running, and Management of Land and Marine Engines and Boilers. With Illustrations. By Stephen Roper, Engineer, Author of "A Catechism of High Pressure or Non-Condensing Engines," etc. Philadelphia, Pa.: Claxton, Remsen, and Haffelfinger, 624 to 628 Market street.

Mr. Roper needs no introduction to our readers as a competent and trustworthy authority on steam engineering; and the present volume will prove useful to all operatives who desire a treatise combining scientific accuracy with a popular style, free from formulas and ultra-mathematical expressions. The tables with which the book is interspersed are numerous and valuable; and there is at the end an interesting historical account of the steam engine.

PRACTICAL GUIDE TO THE DETERMINATION OF MINERALS BY THE BLOWPIPE. By C. W. C. Fuchs, Professor in the University of Heidelberg. Translated by T. W. Danby, M.A., F.G.S., Associate of the Royal School of Mines. Price \$2.50. Philadelphia, Pa.: Claxton, Remsen, and Haffelfinger, 624 to 628 Market street. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This treatise is adapted to the use of any one who desires to easily recognize and comprehend the qualities of any mineral, provided he has an initial acquaintance with chemical manipulation. Although the work is fully descriptive, it is compendious, and will be found well adapted to use in the field.

INSECTS OF THE FIELD. By A. S. Packard, Jr., Editor of "The American Naturalist." Price 25 cents. Boston, Mass.: Estes and Lauriat, 143 Washington street. New York city: Dodd and Mead.

A very interesting little treatise, adapted for students' and amateurs' perusal. It forms part 7 of the publishers' excellent series of "Half Hour Recreations in Natural History."

GREATER CHICAGO, Illustrating the Buildings Recently Erected in the Reconstructed City. Price \$1.00. Chicago, Ill.: J. M. Wing & Co., Ashland Block.

This pamphlet consists entirely of illustrations, which are intended to convince the world that Chicago's commerce is on a scale commensurate with her indomitable energy and the public spirit of her citizens. Many of the buildings represented are of considerable architectural merit.

A BRIGHT MOON, SUN, AND STAR SHINING POCKET MIRROR OF THE UNIVERSE. By D. L. Stinchfield, New Richmond, Ohio.

"Our spiritual kingdom of Heaven is three times divided," says our author, "vertically into three seats, or two antagonistic, positive and negative extremes, and their saving mediator with positive electricity found at the bottom of this great spiritual and pacific and specific ocean of the atmosphere." There is some deep significance in this; and as we feel bound to confess our inability to extract it, we cheerfully resign the task.

STATEMENT OF REASONS FOR EMBRACING THE DOCTRINES AND DISCLOSURES OF EMANUEL SWENDBERG. By the Rev. George Bush. New York city: E. H. Swinney, 25 Cooper Union.

GRANULATION OF GUNPOWDER. By Commander J. D. Marvin, U. S. N. Naval Experimental Battery, Annapolis, Md.

THIRD ANNUAL REPORT OF THE BOARD OF MANAGERS OF THE ZOOLOGICAL SOCIETY OF PHILADELPHIA, PA.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From May 13 to June 3, 1875, inclusive.

AMALGAMATOR.—S. F. Clouser, New York city.
BLANKS FOR SHOVELS.—E. Binns *et al.*, Pittsburgh, Pa.
BOILER BATTERY.—G. Crompton, Worcester, Mass.
BOTTLE STOPPER, ETC.—N. Thompson (of Brooklyn, N. Y.), London, Eng.
CARDING MACHINE, ETC.—G. S. Harwood, Boston, Mass.
COMBINATION FURNITURE, ETC.—A. E. Barnes, New York city.
ELECTRIC ENGINE.—C. A. Hussey, New York city.
ELECTRIC MOTOR.—H. M. Paine *et al.*, N. J.
FLOODING TO PREVENT FIRE.—J. H. Morrell, New York city.
FURNACE BAR.—C. Toob, New York city.
GAS ENGINE.—D. V. Bruce *et al.*, San Francisco, Cal.
GAS STOVE.—J. J. West, Chicago, Ill.
HOIST.—W. D. Andrews, Brookhaven, N. Y.
LAMP, ETC.—H. G. Moehring, Philadelphia, Pa.
LATHE.—A. Wood, Worcester, Mass.
LIQUID MEYER.—H. S. Maxim, Brooklyn, N. Y.
MAKING ALKALIES, ETC.—J. Bennett, Mich.
REGULATING CLOCKS, ETC.—L. Eaton, Worcester, Mass.
SAIL HANK.—D. G. Low, Chelsea, Mass.
SCREWING PIPES, ETC.—F. W. Allen, New York city.
SEWING MACHINE.—J. J. Thompson, New York city.
SHOVEL, ETC.—T. J. Blake, Pittsburgh, Pa.
SMELTING IRON, ETC.—W. Rogers, Leechburg, Pa.
SPARK ARRESTER, ETC.—T. Shaw, Philadelphia, Pa.
STEAM ENGINE.—F. Alden *et al.*, Pittsburgh, Pa.
STEAM PUMP.—C. H. Hall, New York city.
TINNED PLATE.—G. E. Taylor, Philadelphia, Pa.
TOY MENAGERIE.—C. M. Crandall, Montrose, Pa.
TREATING WASTE GASES, ETC.—J. Turner, Chicago, Ill.
WATER MEYER.—P. Ball *et al.*, Worcester, Mass.
WHEEL AND AXLE.—R. W. Davis, Flushing, N. Y. *et al.*

Recent American and Foreign Patents.

Improved Non-Interfering Fire Alarm Telegraph.

Joseph W. Kates, Richmond, Va.—The object of this invention is to provide an improved electric fire alarm, in which is avoided the interference and confusion of signals caused by the sending of two separate signals from different points at the same time. It consists in a method of connecting the instruments at the different signal stations by a second electric circuit, which circuit is opened or closed automatically to operate the armature of an electromagnet, which serves as a stop for a clock mechanism, and locks, by means of the said second circuit, all of the instruments at the signal stations except the one in operation, for the prevention of all interference between the different instruments. It also consists in the method of automatically operating the armature, having a stop for the clock gearing for the locking or unlocking of the other instruments, by a non-conducting tape placed upon the same drums with the signal tape, and passing between contact rollers that form the electrodes of the second circuit, and perforated at its extremities, so that the second circuit is closed for this particular instrument whenever the tape is entirely wound up or entirely run down, and is opened during the operation of the instrument to lock the other instruments. The invention further consists in the combination with the main drum or spring shaft carrying a pinion of a rack bar that engages with a shoulder upon the stop of the armature, to prevent the operating instrument from locking itself.

Improved Water Wheel.

Stephen R. Jenner, Milltown, Ind.—The object of this invention is to utilize a larger per cent of motive power than is usually obtained in common turbine wheels. It consists in placing stationary water ways in between two or more turbine wheels attached to the same shaft, the said water ways being detached from the shaft, alternating with the turbine wheels, and running in direction transversely to the spiral flanges of the turbine buckets. It also consists in the combination with the said wheels and water ways of a cylindrical cut-off and a counterbalance to render the said cut-off sensitive to the action of a governor.

Improved Wire Fence Tightener.

Warren L. Brown and Joel B. Cramer, Dunlap, Iowa.—The object of the invention is to provide, for farmers and others having occasion to construct wire fences, a compact, portable, and efficient device for tightening or straining the wires of such fences, the same being adapted for convenient attachment to and detachment from a post. The wire is attached to a pronged bar, which is adapted to slide on another bar secured to a post. The sliding bar is adjusted by a nut, and the wire is clamped by jaws attached to the stationary bar.

Machine for Handling Straight-Cut Tobacco.

Francis S. Kinney, New York city.—This is a machine for removing straight-cut tobacco from the cutting machine, and boxing or bunching it, without allowing its fibers to become disordered or entangled, and enabling it to be boxed or bunched with the straightest fibers upward.

Improved Grate.

Charles C. Gates, Albany, N. Y., assignor to J. L. Mott Iron Works, New York city.—This consists of a grate, in combination with an outer vibrating ring, the ring being corrugated on its upper surface, which is in the plane of the grate. The concave parts of the corrugations incline downward radially to the periphery, to facilitate the throwing off of the refuse when shaken. The ring is rigidly attached at the lower side to arms, intersecting at the grate's center with a center pin, on which the ring oscillates to shake the grate. The pin is pivoted in a center bearing, rigidly supported by arms of the base of the stove. The invention also consists of a dumping hook for the grate, attached to the center of the ring, in which a journal of the grate rests. The bearing is forward of the grate's center on the depressing side, to lessen the dip of the grate in the ash pit when dumping, and thus affording more freedom for removing the ash pan.

Improved Stud Fastening.

John C. W. Jefferys, Tottenham Court Road, London, Eng.—This invention relates to articles of jewelry or fastenings for dress; and consists in the combination of a flat oblong shank, with the well known crescent shaped-back, capable of being inserted in the button hole by a rotary movement. The back is so constructed as to be turned in either direction, the shank being either flat or consisting of two or more pillars.

Improved Tram Staff.

Samuel B. Williams, Bridgeport, Ohio, assignor of one half his right to Seymour C. W. Dunlevy, of same place.—A tram staff about equal in length to the diameter of the mill burrs is adjustably attached by rectangular brackets to the ends of arms of an upright standard. Sleeve-shaped projections at the central part of standard fit on a center shaft that is provided with a tripod-shaped part to be applied to the spindle of the bed stone. The center shaft is set into a perfectly vertical position to the face of the burrs by revolving the staff at some distance above the same, and adjusting a crank screw at the top of the standard until a regulating quill or piece of steel at the outer end of the staff forms an even contact at the circumference of the burr. In this manner the center shaft may be set by the adjusting screws more readily into vertical position on the burrs.

Improved Washing Machine.

Charles E. Ross, Lincoln, Ill.—By tightening up the nuts of bolts, the staves or strips will be drawn closer together to take up any shrinkage of the wood, and thus keep the suds box always tight. Curved cleats of the suds box and curved cleats of the rubber are placed in reversed positions with respect to each other, the result of which construction and arrangement is that the clothes will not be rolled up in the middle part of the bottom of the suds box.

Improved Hay Press.

William Henry Penniston, Fox, Mo.—By this construction, when the doors of the baling box are unfastened to remove the bale, the same operation releases the lower part of the box, so that the bale, being released from both side and end pressure, may be easily removed.

Improved Cracker Machine.

Adam Exton and John Exton, Trenton, N. J.—This invention relates to an improved cracker-molding machine. The basis of the claims is the mechanism whereby the crackers are conveyed or fed to the docker, and cleared from the table upon which the molding process is completed.

Improved Portable Fence.

Joseph L. Welsh, Mo.—This is a portable fence panel, composed of rails pivoted in posts and secured in a central clamp, which is tied near top and bottom. Braces are arranged to support the rails and uprights.

Improved Calendar.

L. L. Kellogg, Leon, N. Y.—The invention relates to modes of exhibiting on clocks the day of the week, the month, and the day of the month; and consists in combining a loose lift bar having end hooks and notches with an hour hand shaft and lever, as well as an intermittent pin wheel with a fixed disk, an adjustable disk, and a stationary hand.

Improved Car Starter.

George Hunter, Payson, Ill.—To the inner side of one of the wheels is rigidly attached a small gear wheel, and to the inner side of the other wheel is attached a large internally toothed gear wheel. A shaft placed parallel with the axle is made in three parts, connected with each other by universal joints. To the middle part of the shaft is attached one end of the spring, which is coiled around the said shaft. The end parts of the jointed shaft engage by gears with the gear wheels above mentioned. Devices are provided which lock the levers, which hold the gear wheels in gear and out of gear. When the car is to be stopped, the apparatus is so regulated that the forward movement or momentum of the car may wind up a spring. When the car is to be started, the power of the spring may be applied to the wheel near its rim, and thus, with a great advantage of leverage, assist in starting the car. In the same way the spring may be coiled by the advance of the car when upon a level or down grade, and held, to be applied to the car when upon a short upward grade, to assist in its propulsion.

Improved Weed-Covering Attachment.

Joseph W. Dysard, Michigan City, Ind.—A wheel, which runs in the furrow last plowed, is pivoted to the end of an adjustable bar, which is curved to correspond with the position of the furrow slice as it is being turned by the mold board. By this construction the bar, as the plow is drawn forward, will bend down the grass, weeds, and stubble that may be upon the furrow slice longitudinally with the furrow, so that they may be wholly covered.

Improved Peg Cutter.

Matthew Hubler, Lamolite, Ill.—This is an adjustable cutter and rasp, by which the pegs may be removed from any part of the bottom of a boot or shoe. The face of the wheel is rigidly attached to the stem. There are two mortises for the stem, which unite at the end of the shank, and branch obliquely therefrom through opposite sides of the latter. By turning over the shank, the position of the cutter and rasp is changed to enable the operator to cut the pegs from any part of the bottom. Cutters are arranged at both ends of the tool. The rasp follows the forward cutter. An aperture at the heel of the tool has a sharp edge for smoothing off the pegs in the heel of the boot.

Improved Car Brake.

John E. Worthman, Mobile, Ala.—This invention relates to certain improvements in car brakes; and it consists in the combination with a worm or screw thread upon the car wheel shaft, of an adjustable pin attached to a lever arm provided with right angular arms which are connected with the traction rod through which the brakes are applied. The said pin is adjusted so as to be raised above the worm upon the shaft, or depressed so as to register therewith and move the lever arm, in which it is contained, laterally, for the purpose of applying the brakes through the right angular arms as elbow levers. It also consists in the devices for operating the adjustable pin, consisting of a rock shaft which has an arm that is attached to a sliding collar that raises the lever carrying the pin, and a second arm that is attached to an indented disk, so combined with a ratchet wheel and pawl as to apply or remove the pin by the same movement.

Improved Check Valve.

H. P. Buffon, Cleveland, Ill.—The invention consists in combining, with a hollow plug valve, a check valve having its seat in a partition of valve case.

Improved Earth Auger.

John T. Kemper, Hannibal, Mo.—This consists of a cast iron auger pot or body with open sides, having outer reaming plates, and detachable cap sections that close the sides, and are attached to top by a set screw.

Improved Car Coupling.

George W. Kyle, Mylo, Ohio.—The coupling pin is suspended to the front arm of an angular frame that slides in suitable guides of the wall of the car. A lateral piece is supported on the front arm of the frame, and is provided with guide slots for vertical rods, which are pivoted at their upper ends and at their lower ends below the drawhead to a lateral rod that is attached to the longitudinal swinging arm of a flat guide spout. An arm carries the spout up into inclined position along the lower part of the drawhead on raising the pin-supporting frame. The spout serves then for taking up the coupling link of the approaching car, and for conveying it into the cavity of the drawhead simultaneously with the concussion and the carrying back of the slide piece. The pin and pin frame drop thereby, and carry the spout to some distance below the drawhead suspended on the spring rods, but out of the way of damage by the concussion of the drawheads. The pin couples in dropping the link.

Improved Faucet.

Robert L. Hallett, Brooklyn, N. Y.—This is an improved faucet for drawing hot and cold water, or two kinds of liquids, either at the same time and mixed or separately, and discharging them through the same discharge pipe. The invention consists in the combination, with a spherical case having two inlets and a single outlet, of a spherical valve contained within said case, and operated by a stem connected with a hand wheel. The said valve has an orifice which is narrow in the middle and broad at the outer edge, so that the two inlets of the case may be opened either singly or both at a time.

Improved Regulator for Hemp-Spinning Machines.

Christopher Herschaft, Brooklyn, N. Y.—In this invention a countershaft, having two driving pulleys of different sizes, is belted to the driver for the gill bars, and the main driver belt is contrived to be automatically shifted by the upper condensing roller from one to the other of the pulleys on the countershaft for turning the aforesaid pulleys. The arrangement is such that, when the sliver is too large, the rising of the condensing roller will shift the belt on to the pulley for slow speed to feed slower, or on to the loose pulley to stop the gill chain in case the sliver is very much too large. When the sliver is too small, the belt will be shifted so as to increase the speed of the gill bars and feed faster.

Improved Horse Power Link.

Barnard L. Olds, Hightgate, Vt.—Many portable horse powers for thrashing grain and other purposes consist of an endless chain revolving over pulleys composed of tread pieces of wood united together by metallic links, which links are connected by rods, and have cogs on one side, which mesh into pinions, to produce the rotary motion required. The present invention consists in forming the links of a combination of the two. It is composed of a cast iron body and wrought iron back, the latter terminating at each end in a curve, forming a bearing for a journal within it.

Improved Extension Table.

James Poolman, Providence, R. I.—This invention consists of a couple of pairs of toggle bars and a right and left threaded screw for working them, combined with an extension table, for extending and contracting it by the turning of the screw. The object is to lessen the labor, so as to accomplish it by one person, and to draw the table tightly and rigidly together, and stiffen up the middle portion, so as to dispense with the middle leg.

Improved Stopping Mechanism for Spinning Jacks.

Frederick H. Crocker, Genie, N. H.—This is a device which throws off the driving belt in case the squaring band breaks or becomes too loose, and thus prevents the carriage being thrown off the track.

Improved Clothes Pin.

Edmund F. Krewitz, Humboldt, Mich., assignor to himself and Joseph Mitchell, same place.—This invention consists of a clothes pin made of one piece of sheet metal, bent and corrugated to form spring jaws for retaining the clothes on the line.

Improved Base-Burning Stove.

Melville C. Hawley and William Lennox, Mattoon, Ill.—The bars of the grate are made hollow to allow air to circulate through them. The grate is provided with four hollow arms, which project out through the wall of the stove, some of which may be curved upward and some downward, to promote the circulation. This construction of the grate heats air and discharges it into the room. A conical chamber, placed in the lower fire chamber just below the grate (from which a pipe leads out through the center of the bottom of the base to admit cold air), projects the products of combustion toward the walls of the stove, so as to heat said walls, and thus withdraw the heat from the products of combustion and radiate said heat into the room.

Improved Rotary Churn Dasher.

James J. Robinson, Gibson City, Ill.—The object of this invention is to improve the construction of the churn dasher for which letters patent were issued to the same inventor December 5, 1865. The invention consists in a churn dasher in which bars provided at their ends with cross bars and disks are attached to the shaft in an inclined position, and are so arranged that the upper cross bar and disks of each lower bar may be upon a level with the lower cross bar and disks of the next upper bar; and in the combination of an adjustable gathering board with the dasher shaft. This construction makes the cost of manufacture less, and lessens the labor of operating the dasher.

Improved Sulky Cultivator.

Burton C. Cox, Cooper Hill, Mo.—To the inner side of the inner beams is secured a half keeper, to which and the said beam is pivoted the end of a bar, which is bent inward and downward, and projects beyond the rear part of the said beam. To the rear part of the bar is bolted a guard, to prevent clods, lumps, and other rubbish from being thrown against the young plants and injuring them. The plates have sets of holes formed through them to receive the bolts, so that they may be readily adjusted higher or lower to let more or less soil pass to the plants. Upon the upper edge of the bars is formed a projection, which rests upon the upper edge of the beam and serves as a stop to prevent the fender from dropping down too low.

Improved Caustery Electrode, Vesicular Electrode, and Reservoir Electrode.

Jerome Kidder, New York city.—These are three new inventions, devised by a well known inventor of electro-medical apparatus. The first has for its object so to improve the galvanic-caustery instruments for excising tumors, etc., that they may conveniently be operated and the circuit closed and interrupted by the use of one hand only, leaving the other hand at liberty for holding some instrument or for other purposes. It consists of a caustery electrode, with the usual vulcanized rubber handle and slide ring for drawing the incandescent cutting loop, but having the handle extended far enough back of the lower fixed ring that the hand may be applied for firmly holding the instrument, while the spring button for closing and interrupting the circuit is placed in front of the fixed ring, to be operated by the forefinger jointly with the drawing back of the slide and loop by the thumb. The second invention consists of a vesicular electrode, with solid non-conducting head into which the ends of the battery-connecting wires are embedded in such a manner as to be readily brought in contact at the side and end, admitting the application of electricity by a more easily manipulated device than with the vesicular electrodes hitherto in use. The third invention is an improved electrode, for common exterior application, by which the disagreeable feeling or shudder produced by the contact of the cold metallic or sponge surface with the body is obviated. It consists of a common electrode, provided with a reservoir for hot water, and a tightly closed orifice for keeping the contact surface warm for application.

Improved Vegetable Dish.

Mrs. Ella Portington, Factoryville, N. Y.—This invention consists of a vessel provided with radial partitions, forming subdivisions, and a tubular center part, for being placed and rotated on a stand. A number of dishes are thus combined in one.

Improved Bush Hammer.

Charles Littlefield, Vinahaven (Carver's Harbor P. O.), Me.—Upon the ends of the sides of the head are formed flanges, the inner edges of which are curved upon the arcs of circles, and the ends of which project a little beyond the edges of the said head to form a seat for the cutters. The side plates have curved recesses formed in them to receive and fit upon the flanges. In the side plates, near their ends, are formed holes to receive bolts, by which the cutters are secured to the said plates, and the cutters and side plates are secured to the head, binding the various parts of the hammer firmly together.

Improved Coal Chute.

Robert Dunbar, Mansfield Valley, and John Keegan, McDonald, Pa.—This consists of a chute with laterally swinging end scoop, connected by curved adjustable guard plates to the sides of the chute section, to be set to any angle thereto, for conveying the coal without shoveling to any part of the car or boat.

Improved Portable Fence.

Stark Olmstead, Brooks, Ind.—This consists of panels of sawn stuff, having two cross pieces a little distance apart at one end, so that openings are left between. There is one cross piece near the other end, beyond which the slats extend so as to be fitted in the holes between the two cross pieces of another panel. The parts are locked and bound fast by adjusting the panels so connected as nearly in a straight line as may be, making a zigzag fence, which stands upright without posts or stakes in consequence of that form. Besides the binding of the panels together by the coupling effect of straightening the line, a pin is driven diagonally through the projecting end of one of the slats against the cross pieces.

Improved Hoisting Machine.

Victor Dubamel, Easton, Pa.—This invention is a machine which is put in operation by means of a pendulum and ratchet and pawl. It consists of a hoisting drum, which is turned by a pawl operated by the oscillation of the pendulum, when the latter is held to its work by a spring. The drum remains motionless when the pendulum takes its return stroke.

Improved Coal Shovel.

James D. Tallmadge, of Chicago, Ill.—Four wires, more or less, are bent into shape, and are then forced into a wedge-shaped ferrule. The projecting ends of the wires are then bent by hand or upon a properly shaped block into the shape of an ordinary ash shovel.

Improved Machine for Moistening Oleaginous Seeds.

Alfred B. Lawther, Chicago, Ill.—This invention consists of a common or steam-heated reservoir, arranged with one or more revolving perforated stirrer arms, by which the seed is thoroughly mixed and moistened under the admission of hot or cold water or steam.

Business and Personal.

Charge for insertion under this head is \$1 a line.

Metallic Pattern Letters and Figures, to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N. Y.

Hoadley Portable Engines. R. H. Allen & Co., New York, Sole Agents of this best of all patterns.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. F. Fable & Co., New Haven, Ct.

For Sale—Large lot second hand Machinists' Tools, cheap. Send for list. I. H. Shearman, 43 Cortlandt Street, New York.

Windmill rights and royalties for sale cheap. Mill tested and proved a success. See cut in Scientific American, April 10th. For circular, terms, &c., address E. S. Smith, Good Hope, McDonough Co., Ill.

Printers generally have been put under many obligations by the advertising firm of Geo. P. Rowell & Co., New York, for their prompt and courteous manner of doing business. We doubt whether just blame can in any single case be laid on them for dereliction of duty or the nonfulfillment of the terms of any contract. (Exchange.)

Employment wanted by an educated civil engineer, draughtsman, and machinist. C. S. D., Lock Box 135, Waterbury, Conn.

A competent man desires a situation to take charge of Steam Heating Business, or to act as foreman. No objection to leave the city. Address Business, 59 Second St., New York.

Sumac: Dealers in this article are invited to apply to S. C. Merrill, 371 Eighth Street, Louisville, Ky., giving information as to its preparation, etc.

For Sale—A new, well finished Horizontal Engine, 2 in. bore, 4 in. stroke. J. H. Vail, Box 303, New Brunswick, N. J.

Entirely New Household article, used every day, Pat'd June 15, 1875. New Jersey for Sale. Address, with stamp, L. W. & J. F. Smith, Vineland, N. J.

Patterns, Patent Office and Experimental Models, made by Crook & Herring, 36 Center St., New York.

\$25 to \$50 per day to good agents to sell Well-Boring Machinery. A Horse Bore from 10 to 48 in. diam. Send for pamphlet. Pump & Skelton Co., Belleville, Ill.

The American Saw File Guide, for correctly filing saws, manufactured by E. Roth & Bro., New Oxford, Pa., will be sent free for Two Dollars, with terms to agents. Sells at sight. Gives entire satisfaction.

Barry Capping Machine for Canning Establishments. T. H. Bailey & Vail.

For Sale, or to Let on Royalty—Canada Patent for Hanging Eave Troughs and Conductor Pipes. Address J. P. Abbott, Cleveland, Ohio.

Foot Lathes—Wm. E. Lewis, Cleveland, Ohio.

Second Hand Steam Engines, Pumps, and Iron-Working Machinery. Catalogues free. E. E. Roberts, 119 Liberty Street, New York.

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers, signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price \$4, with good Battery. F. C. Beach & Co., 216 Canal St., New York. Makers. Send for free illustrated Catalogue.

Scientific Expert, in Patent Cases, C. Gilbert Wheeler, 115 State St., Chicago, Ill.

For Machine, Cap, Set, and Special Screws of every description, apply to Reynolds & Co., 145 East St., New Haven, Conn.

Taft's Portable Suspension Bath—Address Portable Bath Co., 156 South St., New York City.

Reynolds & Co., 145 East St., New Haven, Conn., manufacture small Routine Articles of every description for patentees.

For Tri-nitroglycerin, Mica Blasting Powder, Frictional Electric Batteries, Electric Fuses, Exploders, Gutta Percha Insulated Leading Wires, etc., etc., result of seven years' experience at Hoosac Tunnel, address Geo. M. Mowbray, North Adams, Mass.

Wrought Iron Pipe—For water, gas, or steam. Prices low. Send for list. Bailey, Farrell & Co., Pittsburgh, Pa.

Small Gray Iron castings made to order. Hotchkiss & Ball, Foundrymen, West Meriden, Conn.

Hotchkiss & Ball, West Meriden, Conn., Foundrymen and Workers of Sheet Metal. Will manufacture on royalty any Patented articles of merit.

Boulton's Paneling, Moulding and Dovetailing Machine is a complete success. Send for pamphlet and sample of work. B. C. Machy Co., Battle Creek, Mich.

For best and cheapest Surface Planers and Universal Wood Workers, address Bentel, Margendant & Co., Hamilton, Ohio.

Dickinson's Patent Shaped Diamond Carbon Points and adjustable holder for working Stone, dressing Emery Wheels, Grindstones, &c., 64 Nassau St., N. Y.

The Original Skinner Portable Engine (Improved), 2 to 8 H.P. L. G. Skinner, Erie, Pa.

Camp Lounge, \$5. C. L. Co., Troy, N.Y., and Newark, Ct. N. Y. City Salesroom, 177 Broadway.

Pipe and Bolt Threading Machines. Prices from \$50 upwards. Address Empire Manufacturing Company, 48 Gold Street, New York.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., 25 Whitney Avenue, New Haven Conn.

American Metaline Co., 61 Warren St., N.Y. City.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Peck's Patent Drop Press. Still the best in use. Address Milo Peck, New Haven Conn.

Faught's Patent Round Braided Belting—The Best thing out—Manufactured only by C. W. Army, 301 & 303 Cherry St., Philadelphia, Pa. Send for Circular.

Three Second Hand Norris Locomotives, 16 tons each; 4 ft. 8 1/2 inches gauge, for sale by N. O. & C. R. H. Co., New Orleans, La.

Genuine Concord Axles—Brown, Fisherville, N.H.

Temples and Olicans. Draper, Hopedale, Mass.

Price only \$3.50.—The Tom Thumb Electric Telegraph. A compact working Telegraph Apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key, and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 216 Canal St., New York.

For 13, 15, 16 and 18 inch Swing Engine Lathes, address Star Tool Co., Providence, R. I.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Boring Metals. E. Lyon, 470 Grand Street New York.

For Solid Wrought-Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa. for lithograph, &c.

All Fruit-can Tools, Ferracute W. K's, Bridgton, N. J.

Notes & Queries

E. W. P. will find a recipe for waterproof glue on p. 204, vol. 31.—J. M. B. will find a recipe for cement for wood and glass on p. 298, vol. 30.—J. A. L. will find directions for making sun dials on p. 409, vol. 29.—E. I. will find a recipe for aquarium cement on p. 232, vol. 28.—E. A. H. will find directions for tinning iron on p. 352, vol. 31.—F. H. R. will find an answer to his question as to proportions of an oscillating engine on p. 359, vol. 32.—A. E. M. will find a recipe for filling for black walnut wood on p. 315, vol. 30.—E. S. H. will find details of a simple method of galvanizing iron on p. 346, vol. 31.—M. B. will find a recipe for a cement for leather on p. 119, vol. 28.—W. C. L. will find a recipe for shoe polish on p. 253, vol. 31.—E. R. B. can gild devices on china by the method described on p. 41, vol. 27.—J. B. Jr. can stain glass blue and red by following the directions on p. 390, vol. 30.—G. O. Jr. will find an explanation of the silvering on glass mystery on pp. 267, 331, vol. 31.—J. K. will find directions for making a cool chamber on p. 231, vol. 31.—H. H. can polish tortoiseshell by following the directions on p. 122, vol. 27.—P. F. T.'s literary queries are not in our line.—M. G. F. can coat iron castings with copper by the process described on p. 90, vol. 31.—P. & Co. can enamel iron by the methods given on p. 362, vol. 32.—L. K. Y. will find a recipe for cement for leather on p. 119, vol. 28.

(1) A. F. A. asks: Would a meniscus lens 1 1/4 inches in diameter, of 6 inches focus, do for a camera for taking photographs? A. Yes, with a stop in front of lens.

(2) C. S. asks: 1. How many times the focus of the lens must a radiant be placed so that the rays may reach the lens sufficiently parallel to form an accurate image at the principal focus? A. At finite distances the image is found at the shorter conjugate focus. 2. In testing an achromatic, while correcting for spherical aberration, is there any means of knowing on what surface the local correction should be made? A. The outer surface. The modern practice is to slightly under correct for color, the spherical aberration being entirely removed. 3. If you will favor us with some practical points in the testing and centering of achromatics, going into details, you will do a great deal for us who are interested in optical experiments, by saving us numerous failures merely from our want of knowledge. A. To test an achromatic, remove the eyepiece and look at the objective lighted by the full moon. Every streak, bubble, or scratch will appear. To center the object glass, put on the cap, place a candle flame at the focus, and tip the glass by bits of tinfoil until the reflected images seen through the blue cone are coincident. Repeat, revolving the tube 90° at a time. In testing for spherical aberration, the images must be sharp, and blurred quickly by a slight movement of eyepiece. Drops of mercury in the sun make a good test object. The test for achromatism: The edge of moon must be clear purple inside the focus and yellowish green outside, colorless when most distinct. Remember that the Huyghenian eyepiece shows color at the edges.

(3) S. asks: 1. How long after interment in the usual mode can human remains be identified? A. The time depends on the nature of the soil. 2. Are the skulls and bones of savage races more enduring in the earth than those of civilized races? A. No.

(4) J. S. C. asks: What will remove the stain of linseed oil from white cotton material? A. Try a little benzine or benzole.

(5) I. McL. asks: When phosphide of calcium is put into water, does the base reduce to powder (simultaneously with the evolution of sulphuretted hydrogen) or does it remain solid? A. The hypophosphite formed is readily soluble in water and goes into solution immediately on formation.

(6) F. W. D. says: I am experimenting in photography, and meet with pretty good success in taking negatives; but when I come to fix the prints, the operation baffles me. I have made a silver bath for the prints in two or three different ways, and the result is the same in every case, namely, the print will always turn to a tan color, instead of remaining black or dark purple. My fixing solution is hyposulphite of soda and water, dissolved in proportions varying from 8 ozs. in 1 quart water to 8 ozs. in 3 quarts water. I leave the prints in the fixing solution about 15 minutes; but they turn within a minute or two. I do not think the fault is in the printing, for I have exposed them till they were so dark as to be almost impalpable. Where is the difficulty? A. This brick red color will always be found in ordinary silver prints. To obtain this required depth of color it is necessary to subject the print to a toning process, with chloride of gold, or with sulphur, as described in answer to W. P. K., p. 409, vol. 32.

(7) W. P. S. asks: In parts of the west, lightning rods are not insulated but built in the substance of the building. Would it not be equally safe and much cheaper to insert platinum points from the most elevated parts of the building? A. The rods should not be insulated. Platinum points neither add to nor diminish the safety. No rod is safe unless it is continuous, and is connected at its lower end with a large amount of metal or conducting material to the ground.

(8) W. P. H. asks: Do you know of any means by which writing on old parchment can be brought out so as to be legible? A. Cover the letters with powdered ferrocyanide of potassium, with the addition of a little dilute muriatic or nitric acid. This treatment will cause the letters to immediately change to a beautiful deep blue color of great intensity. The superfluous fluid may then be immediately absorbed by the application of the edge of a piece of blotting paper, carefully handled so as not to erase the letters, which are at first very soft, and also to avoid staining the manuscript.

(9) W. W. R. asks: Can I make a cheap microscope, powerful enough to show the sap cells in hard and soft woods, such as maple, pine, spruce, etc.? What lenses do I want, and how shall I place them? A. Showing the sap cells of wood depends more on the preparation of the wood than on the power of the lens. You must cut very fine shavings (best done with a razor) in three ways, across the fiber, parallel to the fiber and with the year rings, and parallel to the fiber and across the year rings. Each shows the cells in a particular way; and by combining the observations, you can obtain the best idea of the cell structure. It takes only a weak power to see these cells. But do not attempt to make a microscope; rather buy one. A small microscope, that is, one with a single lens, will answer, and this costs so little that it would be time lost to attempt to make lenses. If you can buy a very small lens of short focus, that is, with sharp curves, you may easily mount it in a stand; and a simple trial will soon show you where to place the lens and the object.

(10) I. K. says: In a dispute upon the subject of electricity, my friend said that it was a force, and I said it was a substance. Which is right? A. This is a question about which the best electricians disagree.

(11) W. P. asks: In making sulphur molds, what is used to harden the sulphur and take away the brittleness? A. We do not know of anything that satisfactorily fulfils both these requirements.

(12) C. G. V. P. says: Pounded glass dusted on fresh paint makes a beautiful effect for ornamental work. Is such glass an article of trade? A. The substance known as pounded glass is manufactured in the glass house by dipping the end of the ordinary long metallic tube into the pot of pasty or semi-fluid glass in the furnace, when on removing the rod a ball of the pasty material remains attached to its extremity. This is blown by the workman into a huge bubble, and until the sides approach the thinness of the soap bubble film, when an additional puff of air into its interior from his lungs causes it to burst and fall in minute spangles and dust into a proper receptacle prepared for them.

(13) E. E. D. asks: How can I make a camera lucida? A. The simplest form of this instrument consists of a thick and finely polished piece of plate glass placed perpendicular to the drawing board and also to the body of the draftsman. The picture or design which it is wished to reproduce is placed with its back upon the board at one side of the glass plate, while the paper for the reproduction is placed in like manner upon the opposite side. On looking at the glass plate from above, and slightly on that side upon which the design lies, an image of the same is distinctly seen, apparently on the drawing paper on the opposite side of the plate.

(14) B. D. asks: Can a lithographer perfect the corners, turns, shading, etc., of imperfect writing? A. Yes.

I. In a new schoolroom the blackboards, painted on brick walls, sweat so much that they become useless for several days. The room is on the lower floor, not out in a basement. Can you give me the cause, with a remedy to prevent it? A. It is very likely due to the fact that the walls have not yet become thoroughly seasoned. Keep the interior of the room at as warm a temperature as possible until the annoyance is dissipated. 2. I have a prescription for painting blackboards in which spirits and spirit varnish are both mentioned. Please tell me the difference between them. Is not spirit another name for alcohol? A. Spirit varnish is probably a solution of shellac in alcohol. Alcohol is commonly called spirits.

Is there any method, process, or ingredient that will keep ink from freezing? A. Ink may be preserved from freezing by enveloping the vessel containing it in some non-conducting substance, such as straw, sawdust, or woolen fabrics.

(15) T. S. G. asks: How high can a pump draw water up a tube? Can it draw over 33 feet? A. No; 33 feet is the highest. The pump should never be more than 28 feet from the water, and even then it requires a first-rate pump to suck water.

(16) F. A. B. asks: What are the ingredients for glazing earthen or crockery ware? A. For ordinary earthenware use the following: White sand 40 lbs., pearlash 21 lbs., and common salt 15 lbs. Calcine them for some time over a moderate fire, and when the mixture is cold grind to a very fine powder. When wanted, temper it with water, and it will be ready for use.

(17) W. E. T. asks: Is there any preparation for silver plating iron? A. Yes. See pp. 84 and 405, vol. 32.

How can I take ink stains out of leather? A. Try a little oxalic acid in water.

(18) F. S. asks: How can I cut glass tubing very easily and without difficulty by first scoring it all the way around, at the point where the separation is desired, by means of a small three-cornered file. The tube is then grasped firmly with both hands on either side of the file mark, with the thumbs approaching it on opposite sides to within about an eighth of an inch; a quick and firm pressure

with both thumbs, simultaneously, while the rest of the hand remains in position, will do the work satisfactorily. To remove the sharp edges of the severed tube, it is only necessary to hold its ends alternately in the flame of a spirit lamp or Bunsen burner for a few minutes.

(19) A. L. B. asks: 1. What is citrate of magnesia? A. It is a combination of citric acid (acid of lemons) with magnesia. 2. How is it made? A. It may be formed by decomposing the carbonate of magnesia by a hot aqueous solution of citric acid. 3. What are its properties? A. It is used medicinally as a mild laxative.

(20) E. L. G. asks: Is there a cheap way of producing an electric light to be used for 12 hours? A. A suitable light for your purpose would require an electromotive force equal to about 50 Grove or Bunsen cells. The cost of such a light (derived from the consumption of zinc, etc., in the battery), for the period of time that you mention, would be considerable. The electric light may now, however, be obtained at a very moderate cost, by means of a Gramme's machine, driven by a small steam engine or other available power. In this case the electric energy is not obtained by chemical action, but by the direct conversion of mechanical motion into electricity.

(21) B. F. T. asks: Is the heaviest coal the best? A. Not always. The impurities contained in coal very materially affect the specific gravity.

(22) C. D. asks: How can I transfer printed letters to silver or silver plate for engravings? A. Try the process of daguerreotype.

(23) M. S. W. says: I desire to utilize the escape steam of an engine 12x18 inches, working at 75 lbs. pressure, by passing it through copper pipes placed in a wooden tank 25 feet long by 36 inches wide. I use a 4 1/2 inch exhaust pipe of copper, which I propose to connect with two 4 1/2 inch copper pipes that will run round in the tank. 1. Shall I, in this arrangement, utilize much heat? A. You can utilize a considerable portion of the heat in the exhaust steam by this method. 2. Will this make much back pressure on my engine? A. Not materially. 3. Would you advise a steam trap? A. A trap will render the apparatus more efficient.

(24) J. C. H. says: I have a 1 horse power engine and vertical boiler. The boiler is 18 inches in diameter, 32 inches high, with firebox 15 inches diameter, 16 inches high, and 24 half inch tubes 15 inches long. In using wood or coke for fuel it works very well, but I desire to use soft coal because it saves firing so often. One day's use of soft coal stops the tubes up with soot, so that they require to be cleaned every day. How can I remedy it? A. Try the plan of dampening the coal a little before firing.

(25) J. M. asks: What size of boiler will suit a 15 feet long boat with a 15 inch diameter screw propeller, and of what size should the cylinder be? A. Cylinder 24x4 inches. Boiler with 40 to 50 square feet of efficient heating surface.

(26) E. R. says: A mill takes its supply of water from a well that is dug to the depth of 45 feet, and bored 50 feet further; the well does not supply sufficient water, and I propose to remedy it by closing the top of the well airtight, and conducting the exhaust steam of the engine into the well at the top, then suspending a pipe of same size as pipe from engine from the top to within 3 or 4 feet from the bottom of the well, and connecting the top of this pipe with the open air by means of another pipe. The well being 5 feet in diameter, the steam would be brought in contact with over 700 square feet of rock condensing surface, which would, I believe, condense the greater part of the steam, or enough to supply the deficiency. How will this arrangement do? A. Your idea strikes us very favorably.

(27) H. E. S. asks: Is the pressure of water greater on the bottom of a tube that is twice the diameter at the top than it is at the bottom, than in a tube that is the same diameter through the whole length? A. If the height of water in each tube is the same, the pressure on the bottom of each, per unit of surface, is also the same.

(28) J. M. S.—The Chicago newspaper referred to had no authority for saying that the Patent Office had sets of from 20 to 25 volumes of annual reports, which parties could have mailed to them by addressing the Commissioner, enclosing a small fee to cover postage. The reports remaining in the Patent Office are not of a connected series, being mostly for years between 1859 and 1862. These are of no real service in looking up inventions, and, without subsequent volumes, are a delusion and a snare to any who are searching for reliable information as to patents issued. The best way is to employ some one accustomed to making searches in the Patent Office to examine and report if an invention is probably patentable. By sending a model, drawing, or photograph, accompanied with description and a fee of \$5 to the office of this paper, such examination will be made and a written report sent by mail to any part of the world.

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

R. B.—It is iron pyrites.—W. R. W.—Your specimen of tree lice is so far as we know, undescribed. We have sent it to the Department of Agriculture, Washington, D. C.—W. H. M.—They are fossils, consisting of siliceous, clay, and oxide of iron, but not sufficient to make an ore.—J. C. W.—The clay is worthless for making porcelain.—J. McW.—They are specimens of quartz and serpentine, of no value.—J. G. McM.—It is hematite.—W. M. S.—We did not detect nickel.

Correspondents who send specimens of minerals, well waters, entomological and botanical subjects, etc., for examination, should carefully and legibly mark the package or box containing the

same with the sender's name. Much confusion and trouble is often caused by such unmarked packages becoming separated from the letters sent with them.

W. B. H. asks: When is the best time for moving grape vines?—S. asks: How can I make a red, blue, and white stencil ink, such as is used for marking boxes, etc.?—C. L. S. and others ask: How can I make transfer paper for marking linen indelibly? It is used in this way: Place the transfer paper upon the linen to be marked, and over that place a piece of ordinary white writing paper, and mark with a lead or slate pencil or stiletto. Heat the writing with a moderately hot flat iron for two or three minutes, and it is permanent.—W. F. W. asks: What prevents bees from swarming, and what will induce them to swarm?

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 Keely Motor. By J. C., by E. T., by J. J. A., by O., by C. F., by W. L. D., by B. K., and by J. C. H.

On Evergreens in Orchards. By F. R. E.
On Tides in the Gulf of Mexico. By T. H.
On Powder Mill Explosions. By J. M.
On the Spider's Web. By S. T. W.
On Melting Iron. By T. H. A.
On Spring Power for Cars. By F. G. W.
On a Singular Electrical Phenomenon. By T. P. C.

Also inquiries and answers from the following:
G. H. B.—F. R.—J. D. C.—C. C.—J. D. S.—C. B. D.—H. G. W.—D. A. W.—R. C. T.—R. C. C.

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.

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

Hundreds of inquiries analogous to the following are sent: "Who buys rare coins? Who makes wooden screw bungs? Who builds bridges? Where can molds for ornamental vases be obtained? Who sells pure platinum? Who sells engraver's tools?" All such personal inquiries are printed as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week ending

June 29, 1875,

AND EACH BEARING THAT DATE.

(Those marked (r) are reissued patents.)

Addressing machine, E. Longley.....	164,925
Air compressor valve, etc., Reynolds & Miller.....	165,139
Anchor, W. A. Currier.....	164,975
Anchor, A. Smith.....	165,006
Bale tie, W. P. Elliott.....	165,081
Band fastener, E. Dresser.....	165,079
Basket, stove, S. H. Wheeler.....	165,045
Basket, wicker, U. S. Wolf.....	165,047
Beams, etc., making hollow, I. Hahn.....	165,094
Bed bottom, spring, J. C. Anderson.....	164,957
Bedstead, invalid, Deneef and Wilkin.....	165,075
Beer, etc., compound for preserving, W. Zinsser.....	165,115
Beer with gas, charging, J. C. Kennedy.....	166,004
Beit coupling, G. A. Manning.....	165,010
Besemer converter, A. S. Dunning.....	164,962
Bit, expandable, F. Willig.....	164,903
Bit, wood-boring, G. L. Holt.....	164,999
Blacking bottles, etc., stopper for, H. D. Forbes.....	164,912
Blast apparatus, hot, H. Essex.....	165,094
Boiler for stoves, etc., upright, Lawton & Gibson.....	165,105
Boiler, steam, E. D. Leavitt, Jr.....	165,006
Boilers, covering for steam, W. Peters (r).....	6,516
Boiler feed water heater, J. Armstrong.....	164,959
Boot, T. Powell, (r).....	6,522
Boot rands, cutting, C. H. Brigham.....	164,983
Boot toe protector, H. & J. Eviit.....	164,985
Boots, crimping leather for, S. W. Jamison, (r).....	6,525
Bottle carrier, soda, A. F. Knorr.....	165,005
Bottle dropping, C. C. Garrett.....	165,091
Bottle measuring, F. S. Baldwin.....	165,064
Bottles, extracting corks from, Page & Faby.....	164,931
Brewer's washing machine, F. Cramme.....	164,905
Bug and bush, W. Johnson.....	165,001
Burner, electric gas lighting, S. Gardner, Jr.....	165,090
Burner for heating, gas, W. R. Hanks.....	165,095
Burner, lamp, T. D. Parsons.....	164,992
Burning hay, straw, leaves, etc., A. Hamilton.....	164,993
Bustle, C. O. Crosby.....	165,069
Butter box veneers, preparing, S. F. Spaulding.....	165,045
Camera stand, F. M. Spencer.....	165,038
Can, airtight, E. Joyce.....	165,031
Cane, etc., bone handle for, J. Harvey, (r).....	6,513
Cap, reversible, M. Fox.....	164,997
Car brake, Aldrich & Higgins.....	164,992
Car brake, S. P. Littlefield.....	165,098
Car coupling, W. H. Bodenhamer.....	164,994
Car coupling, C. E. Ramage.....	165,025
Car replacer, W. Ems.....	165,092
Car starter, Bailey & Pool.....	165,062
Car starter, G. B. Curtis.....	165,079
Carbureter, J. B. Allen.....	165,090
Carpet stretcher, E. P. Shaffer.....	165,092
Carpet stretcher and holder, D. Peters.....	165,092
Carriage seat, C. K. Mellinger.....	165,016
Cartridge cases, necking, D. Payne, (r).....	6,520, 6,521

Catch for endboards, etc., C. G. Schneider.....	164,941
Casting plow points, G. Ward.....	165,016
Casting propeller wheels, flask for, Swift & List.....	165,039
Centrifugal machine, G. Dinkel.....	165,077
Chimney cow, A. J. Robinson.....	165,028
Chuck, planer, Prouty, Coes, & Taft.....	164,954
Churn, rotary, Felt & Child.....	165,096
Churn, rotary, J. J. Shelton.....	165,093
Cigar mold, N. Du Brul.....	164,981
Cigar tip cutter, etc., E. F. W. Eisenmann.....	164,984
Clutch, friction, I. Arnold.....	164,998
Cock, stop, A. Snyder.....	164,944
Cooler, milk, W. H. Johnson.....	165,102
Corn stalk cutter, A. C. Smith.....	165,128
Cotton compress, J. J. Cahoon.....	164,983
Cotton openers, heater for, J. E. Crane.....	165,066
Cotton pickers, heater for, G. E. Taft.....	164,948
Crimping machine, S. W. Jamison, (r).....	6,526
Culinary grater, E. Woodward.....	165,133
Cultivator, T. F. & W. Vandergrift.....	165,136
Cultivator, corn, A. F. Batcheller.....	164,960
Dial, gauge, Crosby & Meady.....	164,908
Dredger, pneumatic, W. Smith.....	165,085
Drill, steam rock, J. C. Githens.....	164,990
Drills, chuck for rock, J. C. Githens.....	164,991
Drip trough for ice boxes, Dyer & Powell.....	164,993
Dryer and baker, W. P. Cora.....	164,974
Drying apparatus, L. K. Fuller.....	165,088
Egg box covers, etc., fastening, W. Wells.....	165,044
Engine, air hand, C. W. Riley.....	165,027
Engine, electro-magnetic, T. Chuteaux.....	165,064
Engine, fire, J. Bean.....	165,066
Engine governor, steam, J. C. Roadley.....	164,917
Engine governor, steam, C. G. Sims.....	164,942
Engine, steam, D. K. West.....	165,139
Eyeglet, T. Garriek, (r).....	6,512
Fats, separating, C. M. Cresson.....	164,907
Feed cutter, E. Wagoner.....	165,138
Feed cutter, T. Webb.....	165,045
Fence wire, D. C. Stover.....	164,947
Fence wire stretching, J. F. Duffy.....	164,910
Filling hook for weaving hair cloth, J. Turpie.....	164,949
Fire arm, breech-loading, O. Schneeloch.....	165,031
Fire brick, manufacture of, J. P. Alexander.....	165,049
Fire irons, stand for, E. A. Jackson.....	165,101
Fire place, W. Tweeddale.....	165,134
Flower pot, J. S. Johnson.....	165,090
Food preserver, C. Brown.....	164,964
Foot rest, Edgcomb & Gore.....	164,911
Fork and skewer pull, combined, E. W. Anderson.....	164,956
Fork and skimmer combined, A. B. Nott.....	165,117
Fruit dryer, A. J. Reynolds.....	165,121
Fruit picker, J. Bailey.....	165,053
Furnace and range, hot air, L. G. Hallberg.....	164,916
Furnace and stove, E. Hawkes.....	164,995
Furniture castor, J. T. Codman.....	164,973
Fuse, electric, C. L. Kalmbach.....	164,921
Gage dial, Crosby & Meady.....	164,908
Gas from petroleum, J. McClarty.....	165,012
Gas scrubber and condenser, W. H. White.....	165,141
Gateway, S. L. Fisher.....	164,996
Glove stretcher, D. S. Hayward.....	165,096
Grain drill, E. D. Mead.....	165,015
Grain tally, A. K. Munson.....	165,021
Harness hame, A. H. Cressap, Jr.....	164,967
Harrow, J. Masters.....	165,108
Harvester, L. B. Stillson.....	6,524
Harvester cutter, T. R. Arnold.....	164,958
Harvester plow, guide, etc., E. F. Herrington (r).....	6,514
Harvester rake, J. S. Marsh.....	164,926
Hat and cap, Isidor & Hein.....	165,100
Head block, J. F. Cook.....	165,065
Heating buildings, etc., A. P. Pitkin.....	165,033
Heating apparatus, steam, L. C. Richardson.....	164,935
Hens' nest, J. P. Clement.....	164,971
Hinges, covering plate for, H. T. Blake.....	165,061
Hook, snap, G. Reynolds.....	165,122
Hopple, J. Shive.....	165,137
Horse toe weight, etc., H. D. McKinney.....	165,014
Horseshoe blank bar, H. H. Gilmore.....	164,914
Hose, hydraulic, J. M. Stone.....	164,946
Hub, A. Rimes.....	164,936
Ice boxes, drip trough for, Dyer & Powell.....	164,993
Ironing board, G. E. Hollister.....	164,998
Jar lifter, W. W. Brower.....	164,968
Key hole guard, J. Goldstein.....	164,992
Knife, tobacco, Lane & Cullem.....	165,104
Ladle, Curtis & Rowley.....	165,071
Lamp chimney, G. Niedermair.....	165,116
Lamp fount, E. Brown.....	164,963
Lamp, gas filter's, J. D. Galloway.....	165,089
Lantern, reservoir street, A. H. Watkins.....	165,042
Lathing, securing metal, J. W. Hoyt.....	164,919
Leather, treatment of, H. Smith.....	165,129
Lock for doors, W. Unverzagt.....	165,041
Locks, catch plate for bag, W. Roemer.....	164,939
Locomotive, hydrocarbon burning, J. M. Goodwin.....	164,915
Locomotive exhaust, W. Stamp.....	165,130
Loom, J. M. Linscott.....	165,024
Match safe, H. C. Wilcox.....	165,142
Measuring packaged fabrics, S. C. Talcott.....	165,121
Moldings, polishing, J. A. Dayton.....	165,073
Motion, transmitting and regulating, J. Zenzel.....	165,144
Oil tank extinguisher, R. Dietrich.....	165,078
Offer, Bohm, Stuhler, and Joeken.....	164,982
Ore, treating, D. Mindeff (r).....	6,519
Organ, reed, Bach and Berg.....	164,900
Organ keyboards, etc., making, M. Pratt.....	165,024
Paddle wheel, J. Salter.....	165,029
Painters' use, breamer for, I. Hayes.....	164,996
Paper barrel, J. W. Jarboe (r).....	6,515
Paper box, J. H. Van Vechten.....	165,137
Paper cutter, rotary, A. Judson.....	164,930
Paper folding machine, etc., C. Chambers, Jr.....	164,904
Paper folding machine, W. Daniels.....	164,977
Paper folding machine, W. and C. Daniels.....	164,978
Pavement, composition, J. P. Cranford (r).....	6,511
Pencil case, W. L. Ludlow.....	165,000
Pencil rubber, eraser, J. B. Blair (r).....	6,510
Photographic head rest, F. M. Spencer.....	165,037
Photographic vignetting machine, C. C. Merrill.....	165,017
Photographs, burner for, E. H. Weston.....	165,140
Piano stringing device, A. G. Gardner.....	164,988
Picture frame, J. T. Robertson.....	164,937
Pipe, smoking, C. J. Jonassen.....	165,082
Pitman, J. R. Taylor.....	165,040
Planer, guide for bench, H. P. Taylor.....	165,132
Planing machine, wood, J. S. Graham.....	164,989
Planter check row attachment, M. Newton.....	165,115
Plows, L. B. White.....	164,951, 164,952
Plow points, casting, G. Ward.....	165,046
Plow, sulky, G. Moore.....	164,929
Pocket books, clasp for, L. Messer.....	165,110
Polishing machine feed, J. A. Dayton.....	165,074
Posta, metal cap for, J. Davenport.....	164,979
Press, brick and soap, J. H. Hearn.....	164,997
Press, cotton, S. Dike.....	164,980
Press, hay and cotton, J. L. De Witt.....	164,976
Press, hay and straw, L. Kirk.....	164,922
Pump governor, C. W. Mills.....	165,112
Punch E. J. Brooks.....	165,092

DESIGNS PATENTED.

8,428 to 8,439.—CARPETS.—R. Allan, Yonkers, N. Y.	
8,440.—PIANO STOOLS.—G. W. Archer, Rochester, N. Y.	
8,441.—STOVES.—W. Buttrick, New York city.	
8,442.—POTTERY.—T. H. Copeland, Geddes, N. Y.	
8,443.—CARD OF BUTTONS.—G. Farmer, Brooklyn, N. Y.	
8,444, 8,445.—CARPETS.—H. F. Goetz, Boston, Mass.	
8,446, 8,447.—TYPE.—C. E. Heyer, Boston, Mass.	
8,448.—COFFIN PLATES.—W. Parkin, Taunton, Mass.	
8,449.—ADVERTISING LANTERN.—F. L. Plisch, N. Y. city.	

SCHEDULE OF PATENT FEES.

On each caveat.....	\$10
On each Trade mark.....	\$25
On filing each application for a Patent (17 years).....	\$15
On issuing said original Patent.....	\$20
On appeal to Examiners-in-Chief.....	\$10
On appeal to Commissioner of Patents.....	\$20
On application for Release.....	\$30
On filing a Disclaimer.....	\$10
On an application for Design (3 1/2 years).....	\$10
On application for Design (7 years).....	\$15
On application for Design (14 years).....	\$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,
June 18 to July 7, 1875.

4,886.—P. Wright, Ottawa City, Ont. Backband for cart saddles. June 18, 1875.	
4,887.—G. H. Reynolds, New York city, U. S. Rock-drilling machine. June 18, 1875.	
4,888.—L. Munro, Ottawa, Ont., et al. Spooler and pin-cushion combined. June 24, 1875.	
4,889.—J. E. Buerk, Boston, Mass., U. S. Watchman's time detector. June 24, 1875.	
4,890.—W. P. Widdifield, Sileam, Ont. Saw carriage and feed movement. June 24, 1875.	
4,891.—E. Seaman, Andover, N. Y., U. S. Window blind. June 24, 1875.	
4,892.—J. S. Wallace et al. Belfast, Ireland. Fire extinguisher. June 24, 1875.	
4,893.—L. B. Stillson, Minneapolis, Minn., U. S. Safety car truck. June 24, 1875.	
4,894.—E. F. Chapin et al. Boston, Mass., U. S. Lamp extinguisher. June 24, 1875.	
4,895.—O. Pagan et al. Philadelphia, Pa., U. S. Roller tube expander. June 24, 1875.	
4,896.—J. M. Munro et al., Ottawa, Ont. Horse hoe. June 26, 1875.	
4,897.—F. Hourk, Montreal, P. Q. Ventilation of sewers. June 28, 1875.	
4,898.—N. Campbell, Rochester, N. Y., U. S. Curtain fixture. June 28, 1875.	
4,899.—W. T. Wood, Mount Juliet, Tenn., U. S. Lamp extinguisher. June 28, 1875.	
4,900.—A. A. Post, New York city, U. S. Liquid meter. June 28, 1875.	
4,901.—F. J. Davis, Newport, Vt., U. S. Foot power lasting tool. June 28, 1875.	
4,902.—H. Hagie, Warwick, Ont. Gate. June 28, 1875.	
4,903.—J. S. Brooks, Pittsburgh, Pa., U. S. Backing electrotypes. June 28, 1875.	

4,904.—J. C. Rorick, Waukegan, Ohio, U. S. Butter worker. June 28, 1875.	
4,905.—C. J. Eames, New York city, U. S. Hydrocarbon reducing furnace. June 28, 1875.	
4,906.—C. Lundy, East Gwillimbury, Ont. Hay rake. June 28, 1875.	
4,907.—J. Hewitt, Grimsby, Ont. Fluting and glowing iron. June 28, 1875.	
4,908.—A. Beaudry, Boston, Mass., U. S. Adze and ax. June 28, 1875.	
4,909.—J. Flower, Detroit, Mich., U. S. Street hydrant. June 28, 1875.	
4,910.—A. R. Morgan, New York city, U. S. Store. June 28, 1875.	
4,911.—Wm. C. Shorey, Napanee, Ont. Horse hay knives and forks. July 6, 1875.	
4,912.—S. Spencer, Boston, Mass., U. S. Burial casket. July 6, 1875.	
4,913.—A. Gardner, Windsor, P. Q. Bevel pump engine. July 6, 1875.	
4,914.—G. W. Walker, Malden, Mass., U. S. Portable ranges. July 6, 1875.	
4,915.—S. O. Greening, Hamilton, Ont. Lightning rod. July 6, 1875.	
4,916.—J. F. Glidden, De Kalb, Ill., U. S. Wire fence. July 6, 1875.	
4,917.—C. A. Sipe, Fairmount, W. Va., U. S. Apparatus for depositing coffins. July 6, 1875.	
4,918.—M. Waterbury, Mason City, Iowa, U. S. Lamp extinguisher. July 6, 1875.	
4,919.—J. Bellamy, Newtonville, Ont. Bag holder and truck. July 6, 1875.	
4,920.—A. D. Williams, Yorkville, Ont. Dinner pall. July 6, 1875.	
4,921.—R. C. Lambert, Quincy, Mass., U. S. Heel and sole trimming machine. July 6, 1875.	
4,922.—R. Osgood, Troy, N. Y., U. S. Dredging machine. July 6, 1875.	
4,923.—E. A. Beers, De Kalb Center, Ill., U. S. Draft equalizer. July 6, 1875.	
4,924.—W. D. Peters et al., Boston, Mass., U. S. Drainer for ships. July 6, 1875.	
4,925.—A. W. Newell, Bradford, Pa., U. S. Tincture and prescription bottle. July 6, 1875.	
4,926.—C. C. Brayley, Toronto, Ont. Rotary engine. July 6, 1875.	
4,927.—N. W. Clark, Clarkston, Mich., U. S. Fish-hatch ing apparatus. July 6, 1875.	
4,928.—W. S. Harland, Clinton, Ont. Self-heating rice pot. July 6, 1875.	
4,929.—J. Payne, New Hamburg, Ont. Thistle destroy- er. July 6, 1875.	
4,930.—A. H. Ladin, New York city, U. S. Disintegrat- ing fibrous substances. July 6, 1875.	
4,931.—A. Forbriger, Cincinnati, Ohio, U. S. Drawing or copy book. July 6, 1875.	
4,932.—D. A. Root, South Bay City, Mich., U. S. Pad lock. July 6, 1875.	
4,933.—W. E. Skinner, Milford, Mich., U. S. Quadrant bevel gage. July 6, 1875.	
4,934.—W. M. Caterson, Philadelphia, Pa., U. S. Poison bottle. July 6, 1875.	
4,935.—C. Windrath, Buffalo, N. Y., U. S. Cigar-bunch- ing machine. July 6, 1875.	
4,936.—B. Patrick et al., Branchton, Ont. Double-acting reversible rotary pump. July 7, 1875.	
4,937.—G. C. Hill, Danbury, Conn., U. S. Ironing board. July 7, 1875.	
4,938.—W. M. Fuller et al., New York city, U. S. Car heater. July 7, 1875.	
4,939.—A. H. Ladin, New York city, U. S. Disintegrat- ing fibrous substances. July 7, 1875.	
4,940.—J. B. McDonald, Tiverton, Ont. Animal poke. July 7, 1875.	
4,941.—D. W. Douglas, Almonte, Ont. Water filter. July 7, 1875.	
4,942.—J. H. Crowell, Providence, R. I., U. S. Machine for making weavers' harness. July 7, 1875.	
4,943.—J. M. Gover, Brockville, Ont. Extension drying table, etc. July 7, 1875.	
4,944.—J. Martin, Jr., Toronto, Ont. Brick-making ma- chine. July 7, 1875.	
4,945.—Russell Pickel et al., Plattsburg, N. Y., U. S. Railway switch. July 7, 1875.	
4,946.—D. Pease, Floyd, N. Y., U. S. Buckwheat clean- ing machine. July 7, 1875.	
4,947.—P. C. Marsh, Northampton, Mass., U. S. Reef- ing sails. July 7, 1875.	
4,948 & 4,949.—E. Gray, Chicago, Ill., U. S. Electro- harmonic telegraphs. July 7, 1875.	

Advertisements.

Back Page - - - - - \$1.00 a line.
Inside Page - - - - - 75 cents a line.
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Adver- tisements must be received at publication office as early as Friday morning to appear in next issue.

For Sale, Cheap.

Large lot of Second Hand Engines and Boilers:
6 H. P. Portables, from..... \$150 to \$250
10 "

(Improved), Key Seat Cutting, Pulley Boring, and Mill
Machines, H. & J. Drills, Steam Engines, and Bailey's V
neering Machines, Cable and Sheaves for transmitting
Power etc. etc. T. H. BAILEY & VAIL, Lockport, N.

Advertisements.

Back Page : : : : : \$1.00 a line.
Inside Page : : : : : 75 cents a line.

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

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

TO LUMBERMEN.

\$100.00 IN GOLD.

In the Great National Sawing Contest, held at Cincinnati, Sept. 1874, The \$100.00 Gold Prize, First Prize Silver Medal for the Best Circular Saw, and First Prize Silver Medal for the Best Cross-Cut Saw, also the two First Prize Medals for the Best Saw Straps and Cross-Cut Saw Attachment, were all awarded to us.

Messrs. EMERSON, FORD & Co., Gentlemen—Nelson Johnson, of this place, put one of your planer Toothed Saws into my mill and sawed 35,000 feet of dry peeled hemlock logs, mostly into one inch fence boards six inches wide, with one set of (30) bits, without sharpening. I consider it the best saw there is in use.

Yours truly,
A. B. CRAIG.

THIS SAW requires NO FILING, NO SETTING, NO ROUNDING, NO GUMMING, and is always one size.

For Price List and Illustrated Catalogue, address
EMERSON, FORD & CO., Beaver Falls, Pa.



Made from pure long fibre Asbestos—Self-Lubricating.
Asbestos Roofing, Boiler Coverings, Paints, &c.
Send for Illustrated Pamphlets, Price Lists, &c.
H. W. JOHNS 87 Maiden Lane, N. Y.
Also for: Downie Trainor & Co., Devonshire St., Boston
Sole by: Kirkwood & Dunklee, 113 Lake St., Chicago.

Portland Cement.
From the best London Manufacturers. For sale by
JAMES BRAND, 35 Cliff St., N. Y.
A Practical Treatise on Cement furnished for 25 cents.

Niagara Steam Pump Works
Established 1862.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N. Y.

PORTLAND CEMENT
For Walls, Chimneys, Foundations, Stables, Cellars, Bridges, Reservoirs, Breweries, etc.
Remit 5 cents postage for Practical Treatise on Cements.
S. L. MERCHANT & Co., 76 South St., New York.



What they say in Europe.

From Messrs. G. W. MURRAY & Co., Engineers, Iron Founders and Machinists, Manufacturers of Agricultural Implements, &c.

"We have now had a few trials of your Tanite Emery Wheels, having used them over 12 months. The ordinary shaped ones (square edges) for dressing castings and general work; those you specially made for us, we use for dressing the teeth of fine pitched wheels. The first cost being so high, and the rapid way they wear, made us give them up at first and go back to the London made emery wheels; but our men (who do the work by piece) agreed to reduce the price so much, if we would supply them, as they said, 'with the fine kind of wheels they had had,' that the reduction does more than pay for the wheels altogether."

Address
THE TANITE COMPANY,
Stroudsburg, Monroe Co., Pa.

Engines and Boilers, New and Second-Hand! Portable and Stationary. For description, address
GOODWIN & WHITE, Oil City, Pa.

GLASS OIL CUPS
of all kinds. Brass Fittings for Steam, Water and Gas.
Brass Castings. Send for Catalogue.
HILLARD & HOLLAND 62 Gold St., New York.

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

Diamond Solid Emery Wheels.
Prices—4x6, \$1.25; 6x8, \$2.25; 8x10, \$3.50; 10x12, \$5.50; 12x14, \$8.50; 14x16, \$12.50; 16x18, \$18.50; 18x20, \$25.50; 20x22, \$32.50; 22x24, \$40.50. All other sizes at proportionate prices. Fast cutting, free from glazing, they are the best Solid Emery Wheels. Give diam. of holes in your order for wheels. Emery Grinders use round by any in the world. AMERICAN TWIST DRILL CO., Woonsocket, R. I., and 15 New Church St., New York.

HARTFORD STEAM BOILER
Inspection & Insurance
COMPANY.
W. E. FRANKLIN, V. P. J. M. ALLEN, Pres.
J. B. FERRIS, Sec.
HARTFORD, CONN.

Working Models
of Experimental Machinery, Metal or Wood, made to order by
J. F. WERNER, 62 Center St., N. Y.

DITCHING and EXCAVATION.
RANDOLPH'S DITCHER and EXCAVATOR: Simple, strong, and adapted to all soils reasonably free from stumps or large stones. Will do the labor of 100 men, steadily, at the cost of ten. Machines of all sizes, cutting from three inches wide, three feet deep, to 36 inches wide, four feet deep. Extra sizes made to order. Circulars, &c., sent on application to
RANDOLPH BROS., 131 Broadway, New York.

BOLT CUTTERS.
Dies open and close and Bolt thrown out automatically. One pattern, holds finished bolts on centres and threads them with greater accuracy and uniformity and ten times as fast as a chaser in a lathe. Highest award of American Institute, 1869 & 1874.
Wood & Light Machine Co., Worcester, Mass. make all kinds of Iron Working Machinery. Also, Shafting, Pulleys, &c.

Mill Furnishing Works

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

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

H. N. WINANS' Boiler Scale Preventive, (11 Wall St., N. Y.) 20 years practical success. No in-oldest, best, cheapest Anti-Incrustant, 15c. per lb.



JASPER, New York, June 18th, 1875.
Of this place, put one of your planer Toothed Saws into my mill and sawed 35,000 feet of dry peeled hemlock logs, mostly into one inch fence boards six inches wide, with one set of (30) bits, without sharpening. I consider it the best saw there is in use.

Yours truly,
A. B. CRAIG.

THIS SAW requires NO FILING, NO SETTING, NO ROUNDING, NO GUMMING, and is always one size.

For Price List and Illustrated Catalogue, address
EMERSON, FORD & CO., Beaver Falls, Pa.

Steam Super-Heaters.

Set under boilers, or in separate furnace, will supply Dry Steam of any required temperature, and save fuel.

HENRY W. BULKLEY, 98 Liberty St., New York.

For showing heat of
Pyrometers, Ovens, Hot blast pipes,
Boiler fires, Super-Heated Steam, Oil Stills, &c.
HENRY W. BULKLEY, Sole Manufacturer,
98 Liberty St., New York

BOLT CUTTERS.

SCHLENNER'S STATIONARY AND REVOLVING
DIE BOLT CUTTERS.

Send for Circulars.

R. L. HOWARD, BUFFALO, N. Y.

DAMPER REGULATORS BEST AND LEVER

MURRILL & KEIZER, 44 Holiday St., Balt.

Machinists' Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.
LUCIUS W. POND, MANUFACTURER,
Worcester, Mass.

WAREHOUSES 96 LIBERTY ST., N. Y.

Lathes, Planers, Boring Mills, Drills and Gear Cutters a Specialty.

THE MAKERS OF A LINE OF STANDARD

and long advertised Mechanical Goods desire an active Agent in each one of the New England States.

Any competent person, giving satisfactory assurance as to the thoroughness and frequency with which he will canvass his State, will receive liberal commission, good protection, and exclusive rights.

Address
MORRIS, Box 2874, New York.

THE NATIONAL Steel Tube Cleaner.

Patented JULY 28 1874.

Adopted and in use by U. S. Navy, for sale by dealers.

Send for Circular. THE CHALMERS SPENCE CO.

Foot E. 9th Street, N. Y. Agents for the U. S.

NON-COMBUSTIBLE STEAM BOILER & PIPE COVERING

WITH AIR SPACE IMPROVEMENT.

Saves ten to twenty per cent. CHALMERS SPENCE CO.,

Foot E. 9th Street, N. Y.; 122 N. 2nd St., St. Louis, Mo.

Excelsior Do Your Own Printing

Portable \$3 Press, for cards, labels, envelopes, etc.

Larger sizes for larger work.

Business Men do their printing and

advertising, save money and increase

trade. Amateur Printing, delight

ful pastime for spare hours. BOYS

have great fun and make money fast

at printing. Send two stamps for full

catalogue presses type etc to the Mfrs

KESEY & CO., Meriden, Conn.

WHEN YOU DESIRE BOOKS, SEND TO GEO. E.

STEVENS & CO., Cincinnati, O. Ask prices for

information.

TO INVENTORS AND MANUFACTURERS

The 44th Exhibition of the American Institute will open

September 9th; Machinery will be received after August 15th, other

goods after August 20th. For particulars address "General Super-

intendent, American Institute, New York."

IRON PLANERS.

ENGINE LATHES, DRILLS, &c. Send for Price List.

NEW HAVEN MANUFACTURING CO.,

New Haven, Conn.

IRON AND STEEL DROP FORGING.

Of Every Description, at Reasonable Prices.

The Hull & Belden Company, Danbury, Ct.

THE BEST INJECTOR

For Locomotive and Stationary Boilers.

FRIEDMANN'S PATENT.

Over 15,000 Now in Use Here and in Europe

Throws more and hotter water, with less steam, than

any others. It has two Waterways, 2x2 Nozzles, and no

movable parts to get out of order.

NATHAN & DREYFUS, Sole Manufacturers,

108 Liberty St., New York.

Send for Catalogue.

T. V. Carpenter, Advertising Agent. Address
Box 725, New York City.

Asbestos Boiler and Pipe Covering,

PATENTED BY US.

Save 20 per cent in fuel. ROOFING IN EVERY STYLE.

ASBESTOS FELTING COMPANY,
316-322 Front St., New York,
Near Gouverneur Street.

Todd & Raftery Machine Co.

MANUFACTURERS OF

The celebrated Greene Variable Cut-Off Engine; Lowe's

Patent Tubular and Pipe Boilers; Plain Slide Valve Sta-

tionary, Hoisting, and Portable Engines. Boilers of all

kinds. Steam Pumps, Mill Gearing, Shafting, &c. Saws,

Tow Ovens, Bagging, Hops, Flax, and Hemp Machinery.

Agents for the New Haven Manufacturing Co.'s Machin-

ists' Tools; for Judson's Governors and Stop-Valves;

Sturtevant Blowers; and Differential Pulley-Blocks.

WAREHOUSES, 10 BAYLEY ST., NEW YORK

WORKS PATERSON, NEW JERSEY.

VALUE OF PATENTS,

And How to Obtain Them.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN PATENTS.

This is the closing inquiry in nearly every letter, describing some invention, which comes to this office. A positive answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his right.

How Can I Best Secure My Invention?
This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct.

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of \$5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, or if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all these countries. Now is the time, when business is dull at home, to take advantage of these immense

foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Canadian Patents.

In order to apply for a patent in Canada, the applicant must furnish a working model, showing the operation of the improved parts; the model needs not to exceed eighteen inches on the longest side. Send the model, with a description of its merits, by express, or otherwise, to MUNN & Co., 37 Park Row. Also remit to their order by draft, check, or postal order, the money to pay expenses, which are as follows: For a five years' patent, \$75; for a ten years' patent, \$95; for a fifteen years' patent, \$115. The five and ten years' patents are granted with privilege of extension to fifteen years.

Trademarks.

Any persons or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for 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.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Copies of Patents.

MUNN & Co. will be happy to see inventors in person at their office, or to advise them by letter. In all cases they may expect an honest opinion. For such consultations, opinions, and advice, no charge is made. Write plain; do not use pencil or pale ink; be brief.

All business committed to our care, and all consultations, are kept secret and strictly confidential.

In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice, address

MUNN & Co.,
PUBLISHERS SCIENTIFIC AMERICAN,
37 Park Row, New York.
OFFICE IN WASHINGTON—Corner F and 7th Streets, opposite Patent Office.



PROSPECTUS
OF THE
SCIENTIFIC AMERICAN,
FOR 1875.
THE MOST POPULAR SCIENTIFIC PAPER
IN THE WORLD.

THIRTIETH YEAR.

VOLUME XXXIII.—NEW SERIES.

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

To the Mechanic and Manufacturer.

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

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

TERMS.

One copy, one year (postage included).....\$3.20

One copy, six months (postage included).... 1.60

One copy, three months (postage included)... 1.00

One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"..... 10.00

One copy of Scientific American for one year, and one copy of "Science Record" for 1875..... 5.20

Remit by postal order, draft, or express.

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

MUNN & Co.

37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. F. JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia and 29 Gold St., New York

SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 6.
(NEW SERIES.)

NEW YORK, AUGUST 7, 1875.

[\$3.20 per Annum,
(POSTAGE PREPAID.)

IMPROVEMENT IN THE VENTILATION OF RAILWAY TUNNELS.

The earlier forms of railway tunnels were built without much reference to the comfort of passengers in respect to ventilation, but the increase of travel, the competition of rival lines, and the demands of an intelligent spirit of improvement have caused renewed attention to be given to the subject. The city of London is traversed in all directions by underground railways, which by their celerity, safety and reliability have become established, in popular favor, as the best means for local travel. Without encumbering any portion of the street surfaces, without creating noise or nuisance to inhabitants along their lines, they afford the most extensive facilities for rapid transit. On a recent holiday in London, the enormous number of 250,000 persons were, it is said, conveyed over the London Underground Railway, and this without taxing the road to the limits of its capacity. The rapidity with which the trains move is something astonishing. The stations are about half a mile apart, and each train, composed of ten or twelve short cars, is equal in length to five or six of the long sixty-seat American cars. During the busy portions of the day, the trains pass each way every two minutes, and it is within this brief space of time that a train starts from one station, moves to the next station, and then discharges and takes up passengers. The Underground Railways of London are composed of many short sections of tunnels, with open spaces between. When the tunnels were built—some ten years ago—but little care was bestowed upon their air supply. The increase of traffic has, however, rendered it desirable to adopt special means to promote ventilation. This has been done at several points by the erection of air shafts at the sidings and stations.

Probably the finest, as it is the latest, example of underground railway construction is that of the Harlem Railway on Fourth Avenue in this city. This great work was fully illustrated and described in our paper last year. The ventilation of the tunneled portions of this road is effected by large openings, made at intervals through the roof of the central tunnel into the street above. The ventilation is fair and gives much satisfaction.

But a still more effective method is that in which the ventilation is done by mechanical means. The tunnel being nothing more or less than a walled chamber, it is only necessary to apply a fan, in a suitable manner, and the entire

air contents of the tunnel may be unerringly changed, every minute, or less frequently, as may be desired.

The well known railway tunnel of the London and North-western Railway, under the city of Liverpool, is now ventilated by means of a single steam fan of large dimensions, placed near the center. This mechanism changes the entire contents of the tunnel in about eight minutes. Such a ventilation gives a purer atmosphere than that enjoyed by the majority of people within the apartments of their homes or places of business.

Our excellent cotemporary *Engineering* gave an estimate not long ago, showing that the underground railway tunnels of London might be mechanically ventilated, by taking the air from them at or near the several stations, by engines of three horse power, at a fuel cost of only about six to eight cents per mile per hour, the air being changed hourly.

The improvement we herewith illustrate is intended for the same general purpose, and is the invention of Mr. Joseph Dixon, of the Broadway Underground Railway of this city. Patented May 25th, 1875. The invention consists in the combination of one or more partitioning doors and a blowing apparatus, with the tunnel. As shown in our engraving, the blowing apparatus, operated by steam, is seen in a chamber at the right of the tunnels. The blower communicates by a horizontal air pipe, shown in dotted lines, with the roofs of the tunnels; and when the tunnel doors are closed and the blower set in motion, there will be a strong exhaust or outflow of air from the tunnels through the blower, which discharges into an adjoining chimney, the fresh air entering at the opposite ends of the tunnels, which are always open. The blowers may be used to force fresh air into the tunnels, if desired.

This method will at once commend itself by its simplicity, effectiveness, and economy. The plans of the inventor include the opening and closing of the tunnel doors automatically by the movement of the cars, by means of a simple arrangement of levers. For further information, address the patentee, Joseph Dixon, 263 Broadway, New York.

Lady Jane Franklin.

The fact of Lady Franklin's illness has been known for a considerable period, so that the news of her death, which occurred on the 18th of July, is not unexpected.

Sir John Franklin sailed in search of the northwest pas-

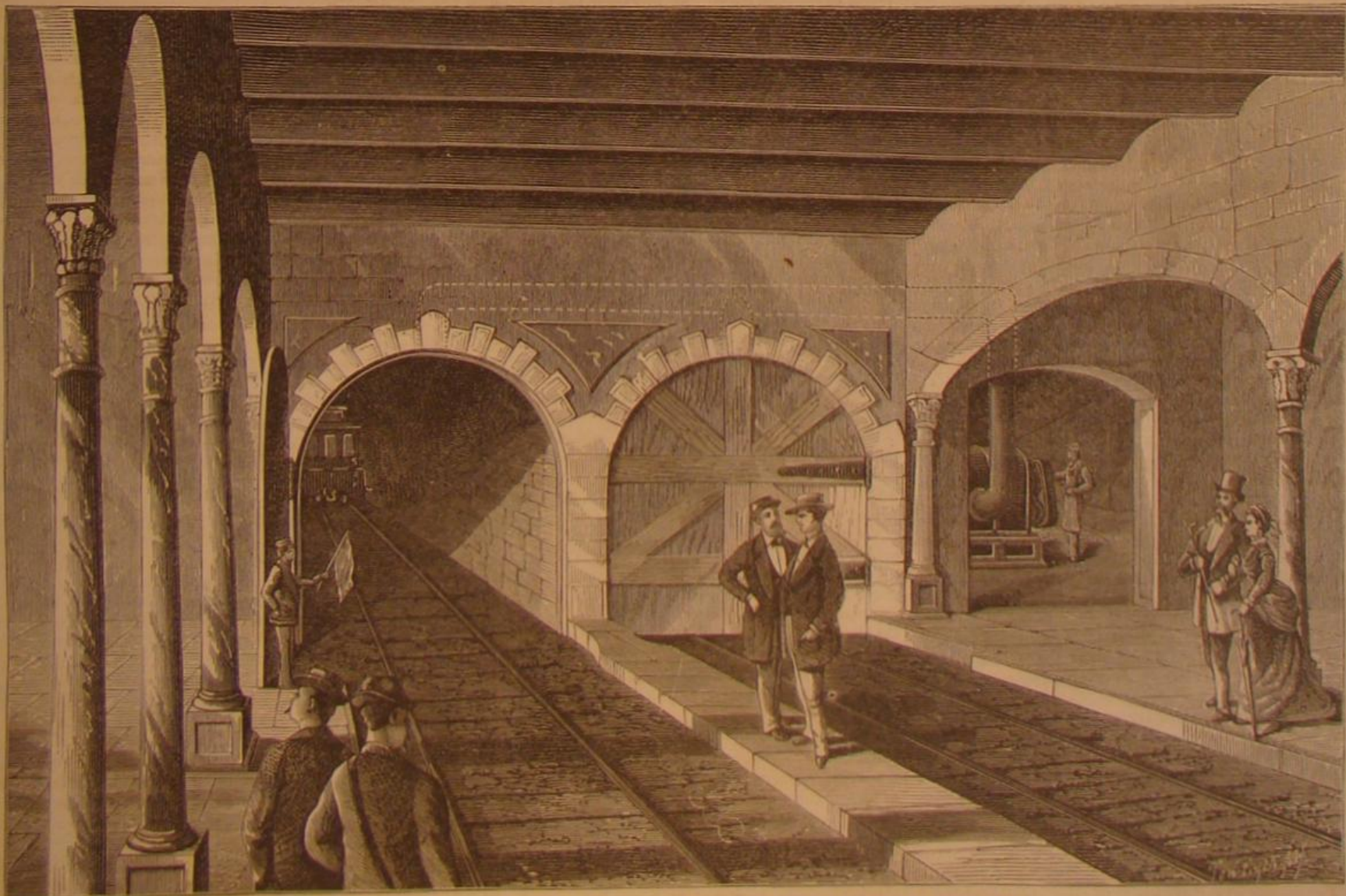
sage in May, 1845, with a small and poorly equipped expedition composed of the ships *Erebus* and *Terror*. In 1847, no tidings of the party having reached England, Lady Franklin began that series of heroic efforts at first to rescue her husband, and subsequently, after his fate had become known, to regain his remains or the records of his labors which she always believed he had left behind him. In 1848, she offered rewards of \$10,000 and \$15,000 to any persons who would carry relief to the missing explorers or attempt so to do. In 1849, she sent, through the President of the United States, a touching appeal to the American people for aid in her search. The Grinnell expedition was the response. In the following year, and subsequently, Lady Franklin fitted out numerous expeditions at her own cost, all of which, however, proved unsuccessful. In 1857, the steamer *Fox*, under the command of Captain Leopold McClintock, was despatched by her, and this vessel, after three years' sojourn in the arctic regions, returned with the first definite news of Sir John Franklin's death and of the abandonment of the *Erebus* and *Terror*.

The reception of this sad intelligence in no wise abated the interest felt by Lady Franklin in all matters concerning arctic expeditions. She still sought further tidings of her husband's expedition, and offered liberal rewards for the same. In 1870, although at the advanced age of sixty-five years, she came to this country in order to converse with Captain Hall, previous to that explorer's departure on the *Polaris* voyage.

Three years ago Lady Franklin purchased a mansion in England for the reception of the relics of Sir John's party. No one was more engrossed than she in the objects of the expedition which has just left England, and before its sailing she again offered rewards for the discovery of the last message which she was certain her husband had written her, and deposited in some place of safety.

Some three weeks ago, Lady Franklin sent by telegraph a request to the Christian people of this country, that they would remember her in their prayers on the following Sunday. The knowledge that her appeal met with an earnest and hearty compliance probably mitigated the last sufferings of one whose whole life will pass into history as a model of pure and wifely devotion.

COAL ashes, sifted very finely, thoroughly ground, and mixed with oil, make a good cheap paint. Any coloring matter may be added.



IMPROVEMENT IN THE VENTILATION OF RAILWAY TUNNELS.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 87 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS.

One copy, one year, postage included.....\$3 20
One copy, six months, postage included.....1 60

Club Rates:

Ten copies, one year, each \$2 75, postage included.....\$27 00
Over ten copies, same rate each, postage included.....2 70

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

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

VOLUME XXXIII, No. 6. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, AUGUST 7, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Aluminate of soda (28).....	32
Answers to correspondents.....	33
Asphalt for packing floors, etc (19).....	33
Bag fasteners.....	33
Batteries, power of (2).....	33
Battery, chromic (3).....	33
Battery, paper in a (11).....	33
Bee culture, city.....	33
Belt couplings.....	33
Bottle explosions, mysterious.....	33
Boiler, rotary, rag.....	33
Boro-silicate of soda (39).....	33
Bridge, another Brooklyn.....	33
Buckles.....	33
Business and personal.....	33
Casting free from holes (34).....	33
Cigar wrapper knife.....	33
Countersink drills.....	33
Decimal divisions of circle (72).....	33
Donaldson the aeronaut.....	33
Drilling hand tools.....	33
Electrical news, the.....	33
Electro-motor, power of (13).....	33
Elevator for granular matters.....	33
Fastenings.....	33
Franklin, Lady Jane.....	33
Frozen water in bottles.....	33
Gas, olefant (26).....	33
Gasoline difficulties (2).....	33
Glass, field, power of (15).....	33
Gold from ore, extracting (22).....	33
Grass planted by grasshoppers.....	33
Grindstones, softening (37).....	33
Hydrometers, the various (16).....	33
Ink for stamping on leather (34).....	33
Ink recipe for (40).....	33
In memoriam.....	33
Inventions patented in England.....	33
Iron, pig, in the United States.....	33
Key holder.....	33
Lead and tin foil.....	33
Life, physical, after death.....	33
Lightning rod difficulties (6).....	33
Locan, Sir W. E.....	33
Magnets, power of (7).....	33
Marble, filling cement for (38).....	33
Matter, ponderable, and the ether.....	33
Mechanical movement, new.....	33
Motor deception, the Keely.....	33
Paint for farm tools.....	33
Patent decisions, recent.....	33
Patent law changes, English.....	33
Patent law discussion, English.....	33
Patents, American and foreign.....	33
Patents, list of Canadian.....	33
Patents, official list of.....	33
Pin drills.....	33
Power for gears (20).....	33
Practical mechanism—No. 25.....	33
Recipes, useful.....	33
Reels, abingie (30).....	33
Salicylic acid, soluble, etc.....	33
Saw, joining band (43).....	33
Shellac, dissolving (21).....	33
Ship, the Russian circular.....	33
Slitting or keyway drills.....	33
Soldering fluids (25).....	33
Sparks, arresting (41).....	33
Steel for springs (32).....	33
Tannate of gelatin (23).....	33
Telegraph difficulties (4).....	33
Telegraph ground plates (8).....	33
Telescope lenses (10, 14).....	33
Tempering springs (31).....	33
Tin and lead foil.....	33
Trade marks, Centennial.....	33
Tunnels, railway, ventilating.....	33
Tweezer for smith's use.....	33
Verdigris, preventing (37).....	33
Water and nitroglycerin.....	33
Water, pumping, etc. (18).....	33
Whale power, steam.....	33
Wire for deep sea soundings.....	33

PHYSICAL LIFE AFTER DEATH.

Man is a physiological trinity. His life is threefold. At the base, and embracing the phenomena of circulation and nutrition, is the organic life, as Bichat terms it—the life which the animal shares with the plant. Resting on this is the animal life, as exhibited in the phenomena of the sensory nervous system; and intimately connected with the latter, as its highest development, is the mental life, characteristic of man. These three are one, but not inseparable. They are not born together, nor do they always die together.

Death is not a simple phenomenon, nor one of instantaneous occurrence. When man dies normally, as of old age, he dies like a tree, in detail, beginning at the top. The series of slow and partial deaths which, with the old man spared by disease, result in the last end of all is eloquently described by Papillon.

"All the senses in succession are sealed. Sight becomes dim and unsteady, and at last loses the picture of things. Hearing grows gradually insensible to sounds; touch is blunted into dullness; odors produce but a weak impression; only taste lingers a little while. At the same time that the organs of sensation waste and lose their excitability, the functions of the brain fade out little by little. Imagination becomes unfixed, memory nearly fails, judgment wavers. Motions become slow and difficult on account of stiffness in the muscles; the voice breaks; all the functions of outward life lose their spring. Each of the bonds attaching the old man to existence parts by slow degrees. Yet the internal life persists. Nutrition still takes place, but very soon the forces desert the most essential organs. Digestion languishes the secretions dry up, capillary circulation is clogged, in their turn that of the large vessels is checked, and at last the heart's contractions cease. This is the instant of death. The heart is the last thing to die."

This orderly sequence and painless closing of life is, however, comparatively rare. Sometimes the mind dies long before the animal life is seriously affected, as when death is preceded by years of imbecility. Sometimes death seizes first upon the extremities and creeps upward, the mental powers remaining intact to the last. Again the mind may flicker with unwonted brilliancy after the animal life has seemed to go out. In all cases, however, the organic life is the last to yield.

A tree does not die instantaneously when felled, though death begins at that moment; similarly life persists in the animal body after the thread of animal life is severed. And as slips from a felled tree may be grafted upon a living trunk, and thus escape the death of the parent stem, so may portions of a dead animal be transplanted to the living, and so have their life perpetuated.

If death were immediate throughout the entire organism, such a transference of members without any interruption of their physiological activity would be utterly impossible.

Thus the vital knot of Flourens, the point in the spinal marrow which that physiologist made the seat and center of vitality, is effectually disposed of. It is true that any disturbance of that portion of the nerve is more fatal than a like disturbance of any other part of the organism; but that is not because it differs in kind from other portions of the nervous system. Life is not more concentrated there than elsewhere; that is simply the initial point of the nerves which animate the lungs; and the breath ceases, and death quickly ensues, when their office is interfered with.

Unlike the remarkable small dog of the nursery rhyme, animals, even the highest of living creatures, do not die "all over" at once. Our bodies are composed of many more or less independent parts, each living its own life, while contributing to the life of the whole, and each dying by itself. The human tissues may not retain their individual vitality so long as those of the lower orders of life, still they are very slow of dying. The hair and the nails continue to grow, and even the complicated processes of absorption and digestion go on for hours after the life of the organism has apparently ceased.

The throbbing of a frog's heart after its complete separation from the rest of the body is often described as a characteristic illustration of the persistent vitality of reptilian structures. But the human heart will do the same. In the case of decapitated criminals, it has been observed that the uncovered heart, even when the stomach, the liver, and the intestines have been removed, will continue the pulsations for an hour or more after the guillotine has done its fatal work. One day when Robin was operating on the body of a criminal an hour after his execution, an example of reflex action was observed as remarkable as any of the seemingly intelligent movements recorded of the limbs of decapitated frogs.

"The right arm," says Robin, "being placed obliquely extended at the side of the trunk, with the hand about two inches away from the hip, I scratched the skin of the chest, at about the height of the nipple, with the point of a scalpel, over a space of nearly four inches, without making any pressure on the muscles lying beneath. We immediately saw the great pectoral muscle, then the biceps, then the anterior brachial, successively and quickly contract. The result was a movement of approach of the whole arm toward the trunk, with rotation inward and a half flexion of the forearm upon the arm, a true defensive movement which threw the hand forward toward the chest as far as the pit of the stomach."

Such spontaneous exhibitions of life by the dead are trifles, however, as Papillon observes, compared with those which may be excited by means of certain stimulants, particularly electricity. In evidence he cites the experiments of Aldini on two criminals beheaded at Bologna, and those of Ure, in Glasgow, on the body of a criminal that had remained an hour hanging on the gallows: the details of which are too horrible for repetition.

Less horrible, but not less remarkable and instructive, was an experiment made by Brown-Séquard on the head of a decapitated dog. Having beheaded the animal, taking pains to make the section below the point at which the vertebral arteries enter their bony sheath, the operator fitted to the arteries little pipes, connected by tubes with a reservoir of freshly oxygenated blood. At this stage the head failed to respond to the action of electricity; but when a current of blood was forced into the arteries, irregular motions of the eyes and the facial muscles began, succeeded by regular harmonious contractions, as if prompted by the animal's will. The injection of blood into the cerebral arteries was kept up for a quarter of an hour, during which the mimicry of life was continued. On stopping the injection, the motions ceased, and the spasms of a second death ensued.

The question was raised whether such a temporary renewal of life could be brought about by the same means in a human subject. Brown-Séquard was confident that it could be done, even with the head of one decapitated by the guillotine, provided certain precautions were taken to prevent the filling of the arteries with air. But when it was proposed to him to try the experiment on a condemned criminal, he declined, not wishing, he said, to witness the agony of such a human fragment temporarily recalled to sensibility and life.

Enough has been given to show that life and death are not such simple affairs as is popularly supposed; and that in another sense than the poet meant, it is not all of life to live, nor all of death to die.

We will close with a suggestion to sensational novelists: Having "snarled up" the hero of the tale in a maze of circumstantial evidence, it would make a very stunning denouement to save him at last, by means of a *post mortem* confession of the crime by a murderer executed for another crime, the confession to be extorted through the combined agency of galvanism and the transfusion of fresh blood!

Or the clever concocter of scientific hoaxes for the *World* might surpass himself by giving a detailed account of such an operation on some obscure victim of rural justice, wherein the resurrected man might make confession of the Nathan murder and reveal the whereabouts of Charlie Ross.

THE KEELY MOTOR DECEPTION.

The Chicago *Railway Review* avers that the *SCIENTIFIC AMERICAN* and other papers have proceeded to kill, dissect, analyze, and condemn Keely's pretended motor, when they confessedly know nothing about its operation or construction. But the *Review* is evidently in error here, for the Keelyites have given many details, not only of the mode of operating the motor and producing the "cold vapor," but also of the manner in which the treasury of the Keely Motor Company was supplied with cash. It is from this information, furnished in pages full at a time by the

parties themselves, in their anxiety to get their scheme before the public, that the adverse conclusions complained of by the *Review* have been reached.

The concurrent testimony of the leading members of the Keely Company, as voluntarily published by themselves, is that Keely produces his alleged power by blowing with his mouth, for 30 seconds, into a 3½ gallon kettle, then lets in a little water, then turns a cock, and behold! he has produced a "cold vapor," having an energy of from two to ten thousand pounds per square inch. The inner arrangement of the apparatus, with its pipes, chambers, nozzles, valves, and connections, is described, and great pains is taken to reiterate that no heat, electricity, chemicals, or other substances save air and water are employed, and nothing is done except to operate the faucet. Now you see it, and now you don't, according to the way the cock is turned. Such in brief is the Keely motor. Mr. Collier, the Philadelphia lawyer and financial agent of Keely, testifies that he made three visits to New York, and obtained in all the sum of one hundred thousand dollars from capitalists here. This money, he says, he obtained by exhibiting to the parties the avowed of Keely substantially to the above purport, Charles H. Haswell, who had witnessed Keely's performances and personally tested and reported upon the apparatus, being among those present. After a portion of the money was paid, the victims were, by agreement, allowed to witness the motor for themselves, and the balance was then obtained from them. A curious fact in connection with this business is that Mr. Haswell now earnestly denies that he assisted the deception or endorsed the integrity of Keely's operations.

More than a year ago we published portions of Mr. Haswell's report given in endorsement of Keely, on the strength of which, Mr. Collier tells us, he obtained the first ten thousand dollars from the New Yorkers. Mr. Haswell has never until now complained of our comments then made. Under date of June 26, 1875, Mr. Haswell writes another report in behalf of the Keely motor, published by us on page 37, current volume. In this report he confirms, at some length, all that he had previously written, specifies the tests he personally made, and again commits himself in support of the scheme. But in the next breath, he writes us complaining that we have done him injustice, and especially requests us to print the subjoined note for his vindication, which we do with pleasure, leaving him to reconcile, as best he can, the denials which he now makes with the various reports in behalf of Keely which he has placed before the public.

To the Editor of the Scientific American:

Your notice of my query to you of the 17th inst. involves a repetition of it.

Thus: Am I to understand that my mere report of certain results, which I saw developed by a vapor in Mr. Keely's house, are held by you to be an endorsement of the integrity of the operation Mr. Keely claims for the generation of it? I being wholly ignorant of the construction of the instrument of generation, or the manner of operating it?

Further, I never was employed, as asserted by you, to test the motor, neither have I done it, or do I know of any one who has.

The gentleman to whom my query was confided appears to have overlooked the fact that observation and analysis are very different matters. I am, respectfully,

CHAS. H. HASWELL.

New York, June 28, 1875.

We have received from all parts of the country many original contributions relating to the Keely motor, *pro and con*, also many new plans for motors quite as wonderful, if not exceeding in merit, the Keely device. Our limited space will only permit the publication of a few of them. Among the essays received is one in which the writer bases his advocacy of the Keely nonsense upon the fallacious but popular idea that water, like nitroglycerin, contains a vast amount of force, ready to be liberated by the mere pull of a trigger. We are unable to publish the entire article, but we make the leading thought of its contents the basis for a few remarks in an article upon some of the practical differences between the two substances mentioned.

ENGLISH PATENT LAW DISCUSSION.

We gave a brief abstract not long ago of the Patent Law Reform Bill introduced in the House of Lords by Lord Cairns. The bill was full of objectionable clauses, its main purport being to bring about the abolition of patent grants in England. The aristocracy of Great Britain have reached the conclusion, substantially, that inventors and their patents are a nuisance, do more harm than good, and ought, as far as possible, to be legislated out of existence. So the bill passed the House of Lords, and was sent to the House of Commons, where it now is.

It is almost unnecessary to say that the adverse sentiments of the Lords, expressed during the discussion of the bill and confirmed by its passage, created the greatest dissatisfaction among working men, engineers, manufacturers, and all who have at heart the advancement of knowledge, Science, and useful industry. Meetings were immediately called in remonstrance against the further movement of the bill, and large numbers of petitions to that end from societies and influential personages have already been sent in to Parliament. The prospect now is that the bill cannot pass the Commons, and will therefore fail to become a law.

For several years past there has been going on in England a discussion of reforms thought to be necessary in the patent law, the prevailing idea being that some radical alteration was necessary, although no agreement could be reached as to what precise change was essential. The present endeavor of the Lords to abolish patents has quickened the discussion, and induced a more practical examination of the present law than ever before. The result appears to be that the existing English law, when compared with that of

other countries, is found to contain many excellences, and the general impression is that it really needs only a few changes.

Under the existing British patent law, any person, whether the inventor or the mere introducer of a new invention, may receive a patent. A specification and drawings are required, but no model. No official examination is made. The question of the validity of the patent is settled by the courts. If the invention described in the patent is proved on trial before the court to have been an old or known device, the grant is void; otherwise, its validity is maintained. The principal points of change now suggested are:

1. A reduction of fees, \$875 being the official charges now made for a fourteen year patent.

2. The granting of patents only to inventors, mere introducers of novelties being at present allowed to take patents.

A third point of reform, very strongly discussed, is the propriety of having examiners to decide upon the novelty of the invention, before issue of the patent, as in this country.

The general drift of the discussion on this head in England appears to be that, while an official preliminary examination has certain advantages, it is also attended with serious disadvantages; and that, on the whole, it would be better to let the law stand as it is, leaving the applicant to make his own examinations. All agree, however, that better facilities for the printing, indexing, and access to existing patents should be provided.

The diverse workings of the system of official examinations is shown in Prussia, where almost every application for patents is rejected, and in the United States, where four fifths of all applications are finally granted. In both of these countries, especially in the United States, in addition to court trials, a vast amount of litigation attends these official examinations at the Patent Office, which is almost unknown in England.

We give, on another page, as an example of the current patent law discussions now going on in England by the ablest minds, an abstract of the recent proceedings of the Institution of Mechanical Engineers on the subject.

CENTENNIAL TRADE MARKS.

As the time approaches for the opening of the great Centennial Anniversary and Exposition, the word "Centennial" becomes more and more familiar and popular in the public mind; hence it has become a favorite stamp for trade goods of almost every description. "Centennial" hats, caps, gloves, brushes, "Centennial" this, that, and the other, are all the rage now; and quite a little rush has been going on at the Patent Office for several months past, for registration of these Centennial trade marks.

The Patent Office has sought to gratify and satisfy the applicants by allowing registration in every case where it had not been previously granted for the same class of goods or articles. But it would appear that such registrations are not likely to be sustained, in any broad sense, by the Courts.

In the United States Circuit Court at Philadelphia, recently, there came up the case of *Hartell vs. Viney*. In the bill of complaint, in which the court was asked to restrain the defendants from the use of a design of the Centennial buildings on medals and the use of the word "Centennial," it was argued that, though the design upon the medals manufactured by the defendants was not an exact copy of the one used by the complainants, it bore so close a resemblance to it as to deceive the public, and that the use of the word "Centennial" was a clear violation of the law of trade marks.

The judge refused to grant the injunction. He said there were two questions to be determined—first, as to the patented design of the complainants and the effect of the two patents. The former had not been copied, but defendants had merely used one of a similar kind. In doing so, there had been no abridgment of their labor and no appropriation of the subject-matter.

In considering the second question, that of the trade mark, the judge did not think the word "Centennial" could be appropriated by any person or association exclusively. It had been applied to works of art for several years, and had been used in the public laws of the United States since 1871. It had been applied to lager beer, to fancy soaps and fancy clothing, and to an infinite number of articles, ornamental and useful. A word of such general use and of so common application could not be the exclusive property of any one. And in the use of such as a trade mark, no court of equity would afford a remedy against a person who had appropriated it.

It has all along been held that no person was entitled to the exclusive use, as a trade mark, of the mere name of a well known article of trade. For example, no hatter could register, as his exclusive mark, the word "hat." The present decision places the word "Centennial" in the same category, and declares that this word cannot, of itself, become a lawful trade mark; and therefore the registration of combined words, such as "Centennial hat," will not prevent others from using the same words upon similar goods.

In order to secure an exclusive right, in connection with the word "Centennial," it will be necessary for the applicant for registration to add a new pictorial device, or some new and distinctive word or title, to be used in connection with the word "Centennial." The following is the statute upon the subject, section 79, law of 1870:

The Commissioner of Patents shall not receive and record any proposed trade mark which is not and cannot become a lawful trade mark, or which is merely the name of a person, firm, or corporation only, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons, or which is identical with the trade mark appropri-

ate to the same class of merchandise and belonging to a different owner, and already registered or received for registration, or which so nearly resembles such last-mentioned trade mark as to be likely to deceive the public: Provided, that this section shall not prevent the registry of any lawful trade mark rightfully used at the time of the passage of this act.

THE DIFFERENCE BETWEEN WATER AND NITRO-GLYCERIN.

One of our correspondents, writing to us in advocacy of the possible truth of the Keely motor deception, bases his conclusions upon the following premises:

"We know that there is an enormous power stored up in nitroglycerin, which may be liberated by a small mechanical force. We know that there is a similar power in water; and because we have never discovered a mechanical means of liberating it, it does not necessarily follow that it cannot be done."

Now the fact is that we know there is not a similar power in water, because water is water, and it is not nitroglycerin, nor anything equivalent to it. Nitroglycerin consists of unburnt carbon and unburnt hydrogen, with oxygen enough to burn it up, which oxygen is loosely held by the nitrogen; the latter is ready to give up or let loose its oxygen on the least cause being given, such as a jar or a blow, when at once it is taken hold of by the carbon and hydrogen, which are then as rapidly, and even more rapidly, burnt than the carbon and sulphur in gunpowder, which also find the oxygen needed for their combustion in the niter mixed with them. It is in these cases the combustion of the nitroglycerin and of the gunpowder, and not so much their expansion by the enormous heat produced, which is the cause of their power. This is proved by the explosion of the mixture of two volumes of hydrogen gas with one volume of oxygen; the result of the combustion, watery vapor, has a volume $\frac{1}{2}$ less than the mixture, and the water produced by its condensation a volume of some 500 or 600 times less; but the temperature developed, that of the oxyhydrogen blowpipe, is one of the highest we are able to produce, and this heat it is which expands the gases so enormously that a soap bubble, filled with this mixture and touched by a flame, explodes with a report like that of a pistol. The result of the explosion is a few drops of water. Water is thus the product of the combustion of hydrogen; in other words, it is burnt up hydrogen, which lost its latent energy at that early period of the earth's formation when all the free hydrogen was burnt up into water. To suppose that water could again develop so much energy is equivalent to attempting to burn the ashes of wood, the cinders of coal, the vapor of gunpowder or of the exploded nitroglycerin, over again. The products of the combustion of the latter substance are mainly water and carbonic acid, and there is the end of it.

Any one who possesses a little knowledge of the elementary principles of chemistry knows that water and air consist mainly of three gases, oxygen, hydrogen, and nitrogen, with a small amount of carbonic acid; he knows that the most learned chemists, men devoting their whole lives to the science, have during a century exhausted their ingenuity and patience to study the properties of these elements and their possible combinations, so that at last these have become parts of the most positive science. Therefore, such startling announcements as of a gas with a volume 500,000 times greater than water, as have been made by Mr. Keely, can, by any person possessing the least information, be only received with serious suspicion.

THE USE OF WIRE IN DEEP SEA SOUNDINGS.

The advantages of wire for deep sea soundings are many and great. Not the least of its merits, compared with rope, are the smallness of its area for the required strength and the smoothness of its surface. By the use of wire, too, the need of cumbersome and expensive apparatus for casting and hauling-in is avoided, and also the loss of three or four hundred pounds of lead at every casting. With rope the work is more difficult and tedious, and less sure at 500 fathoms than at 2,000 with wire. With rope, used in the ordinary way, six men have a heavy haul to bring up the lead in soundings of fifty to sixty fathoms when the ship is under way. By the wire process, a cabin boy can bring up a 34 pound sinker with ease, from the depth of an hundred and fifty fathoms, with the ship going on her course from four or five knots up to full speed. Presenting a smaller surface to the water, the wire is less affected by currents, a lighter sinker can be used, and it is possible to reach the bottom in many cases where sounding by the old method would be impossible. The first experiments with wire were failures, owing to the weakness of the splices made. Though the splice might hold, the stiffening of the wire by the solder used made the joint treacherous, the wire snapping at the edge of the solder. It was sought to obviate this difficulty by using a sounding wire drawn in one piece, and a company in Manchester, England, succeeded in producing for Sir William Thomson a length of crucible steel wire three nautical miles long without a splice. But it was found impossible to make such wire of uniform strength. It would have weak spots, and was liable to kink and snap like packthread. At last Sir William hit upon the happy device of making a strong splice by a long succession of weak and somewhat flexible fastenings, which enabled him to use pianoforte wire, in lengths of two hundred yards. The size employed is No. 22 Birmingham gage, weight 14½ pounds to the nautical mile, and strength exceeding a strain of 240 pounds.

By the use of an auxiliary hauling-in apparatus, it was found possible to avoid the crushing strain on the formerly used apparatus, which made it necessary to abandon the sinker every time a deep sounding was made—a great item in the cost of such observations. Now the sinker can be recovered

from depths not exceeding 3,000 or 3,500 fathoms under ordinary favorable circumstances. Where the depth exceeds 4,000 fathoms, a 100 pound sinker is used, with trigger apparatus for detaching it when it reaches the bottom. For depths of 3,000 fathoms or less, a 30 or 35 pound sinker without detaching apparatus is preferred.

Using these improvements, it is also found easy to take soundings of 2,000 or 3000 fathoms from a sailing vessel hove to in moderate weather, that is, hove to while the line is running out, and until a few hundred fathoms of wire have been hauled in. When the length out does not exceed 2,500 fathoms, the ship may be driven ahead slowly with gradually increasing speed, rising to five or six knots when 1,500 fathoms are out, and to ten or twelve knots while the last 500 fathoms are being raised. Thus a great saving of time is made; for in the ordinary process with hemp cord, the ship has to lay to while all but a few hundred fathoms have been brought in. The only failures in sounding with pianoforte wire have been owing to a neglect of applying a sufficient resistance to the paying out wheel to balance the weight of wire out.

With a 34 pound sinker, it takes about thirty minutes to reach a depth of 2,000 fathoms. Where greater expedition is required, a heavier sinker is used. A 34 pound sinker can be brought up from 2,000 fathoms in about fifteen minutes, making forty-five minutes for the sounding. But the detention is less than this, since the greater part of the line can be hauled in while the ship is proceeding on her course. Using a 150 pound sinker, without recovery, the sounding can be made at 2,000 fathoms with only about twenty minutes' detention. Soundings of 1,000 or 1,500 fathoms with a 34 pound sinker require a stoppage of twenty minutes while the lead is going down, the ship going ahead at full speed as soon as the lead strikes the bottom.

By a properly planned brake resistance, it is arranged that, as the weight nears the bottom, there is an increasing resistance to its motion, so that the paying out wheel stops promptly; there is no coiling of the wire on the bottom, and no danger of kinks. Even at so great a depth as 4,000 fathoms, the perception of the bottom is instantaneous.

Complaining of the indifference of the British Admiralty to this improved method of sounding, as manifested by their holding to the old cumbersome and tedious method, even in the fitting out of a vessel like the *Challenger*, Sir William Thomson pays a high compliment to American naval officers. He says:

"They found my apparatus full of defects. They never asked me to perfect it, but they perfected it in their own way and obtained excellent results. [Witness Commander Belknap's soundings in the North Pacific.] I went on independently in another line, and made a considerably different apparatus from that which is now being used by the Americans; but I was very much struck by the great zeal and the great ability which the American naval officers showed in taking up a thing of this description, which had been merely proved to be good, and charged themselves with improving the details and making it a workable process."

To keep the wire from rusting when not in use, Commander Belknap immersed it in oil. The English use a solution of caustic soda, which prevents rusting well enough, but has the bad effect of corroding the solder of the splices.

The Rumored Death of Donaldson the Aeronaut.

Mr. Washington A. Donaldson and a reporter of a daily journal in Chicago started on a balloon trip from that city several days ago. Nothing has since been heard from them, and the fact of their balloon having taken a course directly over Lake Michigan, and probably encountered a severe storm which arose shortly after their departure, is taken as basis for the supposition that both the daring aeronaut and his companion have perished. Captains of vessels report sighting the air ship, with its car dragging in the lake; but as yet there are no tidings of any portion of the balloon nor of the bodies of the men being found. We should regret exceedingly to learn of Mr. Donaldson's death, for, though rash even to foolhardiness, he was one of the most experienced and skillful aeronauts living, and an inventor of no small genius. For the present, we prefer to believe in his safety, and to cling to our first suspicion that the affair is another of those shrewd advertising dodges for which Mr. P. T. Barnum, with whose show Donaldson was connected, is famed.

Grass Planted by Grasshoppers.

A curious fact connected with the grasshopper raid in Western Missouri is that, wherever pastures have been destroyed by the insects, new varieties of grass, which never before have been seen in the localities, have sprung up. The principal species is a green bunch grass of luxuriant growth, covering ground formerly yielding nothing but blue grass. Cattle eat the new species with avidity. It is conjectured that the seed was brought to the region and deposited by the grasshopper swarm which laid their eggs there last fall. Some definite explanation of the phenomenon would be very interesting, since it is not known where the grass originally grew or what may be expected of it, if its growth continues, in the future. Possibly the grasshoppers may prove a blessing yet.

The Electrical News.

This is the title of a new weekly periodical published in London, under the editorship of Professor William Crookes. Its programme of contents is intended to embrace all matters relating to the science of electricity, together with special reports of progress in the art of telegraphy and the various practical applications of electrical machinery. It is a handsomely printed publication, in magazine form, twelve pages. We welcome its advent, and wish for its success.

IMPROVED ELEVATOR FOR GRANULAR MATTERS.

Our illustrations show an ingenious adaptation of the injector principle to the elevation of corn and other granular material, utilizing the power of the steam directly, and saving the expense of the usual rotary mechanism. It is the invention of Messrs. Korting Brothers, of Hanover, Germany, whose improvements on the injector are too well known to need recapitulation here; and the inventors describe it as especially adapted for raising pulverized charcoal in sugar refineries, but the adaptability of the principle to our grain elevators is sufficiently obvious.

An hermetically closed receptacle, D, is supported above the point to which the charcoal is to be raised, and a partial vacuum of greater or less pressure is created therein by a steam exhauster, V. The receptacle, D, is connected by a suction tube, C, with the suction base, A, Fig. 3, which takes up (by a bottom opening, O, and a suction opening, B) the air, and carries it in upward direction with a velocity corresponding to the force of the vacuum created in the receptacle. The current of air acts on the charcoal entering through the funnel-shaped part, A, Fig. 3, of the suction base, and carries the same, through the suction tube, C, upward into receptacle, D, where the charcoal, owing to the reduced velocity of the air in the larger receptacle, falls by gravity, and the air is drawn off through the exhauster. The exit tube, E, extends from the bottom of the receptacle, D, to the point of discharge, and has an automatically working valve, K, which is opened by the weight of the charcoal in the discharge tube. The tube, E, must be of such a length that the body of charcoal in it when the valve, K, is opened will be of sufficient thickness to prevent the air from entering the receptacle, and therefore the exhaust air will be compelled to pass through the suction base, and be available for raising the material. A funnel below the discharge valve may be connected by a telescope tube with the filters, etc., to convey the charcoal directly to the point where it is required for use. The quantity of charcoal, etc., raised is regulated by the exhauster and the adjustable base. No engine is required; and as a steam pipe is all that is necessary to work the elevator, the apparatus may be erected at any point in a factory. The construction is simple; and the elevator needs hardly any repairs, and is always ready for use. Moreover it does not pulverize the charcoal, a fault common to the various belt and bucket elevators, and one that occasions considerable loss.

grocery or household, the storing companies, with their huge monopoly, their cumbrous carts, and their high charges (owing partially to risk of storing too much, to the great waste, and to interest on money sunk in the process), may soon be gone from among us.

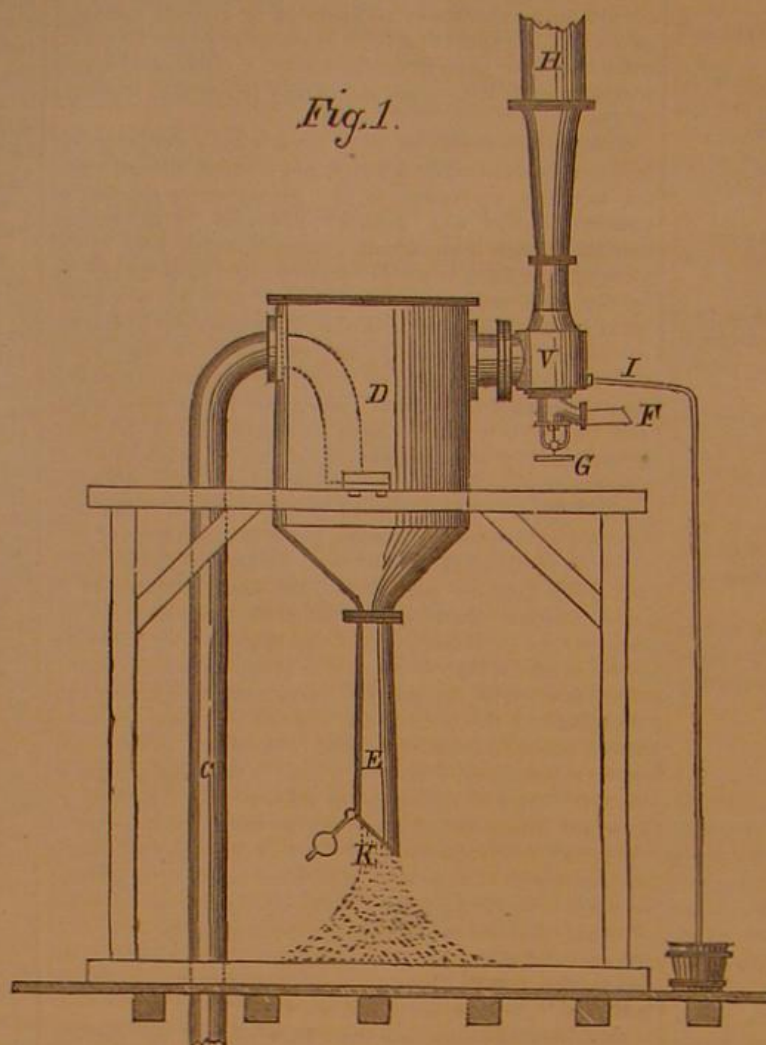
Lead and Tin Foil.

Many metals and alloys can be hammered or rolled into thin sheets, and in this operation the ordinary molecular structure, which they have when cast, is changed, and they

Beside the noble metals, which were used by the oldest civilized nations, bronze (an alloy of copper and tin) was also employed by the ancients for useful utensils, for at the present day a glance at Pompeii teaches us how extraordinarily artistic and neat were the water vessels, stands, and holders of all kinds, as well as the water spouts adorned with bronze figures. We know that the Romans, and perhaps the Phoenicians, obtained their tin from England. But the common metals then known, like copper, tin, lead, and iron, were not prepared in such large quantities, and consequently must have then represented a much higher relative value than now.

Lead, which occurs in Nature, for the greater part, in combination with sulphur only, as sulphide of lead (galena), is the easiest of all metals to reduce from its ores, being obtained at a comparatively low point of fusion. For this reason, as well as on account of the frequent deposits of lead ore in the old world, especially in Greece, Sardinia, and Spain, civilized nations employed metallic lead extensively for pipes and in sheets. In almost every house newly excavated in Pompeii, there may be seen the thick cast lead pipes, with the names of different firms and the place of manufacture cast upon them. These antiquities are chiefly preserved in the museum at Naples. Not only Rome and Greece made use of this easily fusible metal, but even the still older nations of India and China possessed, and still possess at the present time, great skill in smelting lead and tin. Proofs of this are the well known genuine tea chests which are lined with lead, packed, and soldered up in China for shipment.

The Chinese employ an alloy of lead with some tin and copper to prepare metallic foil as thin as paper, in which large lots of tightly pressed tea are packed and shipped to all parts of the globe. The fusible alloy is melted and poured on a smooth stone; and as the mass solidifies slowly, because the amount of heat for fusing can only be small, the Chinese workman has time enough to throw a second smooth stone upon the still liquid mass, and finally, in primitive style, jump upon it so as to increase the pressure. The Chinese people are so extraordinarily conservative in their customs that we cannot expect that this method of making sheet lead will suffer any advance by the introduction of rolling or hammering. In Europe especially in Germany, it is not so very long since men were obliged to work with very limited aids. Then there sprang up in Venice, and afterwards in Nuremberg, the mirror makers, who employed their tin foil with mercury for covering the glass



KORTING'S ELEVATOR.

FROZEN WATER IN BOTTLES.

Visitors to Paris are well acquainted with the glass bottles containing water frozen into solid blocks which are delivered every morning by *La Société des Carafons Frappés* to its customers; and the country cousin wonders indefinitely as to how the block of ice is put into the bottle. A new method of congeling such bottles of water has recently been introduced by M. Carré, an inventor whose success in the introduction of freezing machinery is well known.

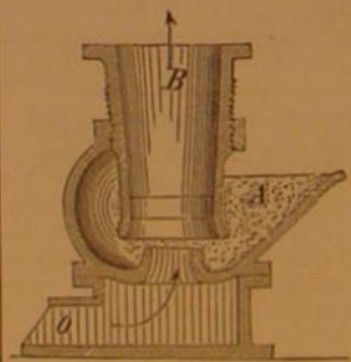
Freezing water in a vacuum is a common lecture room experiment, and it is readily done by placing water in a saucer under the bell glass of an air pump, and exhausting the air; when the ebullition caused by the withdrawal of the aerostatic pressure ceases, congelation begins. It is not difficult to understand the sequence. In passing from a liquid to a vaporous condition, without the aid of heat from outside, the water must borrow some heat from surrounding objects; and this heat passing off in vapor, the remaining water quickly becomes frozen. M. Carré has utilized this process in a very ingenious manner, and has reduced it to a very simple and economical method, capable of domestic use.

The bottle is suspended, by means of a rubber cork, from the nozzle of a pipe, as shown in our engraving; and the withdrawal of the air, by working the hand lever, induces a speedy commencement of ebullition. The rising vapor is drawn through an intermediate vessel filled with sulphuric acid, which at once absorbs and condenses it, and congelation commences in the middle of the water in the bottle; and from the first formed particles, needles of ice soon radiate in every direction. Their number augments in geometrical progression, and their size increases as you behold them, until, in less than one minute from the commencement of the operation, a bottle of water (a liter, four fifths of a quart) is frozen solid with very little exertion.

This seems to be a handy apparatus for use in places where ice is not readily obtainable; and the only inconvenience in its use is the presence of sulphuric acid, which in this relation soon becomes diluted till it is inefficient for its purpose. But it does not seem to be difficult to render the dilute acid marketable, and the attention of chemists may well be turned in this direction. It seems that the hard treatment which the public in some places has for many years suffered at the hands of ice companies may soon be avenged. Ice is now being made and sold in London for 10s. (\$2.50) per ton; and if a more simple method of doing this can be introduced, so that the indispensable commodity may be made in every

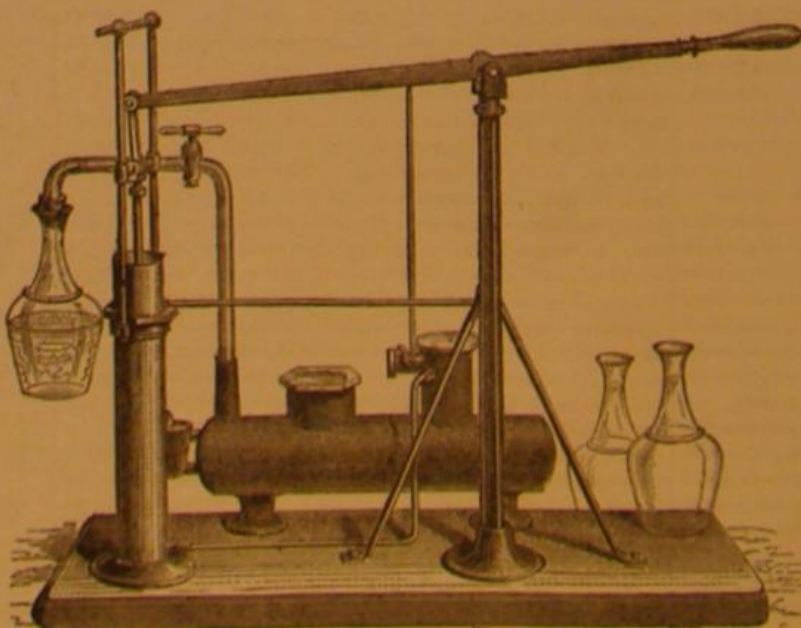
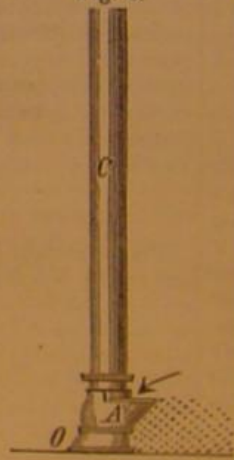
become more dense. Among these metals are gold, silver, copper, tin, platinum, lead, zinc, aluminum, iron, nickel,

Fig. 2.



and their alloys; other metals are not malleable but brittle, and cannot be rolled or hammered out alone, nor drawn into wire.

Fig. 3.



CARRÉ'S FREEZING APPARATUS.

plates. A mirror of the size that we are accustomed to have now could not be obtained in the last century, because the sheets of tin foil were not large enough to make them; besides, the wide cylinders for mirror glass could not then be made.

The demand for larger sheets of metal was satisfied gradually by the progress and extension of machine building, although large plates of copper, tin, and iron had already been hammered out with great skill. A few decades ago snuff was packed in rolled lead foil, but this has been prohibited for a long time. In its place has appeared pure tin foil, which is quite cheap on account of its great thinness and small specific gravity. By reason of its manufacture in larger quantities and new discoveries of tin ore in Australia, the price of tin foil has fallen to one half its previous price.

Tin foil is chiefly used for a reliable airtight covering. Like the well known tin boxes used for preserving food on a sea voyage, so wrapping an article in tin foil protects it from the external air so that it does not decay. Extract of meat, sausage, cheese, etc., are protected in this way.

On the other hand, tin foil prevents evaporation and drying, as of snuff, wine, liqueurs, bouquets of flowers, etc. The airtight metallic wrapper preserves the costly odors and perfumes of many fine articles, as chocolate, fine cigars, vanilla, cosmetics; there is in fact no more reliable protection against the volatilization of valuable odorous substances than the non-poisonous metallic foil referred to. Not only is this object accomplished, but with it are combined neatness and elegance, the useful and the agreeable, since the silver-white, polished, and mirror-like shining metal makes a better impression of neatness than any other envelope for a commercial article. This exterior at once adorns the contents and indicates their high value.—A. Andersohn.

PIG IRON IN THE UNITED STATES.

The production of pig iron in the United States last year amounted to 2,689,413 tons, as compared with 2,868,278 tons in 1873, and 2,854,558 tons in 1872. The following States made more iron in 1874 than in 1873: Maine, Vermont, Massachusetts, New York, Virginia, Georgia, Alabama, Texas, West Virginia, Tennessee, Ohio, and Michigan. The following States made less iron in 1874 than in 1873: Connecticut, New Jersey, Pennsylvania, Maryland, North Carolina, Kentucky, Indiana, Illinois, Wisconsin, and Missouri. The greatest increase in 1874 occurred in the miscellaneous bituminous coal and coke district in Ohio; the greatest decrease in 1874 took place in Lehigh, Pa.

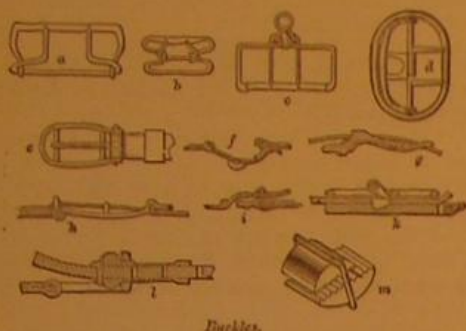
FASTENINGS.

We extract from Mr. E. H. Knight's "American Mechanical Dictionary" the following illustrations and descriptions of various forms of fastenings, including buckles, bag fasteners, belt couplings, bale ties, and broom heads. In connection with the belt couplings, we add descriptions of a few other devices relating to belting.

BUCKLES.

are divided into bar buckles and roller buckles, the only difference being that the latter have a thin metallic tube around the bar opposite the tongue which, by its revolution, facilitates the passage of the strap. *a*, Fig. 1, has a wire passed through the ends of the loop, and bent ends to form tongues.

Fig. 1.



Buckles.

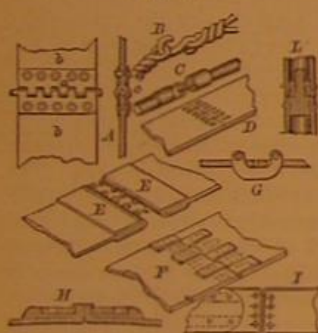
b has a bent wire embracing the waist of the loop. In *c* the recurved ends of the loop form the tongue. *d* has a tongue and pressure bar on one crossbar. *e* is a tug buckle. *f* is a buckle in which the strap is pinched between a pivoted bar and the lip of the frame. In *g* the strap is held between the two parts of the frame, which are pivoted together. *h* has a number of projections which fit corresponding holes in the strap. *i* is a skate strap buckle, in which the tongue can be loosened from the strap by lifting the rear end of the buckle. *k* is a tug buckle, in which the tongue is vibrated by means of a cam. *l* has a pair of metallic jaws and a tongue extending across them, and *m* is composed of a pair of serrated faced blocks, which are brought together by the strain on the strap.

The commonest mode of connecting belts is by a lacing of leather. Many special devices have been contrived to dispense with this last. We give a variety of

BELT COUPLINGS.

in Fig. 2. *A* represents a coupling in which the ends of the belt, *b*, are secured by eyelets or rivets between bent metallic straps, *a*, which form leaves of a hinge, *c*. A pintle passes through the eye of each portion of the hinge. For the round belts of foot and hand lathes, a figure-8 hook, *B*, is employed

Fig. 2.



Belt-Coupling.

or a couple of sockets, *C*, are used, into which the ends of the belt are inserted, and which have a hook and eye respectively. For flat belts in which lacing is not deemed advisable, the ends may be joined by hooks inserted from alternate sides and hammered flat, as at *D*. Other modes involve hooks, *E*, or lapping plates, *F*. Some have curved metal bars, *G*, slotted plate and toggle jaws, *H*, or rivets

which pass through the out-turned end of the belt, as at *I*. *L* is a tie in which a plug with two grooves is made the means of connection; the belt is tubular and the respective ends are throttled by wires into the grooves of the plug. Fig. 3 is a simple instrument for preparing belts for being laced and coupled. It forms the holes for the clasps or lacing by means of a punch, *c*, which acts against an anvil on the other jaw. The latter is graduated and has an adjustable gage, *G*, which may be set at such a distance from the nose of the pliers that a row of holes may be readily punched at a set distance from the edge of the belt.

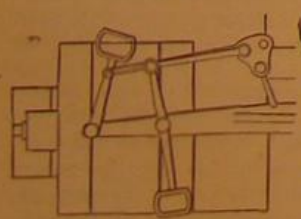
Fig. 3.



Belt-Punch.

Fig. 4 is a belt shifter for moving a belt from a fast to a loose pulley, and vice versa.

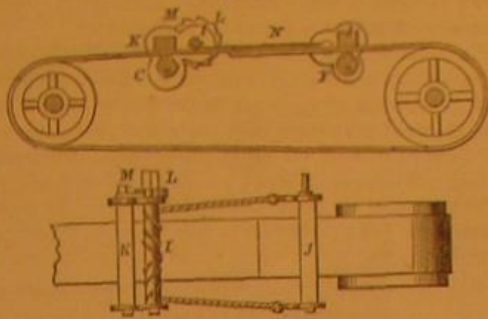
Fig. 4.



Belt-Shifter.

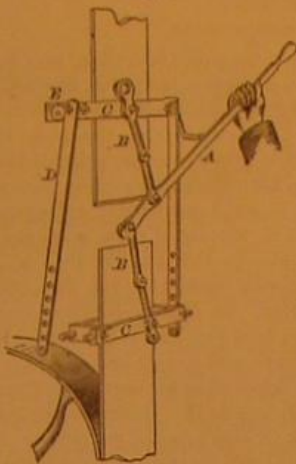
The stretcher consists of a pair of clamps, *K C*, *J F*, and a tightening cord, *N*, the leather in each clamp being pinched by a serrated eccentric. The rope winds upon the roller, *I*, the pawl, *M*, engaging the ratchet, *L*, to maintain the stretch.

Fig. 5.



Belt-Stretcher.

Fig. 6.



Belt-Tightener.

Fig. 6 shows a double clamp and a tightening device, in which *A* represents a lever acting through toggles, *B*, to draw the clamps, *C*, toward each other. When the latter are carried as nearly together as may be requisite, they are held by the link, *D*, until the belt is connected. A variety of different forms of BAG FASTENERS, used for securing the mouths of bags below the hem, are represented in Fig. 7. In *a* a sheet metal tag with a curved tapering slot is permanently attached to one end of the string; the other end of the string becomes jammed in the slot. In *b* the metallic tag attached to one end of the string has a thimble in which the other end of the string is jammed by a wedge. One end of the string in *c* has a permanent ring. The other end is rove through an eyelet in itself and jams against the ring. *d* shows one loop permanently attached to a slotted lever. The latter is passed through the other loop and turned over beyond the dead center so as to jam the loop against the standing part. In *e* the standing end is rove through two holes in the tag, and forms a loop which jams down upon the point end of the cord. The point end, in *f*, is jammed between two pivoted cogged sectors. In *g* the perforated leather tag is riveted to the bag and the thong is rove through the holes so as to bind tightly. *h* shows one end of the cord knotted to the loop of the wire. The other end is passed round the bag and jammed between the jaws. A pair of hinged clasps

Fig. 7.



Bag-Fasteners.

is represented in *i*, the free ends of which interlock. *j* is a spring device acting in the manner of a brooch, a spring pin engaging the catch. In *k* a lever attached to one end of the cord engages a loop on the other end, and is thrown over to carry the loop to a curved portion, which holds it securely. *l* is similar to the last, but has a means of adjustment.

In Fig. 8 a large number of bale ties are represented, their use being to fasten the ends of the hoops by which bales of cotton are held in compact form. *a* is a simple arrangement of hooked bars. *b* shows the strap ends bent and inclosed in a collar. *c* is a rivet, and *d* a set screw, and *e* a species of buckle. In *g* the hoops are passed through slots in a separate piece, and bent over so as to become jammed. *g* is a device of the same kind, somewhat simpler in construction. In *h* a ring engages in notches made on the sides of the bands. *i*, *k*, and *l* are locking devices readily understood from the diagrams. *m*, *n*, *o*, *r*, and *s* all involve separate catch pieces, in notches or slots in which the straps engage. *p* and *y* resemble each other in that the straps are jammed between the portions of a kind of buckle. The other devices need no especial description.

In connection with the subject of ties for bales may be mentioned the devices for baling cut hay, and for baling feed and forage rations, to condense their bulk for transportation. One plan briefly is as follows: The hay is carried by an endless apron to a rotary cutter, which, cutting past a fixed blade, chops the hay into pieces. A winnowing apparatus then removes the dirt from the material, and finally crushing rollers render it soft and flexible. In this condition the hay is placed in a strong press and readily compressed into a solid

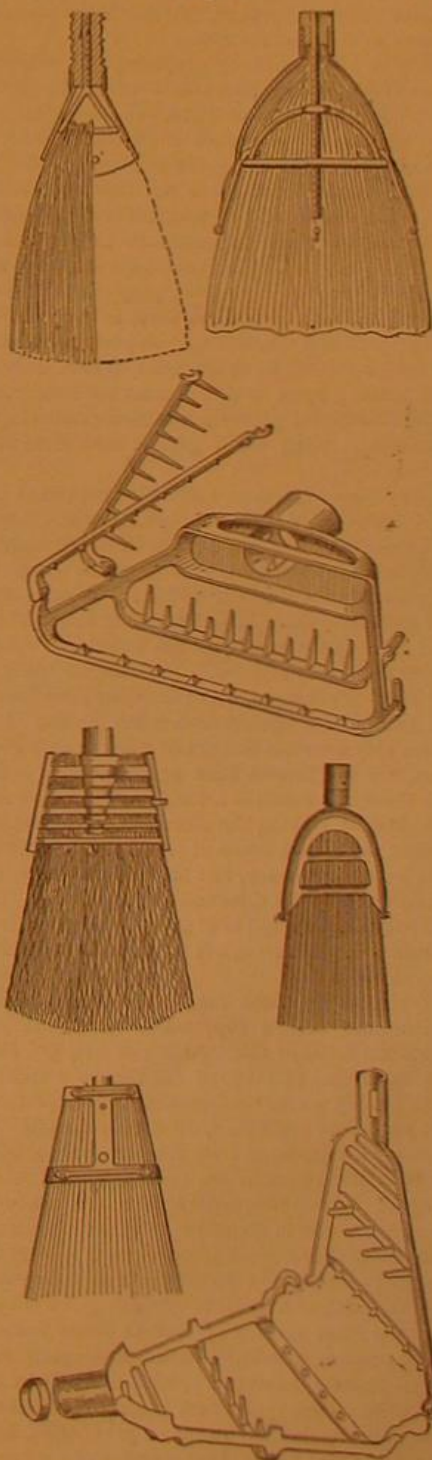
mass. In baling forage rations, a feed of corn is placed in a feed of hay, and the whole is condensed into the shape of a large brick.

Fig. 8.

Bale-Ties.
BROOM HEADS.

such are shown in Fig. 9, are clasps or caps for holding the bunch of broom corn so that a worn stump may be removed and fresh brush substituted. In the upper left hand example, the straw is hung over the stirrup and drawn into the cap by the screwing of the stirrup into the handle. The next

Fig. 9.



Broom-Heads.

figure shows another stirrup, screw shank, and cap arrangement. The figure beneath has a head, the bars of which have prongs to enter the bunches of straw. The bars of one side open to admit the corn, and are then locked in closed po-

sition. The following examples have variously shaped heads and modes of securing the contents. The lower figure has a clasp, with a pair of hinged jaws with pronged bars.

Correspondence.

On Ponderable Matter and the Ether.

To the Editor of the Scientific American:

No intelligent student of Science can help being struck with the violations of the first principles of mechanical philosophy in the current conceptions of ether and dense matter, and which the highest authorities do not know how to avoid. To blind ourselves to them must necessarily vitiate all our conclusions in regard to the constitution of Nature. I therefore wish to draw attention to the most prominent objections, in reply to which there has been nothing at all satisfactory.

Let us assume the ether to be continuous, which, consistently with the principles of thermodynamics, we must; for were it parted, heat would be taken up by it, and an equilibrium of temperature with the bodies it surrounds attained, instead of being, as it evidently is, a cold medium of radiation. Then solid atoms moving through it must displace their own bulk, and lose force of motion according to the resistance; and equally, whether a body be rare or dense, unless the body as a whole displaces the ether bulk for bulk, which is negated by aberration. Besides, according to the laws of fluid resistance, all bodies removing within the ether would be resisted according to the squares of their velocities; and the ether within the interiors of bodies should offer resistance as the velocities (squared) of the molecules. The nearer that planets are to the sun, a greater resistance to their motion should therefore be manifested, their motive forces being proportionally greater. Indeed, many have argued with great force (see Bayma's "Molecular Mechanics," pp. 27 to 31) that motion is impossible if matter be continuous. Bayma himself, however, has to make the ether virtually continuous, or self-attractive, in order to attempt to explain the unresisted motions of the heavenly bodies. Another objection to the continuity of the ether has been the proof that, in a continuous fluid medium, all transversal waves must become changed to longitudinal at a great distance from the point of propagation, which the phenomena of light shows us to be not the case.

The matter is not mended by supposing the ether parted, and ascribing definite intervals between the particles; while to suit the phenomena of light, the ether must be understood to possess the properties of an elastic solid. Although the difficulties attending the explanation of dispersion, and transversal vibrations to any distance, are not so formidable, others as great are made, while the objections already indicated in regard to resistance to bodily motion still remain. No matter to what extent the distances of the ethereal particles may be conceived, proportional forces of repulsion must be assumed to hold them in their respective places, and proportional pressure against gross matter in motion. We need not dwell upon the metaphysical difficulties involved in making space both a plenum and a vacuum for the swinging of ethereal particles, the mathematical quantities of nothingness being vastly greater than those of substance.

"Astronomy says aberration cannot be explained unless the ether be at rest; Optics replies that refraction cannot be explained unless the ether moves," are Professor Lovering's words. Tyndall is self-contradictory. The ether "fills space; it surrounds the atoms of bodies; it extends without solution of continuity through the humors of the eye." "The intensity of the light depends on the distance to which the ether-particles move to and fro." ("Notes on Light," pp. 218-220.) He does not say whether the ether particles which do not fill space strike against each other or not. If they do, they have only a certain amount of space to swing in. If they do not, we are thrown back again upon the generally repudiated theory of action at a distance. Herschel seemed to favor the idea of making the ether self-attractive, but attached beyond the known limits of space, so that it would be virtually in a state of tension, and all wave motion be consequently transversal to the direction of propagation. Others make it self-repellent as well as of great tenuity, to allow the heavenly bodies to pass through it free from the resistance of aggregated particles.

In the ether has also been sought the cause of cosmical motion. Professor Challis supposes a force of impulsion from outside the limits of the stellar universe, and all radiant waves the result of material reaction in a continuous ether. The gravity waves are constant, and proportional to mass; and yet, at the same time, other ever-changing, uninterfering waves are produced from the same bodies, with the alteration of material constitution and conditions! Besides, the difficulty of constant tangential motion is untouched, and the change from waves of attraction to waves of repulsion is assumed in interstellar regions where there is no evidence of such, in order to explain the stability of the Universe. Dr. Guyot, a predecessor of Challis in this line of investigation, opined that the ether became rarefied in dense bodies, the outside ether pressing thereto, like atmospheric pressure upon an exhausted receiver. But this opinion is shown by optical phenomena to be the converse of the truth. Maxwell sought in the ether the mechanical cause of gravitation, but was obliged to confess that he could not conceive of a medium, of which a diminution of intrinsic energy would be so far produced, by the presence of dense bodies, as to result in their mutual attraction, and at the same time be consistent with manifested radiant action. The theory of gravitation by impact, proposed by Le Sage, even as improved by Sir William Thomson, is altogether too artificial to be seriously

held for a moment as being the reality, although it attempts to dispense with the ether as the cause of gravity.

Now is it possible to rescue Science from all this serious entanglement—to have a point of view whence a physical cause of the motion of cosmical bodies can be shown upon strict mechanical principles, and the ether producing such motion consistent with all other phenomena, collateral or otherwise? Whatever is true as a matter of fact may certainly be known, if we get upon the right track. In another communication, I will endeavor to point out the direction. Philadelphia, Pa. WILLIAM DENOVAN.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NUMBER XXVIII.

DRILLING HARD METALS.

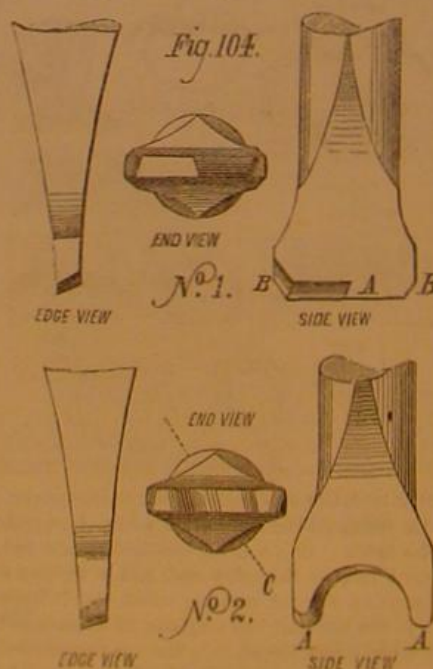
Very hard metal, such as steel tempered to a blue, may be drilled by a drill tempered to a deep straw color, the drill being used at a comparatively slow speed, and forced against the work as hard as possible without breaking the point of the drill. Sufficient oil may be applied, after the point of the drill has entered the metal, to keep the cutting edges barely moist, the drill being again allowed to run dry and again moistened, thus using as small an amount of oil as is consistent with keeping the drill cool. In this way the drill will cut hard steel the best. For cast iron, however, the drill should be kept as dry as possible. In drilling cast iron that is very hard, and also wrought iron that has been case-hardened, the operation may be greatly assisted by taking a hammer and a chisel and jacking the surface of the metal, thus enabling the edges of the drill to bite it. If necessary, the chisel may be made very hard for this especial purpose.

To make a drill exceedingly hard to suit some especial case, it may be heated in a charcoal fire to a dull red heat, and quenched in mercury instead of water. Another method is to heat the drill to a red heat in molten lead, and then to drive it into a block of cold lead, striking successive blows lightly and quickly until the drill is sufficiently cool to permit of its being held in the hand. The cases, however, in which a drill is required to be so hard are exceedingly rare.

If a drill squeaks while being operated, it arises from one of two causes: Either the cutting edges are dull, and require grinding, or else the cuttings are binding in the holes. In the first case, immediate grinding is necessary; in the second, the drill should be withdrawn and the cuttings extracted. Twist drills will bring out most of the cuttings of themselves, but a piece of wire, spoon-shaped at the end, is necessary when plain drills are used.

SLOTING OR KEYWAY DRILLS.

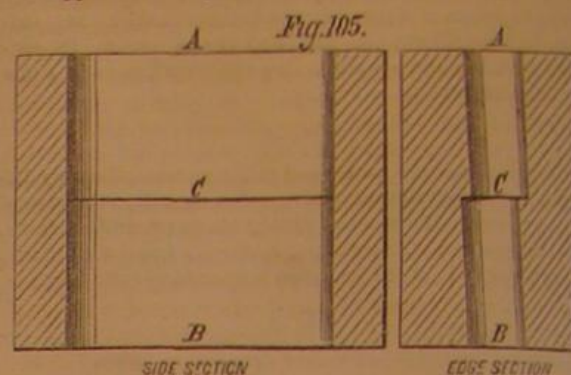
For drilling out oblong holes, such as keyways, or for cutting out recesses such as are required to receive short feathers in shafts, the drill known as a slotting drill, shown in Fig. 104, is brought into requisition. No. 1 is the form in



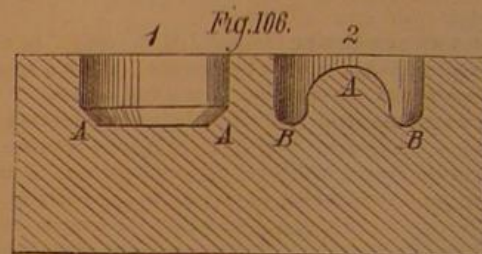
which this tool was employed in the early days of its introduction; it is the stronger form of the two, and will take the heaviest cut. The objection to it, however, is that, in cutting out deep slots, it is apt to drill out of true, the hole gradually running to one side. Suppose, for instance, as is sometimes the case, the slot or keyway is so deep that it becomes desirable to avoid having an extra long drill, which would be liable to bend and spring from the pressure of the cut, and hence that a shorter drill is used, drilling the keyway half way from each side; the tendency of such a drill would be to cut the slot as shown in Fig. 105.

The drill having entered at A on one side, and at B on the other side, and having cut down until it arrived at C, and hence cut the keyway clear through the metal, and the junction of the two not being even at C, it is evident that the keyway will require considerable filing to make the faces so true level, and parallel that the key will fit all the way through. To remedy this defect, the form of drill shown in No. 2 has been brought into use. It will be observed that it enters the metal at the points, A A, first, and therefore cuts a ring of metal out, leaving a projecting piece in the center which serves as a guide to steady it; whereas form No. 1 cuts a flat-bottomed hole. So that, if both drills were simply

rotated and fed as a common drill, the holes made by them would appear as in Fig. 106. It will be observed that in No.



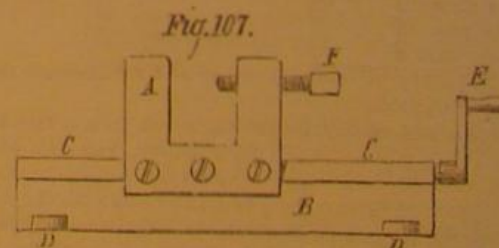
1 the beveled corners, A, alone steady the drill, while in No. 2 there is the whole core, A, tending to steady it, in addition to the round corners, B B. These drills are, however, never used to bore round holes, but oblong ones only, which is accomplished by either causing the drill to travel back and forth to the required length of the hole, the work being held stationary, or else by revolving the drill in a stationary position, while the table to which the work is bolted travels back and forth to the requisite distance, the cut in either case being fed to the drill at each end of the travel. Thus a



slot, equal to the length of the travel of the work or the drill, as the case may be, and of a width equal to the diameter of the drill, is made. If drill No. 1 is employed to cut a recess, it will leave an angular corner, while No. 2 will of course leave a round one, the bottom of the recess in either case being left quite flat, since the bottom of No. 1 is flat of itself, while the rounded corner of No. 2 cuts away, as it travels along, the cone, A, which, as shown in Fig. 106, is made when neither the drill nor the work travels.

Slot drill No. 1 is made by filing the cutting end square, level, and true to the requisite diameter and shape, and then backing off, that is, filing away on one side, the edges from the center of the drill, outwards and across the beveled corner, as shown in Fig. 104; while No. 2 is made by filing up the cutting end true, level, and square, and then filing out the curved hollow centrally in the end face, with a round file held at an angle with the center line of the width of the drill, as shown by the dotted line, C, in the end view of No. 2 in Fig. 104, after which the corners, A A, should be rounded and backed off. The thickness at the cutting end of drill No. 1 should be the same as that given for common drills, while No. 2 may be left somewhat thicker, to give it extra strength, since its form renders it comparatively weak. The reason for keeping the end of No. 1 as thin as a common drill is that it has, at the junction of its two cutting edges, centrally on the end face and between the beveled corners, a cutting edge across the thickness of the drill, as shown in end view, Fig. 104, and is in that respect subject to the defect before mentioned as inherent in common drills. This defect does not, however, exist in slotting drill No. 2, in which the cutting edges on the outside faces extend clear to the center of the diameter of the drill.

Slotting drills should be tempered to a deep brown, and should be supplied freely with oil when employed to cut wrought iron or steel, but must be kept perfectly dry when used upon cast iron or brass. They are revolved at a higher rate of speed than common drills. To employ them in a common drilling machine, whose table has no horizontal sliding motion, it is necessary to make a chuck which will bolt to the machine table; the chuck is to be provided with a pair of jaws to clamp the work, and to make the upper part of the chuck movable upon a slide in the lower part. Such a chuck is shown in Fig. 107, A being the jaws, wherein

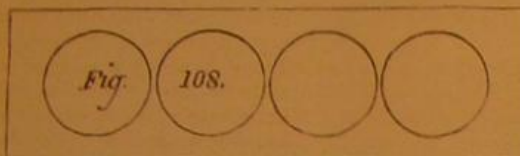


to hold the work by means of the screws, F, of which there must be at least two, B being the bed, provided with the slide, C C, along which the head, A, is operated by means of the handle, E, which turns a screw running down the center of the slide and working in a nut attached to the center of the head, A. The lugs, D D, are provided with holes through which to bolt the bed to the drilling machine table.

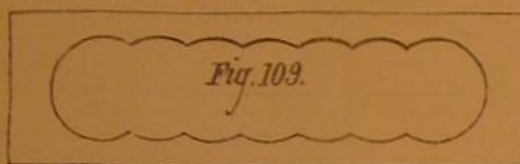
In using such a chuck, the operator will be very apt to vary the distance to which he moves the slide at each cut, the effect of such variation being to cause the edge of the slot or keyway to be very uneven. To remedy this, it is best, after having drilled to the proper depth, to wind the slide and set the drill so that it takes a slight cut out of one

end of the slot at the top, and then (keeping the chuck stationary) to feed the drill down through the slot, thus cutting the end out quite even. In taking the first few cuts at the commencement of the operation, that is to say, immediately after the work is chucked, it is better to cut the slot a little less than the required breadth, so as to leave a little to come out of each end of the slot (as above described) to true it. It is obvious that parallel strips may be employed in the jaws, whereon to rest the work, or to make up the width between the ends of the screws, F, and the opposite jaw of the chuck.

There is probably no one cutting tool used in a machine which saves so much labor as the slotting drill, because it performs a duty that no other tool or machine can perform, and which is moreover a most difficult and tedious one. Before the advent of this tool, deep keyways were cut out of the solid metal in the following manner: First, plain holes were drilled through the work, as shown in Fig. 108, and



then these holes were plugged up by having pieces of round iron driven tightly in them. Then new holes were drilled, the center of each new hole being in the thin wall of solid metal between the plugged holes. After the latter holes were drilled, the remains of the plugs were driven out, when the keyway would present the appearance shown in Fig. 109. This entailed an almost incredible amount of chipping

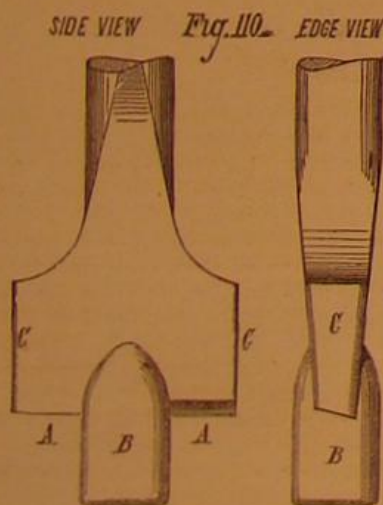


and filing in order to make the sides of the keyway level and true, and the width parallel. This method of procedure is, however, still in vogue to a slight extent, being confined mainly to jobbing and repair shops. It is also employed for very narrow and deep holes, since a slotting drill cannot be employed to advantage in holes of less than about $\frac{1}{8}$ of an inch in diameter, because of the bending and springing of the drill. If, however, twist drills are employed to drill the small holes, the plugging with pieces of iron may be dispensed with, for the reasons shown by Fig. 103 and its accompanying explanatory remarks.

It may here be observed that the principles of the action of the slot drill have been applied to a variety of purposes in woodworking, prominent among which is its use in Boulton's paneling and dovetailing machine. In its adaptation to wood, as in its adaptation to iron, there is no other tool at all capable of performing the same kind of duty, irrespective of either time or quality.

PIN DRILLS.

The next form in which the drill appears is the pin drill, which is a drill having a pin projecting beyond and between its cutting edges, as shown in Fig. 110, A A being the cut-

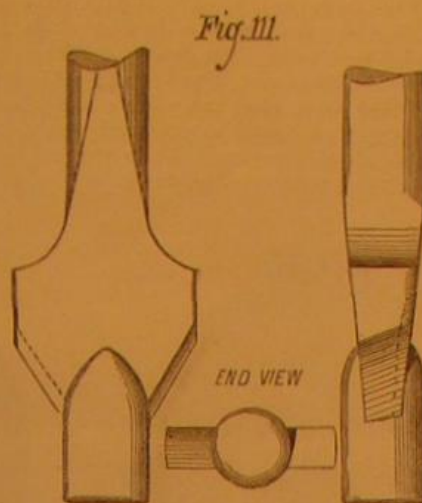


ting edges. The purpose of this drill is to face off the metal round the outside of holes, the pin, B, fitting into the hole so as to steady the drill and keep it true with the hole. In making this tool, the pin, B, the edges, C, and the ends forming the cutting edges, A A, should be turned up true in the lathe; the backing off may then be filed, leaving the cutting edges, A, with the turning marks barely effaced; thus they will be sure to be true and at an equal height from the end of the pin, so that both the cutting edges will perform duty, and not one only, as would be otherwise the case. Pin drills should be tempered to a deep straw color, and run at a comparatively slow speed, using oil for wrought iron and steel, and running dry on cast iron and brass. In cases where, for want of an assortment of pin drills, there is none at hand with a pin suitable for the size of hole required to be faced, a drill having one too small for the hole may be made up to the required size by placing upon it a ring of iron or brass of the requisite thickness and about equal in depth to the pin.

COUNTERSINK DRILLS.

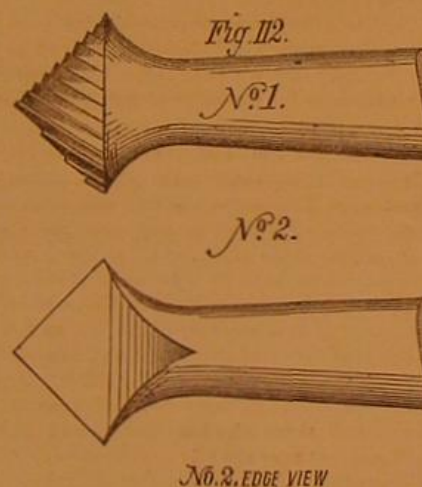
Of countersinks, there are various forms; but before pro-

ceeding to describe them, it may be as well to observe that the pin drill described above may be employed as a flat-bottomed countersink. Fig. 111 represents a taper countersink,



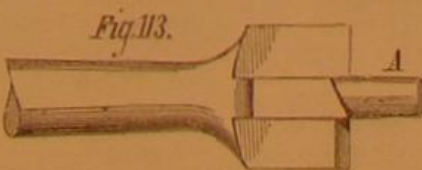
such as is employed for holes to receive flush rivets or countersunk head bolts, this form of tool being mainly employed for holes above $\frac{1}{8}$ of an inch in diameter, A A being in each case the cutting edge, and B, the pin. It should be made, tempered, and used as directed for pin drills. In tempering these tools, or any others having a pin or projection to serve as a guide in a hole, the tool should be hardened right out from the end of the pin to about $\frac{1}{2}$ of an inch above the cutting edges. Then lower the temper of the metal (most at and near the cutting edges), leaving the pin of a light straw color, which may be accomplished by pouring a little oil upon it during the lowering or tempering process. The object of this is to preserve it as much as possible from the wear due to its friction against the sides of the hole. For use on wrought iron and steel, this countersink (as also the pin drill) may have the front face hollowed out, after the fashion of the lip drill, and as shown in Fig. 111 by the dotted line.

For use on holes $\frac{1}{2}$ inch and less in diameter, either of the countersinks shown in Fig. 112 may be employed. No. 1 has



serrations forming cutting edges or teeth, and No. 2 is filled at the conical end exactly to half a diameter, the edge, A, performing the cutting. Either of them will cut true and smoothly, oil being applied when they are used upon steel or wrought iron.

Common drills, ground to the requisite angle or cone, are sometimes used as countersinks, but they are apt to cut untrue and uneven. For fine and light work, the pin drill, with its cutting edges either at right angles to the center line of the pin or at such other angle as may be required, forms the best countersink; it should, however, have more than two cutting edges, so that they may steady it. Fig. 113 presents an excellent form of this tool, A being one of the



four cutting edges.

This tool is formed by turning up the whole body, filing out the necessary four spaces between the cutters, and backing the latter off at the ends only, so that the circumferential edges will not cut, and hence the recesses or countersinks will be all of one diameter.

A New Mechanical Movement.

Mr. James R. Devor, of Goshen, Ind., has recently patented a device by which belts and pulleys, cog gearing, and other mechanism may be made to run on shafts which are out of parallel with each other. The arrangement is as follows: A ball is fastened tightly on each shaft, each ball having a

socket composed of two disks, each of which has a broad slot through which the shaft passes, and which can turn to accommodate a shaft lying in any direction. The insides of the pulleys or cog wheels are made concave to fit the ball, having flanges which lap on the disks. The pulley or cog wheel is revolved by pins passing through it and the slots in the ball on opposite sides. The belt (when such means of transmission is used) is kept in place on the pulleys by guides supported by a rod which connects together the yokes on opposite sides of the ball. By this arrangement the ball is allowed lateral play, and the shaft to which it is attached can pass through the pulley at any angle.

The usefulness of this novel invention will be apparent to mechanics, and a great saving of pulleys, belts, and gearing will be effected by its use in transmitting power from one shaft to another when not parallel to it.

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

Vegetables should never be washed until immediately before prepared for the table. Lettuce is made almost worthless in flavor, by dipping it in water some hours before it is served. Potatoes suffer even more than other vegetables through the washing process. They should not be put in water till just ready for boiling.

The bluish green bronzes used for ornamental articles are very easily imitated. Almost any metal is first covered with a varnish made of ground tin or bronze powder rubbed up with honey in gum water. Then wash with a mixture composed of sal ammoniac $\frac{1}{2}$ oz., common salt $\frac{1}{2}$ oz., and 1 oz. spirit of hartshorn in 1 pint vinegar. After applying the mixture, leave for a day or two in the sun, and then, if necessary, add a second coat. This is a good way to renovate old gas fixtures.

The following is given as a simple welding powder: 1 part dry borax, 1 part fine iron filings, $\frac{1}{2}$ part prussiate of potash; it is sprinkled on the surfaces, the latter being previously slightly moistened. The pieces of iron and steel are then tightly bound together with iron wire, heated to about 300°, and lastly placed under a steam hammer or passed through rolls.

Leather thoroughly saturated with glycerin will prevent, it is said, the passage of gases.

In stamping sheet zinc in dies, much waste occurs from the small difference between the melting point and the temperature at which sheet zinc should be stamped to get the best effect. To obviate this waste, heat the zinc by dipping in oil at the proper temperature.

A cheap and simple brush for applying albumen solutions to photographic plates is made by doubling a piece of cotton plush cloth over the end of a flat stick, and securing the cloth by a rubber band slipped over it.

The following is a cheap substitute for the expensive gold varnish used on ornamented tin ware: Turpentine $\frac{1}{2}$ gallon, asphaltum $\frac{1}{2}$ gill, yellow aniline 2 ozs., amber 4 ozs. turpentine varnish 1 gallon, and gamboge $\frac{1}{2}$ lb. Mix and boil for ten hours.

Beautiful semi-transparent cases of fancy articles may be taken in a compound of 2 parts unbaked gypsum, 1 part bleached beeswax, and 1 part paraffin. This becomes plastic at 120°, and is quite tough.

White lead ground in oil, mingled with Prussian blue similarly prepared, to give the proper shade, and finally mixed with a little carriage varnish, is an excellent and durable paint for farm machinery and agricultural tools.

A mixture of 10 parts lime and 1 part saltpeter is said to destroy currant worms without injuring the fruit.

Boats should be painted with raw oil. Boiled oil used in the paint is very apt to blister and peel from the wood.

Spatter-work pictures, usually delicate designs in white appearing upon a softly shaded ground, are now very popular, and are, with a little practice, easily produced. Procure a sheet of fine uncalendered drawing paper, and arrange thereon a bouquet of pressed leaves, trailing vines, letters, or any design which it is desired to have appear in white. Fasten the articles by pins stuck into the smooth surface, which should be underneath the paper. Then slightly wet the bristles of a tooth or other brush in rubbed India ink, or in common black writing ink, and draw them across a stick in such a manner that the bristles will be bent and then quickly released. This will cause a fine spatter of ink upon the paper. Continue the spattering over all the leaves, pins, and paper, allowing the center of the pattern to receive the most ink, the edges shading off. When done, remove the design, and the forms will be found reproduced with accuracy on the tinted ground. With a rustic wooden frame, this forms a very cheap and pretty ornament.

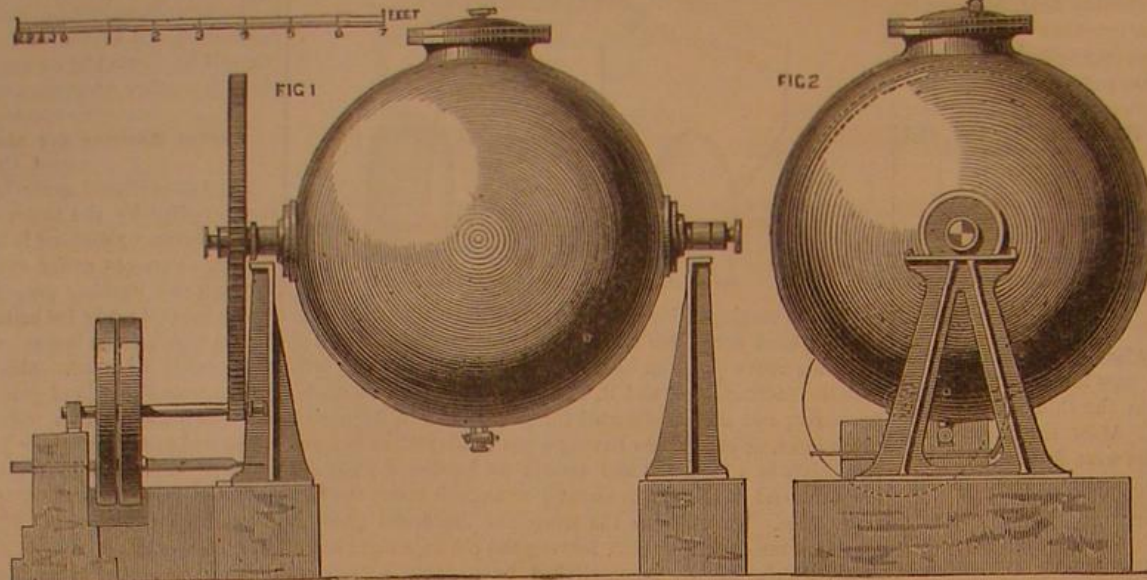
It is said that water lilies may be raised about one's house by the following method: Sink in the ground the half of an old cask, and cover the bottom with peat and swamp mud, and then fill with water. Dig the lily roots early in the spring, and place them in the earth at the bottom of the tub. A gentleman who has tried the experiment has a number of lilies in bloom.

Whale Power vs. Steam.

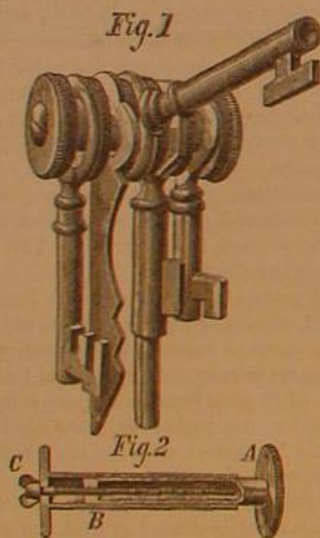
On a recent voyage of the Cunard steamer Seythia, from Liverpool to New York, the progress of the ship was suddenly interrupted by collision with a whale. Two blades of the propeller were broken off, and the ship was obliged to put into the port of Queenstown for repairs. Here her passengers and freight were landed, and forwarded to New York by another steamer, after a week's delay. The whale, it appears, lost his life by the attack, for he was found afloat the next day by a party of fishermen, who towed him ashore. The whale measured 54 feet in length.

IMPROVED ROTARY RAG BOILER.

The rotary boiler, for paper stuff and similar materials, which we herewith illustrate, is the design of Messrs. Bryan Donkin & Co., of London, England. It consists simply of a spherical wrought iron vessel 8 feet in diameter, mounted on a pair of trunnions, both of which are made hollow for the purpose of admitting steam, while one of them carries a spur wheel, through which motion is communicated to the boiler. Inside the boiler are strainers to take off the dirt, and lifters which serve to agitate the rags as the boiler revolves. The flanges of the trunnions and the boiler are faced in the lathe, so that a good joint may be made with red lead simply. Owing to its spherical form, the boiler of course offers twice the resistance to rupture which would be possessed by a cylindrical boiler of the same diameter, and made of the same thickness of plates, while the spherical shape has also the advantage of being self-delivering, the rags falling out as the boiler revolves without the cover on. The gearing by which the boiler is driven is proportioned so that the vessel makes $1\frac{1}{2}$ revolutions per minute, with the shaft carrying the belt pulleys running at $17\frac{1}{2}$ revolutions. Altogether the boiler stands about 11 feet 6 inches high from the floor line to the top of the manhole, and in practice it is mounted so that it may be filled through an opening in the floor overhead.

**DONKIN'S RAG BOILER.****COLEMAN'S KEY HOLDER.**

The annexed engraving represents a simple little device designed for holding keys in a bunch, and intended as a substitute for the ordinary key ring. It consists of a central core or shaft made in two hollow portions, A and B, Fig. 2. Part A enters part B, and a solid portion at the extremity of the former receives the screw-threaded stem, C, which holds the two sections together. Upon the core the keys are placed, and disks of leather or other pliable material are interposed between them, as shown in Fig. 1. The bunch is retained



in place by bringing the two parts, A and B, together by means of the screw, caps on the end preventing the keys from slipping off.

The advantages claimed for this device are that all jingling of the keys is prevented, the latter are held more tightly and in more compact shape, a better leverage is afforded for turning any key in its lock, and the bunch does not hang down, and thus scratch against the polished surface of furniture.

Patented through the Scientific American Patent Agency, July 20, 1875. For further particulars address the inventor, Mr. F. W. Coleman, Rodney, Jefferson county, Miss.

Mysterious Boiler Explosions.

There was a time when people thought that boiler explosions were caused by lightning. Later, this theory was modified, and it was said that electricity was an active agency in boiler explosions, and to this day the latter theory is entertained by many. There has always been a desire to surround these accidents with mystery; to devise some theory that men of ordinary intelligence cannot comprehend. The promulgators of these theories have a fancy for surrounding themselves with an atmosphere of superior intelligence, somewhat akin to the alchemists and astrologers of old. They use unfamiliar technical terms and derivative words, when plain Saxon would be much more to the point, and this they call scientific. When a boiler explodes, people desire to know what was the cause. If they are entertained with theories of suspension or repulsion, when portions of the boiler were found corroded almost to the thinness of paper, they might very properly say "that's too thin." And if, upon careful examination, it was pretty definitely ascertained that the boiler let go at the weak or thin point, any

theory founded upon suspension or repulsion would be likely to have little weight with people familiar with steam boilers.

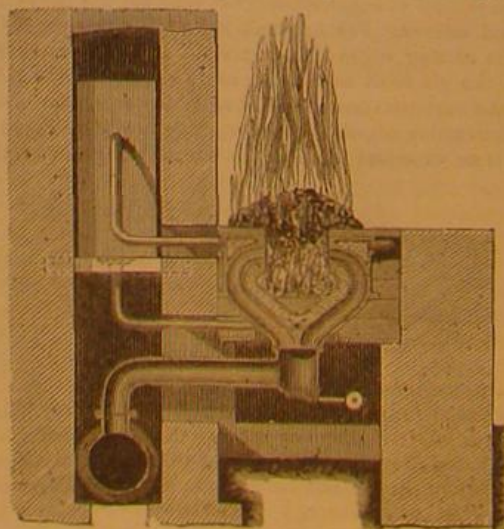
It is well known that any piece of machinery in which there is a weak point must be handled with great care. It must not be overloaded, but the load or strain must be adapted to the weak point. The theory that the strength of any structure is measured by its weakest point is as true of boilers as of any thing else; and when a boiler has a decidedly weak point, it should not be used except at a very low pressure. A safer way would be to repair at once, and thus approximately restore the boiler to its original strength.

A boiler may be corroded in places difficult to discover unless a thorough examination is made when the boiler is cold, and the owner may not know that the pressure which he is using is close up to the ability of the metal, at its weakest point. Under these latter conditions, it will be readily seen that a little excess of pressure only will be required to pass the limit of safety. The weak spot gives out, and damage to a greater or less extent occurs.

A weak spot in a boiler or any other device, does not improve by use; and when a machine breaks down at a point which is ascertained to have been weak for a long time, no one is impressed with the necessity of going into a long discussion to show that mysterious agencies were suddenly brought to bear upon the weak point, causing the break. The fact is the point of fracture was unable to sustain the load imposed upon it. It did its very best, but when the load was not lessened, yet the deterioration of metal continually went on, a time came when, from inability to hold on longer, the machine broke down. Is there any mystery about it? Is there any mystery about the fact that a boiler 6½ feet in diameter, running at a pressure of 75 lbs. to the square inch, with one of the sheets corroded to the thinness of paper, exploded, doing serious damage? We think not, and we further think all efforts to surround such cases with mystery worthy only of those who have soared so high into the regions of theory that they are reluctant to step down before, and into the presence of, facts and common sense. Boilers should be periodically inspected with much care, so that any indications of weakness may be discovered before it is too late. There are few, if any, defects that careful external and internal examination, with chisel and hammer, will not discover; and we would advise all boiler owners to secure the services of some competent man to examine their boilers carefully at least once a year.—J. M. Allen, President of Hartford Steam Boiler Inspection and Insurance Company.

SEEL AND SHAW'S TWEER FOR SMITH'S USE.

We annex an engraving of a tweer for smith's use, in which the blast is divided into two jets, led respectively to opposite sides of the fire. The tweer is branched for the before-mentioned purpose, and is protected by a water casing, which



can have a branch pipe cast on it for connecting it with the water tank; but the usual method of supplying the water is as shown in our engraving. This is a convenient arrangement, and is well adapted for quickly raising an intense heat.

Patented by Ephraim Seel and Thomas Shaw, of Greenfield, England.

Increasing the Solubility and Disinfecting Power of Salicylic Acid.

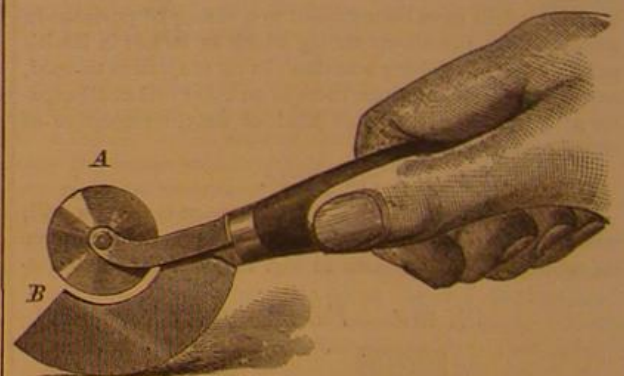
One of the disadvantages attendant upon the use of this long known, but recently introduced, tasteless, and harmless disinfectant has been its very slight solubility in water. The phosphate of soda increases its solubility somewhat, but it has been reserved for a chemist with the euphonious name of Rozsnyay to discover a better means than this. The salt employed by this chemist is one which itself possesses a certain antiseptic power, and this increases the power which the mixture has of retarding putrefaction. This salt is sulphite of soda. If one part of salicylic acid and two parts of sulphite of soda are dissolved cold in 50 parts of water, the solution will be perfectly clear. The solution does not irritate an open wound in the slightest, and its disinfectant power is so great that, while a certain quantity of milk, to which had been added a solution of salicylic acid prepared with phosphate of soda, curdled in five days at ordinary temperature (66° Fah.), another portion of milk, to which was added a solution of salicylic acid prepared with sulphite of soda, remained fluid for two weeks.

Rozsnyay recommends one part salicylic acid and one or two parts sulphite of soda dissolved in from fifty to one hundred parts of water, for general use.

BRECHBIEL'S CIGAR WRAPPER KNIFE.

The invention illustrated in the annexed engraving consists in a combination of two cutting blades secured in a handle, each blade performing a separate office in cutting out the wrappers of cigars. A is a circular knife, which cuts the leaf into the necessary semicircular shape without tearing, an accident likely to happen when the tobacco is dry and the fibers large and hard. From between the bifurcated shank of blade, A, projects the curved blade, B. This serves to shape the leaf in order to form the tip of the cigar, and possesses the same advantages for this employment as the circular knife for its particular purpose.

The tool ordinarily used somewhat resembles a shoemaker's knife. It requires skill in its manipulation, and must be kept constantly keen in order to do its work properly,



the present device requires sharpening but seldom, and it is in many respects a convenient and handy implement.

Patented May 4, 1875. For further particulars relative to sale of patent, address the inventor, Mr. John E. Brechbiel, Highland Falls, Orange county, N. Y.

Another Bridge between New York and Brooklyn.

By an act of the State Legislature of New York, a second bridge over the East River, between New York and Brooklyn, was, some time ago, duly authorized. No such expensive and difficult undertaking as the great suspension bridge now in progress, is required in this new enterprise.

The new bridge is to extend from 78th street, New York, to Lockwood street and Graham avenue on the opposite shore. The East River, at this point, is divided into two comparatively small streams, by the long narrow strip of land which occupies the center of the river, known as Blackwall's Island. The central piers will rest on this island. The greatest span of the great suspension bridge near Fulton street is 1,600 feet; but the widest span of the new bridge will be less than half of that distance. The total length of the bridge and approaches will be two miles. The largest spans are 715, 600, 367, 320, and 300 feet respectively. The section comprises a double track, a carriage way, and two foot ways. The trussed girder system of construction is talked of.

Back Numbers for the Current Year.

We would state, in answer to numerous inquiries whether all the numbers of the SCIENTIFIC AMERICAN can be had for the year 1875, that they can be furnished from January to the present time, in sheets, or in volumes of 416 pages, bound, up to July 1. The price for the bound volume is \$3; in sheets, from January to July, by mail, \$1.60. New subscribers can have all the back numbers if they wish. But, unless requested otherwise, all subscriptions will be commenced at time of receiving the order.

THE RUSSIAN CIRCULAR SHIP.

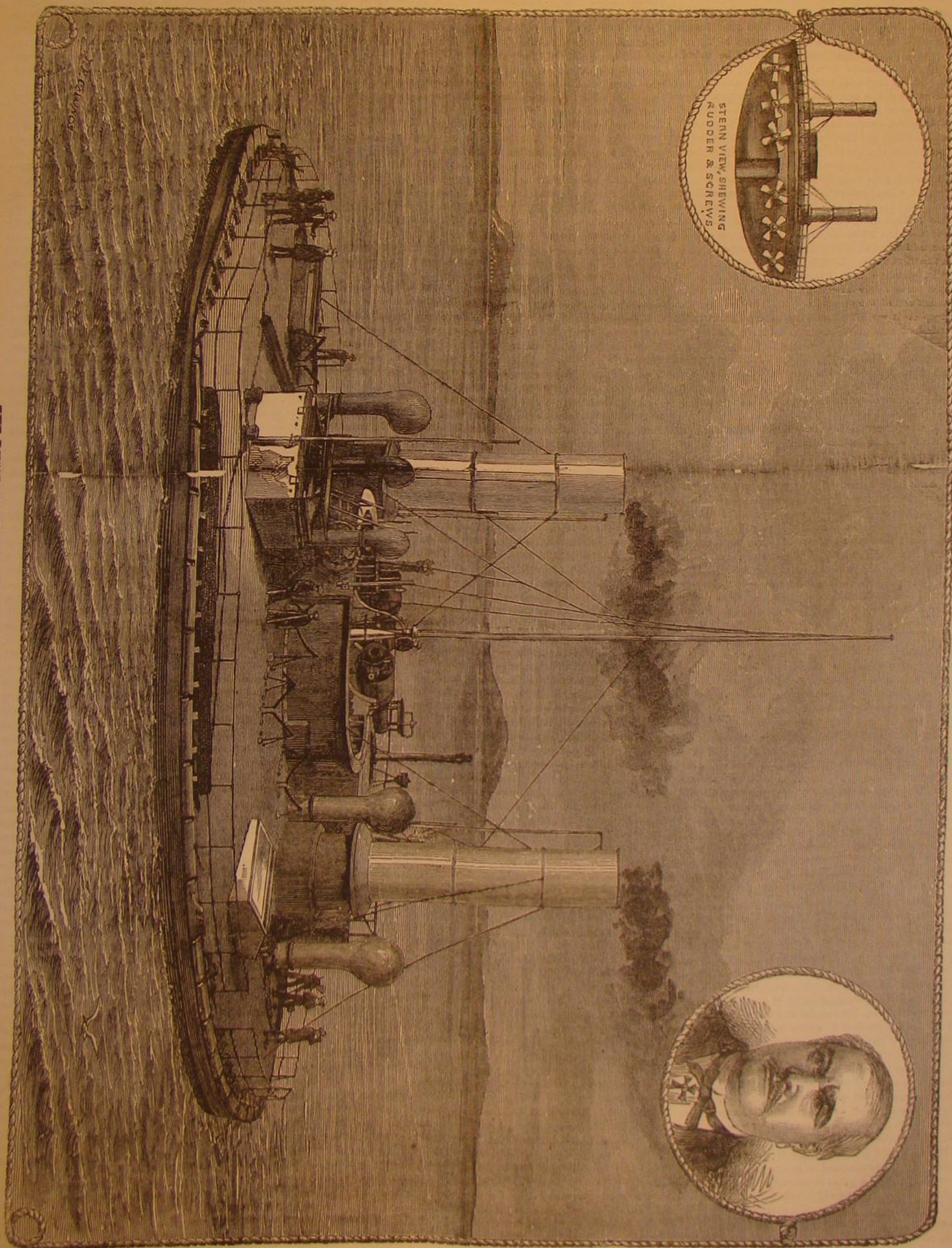
We have heretofore informed our readers of the construction by the Russian government of a circular ironclad man of war, intended chiefly for defensive purposes and harbor service. The form of the vessel was chosen to secure maximum tonnage with compactness, and to present as little broadside as possible to the enemy. Moreover, it would be necessary to strike the vessel nearly point blank to produce any effect on her sides, as a very slight angle of inclination would cause shot and shell to glance off her at a tangent. Owing to the greater displacement in comparison with the weight of hull, vessels thus built can carry much heavier armor and weightier guns than would be possible with those of the longitudinal form. This principle, which has been partly carried out by Mr. Reed in his broadening of vessels to ob-

tain greater displacement, has been found to answer most satisfactorily, and notwithstanding that the tonnage of the Novgorod is 2,491, she only draws 13 feet 2 inches of water, with all weights on board, and with a longitudinal false keel. The armor plates are 9 inches thick, and are backed with channel iron to the amount of 2 inches, so that the armor is virtually 11 inches thick. Moreover, from her circular form, the Novgorod is of an uniform strength throughout, and presents no weak point. The deck, which measures 101 feet in diameter, is also plated to the depth of 2½ inches, while a thickly armored breastwork protects the guns, which are worked in an open turret so as to ensure greater precision of fire, and which can be moved and fired either independently or together, as may be required. The guns are two in number, of 11 inches bore, and weigh 28 tons each. The vessel is pro-

pelled by six screws worked by engines of 480 nominal horse power (see the small engraving in the left hand upper corner of our picture). The speed attained is said to be equal to that of the monitors; but as the vessel is said to be used for defending the mouths of rivers and weak portions of the coast line, a high speed, though desirable, is scarcely absolutely necessary. The rolling and pitching of the Novgorod are said to be far less perceptible than in vessels of an ordinary type, owing to her flat bottom. She was launched in the early part of last year, at Nicolaieff, on the Black Sea. Another vessel of the same type is being constructed. She will be of a larger tonnage, and will bear armor 18 inches thick.

Vice-Admiral A. A. Popoff, the designer of this type of ironclad, whose portrait we give in the upper right hand corner of the engraving, is the son of a Russian naval architect, and is

THE RUSSIAN CIRCULAR IRONCLAD "POPOFFKA NOVGOROD"



about fifty years of age. During the Crimean war he served with the fleet in the Black Sea, and distinguished himself by burning several of the storeships of the allied fleet. At the close of the war he superintended the construction of a large number of fast steaming vessels, and the most powerful iron-clads of the Russian navy have been built according to his designs. Thus, in addition to the circular ironclads (which are called Popoffkas after him), he is the designer of the Peter the Great, concerning which there was so much controversy last year, and of the fast corvettes of the Duke of Edinburgh class, with armor along the water line, similar to our Nelson and Northampton. In addition to his shipbuilding labors, Admiral Popoff has cruised several times round the world in command of the Russian squadron.

The Proposed Changes in the English Patent Laws.

At a recent meeting held under the auspices of the Institution of Mechanical Engineers, to take into consideration the proposed bill for amending the British patent law:

Mr. Bramwell, the president, said there could be nobody so interested in inventions as was the body of mechanical engineers. Among that body were to be found many of the greatest inventors of the age, and men who in their manufacturing were day by day carrying out the results of inventions of themselves, or of others; and thus in the two-fold capacity of inventors and producers, the members of the institution were deeply interested in inventions. He thought that the majority of the press and the public had determined that invention had gone on as it had done in consequence of the existence of a good patent law, which was essential for the protection and for the increase of inventions. The law of 1833 was perhaps not faultless, but it worked very well. A commission sat in 1865 to consider it, and a committee sat in 1871 to consider it, and both recommended certain legislation upon the patent law. Nothing had been done until the present year, when the Lord Chancellor brought in a bill which at the present time formed the subject of the attention of Parliament and of the attention of the members that day. In many respects it would be found that it departed from the recommendations both of the commission and of the committee; and therefore it might be taken that those two bodies, who each had before them a quantity of extremely good evidence, in investigating the matter with the greatest care, had to a large extent their labors thrown away by the present bill, without due attention being paid to their recommendations.

Mr. E. A. Cowper proposed a resolution: "That this meeting is decidedly of opinion that the Patents for Inventions Bill, 1875, proposed by the Lord Chancellor, would be much worse in its operation than the act of 1833." He thought that the patent laws had proved the greatest possible stimulus in this country to the progress of manufacture and invention. He scarcely thought it necessary to go into the merits of the patent laws, because he thought all were agreed that the patent laws were most important. He had looked through the bill and found ten distinct places where the Lord Chancellor had power given to him to refuse all patents, and the way in which it was done seemed at first sight plausible. There might in this way be an absolute destruction of the patent laws. It only depended on how far public opinion would tolerate such a thing as the Lord Chancellor putting his foot down upon every patent applied for. The Lord Chancellor had absolute power, he had power to make rules and regulations, and power even to settle any cases of dispute about licenses; in that way he had full power to destroy a patent whenever he thought proper. He believed they were all agreed that the provisional specification was a good thing, and yet the proposed bill swept it away. Then there were examiners to be appointed who would be entirely irresponsible; they would be something like the examiners of the Patent Office in America, and he must say that the action of those examiners was not very satisfactory. There was a staff of about 400 persons appointed. If an invention was reported upon adversely, there was then a reference to other examiners, then to the commissioners, and finally it was referred to the head commissioner, and sometimes, after having gone through several steps at great expense and great delay, the head commissioner reversed everything that had been done before. He had great pleasure in proposing the resolution.

Mr. William Smith, in seconding the resolution, said he entirely concurred in what had fallen from Mr. Cowper. He had looked into the contents of the bill, and had made some inquiries as to its history. He found also that the Attorney and Solicitor General had never been consulted, and curiously enough, Mr. Woodcroft, a gentleman in whom was centered the whole of the information in connection with the Patent Office and the administration of the patent law, had not been considered. He was not, therefore, surprised that a bill should be introduced which gave no satisfaction to any one except to the enemies of patent laws. It was clear that the measure had been framed entirely for the purpose of neutralizing those laws. It was, in truth, "a delusion, a mockery, and a snare," a snare it most certainly was. Mr. Cowper had mentioned ten, but he believed there were in reality seventeen, cases in which the administration of the patent law was placed solely and exclusively in the hands of the Lord Chancellor. Anything more opposed to public policy than the Lord Chancellor's bill it was scarcely possible to conceive. He maintained that the present eminence of this country was to a great extent due to the wise provision that had been made in regard to patents, but the Lord Chancellor's bill would take away all protection from that important class of property known as invention; and unless a strong effort were made by all the important interests of the

country to stop the progress of the bill, the results would be very disastrous.

Mr. Carpmal said if the country desired inventions to be made it must pay for them in some form or other. There must be room for the inventor to succeed in the battle of life, in the competition that goes on, otherwise the race of inventors may soon become extinct. In the House of Lords, from the debates which took place on the second reading of the bill, they learned that public opinion was not at present sufficiently educated to allow of the abolition of patents, but this was a bill which would pave the way for this not very desirable consummation. No bill which was introduced to the notice of Parliament on the subject of patents could be satisfactory to inventors or those who sympathized with them. For example, he was one of those who considered that examination and investigation of applications for letters patent in some form or another was desirable; but when he asked himself the question: "Is the examination contemplated by the promoters of this bill a fair and bona fide, honest examination, or is it not, on the contrary, the wholesale rejection of applications for letters patent which will be expected at the hands of examiners?" he really knew not what to reply. There was nothing whatever in the bill to prevent its being used as an instrument of wholesale slaughter of patents.

Mr. Smith did not think that Mr. Carpmal thoroughly expressed the opinions of a large section of the class of inventors, and of those who had an interest in invention, in saying that some system of examination was desired. He believed if all the inventors in the country were polled, it would be found that rather than have such an examination as was provided for in the bill, or even as that shadowed forth by Mr. Carpmal, they would prefer to take their chance. They were the best judges of what they wanted, and the question of whether there was any infringement of a patent could easily be dealt with. The best method to employ, in the opinion of a large number of persons, was to have a larger number of libraries offering facility of examination to all inventors, so that everything that had been done could be easily ascertained. This would be far better than the employment of an expensive staff of examiners, who after all might not thoroughly understand the inventions submitted to them.

Mr. Camplin said he believed there was great feeling among inventors in favor of a proper system of examination; but he thought that an examination into the novelty of an invention must always be a matter of considerable difficulty; and unless there were at the Patent Office full and complete indexes, giving an opportunity to the examiners of going into the different inventions that had been already passed, the office of examiner would be a useless one—it would be impossible for them to do their work satisfactorily without having all those appliances at hand. If, however, those indexes and appliances were placed at the service of inventors, they might enable them to do for themselves the very thing which the expensive examiners were appointed to effect. The provisional specification was of great importance to the working class of inventors for two or three reasons. In the first place, they were not likely to be able to put their ideas into such a form as would satisfy the requirements of the law. They would therefore require professional assistance, which would entail considerable expense at the outset; during all that time they would be waiting for any protection which might enable them to negotiate with employers or capitalists with a view of getting their inventions carried out. Nearly all the petitions that had been sent to the House of Commons on the subject spoke of the abolition of the provisional protection as a thing that would be greatly detrimental to the class of inventors.

Mr. E. Newton said that the object of the resolution, which was passed, appeared to him to have been to get rid of the bill altogether; and perhaps that was cutting the Gordian knot in the right way, because unless some very serious alterations were made in the bill, there was no doubt that it was intended for the purpose of abolishing patents altogether. But inasmuch as they must be prepared for the bill passing the second reading and getting into committee, it became necessary first to consider in what way the bill should be amended, or whether they should or should not point out some things that really required excision from the bill and that some others should be introduced in their stead. He quite agreed that it would be better to retain the provisional specification. It was all very well to say that England was the only country that gave provisional protection. It was the only country in which a general description of an invention could be deposited, and a protection of some kind or other obtained for it. In all other countries a detailed description had to be given, illustrated with drawings, and sometimes with a model, setting forth the whole nature and object and scope of the invention; but those who stated that forgot one thing. In the first place, for instance, in America patents were much less expensive than they are here; in France and Belgium they were also less expensive; but beyond that, in France, during the existence of the patent, various improvements and additions could be added on to the original invention, and therefore if something has been omitted in the original specification it could be added on from time to time as these things occur. In America the patent could be re-issued, the original patent could be delivered up if it was found defective in some points, and anything that had not been properly described in the drawing could be included in the re-issue. Under these circumstances it appeared to him that England was in a totally different position to foreign countries in regard to this question.

As regards examination, he was one of those who originally strongly objected to it, because he had seen the absurd-

ity of it in the United States. The examination there was supposed and theoretical. The law was as good as it could be, but it worked exceedingly badly. He had seen instances in which inventions had been patented over and over again. Mr. Cowper, he knew, had before him a number of extraordinary instances in which inventions had been patented over and over again in the United States, notwithstanding the boasted examinations which these things are supposed to have gone through. He agreed with Mr. Carpmal that an examination of some kind would be an advantage. He would move: 1. That any preliminary examination of applications for letters patent that may be hereafter instituted should not extend beyond the questions whether the specifications are clear, and whether the invention is open to objection on the ground of want of novelty, regard being had to prior publications in the Patent Office. 2. That an adverse report should not disqualify an applicant to a patent. 3. That in lieu of the proposed publication of reports (which would in many instances operate unjustly) the applicant should merely be required to insert in his specification an acknowledgment of the existence of the prior matter found and pointed out by the Patent Office officials, with a clear statement of what he claims notwithstanding.

Mr. Lloyd Wise said the proposal that, notwithstanding the adverse opinions of examiners, patents would be allowed, had been supported by the Associated Chambers of Commerce, the Society of Arts, the Society for the Promotion of Scientific Industry, and others, and was a very good one if taken in conjunction with the proviso, in Mr. Newton's resolution, that adverse reports should not be published, the examination being one as to novelty alone. If the insertion of acknowledgment of prior matter in the specification was required, the public would be effectually informed as to the nature of the invention.

Dr. Siemens said he thought they had all learned a lesson within the last few months. It was not more than two or three months ago since they had an important paper by the president, before the Society of Arts, on the question of the patent law, and at that time the voices were many and loud against the existing patent law. He was, perhaps, in a great minority in saying that he thought the existing law not bad, and that before they lifted a stone against it they should be very careful as to what they got in its stead. They had got something in its stead now, and he thought they ought to be very grateful to Lord Cairns for having attacked the question so boldly. He had benefited both classes, both the applicants for patents and those opposed to them; the former in showing them they really had a valuable patent law, which might be susceptible of improvement in detail, but which contained many important provisions which distinguish the English patent law before the patent laws of other nations. Opponents of patents would have learned by this time that it was not so easy to knock patents on the head. The opposition that had been raised against the provisions of the bill now before Parliament was so decided, and so well supported by reason, that he doubted very much whether the bill would go on, and perhaps next year or at some future time there would be a bill which would not attempt to undermine the patent laws, but which would be conceived with a view of improving them. In that case he was sure that all true friends of industrial progress, whom he would identify with friends of patent administration, would support such a measure. There seemed now to be very little difference of opinion with regard to the main features of such a patent law as would satisfy all classes. The most difficult point, and one on which they had that day heard different opinions expressed, was that of preliminary examination. Looking to the working of that system in other countries, it was found that it existed in America and in Prussia. In America it existed with a bias in favor of inventors. The American legislature favored the applicant, and, if any abuses arose, they were abuses inherent to that system of examination with power of rejection. In Prussia there was a system of examination with a bias against patent laws altogether. It appeared to him if the bill of Lord Cairns was to pass into law, the examinations would approach more nearly to the Prussian. The commissioner appointed would be instructed to seek for an excuse to refuse them, rather than try to modify the application in such a way as to give the applicant the benefit of the patent; and that being the case, he thought they should be very careful how to accept this clause of the bill. The question was involved in difficulty, and he must say that he had not found a formula that would altogether satisfy his own mind. Examination was decidedly useful; it gave the applicant information which must be useful, if it would stop there. Would it not therefore be sufficient for the examiner to point out to him clearly what had been done and what had been proposed to be done, and to warn him that in his claims he must avoid those breakers ahead? Nothing more was necessary. They need not go the length of printing a condemnation upon his very door. They might tell him, "This, that, and the other, is known, is published; avoid it; but we do not advise you to proceed or not proceed with your application." Some such medium course would probably get rid of the difficulty, which was a real one; but in all other respects he thought that the friends of the patent law, and those who had had experience of patents, seemed to be all agreed. So that it was unnecessary for him to enlarge upon any portion of the bill. He could only therefore concur with the resolution that had been proposed and seconded, and he hoped it would be carried.

Mr. Napier thought the bill should not pass in its present form. There was a strong feeling in favor of patents. He had been connected with them for many years as manufacturer and patentee, and when he read the bill he was very sorry to think that the Lord Chancellor should have framed

1t. As far as he could judge, it seemed to be ignorantly framed. Having had to do with a large number of patents, he thought it was really necessary to have a provisional specification. He thought it was undesirable in any way to limit and tie up the patentee. It had been said that the patentee should be looked after, that he should be patronized; but he was afraid that in the House of Lords there was no real intention of patronizing the patentee. Indeed, the patentee did not require patronage; he required to be left alone, to have freedom. Speaking for himself, if he wanted any one to examine what he considered an invention, he would ask them. If the patentee wanted assistance, it should be furnished to him for nothing, and if that were done then the patentee would be in a right position. A patentee was naturally anxious to know whether there had been a previous patent which he would infringe upon. He did not want to take out a patent which had been taken out before, because he knew that the result would be to ruin himself in that particular thing. Therefore he was very anxious for his own safety. He therefore thought it very desirable to leave the patentee alone. He was a very useful person, in fact the whole of the progress of the country depended upon the inventor. That was saying a great deal, but if they looked into the library of the Patent Office and scanned the amount of mind that they found there shown in print, and if they could only suppose how in any other way but by patent law that mind had been used for the improvement which they found there indicated, he thought it would be impossible to conceive how by any other means than by patent law there should have been so much progress made.

Mr. Smith said it might be well to adopt the French system and require payment of, say £5 on application, and £5 a year afterwards. He did not wish to see the patentees patronized, but every means should be given them to enable them to judge for themselves, and also to employ such men as Mr. Carpmal, from whom they would get more assistance than they could from a large staff of examiners. He would give inventors the full benefit by taking off the enormous taxation in the third and seventh years, and making the payment an annual one, so that the patent could be dropped at any time.

Mr. Carpmal said there were, no doubt, abuses in the American system, but they had been often exaggerated. There was a reason for those abuses that did not exist in England. The American civil service was entirely political, and every one of the staff of the Patent Office had to subscribe a part of his salary to keep his party in office. With regard to the search, Dr. Siemens said that a search by a patent agent was expensive, and it could not be otherwise. When a patent was instructed to make a search, he had to build a scaffolding for the purpose, but in a government department there would be a scaffolding available for the public generally. He had taken out patents in America, France, and Belgium. In France and Belgium there was nothing to do but to ask for a patent, and he valued it according to the facility with which it was given. In America the process was very long; and separate patents were required for different details that would be included in one patent in England. That brought up the cost to about the same amount as in this country. He did not see how they could do much better than carry out the act of 1852 in its integrity. The bill of the Lord Chancellor was wholly uncalled for. Patentees had not agitated for it, and he did not regard the House of Lords as a body well qualified to judge of their requirements. He thought the bill would have very little chance in the House of Commons.

Mr. Smith thought it advisable to pass such a resolution as the following:—"That this meeting is of opinion that many of the provisions in the Lord Chancellor's Bill are contrary to public policy, and an interference with the admitted rights of inventors and others connected with property in invention."

Mr. Newton seconded the resolution, which was carried. The President said that the bill, as they were aware, had passed the House of Lords. He had the highest respect for that body, but he did not think it was a tribunal he would select for the purpose of determining upon the policy of the patent laws. He believed that the Lord Chancellor, in the very speech in which he introduced the bill, showed that he was not very practically acquainted with manufactures. His recollection was that, when the Lord Chancellor alluded to the new process of toughening glass by steeping it when hot in oil, he spoke of it as being in contradistinction to that process, ordinarily pursued in glass manufacture, by steeping it in cold water. He thought it would be found, on reference to his speech, that that was the Lord Chancellor's opinion on one of the processes in glass manufacture. Lord Somerset who, having been at the head of the Admiralty, should, he thought, have had a little respect for inventions, was very jocose. He said that an inventor came and made a screw wide at one end, and another came and made it narrow at that end, and that gave him the right of patent, on which there was great laughter. It might have occurred to his lordship that the whole difference between a good screw and a bad one lay in the form of it, and that it was not until after years of experiment that a good propeller was obtained. Even at the present day they knew it was a disgrace to mechanics that they could not get a propeller that would utilize a greater percentage of power than was got by the screw. But he thought it was a matter of complaint that the patent law was made the property of lawyers. The bill had been framed by a lawyer without consultation with those who did know something about it; it entirely passed by several of the recommendations of the commission of 1865 and the committee of 1871-2, and it contained clauses that were in themselves most prejudicial. He was glad that the opponents of the bill

had been furnished with powerful arguments against it at the present meeting. They might not be wanted for the present session, for he hoped the bill would be not among the "innocents," but among the wicked, that would be slaughtered; but as it might revive next session, he hoped that the proceedings of that day would have their due weight; and he hoped, if needful, that the members of the Institution of Mechanical Engineers would meet another year to protest against a bill so injurious to the interests, not only of inventors, but of the country.

In Memoriam.

He used to make his appearance at our desk about once a week, for nearly ten years. He always carried a musty roll of drawings, which seemed to be a little more worn and a little more yellow at each visit. Eventually they came to look like the part of his coat against which they rubbed—dirty black and shiny. He was very patient; perhaps he gave us credit for being so likewise; besides, he was deaf. Therefore, he could wait and glare benignly though vacantly, over his rubicund nose, upon us until we had finished with some preceding visitor. Our part of the conversation was confined to nods, interjected whenever we became aware that he had stopped for breath.

Some years ago we understood a little of his story, but it departed from our recollection. It was too complicated: we either had to forget that or everything else. We did not tell him so, however, and consequently he supposed we were blessed with a stupendous memory; for after he had finished his invention and begun on the improvements, of which he had a new one to describe every time he appeared, he assumed that we remembered all of his previous oration. He improved his original notion out of existence several times, so that in the end his dilapidated drawings had nothing to do with the subject of his remarks. That idea occurred to him eventually, and he neglected to show them. This was after a great many people got impatient in attempting to reconcile them with his description. He would talk none the less, however, making enormous drafts on our imaginary faculties for comprehension, and on his own for facts. He believed that alcohol was food, and practically tested his theories frequently, which did not improve the coherence of his remarks nor the aroma which pervaded his presence. We found out, after a while, that we were a kind of mental safety valve for him. So long as we would listen he was happy; and doubtless, when he slowly departed toward the nearest bar room, his moral refreshment was equalled in degree only by his physical dryness.

This article is an obituary. It may be a peculiar one, but not more peculiar than its subject. We have missed him and his roll of drawings for about one week. There is a competition in progress, before a committee which sits daily, of schemes for a great city improvement. He entered the lists of competitors with that roll of drawings. Somehow he became possessed of the idea that he had distanced all rivals, whereupon he indulged in a too prolonged banquet. Then he tumbled down stairs and broke his neck.

In the above will be recognized a character well known about New York city, a genius of more than ordinary cleverness, and an engineer of practical skill; but his hobby and his habits killed him.

City Bee Culture.

A manufacturer of a summer drink, which seems to be quite popular during the present heated weather, has taken a store in the neighborhood of our offices, and placed in the show window a beehive, in which, in full view of the crowd which constantly gathers, the busy insects make the honey which, it is asserted, is mingled with the cooling beverage. The window is open at the top, and the bees are allowed to collect their materials from the street refuse. The honey seems to be of excellent quality, and the bees require no further care nor attention than if foraging among their favorite clover fields.

At the Fair of the American Institute last fall, a very fine case of honey was exhibited, the contents of which, we were informed, had been obtained by the bees entirely from the swill barrels, the sugar-house waste, and the flowers in the public parks of the city. There was nothing about the material to distinguish it from the best honey made from clover, and it undoubtedly should and probably did find a market just as readily. The quantity of such honey-yielding refuse wasted in the metropolis is enormous. Why then should it not be more widely utilized through the bees? Private apiculture can be carried on just as well on a house top or in a back yard as upon a farm, and any one with such space at his disposal might easily manage a few hives and build up a paying business, and it would afford amusement to the experimenter and his friends. There are many people, out of the thousands seeking work here just at present, to whom some such new occupation—for such bee culture would be, thus carried on in the city—might be of considerable assistance in eking out a support during the stagnation of business peculiar to the heated term.

A contemporary suggests bee culture as an excellent employment for women, an idea with which we fully concur. A case is mentioned of a lady who started with four hives purchased for \$10, and in five years she declined to sell her stock for \$1,500, it not being enough. Besides realizing this increase on her capital, she sold 22 hives and 436 pounds of honey. Another instance is on record, of a man, who, with six colonies to start with, in five years cleared 8,000 pounds of honey and 54 colonies. Fine honey readily fetches, at retail, from 25 to 40 cents a pound.

SIR WILLIAM EDMOND LOGAN, the distinguished geologist, died recently at the age of seventy-seven years.

DECISIONS OF THE COURTS.

United States Circuit Court—Southern District of New York.

GILBERT & BARRETT MANUFACTURING COMPANY vs. GARDNER TIERRELL.—PATENT GAS APPARATUS.

[In equity.—Before WOODRUFF, Circuit Judge.—Decided June, 1874. WOODRUFF, F. J.]

The bill herein is filed to restrain the infringement of a patent granted to J. F. Barker and C. N. Gilbert on the 3rd of August, 1869, for an approved apparatus for carbureting air.

By means of this apparatus, it is claimed that gas is produced from petroleum and similar volatile oils employed for carbureting atmospheric air, thus rendering it combustible, light-producing, and suitable for lighting houses, manufactories, etc.

Neither the process nor the chief parts of the apparatus are claimed to be new. The claim in the patent which the defendant is charged with infringing is in these words:

The arrangement of the carbureter with a motor wheel, said motor wheel being driven by a descending weight or other equivalent mechanical power applied to force the air through the carbureter to the burners, said carbureter being placed within a vault by itself, separate from the building into which lighted, the whole arranged and connected with pipes, substantially herein—that is, in the specification—described and set forth.

It appears by the proofs that, prior to the invention of the patentees, attempts to produce and bring into use gas for use as manufactured by forcing atmospheric air through or in contact with volatile oils under such pressure that it was suitably impregnated or carbureted were liable to two difficulties.

The chief of these was that, under any already devised arrangement, the danger of explosion, as an incidental result of the escape of gas from the carbureter, was very great; and this not only per se hindered its use, but made it difficult or impossible to procure insurance upon buildings so lighted. Another difficulty lay in the fact that, in passing the gas from the carbureter through the distributing pipes, whenever the temperature of the pipes was lower than that of the carbureter, condensation occurred, which produced in the pipes not an obstruction merely, but a highly inflammable liquid, greatly inconvenient and dangerous.

If an attempt was made to obviate these objections by locating the apparatus in apartments separated from the building, lighted, there was a necessity to provide for the changes of temperature in our ever-varying climate, which were liable to cool the carbureter to a degree which made it practically inoperative; or, if the apartment was artificially heated, the danger of explosion was not avoided.

I shall not enter very fully or minutely into discussion of the details of the patented apparatus, since most of them are confessedly old. The chief feature of the improvement is in the placing of the carbureter underground, in a vault separate from the building to be lighted, at any desired or convenient distance therefrom, while the power and the motor, by means whereof the atmospheric air is forced through pipes leading into the carbureter, is placed in an apartment in the building, or near thereto, conveniently accessible, with or without a light, so occasion may require, whenever for adjusting the motive power or machinery thereof it is desired to do so. Such apartment being thus wholly separated by walls or intermediate earth, or both, no gas from the carbureter pervades it, and no danger of explosion arises.

Be it also this result, which may be claimed to be purely incidental, and perhaps not novel, because it would result from any mere separation of the two parts of the apparatus by placing them in different apartments, a most important result is effected in making such separation practicable, and at the same time producing an even, regular supply of the gas by the carbureter unobstructed by changes of temperature above ground, and effecting also a preliminary condensation before the gas enters the distributing pipes, which relieves the operation of the apparatus from the objection secondly above named.

Three questions are hereupon raised. Was this new arrangement patentable? Was it new, and were the patentees the first inventors? Does the defendant infringe?

1. Upon the first question it is insisted that the patentees merely changed the location of the carbureter, and that the mere change in the location of an old device is not patentable.

In *Marsh et al. vs. The Dodge and Stevenson Manufacturing Company*, in the Northern District, at the June term, 1873, (5 Official Gazette, 29) I had occasion to say that "mere change of location is not invention." But it was also held that "where change of location involves the employment of new devices to adapt an apparatus for use in the new position, and a beneficial result is produced, then this location, in its connection with such new devices—that is the means by which the result is produced, and not the result itself—is patentable; and where such change of location brings into existence a new combination to produce a new and useful result, such new combination is patentable."

This illustrates the nature and patentable character of the arrangement described in the patent in this case. By the new arrangement the patentees bring into contributory and effective cooperation, with a carbureter and the machinery for supplying atmospheric air thereto, the earth and its even temperature below the surface, and obtain protection from the effect of the carbureter and its accumulation in the frequently visited location of the motor, and from the danger of consequent explosion, and secure, by the passage of the gas from the carbureter through a cooler medium, the preliminary condensation, which makes the use of the gas in the building and its passage through the distributing pipes safe, convenient, and valuable.

It is an impeachment of the patent to say that this is only making use of the natural laws which, operating below the surface, make such new location desirable as a matter of mere judgment. It is more than that. It brings into conjoint operation and effect new elements, working actively and also operating passively to produce the result, and to produce the ultimate and final result in a better manner—in a manner which combines safety with convenience and utility as had never before been achieved.

The most important inventions ever made consist in subordinating natural elements or controlling natural laws to the production of useful results.

I cannot doubt that the invention of the patentees was patentable, as truly so as it is abundantly proved to be greatly useful and valuable.

2. The questions of fact—was this arrangement new, and were the patentees the first inventors—must be answered in the affirmative.

I cannot, in a brief opinion, review in detail the evidence. I must content myself with saying that, after a careful examination of the testimony and attention to the very full argument of the counsel, the conclusion seems to me clear that no prior devices or arrangements anticipated the patentees.

3. Does the defendant infringe? It was but feebly, if at all, insisted that, if the arrangement of devices by the patentees was entitled to be called invention, and was patentable, as above explained, the defendant did not employ its distinguishing features or characteristics. The details in the construction of his carbureter were not precisely like that used by the complainant, but those specific features were not claimed. The substantial operation of his carbureter and the mode of impregnating the atmospheric air are alike in both.

The difference between the apparatus of the defendant and that of the patentees chiefly relied upon is that, whereas the latter make the cavity below the ground a vault having surrounding walls, the defendant, having inserted his carbureter in the cavity, surrounds it with earth in direct contact therewith, and carries up to the surface a pipe through which to replenish the carbureter with oil, instead of having a removable opening to the vault below employed by the patentees.

The substance of the invention the defendant uses. The means of its effective useful operation are the same. The even moderate temperature of the earth, the underground passage of the gas, and the effect thereof are alike used in both. The difference in the construction of the carbureter used by the patentees, as described in the drawings, may make a more permanent opening about its sides desirable; but I cannot regard these details as of the substance of the invention. The apparatus of the defendant does substantially operate by the same means, in the same way, and to produce the same result.

The complainant must have a decree for an injunction and account in the usual form.

EDMUND STANLEY and William Stanley, for complainant.

Edmund Wetmore, for defendant.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 4 to July 5, 1875, inclusive.

- BACKING ELECTROTYPES.—J. S. Brooks, Pittsburgh, Pa.
- BAG FASTENER.—A. M. Miller et al., Sturges, Mich.
- BESSEMER CONVERTER.—J. E. Fry, Johnstown, Pa.
- BOTTLE STOPPER.—N. Thompson (of Brooklyn, N. Y.), London, England.
- BOTTLE STOPPER, ETC.—N. Thompson (of Brooklyn, N. Y.), London, Eng.
- BRACE.—G. Westinghouse, Jr. (of Pittsburgh, Pa.), London, England.
- COMB.—A. Poppenhusen, College Point, N. Y.
- COTTON OPENER, ETC.—R. Kitson, Lowell, Mass.
- CUTLERY.—J. W. Gardner, Shelburne Falls, Mass.
- DOOR FASTENER, ETC.—E. C. Bacon (of Boston, Mass.), London, England.
- FIRE ARM.—J. D. Greene, London, England.
- FRICTIONAL ELECTRIC BATTERY.—G. M. Mowbray, North Adams, Mass.
- GAS STOVE.—J. L. Sharp, New York city.
- GLAZING LEATHER, ETC.—R. Lee (of Phila., Pa.), Huddersfield, England.
- GRAINING LEATHER, ETC.—R. Lee (of Phila., Pa.), Huddersfield, England.
- GRATE BAR.—F. S. Smith, New York city, et al.
- HOT AIR FURNACE.—S. Smith et al., Worcester, Mass.
- LAMP REFLECTOR.—C. M. Murch, Cincinnati, Ohio.
- LEATHER PULP, ETC.—R. James, Worcester, Mass.
- LIFE RAFT, ETC.—J. Cone, Bristol, Pa.
- LOOM, ETC.—T. A. Dodge, Cambridge, Mass.
- MACHINE GUN.—W. B. Farwell, New York city.
- METAL TUBE, ETC.—G. J. Brooks, Brattleboro', Vt.
- NUMERICAL TOT.—W. Rose, New York city.
- ORDNANCE.—D. Davison, New York city.
- PAYING COMPOSITION, ETC.—J. R. McClintock, New Orleans, La.
- POISON VESSEL, ETC.—W. M. Caterson, Philadelphia, Pa.
- POLISHING COMPOSITION, ETC.—F. Alwater, Norwood, N. J.
- REAPING MACHINE.—Gammion et al., Chicago, Ill.
- SHYTING MACHINE.—J. F. Allen, New York city.
- RIFLE TARGET.—J. G. Bennett, New York city.
- WOOD SCREWS, ETC.—T. J. Sloan, New York city.
- WRITING DESK.—W. S. Wootton et al., Indianapolis, Ind.

Recent American and Foreign Patents.

Improved Clothes Dryer.

Conrad Hauser, New York city.—The rod-carrying standard is made with folding legs that may be spread. The clothes-carrying arms are supported at different height and direction in perforations of the standard, and may be readily inserted and taken out as required. A base plate above the folding legs is recessed with as many socket holes as there are rods, for seating one end of the same therein, while the other end is attached, by a suitable fastening device, to the standard.

Improved Joint Support for Street Railway Rails.

C. B. Sheldon, 7 State street, New York city.—This is a splice plate for rails laid on stringers, which is flanged on the under side to conform to the upper side of the stringer. The plate has elongated bolt holes, through which it is firmly bolted to the rails by bolts whose heads are countersunk in the bottom of the groove in the upper side of the rail, so as to hold the rail ends and the plates firmly together to prevent the spring of the rails up and down. By this plan the two rails are firmly bolted to the plate so that one cannot rise without the other.

Machinery for Beating out the Soles of Boots and Shoes.

Seth D. Tripp, Lynn, Mass.—This machine is contrived with a series of lasts for holding the shoes, which are slowly revolved upon a wheel to be presented successively to different smoothing devices, and so that the attendant may take the finished boot or shoe off the last and put on one to be finished while the last is passing; or if needful he may stop the machine while changing the shoes in case it is geared for quick motion. The machine is thus adapted for performing the work expeditiously.

Improved Sash Fastener.

Peter Meyer, Iowa City, Iowa.—This consists of a spring band, attached to the sash frame, and locking by a perforation on pins arranged at suitable distance on the window frame.

Improved Nut Lock.

Walter F. Marthens, Pittsburgh, Pa.—This invention is an improvement in the class of nut locks in which a spring pawl is pivoted to the nut, and engages with a rib or shoulder formed on the bolt to which the nut is applied. The arrangement is such that the spring will hold the locking plate engaged with the bolt, or disengaged from it.

Improved Governor.

William D. Marks, Chattanooga, Tenn.—The pendulum spindle is in two sections, of which the lower one, to which the driving power is geared, is capable of sliding lengthwise a little, at the same time that it turns the upper one. It also screws up and down in the hub of its driving wheel, and is connected to the wheel by a spring, which allows the wheel to overrun the spindle a little, and screw the spindle along when the motion increases to close the valve in advance of any change in the position of the pendulum. When the motion of the engine slackens, the tension of the spring causes the spindle to overrun the wheel, which will screw the spindle along the other way, and open the valve in advance of the changing of the pendulum, thus making a sensitive governor.

Improved Hay Rack.

Joseph Hall, Riverside, Neb.—This improved hay rack is constructed in such a manner that it can be taken to pieces and stored away when not in use, while it may be readily set up and placed on the wagon by one person. It consists of a bed frame, which is placed on the running gear of a wagon, and provided with vertical standards having detachable cross beams, and with inclined side and end ladders attached thereto, and load binding cords stretched by a windlass attachment.

Improved Valve Gear for Steam Engines.

Margaret V. Hewes, Newark, N. J., administratrix of Joseph L. Hewes, deceased.—The invention consists of a cut-off valve geared with the driving shaft by a compensating contrivance to cause the valve to gain on, and fall back of, the motions of the driving shaft at each revolution in the proportion of its variations with the piston by the effect of the different angles of the crank, and thus to cut off exactly alike for each movement of the piston.

Improved Draw Bridge Fastening.

Carroll J. Atkins, Louisiana, Mo.—Spring bolts are arranged on the draw, with sockets on the rests for these bolts to spring into when they come to holes. The bolts are connected by rods or chains with apparatus at the engineer's stand, whereby he may set them to spring into the holes at the proper time, and also to draw them out, to disconnect the draw when it is to be moved.

Improved Hog Trap.

John Murray Kimball, Wyoming, Iowa.—This trap is secured in a doorway of a pen, by means of the hooks attached to the outer side of the posts. The outer end of the lever is then raised to swing the lower end of a board outward, to open a space between boards wide enough for a hog to pass his head through. The hog is then driven to the trap, and as he passes his head through the said space the lever is lowered, swinging the lower end of the board inward, catching the hog by the neck, and holding him securely while being operated upon, a pawl taking hold of a notch in the lever, and preventing the board from being pushed outward by the struggles of the hog.

Improved Flooring Clamp.

James T. Moss and George J. Moss, Ashborough, Ind.—This consists of a fulcrum for the clamping lever of a flooring clamp, contrived to bear by a plate on the upper side of the joist, and another to bear on the under side. The parts of the clamp are connected by extensible plates, extending along one of the vertical sides of the joists, to adapt them for joists of different sizes, and to hold them so that they gripe the joists, and thereby hold fast on them when the lever is forced against the flooring.

Improved Mousing Hook.

Franklin G. Appley, Providence, R. I.—A band is placed on the shank to hold the hook to the shank and keep a shoulder in a recess in the shank. A lip on the band prevents a rope from catching in the angle, and a lug on the outer end of the hook keeps the ring from slipping off. To make the hook fast, the ring is turned half round, and is provided with a recess beneath the lip, which allows it to slip over a lug to release the hook.

Improved Wagon Brake.

Daniel L. Deffenbaugh, Bedford, Pa.—This construction enables the brake to be applied, when the wagon is so loaded that the ordinary brake lever cannot be operated, by a person in the rear of the loaded wagon, in which position he cannot be run over and injured, should he happen to fall.

Improved Heel Polishing Machine.

Leopold Graf, Newark, N. J.—The principal improvements combined in this invention include a cam that can be operated very quickly to fasten and release the work, also an eccentrically rotating slotted plate for turning the surface of the irregular or eccentric heel evenly and uniformly against the polisher, and finally a ratchet wheel and holding pawl, by which the tension of the spring which adjusts the heel forward or backward to the polisher can be increased or diminished at will.

Improved Paper Feeding Machine.

Socrates Scholfield, Providence, R. I., and Charles E. Baker, Montclair, N. J.—This is an improved device for raising the edge of the top sheet of a pile of paper from the sheet below, in order that the sheets may be successfully fed to a printing press or other machine a single sheet at a time. The invention consists in the combination of a lifting pin and a separate cutter with each other in such a way that the cutter may make a hole in the top sheet and rise to allow the pin to raise the edge of the sheet, and in the combination of a holder with the cutter and the lifting pin.

Improved Water Wheel.

Charles H. Sturges, Saratoga Springs, N. Y.—This invention consists of blades projecting radially from a vertical shaft in a case employed merely to conduct the water away. A series of jet pipes in the bottom of the reservoir above are inclined to discharge the water against the sides of the blades at little more than a right angle to the line of escape from the buckets. A gate in the reservoir is contrived to open the jets in succession, so as to regulate the amount of water by the number of jets. The invention also consists of a secondary set of jets discharging in the reverse direction, and contrived to be opened by the same gate when the others are closed, to reverse the wheel.

Improved Sofa Bedstead.

Axel Holmers, Boston, Mass.—This improved sofa or arm chair bed can be thrown open in such a manner that the seat or back of the sofa is not used at all for the bed, and consequently is less worn, retaining its form and appearance. The invention consists of four parts, two for the back and two for the seat, hinged together, to be swung open by disconnecting the arm top pieces from the arm braces, which form the legs of the front part of the bed. The sofa back and seat form the outer side, and a spring bottom the inner and bed part of the sofa bed.

Improved Planing Machine.

Henry C. Holloway, San Diego, Cal., assignor to himself and John S. Harbison, of same place.—This invention consists particularly in attaching angle plates to the slitting saws, whereby they are secured radially to the plane-carrying cylinder. This admits of convenient and quick adjustment of the saws along the cylinder, so that they may be caused to slit the stuff into pieces of any desired width.

Improved Watch Case.

Simon B. Simon, New York city.—This invention consists in making watch cases long and narrow or cylindrical in form, and of such a size that they may be carried in the pocket, worn in a lady's belt, or worn as an ornament or charm.

Improved Manufacture of Artificial Stone.

Luke W. Osborn, Morgan, and Edward D. Merriam and Peter B. Doty, Conneaut, Ohio.—This is a combination of sand, resin, brimstone, and coal tar, with or without oil and plaster of Paris, for the manufacture of artificial stone.

Improved Piano Tuning Pin Lock.

George P. Reeves, Helena, Montana Ter., assignor to himself and Charles Rumley, of same place.—This is an improved fastening device or lock for the tuning pins of pianos or other stringed instruments, for the purpose of rigidly holding the pin in position after the proper pitch of string has been adjusted by the tuner. The invention consists of an outer stationary and interior sliding jaw plate, placed around the tuning pin, and the conical wedge part of a locking pin or key, that forces the jaws around the tuning pin for binding the same firmly after tuning.

Improved Screw-Cutting Die.

Virginius J. Reece, Greenfield, Mass.—The object of this invention is to control the adjusting device for the dies of screw cutters intended for cutting the full thread at one operation, so as to hold the dies firmly both on the outer and inner edges, and thus keep them perfectly firm and solid. The invention consists of taper-pointed screws between the dies to open them and regulate their distance apart, in combination with two taper-pointed screws screwing through the die holder against the dies, and holding them firmly thereto.

Improved Tool for Pivoting Watch Wheels.

Frank R. Bucklin, East Tilton, N. H.—This invention consists of a tube with a plug in one end, a handle in the other, a centering spindle in the center of the plug and handle, a cap for confining the wheel on the end of the plug, and an outside centering rod on an outside tube, all contrived for holding a pivot on the squared end of a post from which the pivot has been broken, so as to be soldered on readily.

Improved Machine for Tenoning Spokes.

Joshua R. Coleman and Samuel Myers, Gallon, Ohio.—In this improved machine, the spoke is accurately centered in relation to the cutter head by means of angular clamping plates operated by right and left screw-threaded shafts. The jaws of the cutter head have angular faces, which bear upon the tenon, whatever be its form, at four different points, thereby supporting and steadying it under the action of the cutters. The crank shaft, which rotates the cutter head, works in the tubular stem of the cutter head, and a burr or screw collar determines their relative adjustment, and thereby the length of the tenon.

Improved Plow.

Augustus Griggs, La Fayette, Tenn.—The standard is framed to the rear end of the plow beam, and is made with an offset to rest against the lower side of the beam. The forward side of the standard is concaved from its shoulder to its point, to form a seat for the mold board. A cutter passes through a mortise in the beam, the mold board, and the standard, and is adjustably secured in place by pins. This acts also as a brace, to strengthen the standard against the draft strain.

Improved Gas Extinguisher for Street Lamps.

Lewis Boore, Buffalo, N. Y.—By suitable construction, when the pressure upon the gas is increased at the gas house above the amount to resist which a cup is weighted, the said cup will be forced upward, raising the lower end of a tube above mercury, and allowing the gas to pass through said tube to the burner. The tube is held down against the increased pressure by the catch, which is pivoted to a small bracket attached to the cover. As the cup and tube descend upon the decrease of the pressure, the edge of a flange strikes the catch, pushes it back, and passes below it. The said catch immediately swings forward over said flange, preventing the rise of said cup and tube until the said catch has been drawn back. When the time for lighting the street lamps approaches, the pressure upon the gas is increased to the desired point at the gas house. Then, as the lamplighter comes to each lamp post, he pushes back the catch, and, as the tube and cup rise with the pressure, he lights the escaping gas. When the time for putting out the lights arrives, the attendant at the gas house reduces the pressure to the proper point, and all the lights in the street lamps are put out at the same time.

Improved Grain Drill and Planter.

Henry Reutheiler and Elias M. Morgan, Belleville, Ill.—A pivoted yoke straddles an eccentric on the axle of the truck, and imparts its own vibratory movement to a rock lever, which reciprocates the grain dropper through the medium of the ordinary connecting rod. The invention also includes certain devices for attaching the truck to the axle and preventing its rotation.

Improved Ice Cream Freezer.

John W. Condon, Baltimore, Md.—This invention relates to certain improvements in ice cream freezers, and it consists in the combination with the top plate of the freezer of a flange to extend over and protect the teeth of the gear wheel upon the cover of the cylinder from the particles of ice, salt, and other obstruction. It also consists in a single coupling collar, which slides laterally and couples or uncouples the actuating shaft of the driving wheel and the shaft of the pinion that operates the freezer cylinder.

Improved Heel-Polishing Machine.

William Westcott, Syracuse, N. Y.—This invention relates to certain improvements in machines for polishing the heels of boots and shoes, and it consists of a branched frame which carries the shoe-holding devices, which frame is located just beneath the polishing tool, and is pivoted upon horizontal pivots to a vertical rod, which is attached to the frame work by a swivel joint, and is held up by a spiral spring. In one end of the branched rod is an adjustable spring-seated rod, regulated by a cam and set screw, which said rod enters a socket of the last and presses the heel of the shoe against a pivoted plate. The invention also consists in the combination with the shoe-holding devices and the branched frame of a hand lever and pawl for withdrawing the shoe from the polishing tool, and in the peculiar construction of the polishing tool, in which a soapstone block is provided with side plates, to which the support is pivoted to prevent wearing the said block.

Improved Telegraphic Circuit.

William E. Sawyer, Washington, D. C.—The main principle of this invention consists in a division of the transmitting battery current, and the placing of that battery at the receiving end of a line. The result of this application of electric force is not to free a line of tailings or the attenuation of impulses transmitted, which may exist to any degree in the line wire, but to prevent those tailings or attenuations of impulses from producing any effect upon the instrument. In order to produce or cut off action, or discoloration of chemical paper, in the receiving instrument, it is only necessary that the closing of the circuit at the transmitting end of a line shall set the current from the battery at the receiving end to dividing and a part of it flowing in the direction of the transmitting end. It is not necessary, therefore, that an impulse shall ever reach the transmitting end. It is not necessary that the current shall travel any distance upon the line wire, but that we reduce the potential of current acting upon the receiving instrument; and to reduce this potential, it is merely necessary that the current shall begin to flow by divisions toward the transmitting end.

Improved Bale Band Tightener.

John L. Sheppard, Charleston, S. C.—The object of this invention is to provide a device, to be used in connection with baling presses, for the purpose of tightening the bands upon the bales when the latter are being prepared for market. It consists in a large roller journaled in a frame attached to the baling press and driven continuously by power applied through a band and pulley. Journaled in frames by the side of said large roller are a number of smaller rollers, whose peripheries touch that of the larger one. Said smaller rollers are journaled eccentrically in secondary bearings, which latter are also journaled in the framework. To said secondary bearings are attached lever extensions, by means of which the pressure of the smaller roller upon the larger one may be regulated.

Improved Bob Sled.

John J. Sandgren, Ironton, Wis.—This is an improvement in bob sleds with separately moving and adjustable runners, that adapt themselves to the unevenness of the ground. The invention consists of the connection of the runners with the lateral beams by suitable pivot joints, and the lateral brace connection of the runners with the tongue and reach.

Improved Carpet Cleaner.

David B. Scofield, Baker City, Oregon.—In using the apparatus, a small quantity of very hot soap suds, to which may be added a small quantity of other ingredients used for removing grease and dirt, is drawn up into the lower part of tube. The lower end of the tube is then placed upon the carpet over the spot to be cleaned, and a piston is worked up and down below a valve, forcing the suds into and drawing it out of the carpet until the grease or dirt has been removed. The piston is then worked above the valve to draw the suds out of the carpet, a sponge preventing the suds drawn out from flowing out through the lower end of the tube, and the valve preventing it from being forced out by the descending piston. In this way the suds can be drawn out so thoroughly that the wet spot will readily dry.

Improved Oil Can.

Gouverneur K. Haswell, assignor to himself and Charles H. Haswell, Jr., 6 Bowling Green, New York city.—This is a can or other oiler, in the nozzle of which is a valve to shut off the escape of oil and prevent waste, having a spring for closing it, and connected by rods and a lever with a thumb piece upon the outside. The invention also consists of a vent hole, in connection with one of the connecting rods and a stopper on the rod, so contrived that the vent opens and closes with the valve. The oil spout is constructed in sections, one of which has the upper end contracted sufficiently within the base of the next section, which is fitted on it, to form a rest for the spring which closes the valve, and another has its top similarly contracted to form the seat for the valve.

Improved Baling Press.

John C. Stokes, Villanow, Ga., assignor to himself and Joseph W. Cavender, same place.—This invention has for its object to improve the construction of the baling press for which letters patent were granted to the same inventor November 24, 1874. By suitable construction, as the shaft is turned in the direction to wind up the rope and raise the follower, other ropes will be unwound, allowing the outer ends of levers to drop outward beneath plates by their own weight, so that the follower may be free to rise. As the shaft is turned in the direction to wind up the ropes, the upper ends of the levers will be drawn inward; and as they approach the vertical position the levers will act as toggle joints, and press the follower downward with immense power.

Improved Turbine Water Wheel.

James M. Denson, Columbus, Va.—This invention is a turbine water wheel provided with a rotary upwardly-movable gate, inclosing and covering the chutes or water ways. The gate may be raised or lowered to any desired height along the wheel, according to the power required.

Improved Children's Swing.

George A. Fanjoy, Williamsburgh, N. Y.—This invention consists in an elastic back for a swing seat, made of a strip of hard elastic wood, bent into proper form, and having a strip of metal attached to its outer side. There are also straps designed to be passed between the child's legs, to keep him from slipping off the seat forward. The back is connected with the rear and side edges of the seat by other straps so as to be flexible, to allow the back to be drawn together to fit the child.

Improved Plow Colter Cleaner.

Theodore Wallis, Scipio, and Oscar J. Case, Auburn, N. Y.—As the plow moves forward, an arm moves forward and back along the colter, and pushes off any grass, weeds, stubble, or other rubbish that may lodge upon it.

Business and Personal.

The Charge for Insertion under this head is \$1 a Line.

Manufacturers of Machinery for all purposes will confer a favor by mailing their Circulars to Geo. A. Coughlin, Manufacturer's Agent, Middletown, Pa.

Headley Portable Engines. R. H. Allen & Co., New York, Sole Agents of this best of all patterns.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. F. Frisbie & Co., New Haven, Ct.

For Sale—Large lot second hand Machinists' Tools, cheap. Send for list. I. H. Shearman, 43 Cortlandt Street, New York.

Windmill rights and royalties for sale cheap. Mill tested and proved a success. See cut in Scientific American, April 10th. For circular, terms, &c., address E. S. Smith, Good Hope, McDonough Co., Ill.

The advertising house of Geo. P. Rowell & Co. has already gained a world-wide reputation. Its business is being extended every month, and it now has contracts for space in nearly every newspaper published in the United States and Canada. Messrs. Geo. P. Rowell & Co. have evinced a remarkable business tact, and have reduced the advertising system down to a very nice science. (Journal-Recorder, West Meriden, Conn.)

Clark's Pressure Blowers and Exhaust Fans.—Send for price lists. R. W. Wilde, 30 Cortlandt St., N.Y.

A Valuable Patent for Sale—Gas Engine worked by heat evolved by an oxyhydrogen mixture, when ignited. Address P. Vera, care of T. Duque, 763 Broadway, New York.

For Sale—A Complete set of Patent Office Reports, from 1790 to 1871, inclusive, bound in full sheep and in perfect order. Price \$150 currency. This set cannot be duplicated in this country, and is worth \$250. Address Lock Box 38, Washington, D.C.

Reciprocity! Wanted: Machinery to hull, clean and polish 500 or 400 lb. rice per hour in the best possible style. State full particulars to E. Lindemann, Wallua, Sandwich Islands.

Valuable Patent for Sale Cheap, by State or County Rights—A perfect Odorous Broom, the only one ever invented over which control is had for inspection while using—without odor or grease, on stove or floor. All fat and juices saved in Broom Pan. See Scientific American, June 26. Address Joseph Mansfield, Jefferson, Wis.

File Cutting Machines—Parties having such, and wanting a practical man, address P. O. Box 185, Syracuse, N. Y.

Wanted—A 10 ton Steam Crane for Pipe Foundry, new or second hand. Reply by telegraph. Hamilton's Foundry, Toronto, Ont.

Situation Wanted—To take charge of a Boiler Shop. Address J. T. Connelly, Connelville, Pa., Patentee Gusset Connection Locomotive Boilers.

Patterns, Patent Office and Experimental Models, made by Crook & Herring, 36 Center St., New York.

Barry Capping Machine for Canning Establishments. T. H. Bailey & Vail.

Second Hand Steam Engines, Pumps, and Iron-Working Machinery. Catalogues free. E. E. Roberts, 119 Liberty Street, New York.

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price \$6, with good Battery. F. C. Beach & Co., 246 Canal St., New York, Makers. Send for free illustrated Catalogue.

Scientific Expert, in Patent Cases, C. Gilbert Wheeler, 115 State St., Chicago, Ill.

For Tri-nitrolycerin, Mica Blasting Powder, Frictional Electric Batteries, Electric Fuses, Exploders, Gutta Percha Insulated Leading Wires, etc., etc., result of seven years' experience at Hoosac Tunnel, address Geo. M. Mowbray, North Adams, Mass.

Wrought Iron Pipe—For water, gas, or steam. Prices low. Send for list. Bailey, Farrell & Co., Pittsburgh, Pa.

Small Gray Iron castings made to order. Hotchkiss & Ball, Foundrymen, West Meriden, Conn.

Hotchkiss & Ball, West Meriden, Conn., Foundrymen and Workers of Sheet Metal. Will manufacture on royalty any Patented articles of merit.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven Conn.

See N. F. Burnham's Turbine Water Wheel advertisement, next week, on page 109.

Houston's Turbine Water Wheel, manufactured by Wm. P. Duncan & Co., Bellefonte, Pa.—Send for Circular.

Steam and Water Gauge and Gauge Cocks Combined, requiring only two holes in the Boiler, used by all boiler makers who have seen it, \$15. Hillard & Holland, 15 Gold St., New York.

"Lehigh"—For information in regard to emery wheels, their uses, &c., address L. V. Emery W. Co., Weissport, Pa.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Ramsey & Co., Seneca Falls, N. Y., U. S. A.

American Metal Co., 61 Warren St., N.Y. City.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Peck's Patent Drop Press. Still the best in use. Address Milo Peck, New Haven Conn.

Faught's Patent Round Braided Belting—The Best thing out—Manufactured only by C. W. Army, 301 & 303 Cherry St., Philadelphia, Pa. Send for Circular.

Three Second Hand Norris Locomotives, 16 tons each; 4 ft. 8 1/2 inches gauge, for sale by N. O. & C. B. R. Co., New Orleans, La.

Genuine Concord Axes—Brown, Fisherville, N.H. Temples and Ollivans. Draper, Hopdale, Mass.

Price only \$3.50.—The Tom Thumb Electric Telegraph. A compact working Telegraph Apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key, and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 246 Canal St., New York.

For 13, 15, 16 and 18 inch Swing Engine Lathes, address Star Tool Co., Providence, R. I.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa. for lithograph, &c.

All Fruit-can Tools, Ferracute W. K.'s, Bridgton, N. J.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. K. Lyon, 470 Grand Street New York.

Notes & Queries

A. J. R. will find directions for preparing liquid glass (silicate of soda) on p. 225, vol. 23.—R. K. is informed that making malleable iron castings is described on p. 138, vol. 29.—R. F. will find a recipe for cement for china on p. 346, vol. 24.—F. C. will find directions for enameling iron saucepans, etc., on p. 149, vol. 28.

(1) E. G. T. says: I have a small telegraph apparatus for learners, consisting of a key and sounder, the current being obtained from a simple battery of zinc, copper, and blue and white vitriol. How could I make it work an electric light? What material would be required, and how should I arrange it? A. See p. 35, vol. 33.

(2) W. C. asks: 1. Which will be the stronger of the following? Three cells of Bunsen, zincs 1 1/2 x 1 1/2 inches, carbons 3/4 x 2 1/2 inches, porous cups 8 inches high, 3 inches diameter, and 1/4 inch thickness; or a Grenet battery of 8 cells, zinc plate 1 1/2 x 2 1/2 inches, and carbon plates 1 1/2 x 2 1/2 inches? A. On short circuit, the Bunsen. On long circuit, the Grenet. 2. Can the electric light be produced with one of the above batteries? A. Yes, with either. Use 50 cells Bunsen or 100 Grenet. 3. Is the middle plate of a Smee cell sometimes made of carbon? If so, is it as good as the silver coated with platinum? A. Yes. 4. Where can I find directions for making induction coils? A. On p. 219, vol. 32.

(3) E. G. S.—There would be no action in a battery of zinc only, arranged as you propose.

(4) A. B. says: I have a telegraph line of 1/2 of a mile in length, with two relays on it made of No. 24 cotton-covered copper wire, 1 lb. of wire in each relay. The battery is of the Lockwood and Callaud pattern, six jars each. The current is strong enough to produce a very disagreeable sensation on the tongue when it is placed between the wires of the main line. The relays will not work with sufficient force to operate the sounder that is attached to the local battery. One jar of the local battery will work the relay on a 2 foot circuit very well; but if I put my tongue between the wires of the local battery, I cannot discover any current passing. What is the matter with the relays, and what shall I do to make them work? A. Do you use a ground for a return wire? If so, try another wire in place of the ground.

(5) A. G. Jr. says: In Science Record for 1873 some one recommends chromium as a negative metal in galvanic couples. I see in the market lead plates, covered with a film of what purports to be chromium, and apparently coated by deposition. If chromium can be so deposited, what salt of the metal is there that can be used? A. The chromium is not deposited upon the lead electrically, but is pulverized mechanically, and then pressed into the lead.

(6) G. H. says: Can a lightning rod lose its properties as a conductor, after standing 7 or 8 years and becoming considerably tarnished from exposure? Is it more dangerous to use such a rod than none at all? I ask these questions because our factory was recently struck by lightning, the electricity leaving the rod after passing down a short distance and entering the building, where it expended its force among a lot of iron castings, which lay upon the floor directly opposite that part of the wall to which the rod is attached. Its action upon these castings is shown by small spots, where the iron seems to be eaten as if by some acid, though the roughened surface is somewhat brighter and looks as if a small quantity of molten tin had been dropped there. I cannot find that the fastenings of the rod are out of order, and therefore wonder why the electricity should leave it, unless its conducting qualities are impaired. Would repolishing the rod restore its efficiency? A. The age of the rod would not affect its usefulness, unless the joints had lost, by rust, their conducting power, or the rod was diminished in size by rust. We would be glad to have you examine the portion which goes into the earth, and let us know whether it is still perfect, how deep it runs into the ground, and what the condition of the earth about it is in regard to moisture; also whether the rod contains any joints, or whether it is one continuous rod. What metal is the rod composed of?

(7) G. B. asks: Of what shape must I construct a magnet in order to gain the most power? A. Of horseshoe shape. 2. What power can be got per square inch? A. This is proportional to the size and number of turns of the wire and the strength of the battery. 3. What ratio does the power diminish as the distance is increased? A. As the square of the distance.

(8) J. M. says: I tried to make ground connection by taking two pieces of sheet tin, 1 1/2 feet square; I soldered copper wire to them and buried in moist earth about 3 feet in ground, and it would not work with about 100 feet of wire. What is the reason? A. Your plate was too small. 2. I made a battery in the following manner: 1 quart jar with coil of copper in bottom, and a zinc fitting the jar, with hole in center and suspended along the copper, with wire attached. A wooden cup was put in the jar with holes in the bottom for the blue vitriol. I let it stand about 4 hours, and it gave a current. Is such a battery in use, and what do you think of it? A. Your battery is a modification of the Daniell. We cannot see that it has any peculiar merit. 3. How is the electric light made? A. See p. 35, vol. 33.

(9) W. R. D. asks: 1. What is the most practicable method of electrotyping by means of zinc? A. See p. 405, vol. 32. 2. How is silver plated? A. By an electrolytic process.

(10) M. D. asks: 1. What size of objective and eyepiece would suit a tube 4 feet long? A. The size of the object glass depends on its approach to perfection. When achromatic and of the proper curves, it may be 3 or 4 inches in diameter for a tube 4 feet long; but the only way, and that followed by all astronomers, is to try the glass, and, if it is not satisfactory, to reduce the size with diaphragms until a sharp image is obtained. 2. How can the object and eyepieces be neatly and correctly attached? A. Neat and correct mounting can only be done by turning the tube on the lathe, as the glasses have to be perfectly centered, which means that the optical center of the curve must coincide with the axis of the tubes, and this is of primary importance. Of course the focal length of the object glass must be a little less than the length of the tube; while that of the eyepiece may be shorter, in proportion as the object glass is better in quality. An inferior objective can bear only a weak eye glass, that is, one of long focus. 3. What is an approved elementary treatise on astronomy? A. Herschel's "Astronomy," published by Appleton, is one of the best.

(11) H. P. T. asks: Is there anything gained in a Callaud or gravity battery by covering the zinc with unsized paper? Does it reduce the working strength of the battery? In case of accidental disturbance and mixing of the solutions, does it prevent the deposition of copper upon the zinc? I find after long use that the paper is covered here and there with crystals of copper; but upon removing the paper I cannot see any trace of copper upon the zinc. A. If the gravity battery is properly put together, so that the fluids do not mix, there will be no local action. The paper will do no harm and not much good.

(12) A. B. says: I have been trying to invent a process which would assimilate circles to right lines, in other words, to do away with the tedious process of referring numbers to logarithms and back again in ordinary trigonometrical calculations. My idea is to do away with degrees, minutes, and seconds in the circle, and to reduce all parts to decimals. Therefore I propose that the circumference of a circle shall be 1,000 or 10,000 or 100,000,000, and all the parts correspond in decimals. Is this practicable? If not, why? A. This method is practicable, and was used in the beginning of this century in France, when attempts were made for a thorough introduction of the decimal system, making a day 10 hours long, the week to 10 days, etc. At that time tables were calculated and published, in which the quadrant of the circle was divided into 100 degrees, the degree into 100 minutes, the minute into 100 seconds, so that the quadrant was divided into one million parts; but it met with no favor, as the natural division of the circle is into 6, which is no divisor of 10. Your system is worse, as dividing the whole circle into 1,000 parts gives 250 for the quadrant. If you study thoroughly the use of logarithms in trigonometrical calculation, you will see that it would be a retrograde step to do away with them, as they simplify the calculations enormously, and admit of a great saving of time. You will need your tables of sines and tangents just as much without logarithms as with them, and without them no trigonometry is possible. You may calculate them for decimal degrees, but the change does not amount to much, and does not involve any fundamental principle, as they cannot be dispensed with.

(13) A. K. says: 1. In constructing a small electromagnetic motor, in which two electro-magnets cannot be successfully applied, I intend to substitute one of them by a well magnetized iron bar. Will said bar magnet, working on a pivot in such a manner as to bring one of its poles in contact with a pole of the electromagnet, be attracted and repulsed regularly whenever the poles of the electro-magnet are changed, or will it lose its polarity after a while and be attracted by a negative as well as a positive pole? A. Iron will not retain magnetism. 2. Will the repulsion be of the same power as the attraction? A. Yes. 3. Will an oblong-shaped core answer instead of a round one, as commonly used for electro-magnets? A. Yes.

(14) D. R. S. says: Please give me minute details of how to make and mount a telescope, such as is used on rifles for long range firing. A. We would not advise you to try to make such a telescope unless you are an optician. The lenses generally used for this purpose are made and mounted in France, and it is difficult to compete with their makers as to quality, and impossible as to price. A tube about one foot long is required, and attached to it are a French objective at one end, and a sliding eyepiece at the other end.

(15) H. E. asks: 1. Can a field or marine glass be obtained that will enable an observer to recognize the face of a person at a distance of two miles? A. No field glass can have that power; a large astronomical telescope is needed for this purpose. 2. Can a binocular telescope accomplish this? A. A binocular telescope is necessarily of limited size; but if long enough, it will serve the purpose a little better than a single one.

(16) W. C. M. asks: 1. On what principle is the Baumé hydrometer constructed? We tested a sample of oil with five hydrometers, and they all showed differently. A. There are four kinds of hydrometers. The first is that of Baumé, which must indicate zero in pure distilled water in relation to liquids heavier than water, and 10° in relation to liquids lighter than water. In the second kind, the specific gravity of distilled water is assumed at zero in both scales, either for heavy or light liquids. This is adopted in the Pharmacopœia Batava. The third is that of Cartier, which is like that of Baumé except that the degrees are larger, every 20° of Cartier being equivalent to 22° of Baumé. The fourth is the centesimal hydrometer of Gay Lussac, which is made for use in alcohol only. To test any of these hydrometers for accuracy, without having a recognized standard to com-

pare them with, requires a hydrostatic balance. Baumé for heavy liquids must indicate zero in distilled water of 60° temperature; and in a salt solution, of 1.16 specific gravity and at the same temperature, it must indicate 20°. Baumé for light liquids must indicate 10° in distilled water, and 30° in a mixture of water and alcohol, of a specific gravity of 0.88. The hydrometer of the Pharmacopœia Batava for heavy liquids must indicate the same as Baumé, but that for light liquids must show zero in distilled water and 20° in the mixture of water and alcohol of 0.88 specific gravity. In Cartier's hydrometer, the specific gravities mentioned must correspond with those of Baumé minus 2° nearly, that is, the indications of Cartier are nearly 2° less for every 20°. Gay Lussac has based his alcoholometer on the principle of placing zero for water and 100° for absolute alcohol, while 100° corresponds with 44° of Cartier, and 47° of Baumé. Half alcohol and half water, having a specific gravity of 0.917, must correspond with 27° of Baumé, 13° of the Pharmacopœia Batava, 21° of Cartier, and 56° of Gay Lussac. It will be seen that this testing is troublesome, and it is best to procure a reliable standard to compare your hydrometers with.

(17) L. D. T. asks: 1. What is the best way to build a brick cistern, so as to filter the water perfectly? A. See p. 92, vol. 32. 2. How deep does an 8 foot diameter cistern want to be to hold 100 barrels water? A. About 12 feet.

(18) W. L. says: 1. We keep water up stairs to use in case of fire, but it has to be changed often. What can be put in to keep it from smelling bad? A. It will be better to continue to change. 2. The steam pump draws the water now from the well, about 15 feet, with a 2 1/2 inch plunger of 10 inches stroke, running at 62 per minute. Flow of water is about 208 feet per minute, through iron pipe 1 1/4 inches in diameter. The pipe is large enough to keep tank full of water, and sometimes we have to shut off to keep from running over. If we should lay 1 1/4 inch iron pipe to the river, down a gradual descent of about 16 feet, then down to bottom of river 8 feet, making in all about 24 to 25 feet raise, and about 300 feet in length, will it work well? A. Yes, if properly laid.

(19) M. T. W. says: Can you give me a formula for making a cheap concrete of lime, sand, cement, or any other suitable material that will pack in an inch space between planks 2 1/2 inches, and resist the action of heat, cold, and the atmosphere? A. In France, asphalt is extensively used for this purpose, especially where the plank is laid on the ground, for cellar floors, etc., in which case no sleepers are used.

(20) A. H. asks: I have a kitchen 14 feet wide, with shed roof. The roof has 2 feet fall, and is slanting. Whenever we have a heavy rain, the water stops on it and comes through very badly. Is the roof too flat? A. Your roof is too flat for shingles. You had better raise it so as to give it a steeper pitch. Six inches to the foot is little enough.

(21) J. E. D. asks: Is there anything that will cut shellac except alcohol? A. Shellac is soluble in a hot solution of borax in water.

(22) E. H. asks: What is the best method of obtaining free gold from the ore? It is very soft, mined with pick and shovel only. A. First crush the ore very finely, mixing it with water by agitation, and allowing it to run over a short inclined plane composed of sheet copper, the surfaces of which have previously been evenly colored by a film of mercury which adheres strongly to it. Through the strong affinity existing between the two metals (gold and mercury), the particles of the gold are arrested by the quicksilver, while the other substances accompanying it pass by without hindrance. The alloy of gold and mercury formed may be decomposed by placing it in an iron retort, the beak of which, or its connection, dips beneath the surface of some cold water in a suitable vessel. On the application of a strong heat to the retort, the mercury is vaporized, and, distilling over, is condensed beneath the surface of the water, while the gold remains behind in the retort. The above is one of the best methods in use; but if the gold is required in a very pure state, the following process may be employed: After finely crushing the ore, subject it to the action, for some time, of a hot mixture of muriatic and nitric acids, 3 parts of the former to 1 of the latter. To this solution, after decantation from the undissolved residue, add a strong solution of copperas in water, until no further precipitate forms. Allow to subside and decant the supernatant liquid. The precipitate consists of the pure gold in a minutely divided condition, to which, alone, its dark color is due. An excess of acid in the above operation should be particularly avoided, as it will only redissolve, in part, the precipitate formed on addition of the iron salt.

(23) L. C. T. asks: You recently gave me a recipe to form tannate of gelatin inside a keg. Please tell me the quantity of gelatin by weight to use to 3 quarts water, and the quantity of tannin by weight to 1 quart water? A. Use about 1 1/4 lbs. gelatin to 3 quarts water, and a saturated solution of tannin. 2. I presume the gelatin is a fine form of glue, and not that used for pastry purposes. A. You are right.

(24) C. C. & B. ask: What kind of stamping ink will not smear when used on leather glazed with oxalic acid, glue, and white of eggs? A. Try a strong solution of copperas in water.

(25) G. A. B. asks: 1. What kind of acid is used in soldering, and how is it prepared for use? A. Add zinc to a small quantity of muriatic acid, until no further solution takes place. 2. What kind of copper is used for making soldering tools? A. Ordinary copper, carefully tinned. 3. Is there anything better than copper to make soldering tools of? A. No.

(26) J. F. B. asks: How can I make olefant gas? A. The gaseous products of the destructive distillation of the fatty or so-called fixed oils and resins are very rich in elay gas (olefant gas). As oils yield further only a small quantity of carbonic acid gas, and no sulphuretted hydrogen, oil gas does not require any purifying, and hence the apparatus may be very simple; while, owing to the high illuminating power, smaller gas holders, smaller pipes, and burners of different construction are required. One pound of oil yields 20 to 25 cubic feet of gas, equal to 90 or 95 per cent.

(27) A. W. C. asks: Is there a remedy to prevent verdigris forming on copper cartridges when carried in the thimbles of a belt? A. Dip them for a moment, when clean, in an alcoholic solution of shellac. Allow them to dry completely before placing in the belt.

(28) S. W. S. asks: What is aluminate of soda? A. It is now prepared on a large scale, as it has been found a very useful form of soluble alumina, especially in dyeing and calico printing. The preparation of this compound is based on the solubility of hydrate of alumina in caustic potassa or soda lye, and the ready decomposition of the solution by carbonic and acetic acids, bicarbonate and acetate of soda, sal ammoniac, etc. The compound is generally formed by calcining either cryolite or bauxite, minerals containing a large per cent of alumina, with carbonate of soda, in a reverberatory furnace. It may be obtained on a small scale, by boiling alumina with caustic soda lye for some time.

(29) J. R. asks: What are the drawbacks, if any, to the use of gasoline as an illuminating agent, as applied for that purpose in the automatic gas machine? A. They are mainly due to the dangerous character of the materials used; gasoline, naphtha, and similar volatile hydrocarbon oils. The vapors arising from these oils, being heavier than the air, have a tendency to accumulate in pools on the floors of the cellars or vaults where the oils are used, and becoming mixed with the air form a terribly explosive mixture. The ignition of which, from the careless dropping of a partially extinguished match, or flame of any kind, often sufficient to destroy the building.

(30) R. R. Z. says: 1. You speak of a glaze or enamel called borosilicate of soda. How is this made? A. Melt together pulverized felspar 27 parts, borax 15 parts, sand (fine, white) 4 parts, potash, niter, and potter's earth, 3 parts each. Then add 3 parts of borax reduced to a fine powder, also fine black oxide of manganese in the proportion of 48 grains oxide to 6 lbs. of the enamel. When fully fused, throw into cold water, and then remelt and again quench in water, as before. Repeat this until the enamel is fine and white. It is then ready for use. 2. Will it stand the action of hot 60° sulphuric acid? A. Yes.

(31) J. O. F. asks: What is the latest and most approved plan of tempering small springs? A. There is nothing better than dipping them in oil and blasing the oil off.

(32) M. W. H. asks: 1. Will tool steel make good steel springs? A. No; it is apt to break. 2. What kind of steel is best for springs? A. Spring steel. 2. Can springs be tempered in water or oil, so that they will be tough and limber? A. Yes; harden in water, temper with oil.

(33) W. H. C. asks: What is the best way to join a band saw? A. Braze it, taking care to hold the ends true.

(34) P. J. M. asks: What is the best means to secure a good casting, free from blowholes and defects, where you are obliged to cast into it some pieces of wrought iron, as done in a fly wheel with cast rim, wrought iron arms, and cast iron hub? A. Heat the wrought iron, and have a good dry mold, casting endwise whenever possible.

(35) J. S. M. asks: 1. Does it take more power to run beveled gears than it does to run spur gears? A. There is no practical difference. 2. Can you tell me the best way to find the proper size of a hole (in a face plate, for instance), in which a thread is to be cut? I have heard that it is best to measure the outside of the thread of the screw; and if it is 10 to the inch, the hole should be bored $\frac{1}{16}$ less, which will give a full thread to match. If the thread is 12, $\frac{1}{16}$ twelfths is right, and so on for every number of threads. A. We have never heard of the rule you give. Try it, and let us know the result.

(36) E. E. K. asks: Can india rubber valves which have been used in hot and cold water pumps be remolded for the same use? A. No.

(37) J. C. G. says: I have a grindstone 3 feet in diameter and of 5 inch face, that seems a great deal too hard for sharpening tools for working in wood. How can I soften it? A. Your only method is to keep water running over it, which will partially soften it.

(38) B. K. D.—If your self-operating water elevator only costs \$250, you can very readily test the question of demand by putting it on sale.

(39) H. G. S. asks: On a gravestone of fine Italian marble, the engraver inadvertently cut a superfluous comma. How can I fill it in so as to be permanent, and show as little as possible? A. We can think of nothing better for the purpose than plaster of Paris, mixed with a small quantity pulverized mica.

(40) R. says: I have tried many of your ink recipes, and send you an improvement on one which I found in the SCIENTIFIC AMERICAN, and used many years ago. Black ink: No. 1. Take powdered cloves $\frac{1}{4}$ oz., extract logwood 2 oz., hot water 1 gallon; dissolve. No. 2. Take bichromate potash, powdered Prussian blue each 150 grains, prussiate of potash 50 grains. Dissolve in 1 pint warm water, then mix No. 1 and No. 2 together. The Prussian blue is the improvement; it flows freely and dries quickly. Sugar will spoil it. I have not known it to gelatinise or mold.

(41) M. M. says, in reply to C. P. B., who is troubled by sparks flying from the top of his chimney: There is a much better way to stop the evil than by the use of a screen. So arrange your flue that the draft shall be projected downward into a short chamber, of about 5 or 6 times the sectional area of the chimney flue. From this chamber, let the draft enter the chimney. The current of smoke passing through this chamber will be so slow that nearly all the dirt will settle out of it. If the bottom of the chamber is kept flooded with water, no dirt whatever will pass out of the chimney. I have seen a chimney, that was a complete nuisance to the whole neighborhood, made perfectly clean by the above plan. The draft will not be affected perceptibly. The draft might pass from the side of the chamber to the chimney, but it should be near the opposite end from where it enters.

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

G. P. L. R.—No. 1 is decomposed sandstone containing scales of mica. No. 2 is a white clay. No. 3 is a fossiliferous stone containing a large percentage of lime. No. 4 is celestine. No. 5 is a variety of hard fine grained sandstone. Specimens of New Jersey green sand can be obtained from Dr. G. H. Cook, State Geologist, New Brunswick, N. J.—O. C.—Send us a sample of your oil, and we will endeavor to help you.—A. B. L.—A qualitative analysis was made of your samples. No. 1 contains sulphide of lead and iron. No. 2 contains sulphide of lead, iron, and quartz and No. 3 is quartz and sulphide of iron. No. 4 is sulphide of iron with traces of arsenic. No. 5 is sulphide of iron and quartz. We do not consider them of much value. You will find the cost of working these mines too expensive, as fully 70 per cent of the minerals is quartz.—M. A. B.—They are the wings of red mites, sub-order oscarina.

COMMUNICATIONS RECEIVED.

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

On a Cure for Toothache. By E. D. P.
On the Keely Motor. By J. R., by L. W. S., by J. W. C., by L. K. Y.
On Mechanical Motors. By J. E.
On the Chemical Firefly. By C. W. W.
On the Potato Beetle. By O. E. D., and by J. G.
On the Iron Horse. By F. H. R.
On the Cincinnati Exposition. By J. C. B.
On Dental Surgery. By —
Also inquiries and answers from the following:
J. E. W.—L. G. F.—R.—W. B. H.—M. O. H.—P. O'N.—H. F. N.—J. W. C.—T. H.—A. W. & Co.—J. M. T.—W. J. P.—J. E. C.—S. C. M.

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 Baumé hydrometers? Who makes field glasses and binocular telescopes? Who sells apparatus for making olefant gas? Who makes rag boilers for paper makers' use?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH
Letters Patent of the United States were
Granted in the Week ending
July 6, 1875.
AND EACH BEARING THAT DATE.
(Those marked (r) are renewed patents.)

Advertising medium, H. Baldwin	165,147
Air brake, automatic, S. B. Ladd	165,337
Anger, earth, J. P. Simmons	165,376
Axle protector, C. G. Cowell	165,313
Bale band tightener, J. L. Sheppard	165,874
Barrels, bung for, Norris and Hickley	165,360
Barrels, compressing, E. J. Granger	165,163
Basket and table, lunch, E. B. Carver	165,305
Basket, stove, B. B. Wheeler	165,285
Battery, gal. zinc, Diamond and Gaffey	165,210
Battery pole, galvanic, H. P. Dechert	165,312
Bearings, anti-friction, Lathrop and Weber	165,340
Bed bottom, L. Hull	165,166
Bedstead, W. West	165,334
Blind slot adjuster, J. G. White	165,394
Blind stop, C. E. Steiler	165,269
Boiler, agricultural, W. A. Swarthout	165,882
Boiler tube cleaner, M. M. Smith	165,182
Boiler counter stiffener, J. L. Hatch (r)	165,344
Boot heels, polishing edges of, J. H. Ryder	165,330
Boot and shoe last, C. F. Hill	165,330
Brush, tree, T. Branigan	165,181
Brush, Albaugh and Toole	165,195
Brush, O. Jennings	165,298
Brush holder, J. Blair	165,339
Buckle, trace, M. T. Hayes	165,380
Burner, argand gas, J. H. Fuller	165,331
Butter package, metallic, Roberts and Briggs	165,266
Butter preserving skin, J. Wilhelm	165,268
Cakes, manufacture of, C. C. Tracy	165,386
Can, oil, T. Hoddick	165,351
Canal lock gate, J. E. Renk	165,178

Car brake, R. C. O'Hara	165,250
Car brakes, operating, S. B. Ladd	165,336
Car starter, S. Corse	165,309
Car ventilator, railroad, E. Rueane	165,180
Car air brake, A. James	165,235
Carburetor blower, W. H. Reed	165,254
Carbureting machine, E. Schoenberg	165,372
Casting bronze, G. R. Meneely	165,353
Casting metals, Grasser and Stepp	165,164
Casting turbine wheels, G. H. Jones	165,237
Cattle rack on scales, raising, P. C. Dockstader	165,217
Chair, barrow's, W. Hoehn	165,282
Chair, folding rocking, A. W. Stewart	165,185
Charcoal, making animal, O. Lugo	165,344
Clevis, safety, C. N. Poundstone	165,253
Clock work, winding electric, J. W. Wignall	165,233
Coal vase and standard, G. J. Munschauser	165,248
Cock and anti-concussion valve, I. F. Van Duzer	165,190
Cock, globe, J. Powell (r)	6,527
Cooler, milk, Porter and Easton	165,364
Cooler, water, G. I. Mix	165,337
Corn drill, pilot wheel, J. Campbell	165,155
Curtain fixture, J. S. Brown	165,299
Dams, construction of, W. Schmolz	165,371
Dental vulcanizing apparatus, F. Heindemann	165,328
Digger, potato, J. H. Louch	165,342
Draft evener, A. Whittemore	165,395
Drawing frame roll cover, Atkinson and Edwards	165,197
Dryer, J. F. Gent	165,228
Eaves trough, R. Tyhurst	165,388
Egg box, W. H. Holdam	165,233
Ellipsograph, M. Toulmin	165,195
Engine, condensing, J. F. Barker	165,148
Engine, reciprocating cylinder, Palmer and Dewey	165,175
Engine, steam, S. F. Davenport (r)	6,532
Engine valve, steam, G. E. Tower	165,157
Evaporating pan, P. E. Fox	165,223
Eyeglass, J. J. Baesch	165,199
Eyeglass, W. H. Peacham	165,251
Fences, barb for wire, Duffy and Schroeder	165,230
Fertilizer, O. Lugo	165,345
Fertilizer, C. H. North	165,172
Filtering apparatus, liquid, T. R. Sinclair	165,377
Fire arm, revolving, J. Rupertus	165,369
Fire place, J. Adair	165,194
Floodway for warehouses, J. H. Morrell	165,247
Flower bracket, A. J. Gardner	165,227
Flower pot bracket saucer, Freeman & Smith	165,224
Furnace for burning straw, J. R. King	165,169
Furnace, soldering iron, P. P. Beals	165,200
Furnace for making iron, G. J. & S. J. Shimer	165,372
Gage, caliber, G. W. Weld	165,196
Gage, metal or paper, E. W. Dennison	165,128
Gage, pressure, J. W. Stiles (r)	6,520
Game apparatus, J. D. Butler	165,154
Gas apparatus, R. P. Spice	165,266
Gas apparatus, coal, M. W. Kidder	165,163
Gas governors, diaphragm for, W. Frost	165,161
Gas mixing valve, L. D. Towseley	165,188
Gas, manufacture of, P. W. Mackenzie	165,347
Gas, manufacture of, H. W. C. Tweddle	165,189
Gas retorts, cleaning, H. S. Wolf	165,306
Gate, farm, W. Waggoner	165,191
Generator, steam, J. & G. Firmenich	165,222
Grate, Warrington & Forrester	165,270
Grave, coffin, and monument, Speers & Clark	165,367
Grinding wheel, J. W. & I. S. Hyatt	165,231
Gun, machine, D. C. Farrington	165,312
Hame, Nunnelee & Kirksey	165,349
Harness saddle, H. H. Hallett	165,165
Harvester, J. H. Elward	165,316
Harvester, J. M. Rosebrook	165,368
Harvester, Webster et al	165,280
Harvester, corn and cane, T. Merrell	165,171
Hat bodies, stretching, G. Yule	165,400
Head rest, O. C. White	165,286
Heaters, frame for fire place, N. A. Boynton	165,298
Heating apparatus, hot water, E. F. Wackwitz	165,277
Hides, raising and transferring, W. Coupe	165,212
Hinge, gate, G. Marsh	165,351
Hog-ringing apparatus, S. & J. W. Sparks	165,296
Hook, bench, C. E. Smith	165,262
Hook, snap, C. E. Jackson	165,333
Horseshoe, J. Wanstall	165,278
Hose, hydraulic, L. H. Downing	165,159
Hose, rubber, J. Greacen, Jr.	165,334
Hub, E. F. Friend	165,225
Ice cream, etc., measuring, T. Buckhard	165,304
Insect-destrorying compound, E. Wilkins	165,289
Insect powder box, W. J. Van Patten	165,276
Iron and steel, flux for welding, D. Miles	165,246
Journal bearing, A. B. G. A. Williams	165,392
Knitting bullion fringe, E. P. Curtiss	165,311
Lamp chimney, R. Norris	165,361
Lantern, magic, L. J. Marcy	165,242
Liquid filtering apparatus, T. B. Sinclair	165,377
Liquids, dispensing effervescent, L. Warker	165,391
Lock for safe and vault doors, J. Sargent	165,370
Lock, seal, L. I. Todd	165,384
Mail bag, Boyle & Stephens	165,205
Mail bag catch, Amrock & Judson	165,293
Maillet, A. G. Fellows	165,321
Match box, O. H. Hicks	165,329
Measuring distances, F. Weldon	165,262
Metal or paper gage, E. W. Dennison	165,158
Mill, metal rolling, J. I. Williams	165,290
Molds, blackwashing, J. B. Aston	165,186
Mortising machine, J. Berry	165,304
Muff, ear, E. Strauss	165,273
Music stand, J. Lyons	165,316
Nails, making chisel-pointed, G. Stacy	165,380
Not lock, D. D. Jones	165,167
Oil casks, sinks for, F. C. Wyckoff	165,399
Ordnance, projectile for, H. Reilly	165,335
Paper bag machine, C. B. Stilwell	165,381
Paper bag machine, G. Van Hoesen	165,390
Paper damping machine, C. Kahler	165,298
Paper pulp, bleaching juice for, E. Conley	165,172
Paper pulp screen, J. S. Warren	165,182
Paper vessel, J. Stevens	165,370
Paper, etc., device for protecting, J. L. Firm (r)	6,530
Pianoforte action, T. P. Carr	165,304
Picture frame hanger, A. Brown	165,306
Pile driver, steam, T. T. Loomis	165,170
Piles of old rails, forming, J. Downing, Sr.	165,219
Pipe cover, smoking, F. L. Suter	165,274
Pipe fongs, S. Stone	165,371
Plane, dado, Miller & Bailey	165,306
Plane iron, W. Young	165,291
Plane, tongue and grooving, C. G. Miller	165,335
Planting machine, J. K. Smith	165,264
Planter and fertilizer distributor, D. F. Balentine	165,198
Planter, corn, W. B. Garoutte	165,323
Plow, G. Ringen	165,179
Plow, vineyard, M. Rees	165,238
Pocket book frame, B. M. J. Blank	165,200
Pocket book lock, F. King	165,239
Potato bugs, destroying, Mathewson & Mills	165,243
Press, A. W. Harrington	165,327
Press, baling, H. L. Pike	165,292
Press, power, J. E. Collins	165,306

Printer's leads, making, L. W. Tracy	165,367
Pump, E. McDermott	165,314
Pump, A. M. Putnam (r)	6,537
Pump chain adjuster, J. B. Brown	165,397
Pump bucket, chain, W. C. Barker (r)	6,551
Purifier, middlings, J. C. & F. C. Knoebel	165,340
Quartz mortar, A. W. Anderson	165,146
Radiator, E. Russell	165,181
Railway signal, circuit closer, S. Weeks	165,281
Railway sprinkler, G. M. Stephens	165,184
Railway switch, J. C. Wilhelm	165,287
Railway wrench, J. R. Finley	165,319
Regulator, feed water, J. Wertheim	165,268
Rein holder, Bulger & Ingalls	165,153
Sad iron, S. Elliott	165,160
Sample holder, revolving, J. H. Preater	165,366
Sash fastener, W. Brown	165,300
Saw, Brown & Sedore	165,132
Saw, Jig, S. B. Fuller	165,162
Saw set, A. E. Hoffman	165,322
Saw wheel, band, F. Gleason	165,322
School settee and desk, J. Peard (r)	6,536
Screws, threading wood, Prindle & Kennedy	165,367
Separator, grain, H. H. Seely	165,373
Sewing machine, O. T. Gronner	165,325
Sewing machine, McKay & Mathies (r)	6,526
Sewing machine needle, G. H. Belock	165,204
Sewing machines, etc., driving, W. J. Lane	165,238
Sewing machine motor, W. J. Lane	165,299
Shaft, knuckle coupling, O. D. Herrick	165,231
Shingles, cutting, G. H. Degraw	165,313
Signal apparatus, electric, C. A. Stearns	165,183
Skate, Dexter & Tanner	165,216
Skins, preparing or tanning, E. Manasse	165,348
Skirt elevator, G. W. Denny	165,315
Smoking case, H. W. Damm	165,215
Snow plow, Reeder & Fetterhoff	165,177
Soda water apparatus, W. Loughbridge	165,242
Soldering apparatus, G. H. Perkins	165,362
Speeder, T. Mayor	165,332
Spinning machines, filer for, C. K. Pevey	165,363
Spoke socket, B. Poulson	165,265
Stamp canceler, D. M. Cooper	165,268
Steel welding compound, etc., S. Slater	165,373
Stereoscope, H. J. Lewis	165,221
Still, J. B. Beam	165,261
Stove, W. Burrows	165,298
Stove, heating, A. Bettes	165,295
Stove, heating S. H. Kreider	165,285
Stove heating, H. J. Rutan	165,293
Stove, parlor cook, A. White	165,295
Stoves, self-closing door for, N. A. Boynton	165,297
Strainer for pots, P. Michels	165,254
Strap slide, breast, T. C. Crenshaw	165,214
Straw cutter, A. Vahldiech	165,289
Table leaf lifter and support, T. E. Smith	165,395
Tag stringing machine, W. L. Nye	165,173
Tailor's measure, W. D. C. Tiney	165,283
Tanning hides, A. DeMeritens	165,314
Tanning skins, preparing or S. Manasse	165,348
Teeth, celluloid bases for artificial, J. G. Cannon	165,303
Telegraph, automatic, P. B. Delany	165,156
Telegraph, duplex, G. Smith	165,303
Telegraph, printing, J. E. Smith	165,197
Telegraph relay, P. B. Delany	165,157
Tyre upsetting machine, M. G. Schenck	165,261
Tube expander, P. Fitzgibbons	165,230
Valve gear, G. E. Tower	165,186
Valves, globe, J. Powell (r)	6,528
Valves, steam, H. E. Marchand	165,269
Vegetable cutter, S. Hancock, Jr.	165,229
Vehicle seat, J. R. Hill	165,323
Vehicle spring, Deland and Scherb	165,218
Vehicle wheel, W. Corris	165,211
Ventilator, P. Mihan	165,245
Vessels, raising sunken, J. N. Furman	165,278
Warehouses, roadway for, J. H. Morrell	165,247
Wash bench, G. Bauman	165,149
Wash stand, N. O. Bond	165,296
Washing machines, J. Myers	165,158
Watch chains, charm for, R. B. Esler	165,317
Watches, safety pinion for, L. W. Thompson	165,375
Water closet shut-off, J. Cavanagh	165,209
Water closets, cleansing, J. J. O'Donohue	165,174
Water mains, tapping, J. Curran	165,310
Water trap, W. A. Butler	165,102
Water wheel, turbine, S. R. Jenner	165,254
Whiffletree plate, B. S. Porter	165,176
Whisky, manufacturing, E. Wernick	165,292
Windmill, W. H. Aldrich	165,292
Windmill, W. A. Guzman	165,294
Windmill, D. C. Stover	165,272
Wire, machine for rolling, J. & S. Law	165,341
Wood, machine for carving, J. F. Blackman	165,190
Wrench, railroad, J. R. Finley	165,319

FOUNDED BY MATHEW CAREY, 1785.

& CO., 346 Canal St., New York. Makers of the celebrated Tom Thumo and Miniature Telegraph Instruments

Advertisements.

Back Page \$1.00 a line.
Inside Page 75 cents a line.
Engraving may be had at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Friday morning to appear in next issue.



STATEMENT OF THE TRAVELERS

23rd SEMI-ANNUAL STATEMENT OF THE TRAVELERS INSURANCE CO. HARTFORD, CONN., JULY 1, 1875.

ASSETS.	
Real estate owned by the company.....	\$ 78,561 24
Cash on hand and in bank.....	115,423 38
Cash in hands of Agents, or in transmission.....	30,132 74
Loans on first mortgages real estate.....	1,824,877 50
Deferred premiums.....	21,944 05
Accrued interest.....	79,945 95
United States government bonds.....	380,740 00
State and municipal bonds.....	116,385 00
Railroad stocks and bonds.....	179,840 00
Bank and insurance stocks.....	500,740 00
Bills Receivable.....	40,000 00
Total Assets.....	\$3,470,319 86
LIABILITIES.	
Reserve, four per cent. life department.....	\$2,114,420 55
Reserve for re-insurance, accident dept.....	169,000 18
Claims unadjusted and not due, and all other liabilities.....	168,634 95
Total Liabilities.....	\$2,452,062 68
Surplus as regards policy-holders.....	\$1,018,257 18
Surplus as above, on four and one-half per cent. reserve, N. Y. standard, \$1,228,499 73.	

JAS. G. BATTERSON, President.
RODNEY DENNIS, Secretary.
JOHN E. MORRIS, Asst Sec'y.
NEW YORK OFFICE, 207 BROADWAY.

MOTES EXTERMINATED!!
In FURNITURE, Carpets and Clothing, without injury to the most delicate color or Goods. The expense for material and labor to clear them from the largest Parlor Suit will not exceed One Dollar. For ONE DOLLAR we will forward recipe and instructions and GUARANTEE all we claim or refund the money. We refer to any National Bank in our City, and the Commercial Agency of Messrs. Dunn & Co.

NEWTON & DAVIS, BINGHAMTON, N. Y.

TWIST DRILL GRINDING MACHINES, EX-
tending Boring Bars, Self-Feeding Hand Drills, Rotary Shapers, Planers, Drilling Machines. C. VANHAGEN & CO., makers of Improved Machine Tools, Phila.

BLAKE'S PATENT
Stone and Ore Breaker
Crushes all hard and brittle substances to any required size. Also, any kind of stone for roads and for concrete, &c.
Address: BLAKE CRUSHER CO., New Haven, Conn.

FOOT LATHES.
Address WILLIAM E. LEWIS, Cleveland, Ohio.

\$25 a day guaranteed using our well Auger & Drills. \$100 a month paid to good Agents. Auger book free. J. J. Auger Co., St. Louis, Mo.

THE BEST INJECTOR
For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe
Throws more and better water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order.
NATHAN & DREYFUS, Sole Manufacturers, 105 Liberty St., New York.
Send for Catalogue.

THE TANITE COMPANY
Emery Wheels, Emery Grinders
STROUDSBURG, MONROE CO. PA.

Special Notice to Dealers in and Users of Wood Working Machinery.

The undersigned, having purchased the entire Manufacturing Establishment of E. BALL & CO., including PATTERNS, PATENTS, GOOD WILL, CORRESPONDENCE, and everything pertaining to the business (book accounts excepted), will continue the manufacture of Wood Working Machinery, and be prepared to furnish new machines, or parts for repairs, as furnished by either concern in years past.

We shall at once remove our present Works to our new quarters—uniting the two establishments—and be able to furnish customers with improved Machinery, both in quality of stock and workmanship, and at reasonable prices.

We would take this opportunity to return our thanks to our old friends and customers, and would be most happy to see them at our new quarters (24 Salisbury Street), and would remind them that we shall continue to manufacture Wood Working Machinery generally, making a specialty of Woodworking, Planing, and Dimension Planers, Surfacing Machines, Tenoning, Mortising, and Ho-Saw Machines, Saw Bees, &c. Yours, respectfully,
WITHERY, HUGG & RICHARDSON,
24 Salisbury St., Worcester, Mass., U.S.A.

RICHARDSON, MERIAM & CO.,
Manufacturers of the latest improved Patent Danieles' and Woodworth Planing Machines, Matching, Bash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Be-sawing Machines, Saw Mills, Saw Arches, Scroll Saws, Railway, Cut-off, and Hip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Woodworking Machinery. Catalogues and price lists sent on application. Manufacturing, Worcester, Mass. Warehouse, 50 Liberty Street, New York.

IMPORTANT FOR ALL CORPORATIONS AND MANUFACTURERS.—Buerk's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. BUEK, P. O. Box 970, Boston, Mass.
N. B.—The suit against Imhäuser & Co. of New York, was decided in my favor, June 10, 1874. Proceedings have been commenced against Imhäuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law.

WROUGHT IRON BEAMS & GIRDERS

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

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gauge, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the Calumet and Collins' Pat. Corlino, and furnish Pulleys, Hangers, &c., of the most approved styles. Price list mailed on application to
JONES & LAUGHLINS,
Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa.
190 S. Canal St., Chicago, Ill.
Stocks of this Shafting in store and for sale by
FULLER, DANA, & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers Street, N. Y.
PIERCE & WHALING Milwaukee, Wis.

Water Wheels.
More than four times as many of Jas. Leffel's Improved Double Turbine Water Wheels in operation than any other kind. 34 sizes made, ranging from 5 1/2 to 95 in. diam. under heads from 1 to 240 ft. Successful for every purpose. Large new pamphlet, the finest ever published, containing over 30 fine illustrations, sent free to parties interested in water power.
JAS. LEFFEL & CO., Springfield, O., & 109 Liberty St., New York City.

Boul's Patent
Reverse Motion Paneling, Variety Moulding and Dovetailing Machine,
cuts Panels of any design or style of mould in the solid wood with neatness and dispatch. Is a first class Shaper, Edge and Scribe. Does general Dovetailing with thick or thin stock. Simple.
Send for Pamphlet and Sample of work.
Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the
B. C. MACHINERY CO., Battle Creek, Mich.

HAND SAW MILL—Saves the labor of 3 men. S. C. HILLS, 51 Courtlandt St., New York.
Munn & Co.'s Patent Offices.
Established 1846.
The Oldest Agency for Soliciting Patents in the United States.
TWENTY-EIGHT YEARS EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.
They employ as their assistants a corps of the most experienced men as examiners, specification writers, and draftsmen that can be found, many of whom have been selected from the ranks of the Patent Office.
SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.
MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th Streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and releases, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences give written opinions on matters of infringement, furnish copies of patents in fact attend to every branch of patent business both in this and in foreign countries.
Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted.
A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.
A pamphlet of 116 pages, containing the laws and full directions for obtaining United States patents, also a circular pertaining exclusively to Foreign Patents, stating cost for each country, time granted, etc., sent free. Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, N. Y.
BRANCH OFFICE—Corner F and 7th Streets Washington D. C.

Engine, Spindle, & Cylinder Oil. E. H. KELLONG, 11 Cedar St., N. Y., manufactures the best. Established '59.

NOYE'S Mill Furnishing Works
are the largest in the United States. They make Burr Millstones, Portable Mills, Saut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

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

Portland Cement.
From the best London Manufacturers. For sale by JAMES BRAND, 35 CHIEF ST., N. Y.
A Practical Treatise on Cement furnished for 25 cents.

Niagara Steam Pump Works
ESTABLISHED 1862.
CHARLES B. HARDICK,
No. 23 Adams Street, BROOKLYN, N. Y.

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

HARTFORD STEAM BOILER Inspection & Insurance COMPANY.
W. B. FRANKLIN, V. P. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec.
HARTFORD, CONN.

FEUCHTWANGER & CO., Chemists, manufacture and import many rare chemical productions, Soluble Glass, Fluoric Acid, Nickel Salts, Marble Putty, Sulphides, all Metallic Oxides; keep Fluorapar, Chlorapar, Flint, and finest Silica; Manganese, crystals, granulated, and powder of the highest grade. For sale at 180 Fulton Street, New York.

REYNOLDS & CO.,
145 EAST ST., NEW HAVEN, CT.,
MANUFACTURE
Iron and Steel Set Screws, Round, Square, and Hexagon Head; Machine and Cap Screws; Piano, Knob, and Lock Screws; Machine, Bridge, and Roof Bolts; Bolt Ends, Blanks, Nuts, Washers, etc., of every description.
Send for Price List.

GENUINE CONCORD AXLES
TRADE MARK
The Standard—Best Stock—Finest Finish.
MANUFACTURED ONLY BY
D. ARTHUR BROWN & CO., Fisherville, N. H.

WIRE ROPE
Address JOHN A. ROEWLING & SONS, Manufacturers, Trenton, N. J., or 117 Liberty St., New York. Wheels and Rope for conveying power long distances. Send for Circular.

STEAM PUMPS.
FIRST PRIZES, VIENNA, PARIS, NEW YORK, BALTIMORE, BOSTON.
Send for circular of recent patented improvements.
THE NORWALK IRON WORKS,
South Norwalk, Conn.

An deutsche Erfinder.

Diese große und thätige Classe unsrer Bevölkerung machen wir besonders darauf aufmerksam, daß unsre Firma durch ihre Verbindung mit Washington und den europäischen Hauptstädten, besondere Vortheile zur Erlangung von in- und ausländischen Patenten bietet.

Jeder Erfinder, gleichviel welcher Nationalität angehört, ist durch die liberalen Patentgesetze der Vereinigten Staaten zum Patentschutz für Erfindungen berechtigt. Unsre Firma ist bereit, geführt auf 26jährige Erfahrung, deutsche Erfinder jeder Zeit zu beraten und zu mäßigen Preisen jeder Patent und pünktlichen Patent zu erlangen.

Die Deutsche Section ist in den Händen fähiger deutscher Ingenieure, welche in der Office persönlich mit Erfindern verkehren werden.

Der „Scientific American“ wird in seinen Spalten die bedeutendsten Erfindungen besprechen.

Correspondenz erbeten und prompt beantwortet. Pamphlete in deutscher Sprache werden auf Verlangen franco zugefandt.

Adresse:
Munn & Co.,
„Scientific American“ Patent Agents
37 Park Row, New York City

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

WHEN YOU DESIRE BOOKS, SEND TO GEO. E. STEVENS & CO., Cincinnati, O. Ask prices or information.

TO INVENTORS AND MANUFACTURERS

The 4th Exhibition of the American Institute will open September 21st; Machinery will be received after August 15th, other goods after August 29th. For particulars address "General Superintendent, American Institute, New York."

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

Excelsior Do Your Own Printing
Portable \$3
Print Presses
Business Men do their printing and advertising, save money and increase trade. Amateur Printing, delightful pastime for spare hours. Boys have great fun and make money fast at printing. Send two stamps for full catalogue presses type etc to the Mfrs
KELSEY & CO., Meriden, Conn.

Steam Super-Heaters.
Set under boilers, or in separate furnace, will supply Dry Steam of any required temperature, and save fuel.
HENRY W. BULKLEY, 95 Liberty St., New York.

Pyrometers. For showing heat of Boiler flues, Super-Heated Steam, Oil Stills, &c.
HENRY W. BULKLEY, Sole Manufacturer, 95 Liberty St., New York

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOSEPH G. ROGERS & CO., Madison, Ind. Send for book on Boiler Incrustation.
H. N. WINANS' Boiler Scale Preventive, (N. Y. Wall St., N. Y.) 20 years practical success. No incrustation, best, cheapest Anti-Incrustant, 50c. per lb.

Machinists' Tools.
EXTRA HEAVY AND IMPROVED PATTERNS.
LUCIUS W. POND, MANUFACTURER, Worcester, Mass.
WAREHOUSES 95 LIBERTY ST., N. Y.
Lathes, Planers, Boring Mills, Drills and Gear Cutters a Specialty.

THE NATIONAL Steel Tube Cleaner.
PATENTED JULY 23 1874.

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

NON-COMBUSTIBLE STEAM BOILER & PIPE COVERING
WITH AIR SPACE IMPROVEMENT.
Saves up to twenty per cent. CHALMERS SPENCE CO., foot E. 9th Street N. Y.: 1222 N. 2nd St., St. Louis, Mo.

Todd & Raftery Machine Co.
MANUFACTURERS OF
The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Fine Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds. Steam Pumps, Mill Gearing, Shafting, &c., 800, Tow Oakum, Bagging, Rope, Flax, and Hemp Machinery, Agents for the New Haven Manufacturing Co.'s Machinery's Tools; for Judson's Governors and Stop-Valves; Sturtevant Blowers; and Differential Pulley-Blocks. WAREHOUSES, 10 BARCLAY ST., NEW YORK WORKS PATERSON, NEW JERSEY.

PROSPECTUS
OF THE
SCIENTIFIC AMERICAN,
FOR 1875.
THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.
THIRTIETH YEAR.

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

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

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

TERMS.
One copy, one year (postage included)..... \$3.20
One copy, six months (postage included).... 1.60
One copy, three months (postage included).... 1.00
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"..... 10.00
One copy of Scientific American for one year, and one copy of "Science Record" for 1875..... 5.20
Remit by postal order, draft, or express.
Address all letters and make all Post Office orders and drafts payable to

MUNN & CO.
37 PARK ROW, NEW YORK.
THE "Scientific American" is printed with CHAR. NEWBORN & CO.'S INK. Tenth and Lombard Sts., Philadelphia and 59 Gold St., New York

SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 7.
[NEW SERIES.]

NEW YORK, AUGUST 14, 1875.

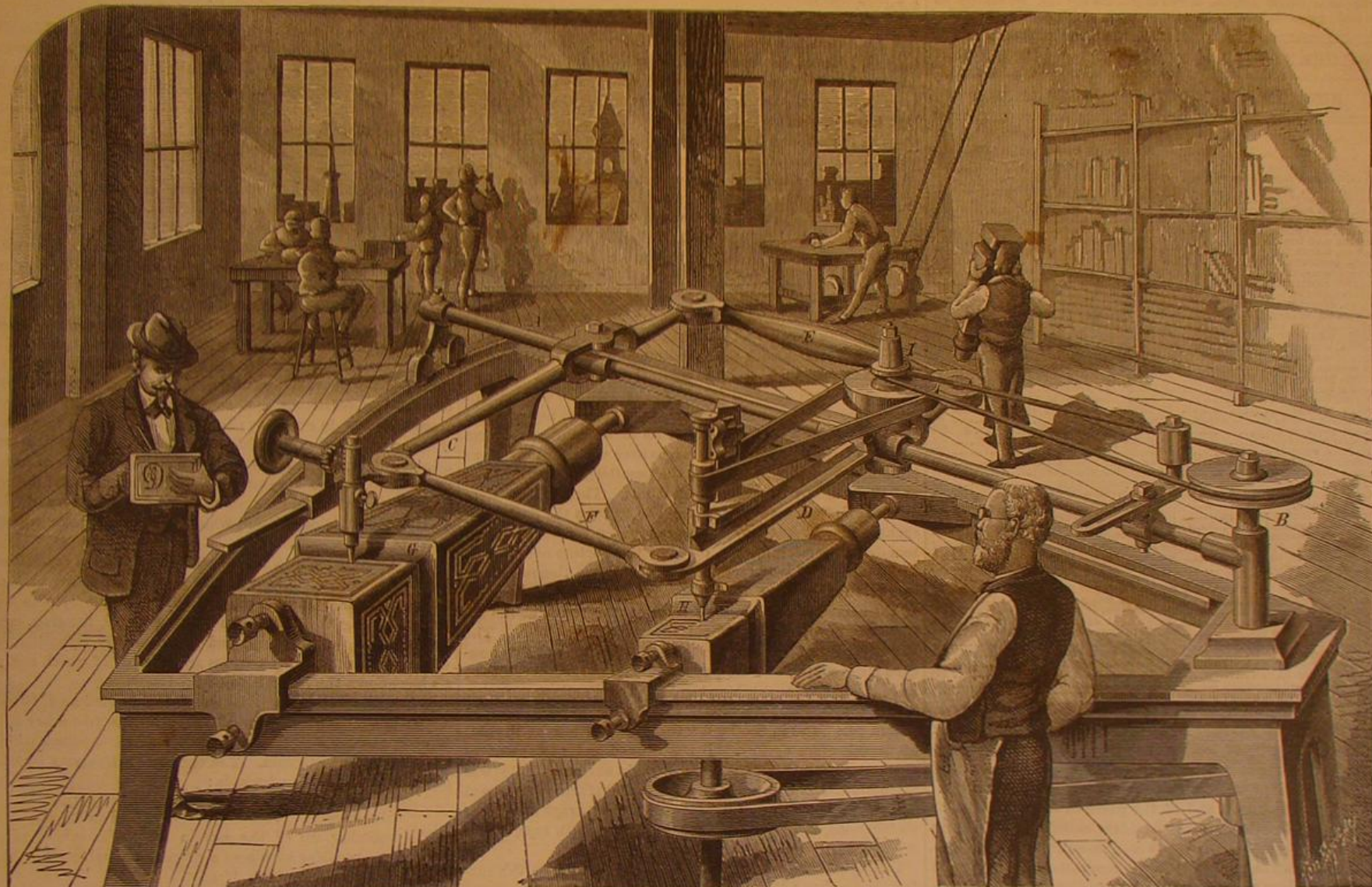
[\$3.20 per Annum,
[POSTAGE PREPAID.]]

IMPROVED WOOD-CARVING MACHINE.

We illustrate herewith a new apparatus designed to perform all kinds of carving, from the coarsest scroll work or similar decoration used upon furniture, down to the pictorial engraving of wood blocks. The principal features of the invention are its simplicity and the ease with which it may

the pantagraph frame. Said bars are connected by two other pivoted bars, E and F, which complete the square. The bar, C, carries the pattern tracer, G, and the extremity of said bar serves as a handle for the workman to guide the tracer into the various curves and indentations of the pattern. Adjustably mounted upon bar, D, is a vertical shaft which

serves as a counterpoise, and balances the frame on centers on the sleeves on bars, C and D, which surround rod, A. The motion of the frame, therefore, is universal; and at the same time, the parts are perfectly balanced in every position, reducing the manual labor of moving it to a minimum. This is probably the most important improvement in the inven-



BLACKMAN'S WOOD-CARVING MACHINE.

be operated, requiring no skilled attention nor especial care other than that involved in the very plain proceeding of following the outlines of a given pattern with a pointer moved by hand. The machine, in construction, is nearly identical with the pantagraph, an instrument used by draftsmen for duplicating drawings on an enlarged or reduced scale, the carving cutters being substituted for the pencil used in that apparatus. A is the principal rod or shaft upon which

carries the cutting tool, H. Said shaft is driven by a belt from the pulley, I, fixed at the central portion of the bar, D, which, in turn, is actuated by another belt from the pulley located on the summit of the vertical shaft, B. Shaft, B, is belted to the driving pulley shown under the table.

It will be obvious that any motion given to the tracer, G, will be at once followed by the cutting tool, H, so that, for example, if the tracer be moved about the edges of a certain curve, the cutter will follow a like path. The latter, however, will be reduced in size, though in exact proportion, on account of the cutter being located nearer the center of the circle of which the bar, A, is the radius, than the tracer. Since the sleeves to which the bars, C and D, are pivoted are adjustable, it is clear that the nearer the cutter is carried toward the shaft, B, the smaller will be the path it describes, corresponding to that moved over by the tracer; and therefore the object, the outlines of which are followed by the latter, may thus be reduced, to any less scale desired, by suitable movements of the sleeve of the bar, D, in or out on the rod A.

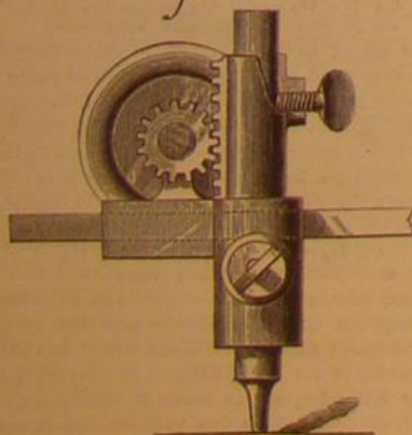
In the engraving, the machine is represented as carving the scroll work upon a pianoforte leg, which is mounted on centers so that the surfaces to be operated upon may be brought uppermost in succession. The work is always reduced in scale from three fourths downward, so as to secure greater ease and accuracy in operation; and therefore the pattern, which is shown secured beneath the tracer, G, is considerably larger than the article itself, which is fastened beneath the cutter.

Thus far we have referred principally to motions of the tracer and cutter in a horizontal plane. In order, however, to cause the tool to form the raised or indented portions of the work, it is necessary that there should be free movement in a vertical plane, so that, by continuous pressure on the tracer, the cutter may cut downward or be raised to leave certain portions in relief. The bar, E, it will be noticed, is very much heavier in construction than bar, F. It thus

tion, and gives a large advantage over the ordinary routing machine, the motion of the cutter of which is confined to one horizontal plane.

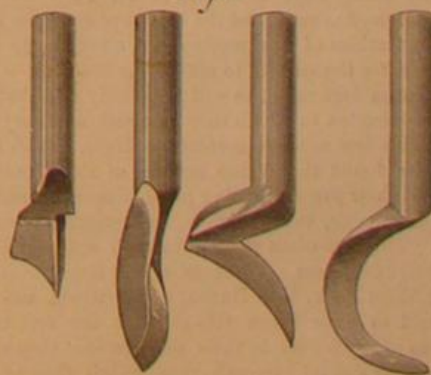
Connected with the upper part of the tracer, G, is a small rack, with which engages a pinion operated by a hand wheel. This device is shown more clearly in Fig. 2. Its object is to control the vertical action of the cutter, so that, if desired, it can be prevented from making as deep an indentation as called for by the pattern, or just the reverse. In Fig. 3 several forms of the cutters used are shown.

Fig. 2.



the working part of the device is supported. Its inner end is attached to a sleeve which surrounds the vertical driving shaft, B, which serves as a center for the circle, an arc of which is described by the outer extremity of the rod which is mounted on slides or rollers which traverse a curved track upon the table. Pivoted, as shown, to collars which slide freely upon the rod, A, and which may be adjusted thereon and clamped in position by set screws, are bars, C and D, o

Fig. 3.



The capacity of the machine is large, since the table may be built on a more extended arc, thus admitting of an area to be worked over as great as is afforded beneath the cutter, allowing, of course, room for the pattern. The invention is light in all its portions, and easily constructed. It will prove, we think, a valuable aid to workers in wood of all classes.

Patented July 6, 1875. For further particulars address the inventor, Mr. John F. Blackman, with Vanderbergh, Wells & Co., corner of Fulton and Dutch streets, New York city.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 87 PARK ROW, NEW YORK.

O. D. MUNN.

A. R. BEACH.

TERMS.

One copy, one year, postage included.....\$3 20
One copy, six months, postage included.....1 60

Club Rates:

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

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

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

VOLUME XXXIII, No. 7. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, AUGUST 14, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Air, hot, for power (21).....	107
Aquarium and warden case.....	107
Architecture, cottage.....	108
Azalea, hardy.....	108
Back gears on lathes (4).....	97
Battery, metal sponge in (39).....	108
Battery, zinc and copper in (24).....	108
Benzine and benzol.....	102
Blower, piston (11).....	104
Boats, propelling (13).....	104
Boiler incrustations.....	101
Boiler inspections, a year's.....	101
Boilers and engines for boats (22).....	108
Bricks, cleaning (41).....	108
Brass, stains from (26).....	97
Buildings, etc., exit from.....	107
Bullets, size of (3).....	108
Carbon, conducting power of (39).....	102
Cars, steam street.....	98
Car wheels, dimensions of (8).....	105
Celery, preserving (49).....	107
Centennial, progress of the.....	99
Coal per horse power.....	101
Coffins, wicker.....	108
Compressed air as an antiseptic.....	105
Cotton mathematics.....	101
Crane, a powerful.....	98
Crank pin, revolving (34).....	101
Electric phenomenon, remarkable.....	103
Engine power for sawing (51).....	102
Engines, short stroke (19).....	108
Engine valves.....	108
Engine, water in an (28).....	107
Explosives, igniting (38).....	107
Fire escapes wanted.....	98
Fish oil for painting, etc. (36).....	99
Floor clamp, improved.....	107
Flying machine, another.....	107
Friction and surface (5).....	107
Galvanometer, a simple.....	108
Glass, ground, marks on (23).....	98
Gun, improved toy.....	107
Hayraking, steam.....	105
Ice sheet, the great.....	96
Improvements, needed.....	101
Link, gold and silver.....	107
Inventions patented in England.....	105
Inventors wanted, two.....	101
Iron horse, the.....	100
Lard, burnt (14).....	107
Lightning rods (28).....	107
Linseed oil, drying (45).....	108
Mag. etism, attraction of (15).....	97
Magnetism, terrestrial.....	108
Marking ink, colored (42).....	108
Mathematics, importance of.....	102
Metals as electric conductors (29).....	104
Metals of Feb. 13, the.....	104
Mothers of scientific men.....	101
Motor, cold air, No. 2.....	101
Patents, American and foreign.....	108
Patents, list of Canadian.....	108
Patents, official list of.....	108
Peach crop, an enormous.....	97
Peasies, eagle (9).....	107
Petroleum, the paraffins of.....	102
Planing machine pressure blocks.....	102
Podometer, the.....	98
Power from a coffee mill.....	105
Press, screw, power for (30).....	107
Pumping, power for (50).....	108
Races, boat, horse, and human.....	105
Rubber, dissolving (43).....	108
Salicylic acid.....	96
Sawmill gearing (39).....	107
Singer, Isaac M.....	101
Smith college.....	103
Snuff for insects.....	102
Soda manufacture.....	108
Soldering tin (46).....	108
Spinning difficulty, a (29).....	107
Spur wheel teeth (31).....	107
Steam decomposed by heat (2).....	107
Steel bronze.....	98
Steel ingots, casting.....	99
Strain on a drawbar (1).....	107
Taps, thread for pipe (32).....	107
Telegaph, a (40).....	108
Torpedoes, igniting (41).....	108
Torpedoes, the youngest.....	98
Walls, damp (4).....	107
Watches, English vs. American.....	105
Water in Archimedeian screw (15).....	107
Water jet, etc., vertical (15).....	107
Water, happy, for engines (7).....	107
Water through nozzles (16).....	108
Wood-carving machine.....	98
Zinc, spots on (46).....	108

THE GREAT ICE SHEET.

In the heat of summer nothing is more refreshing than a generous quantity of ice. And it may be refreshing to the mind, at least, to contemplate, in these sultry summer days, the great sheet of ice that once enveloped all the northern part of our continent, and of the globe as well.

All have seen the immense boulders, called "lost rock" in some sections, scattered over the northern part of the United States, which have little or no resemblance to any mass of rock in place anywhere in their vicinity, and have perhaps asked the question: Where did they come from? also the heaps of sand, gravel, and cobble stones of various sizes, which form many of our ridges, knolls, and hills, and which are totally unlike any fixed rock near them. Some of these have coarse and fine pebbles promiscuously mixed together, and others show beds of stratification in which the coarse and fine seem to be sorted and arranged by themselves. Some, too, have doubtless seen the parallel scratches on the surface of rocks, and noticed, as the Indians did before them, that they all have one direction, and that is usually north and south. Now all these phenomena are attributed to a single cause, and that is the great sheet of ice which Nature stored up ages ago without the necessity of protecting it in an ice-house. The transported boulders, of all sizes down to pebbles and even fine sand, and the scratches upon the rocks, are clear indications of a movement on a very large scale. And if one takes the trouble to search for the place whence these erratic boulders came, he will invariably find that it is north of the position in which they now rest, and varying in distance from a few miles to several hundreds. It will very frequently be found that these masses of stone could not have reached their present resting place without crossing intervening mountains, valleys, lakes, and sometimes parts of the ocean. They are often perched in very singular and almost inaccessible places. There is a very large one on the summit of West Rock, New Haven, under which the regicides are said to have taken refuge after the restoration. Some are so nicely poised in their position that they can be easily rocked by a child, though they weigh tens of tons. One of the most noted of these erratic blocks is called Pierre à Bot, of fine granite, which now rests on the Jura, 800 feet above Lake Neuchâtel, near the early home of Professor Agassiz. This has a solid content of 40,000 cubic feet, and was transported from Mont Blanc across Switzerland, a distance of sixty or seventy miles. Through the influence of their world-renowned fellow townsman, the city authorities of Neuchâtel have constructed a promenade to it.

To explain the transportation of these wanderers from their homes, various theories have been advanced, as the ef-

fects of floods, or of powerful mud currents, gas explosions of great violence, hurling rocks in all directions, and drifting ice, carrying boulders on its mass and depositing them wherever the ice melted. But these and many others fail to satisfy the observed conditions, and utterly fail to the ground in presence of the facts. To our lamented Agassiz belongs the credit of first attributing the cause of all our drift phenomena to glacial action. But he was not the first to observe that boulders were carried long distances by land ice. More than twenty years before Agassiz announced his conclusions, a chamois hunter of Valais said to M. Charpentier: "Our glaciers had formerly a much longer extent than at present. Our whole valley was occupied by a vast glacier extending as far as Martigny, as is proved by the boulders found in the vicinity of this town, and which are far too large for the water to have carried them thither." Charpentier adds that he afterwards received similar explanations from mountaineers in other parts of Switzerland: once, in 1834, from a woodman, when he had at the very time in his pocket a paper advancing the same theory, which he was then going to Lucerne to submit to a convention of Swiss naturalists.

In 1836, Agassiz became acquainted with Charpentier and was made familiar with his investigations. Soon after, he (Agassiz) carried the theory beyond the limits of the Swiss Alps, and made it embrace a sheet of snow and ice extended enough to cover a continent. Having noticed that the markings in the region of the Alps below the glaciers were the same as those found beneath the ice mass, he compared these with similar appearances in Northern Europe and Asia, which were generally attributed to the great flood, and made the bold generalization that all were due to the very same cause, and that one vast sheet of ice must have covered all the northern regions of the globe. While these theories at first met with great opposition, they are now universally accepted.

According to Agassiz, the sheet of ice extended in this country as far south as South Carolina or Alabama, and was thick enough to cover all the mountains of the eastern part of North America with the exception of Mount Washington. This peak projected, a lone sentinel on that vast waste of ice, two or three hundred feet. In the latitude of northern Massachusetts, he conceives the ice to have been between two and three miles thick; and it held its direct southerly course in spite of the mountains and ridges over which it moved, as is indicated by the direction of the parallel grooves it made, and the trains of boulders which it left. The boulders were all torn off, by the advancing ice sheet, from the projecting rocks over which it moved, and carried or pushed as "bottom drift," scratching and plowing the surface over which they passed, and being scratched and polished themselves in return, till they were finally brought to rest by the melting of the ice. They were not carried as far south as the ice sheet extended, seldom beyond the parallel of 40° N. The native copper of Lake Superior was drifted four or five hundred miles south; and the pudding stones of Roxbury, Mass., were carried as far south as the Island of Penikese.

The tough, elastic, compact clay, called in this country "hard pan" and in Scotland "till," is described as the oldest deposit of glacial agency. It was formed under the great ice sheet as it ground along on the earth's surface. This was often plowed and forced forward in a confused mass, was thickest in the valleys and on the lee side of crags and other obstructions, and thins out towards the mountain tops, where it appears only in protected places.

During the existence of this ice sheet over the earth's surface, geologists tell us there was a great depression of the crust, which of course resulted in an equally great encroachment of the sea upon the land. Various reasons have been assigned as the cause of this. Adhémar, and later Croll, attribute it to a displacement of the earth's center of gravity, due to an increased weight of ice at the north pole, while at the same time there is a diminution of ice at the south pole. The latter authority estimates that the melting of two miles of ice from the antarctic regions would raise the ocean level one foot; and the simultaneous abstraction of heat from the arctic regions would add a mile to the thickness of the ice at the north pole; and that these results would so change the earth's center of gravity as to cause a submergence of nearly 500 feet in the northern polar regions, and a gradual diminution of this amount towards the equator. But, unfortunately for this theory, the facts show that the amount of submergence does not diminish with uniformity as we recede from the pole, but with much greater rapidity than the theory requires.

Another theory, advanced by Professor Shaler, attributes this depression to the weight of ice accumulated on the continents during the glacial period. This theory assumes that a cap of ice, a mile or more in thickness, would, by its gravity, depress the earth's crust at least 500 feet from the Great Lakes to the Arctic Ocean. That this weight would tend to produce a depression cannot be denied; but it is hardly probable that it would be sufficient to produce so great an effect upon the earth's crust, which is probably not less than 100 miles thick, and so shaped as to offer a resistance to pressure very similar to that of a monstrous arched bridge. It would seem more natural and reasonable to attribute this depression to the commonly accepted cause of all the elevations and depressions on the earth's surface: the contraction of its crust due to constant cooling.

After the disappearance of the ice sheet, there were local glaciers which conformed to the larger valleys, like those now seen in the Alps. They carried down boulders torn from the rocks along their sides and deposited them, with other debris, as terminal and lateral moraines, which often dammed up rivers and formed many of the lakes which now beautify

our landscapes. Other lakes were formed in the solid rock by the gouging action of the boulders frozen into the ice. At perhaps about the same time there was again an upheaval or elevation of the land, or, more strictly, successions of elevations. These caused a rapid drainage, from the land, of the water previously making up the ice sheet, by which the drift was stratified and its pebbles assorted and rounded; hills and ridges were formed by a deposition of material suspended in the water, just as drifts of various shapes and sizes are formed by the snow suspended in the air; and the beautiful terraces which ornament so richly our river valleys were formed. These elevations were also due to shrinkage of the earth's crust, for a depression in one place must necessarily make an elevation in another.

SALICYLIC ACID.

Disinfectants and antiseptics may be divided into two classes, those which have a destructive action by the dominant power of their chemical affinities, of which chlorine is the type, and those which have a preservative action, causing them to prevent decay and putrefaction, of which class carbolic acid is the type.

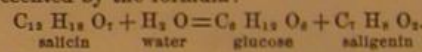
The first class destroy the infectious materials. Chlorine does so by its great affinity for hydrogen, which breaks down all hydrogen compounds; while at the same time, if oxygen is set free, the latter will, by the power of its nascent condition, finish the work and utterly destroy the compound. As all organic infectious substances are hydrogen compounds, the special action upon them of chlorine or its equivalent is evident.

Of the second class of disinfectants, preventing the decay of organic compounds, there are several. Carbolic acid and its nearly equivalent creosote, chloride of zinc, arsenic, bichloride of mercury, and others are well known. Notwithstanding that many of them may be used as disinfectants, they are rather preservatives, protecting as they do the organic substance against the destructive agency of zymotic principles, and against the action of fermentation, emaciation, or other modes of decay.

Till recently, all the known disinfectants and preservatives had the grave defect of possessing a bad odor or flavor, or of being poisonous, and sometimes these disadvantages were combined in one body; and the discovery of a preservative and disinfectant having neither taste nor smell when diluted, and an agreeable odor when concentrated, is of great importance. Such a substance is salicylic acid, and it may be well, therefore, to give an outline of the history of the discovery of this compound, which promises to come widely into use.

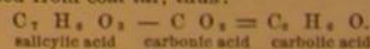
The starting point was the study of salicin, a crystalline bitter substance contained in the leaves and young bark of willow, poplar, and some other trees. It is simply obtained by exhausting the bark with boiling water, filtering, concentrating by evaporation, and subsequently crystallizing, when pure white, silky needles are formed, of which analysis has shown the formula to be $C_{12}H_{16}O_6$.

When this substance is boiled with a diluted acid, it will absorb one atom of water and be split up into two other substances, glucose or grape sugar and a new compound which has been called saligenin. The chemical action may be simply represented by the formula:

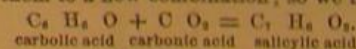


The splitting up of the salicin atom has caused some chemists to consider salicin as a glucoside of saligenin. The latter has little bitter taste, if any.

When saligenin, $C_6H_8O_2$, is submitted to the action of chromate of potash and sulphuric acid (a powerful water-forming mixture), two atoms of hydrogen are oxydized out of it and become water, and $C_6H_8O_2$ becomes $C_6H_6O_2$, a thin, colorless, and very fragrant oil, heavier than water, but soluble in it. This has been called salicyl. When salicyl is oxydized by chromic acid, it takes up an atom of oxygen, and $C_6H_6O_2$ becomes $C_6H_6O_3$; this is the salicylic acid, the subject of our remarks. It crystallizes in prismatic form, and is very soluble in hot water and alcohol. When heated, it melts; and by further heating to distillation, it gives off carbonic acid and becomes carbolic acid, the same as is obtained from coal tar, thus:



This gave a hint to the chemists investigating this substance, and they tried to obtain it by a shorter route by combining carbolic acid with carbonic acid, and they succeeded. Carbonic acid gas is simply passed through the liquid carbolic acid; but in order to loosen the elements in its atoms, pieces of sodium are introduced, which, by their affinity for oxygen, loosen the bands between the C, H, and O, and so predispose them to a new combination; so we have



And this close relationship between the two substances gave rise to a suspicion that the salicylic acid was, in a certain sense, a deodorized carbolic acid, and would have the antiseptic properties of the latter without possessing its intense tarry flavor and odor, which make it totally unfit for the preservation of food. This was verified, and it was found that, when three grains of this salicylic acid are placed in a pint of fresh milk, it will keep 40 hours longer than without it. Its presence cannot be detected by odor or taste, and it is claimed that it does not impair the wholesomeness. It also prevents fermentation, and arrests it when begun, in cider, beer, wine, sugar solutions, etc.

We repeat that the discovery of a substance of this class, the presence of which is not revealed by taste or smell, is of the utmost practical importance.

TERRESTRIAL MAGNETISM.

If a magnetized steel needle is suspended by its center of gravity, or placed upon a point, it will take a determinate direction towards a point of the horizon which is very nearly north and south. The force which produces this direction is called terrestrial magnetism. It is one of the modes of manifestation of the natural sources of electricity, since magnetism itself is only a particular form of electricity. The magnetic force of our globe is manifested at its surface by three classes of phenomena, namely, the declination of the magnetized needle, its inclination, and the intensity with which the force acts. The declination is the angle that is formed with the direction of the meridian of the place by the direction of the magnetized needle placed upon a vertical pivot. The inclination is the angle that is formed with the horizon in the magnetic meridian by the direction of a magnetized needle sustained by its center of gravity, around which it is able to turn freely in a vertical plane. These three elements, declination, inclination, and intensity, not only vary from one place to another, but in the same place with time. They also manifest irregular and accidental variations, designated under the name of disturbances, the existence of which is connected with the presence of some natural phenomena, such, in particular, as that of the aurora borealis. It is well established that the forces which act upon the magnetized needle emanate directly from the terrestrial globe, and we are naturally led to regard the earth as a great magnet, and as having one pole situated to the north of us, attracting the north pole of a needle in that direction.

If we suspend a magnetic needle by its center of gravity, so that it may move freely either in a vertical or horizontal plane, the extremity which turns towards the north will incline below the horizon, making at New York an angle with the horizon of about 73°. Hence we conclude that, if the earth be a great magnet, giving direction to the needle, its pole must be situated, not on the north horizon, but almost vertically beneath us.

If the earth is really a magnet, the magnetism of soft iron ought to be decomposed by it, in the same manner as is done by a bar magnet, and such is the fact. If a bar of soft iron is held in the direction which a magnetic needle assumes when freely suspended, its lower end immediately becomes a north pole, and its upper end a south pole, as is shown by bringing a small magnetic needle near each end of the bar. On inverting the bar, it will be found that its poles have immediately changed, the lower end being again a north pole, and the upper one a south pole. If the bar is held horizontally, pointing east and west, no such effect takes place.

A similar but slightly diminished effect is produced on a bar of iron suspended in vertical position; and iron rods which have remained long in a vertical position frequently acquire permanent magnetism.

When a bar of iron is rendered magnetic by the influence of terrestrial magnetism, a stroke of a hammer will sometimes fix the magnetism, and the poles will not be reversed when the bar is inverted. But if several blows with the hammer be struck when in the inverted position, its magnetism may be destroyed or its poles be reversed.

The action exerted by the earth upon a magnetic needle is simply to give direction to the needle, for the weight of a needle is not increased by its magnetism. Hence it is concluded that the attraction of the earth for one pole of the needle is exactly equal to its repulsion for the other. If a magnetic needle be placed upon a cork floating on water, it will soon adjust itself to the magnetic meridian; but it has no tendency to travel either toward the north or south.

Although a magnetic needle, when fully suspended, generally points nearly north and south, it is found in almost all parts of the world that the north pole of the needle deviates a few degrees from the astronomical meridian. This deviation is called the magnetic declination. The declination is said to be east or west, according as the north pole of the needle deviates to the east or west of the true meridian. The declination of the needle is very different at different places on the earth's surface. There are places where the declination is 10°, 20°, 30°, and even 90° west; and there are places where the declination is as much to the east. At most places on the earth's surface, the dipping needle will not rest in a horizontal line, one pole pointing downwards and the other upward. This dip varies at different places from 0° to 90°, and observations to determine its amount have been made in almost every part of the world. In order to represent all these observations conveniently upon a chart, a line is drawn connecting all those places where the dip is the same. A line connecting all those places where the needle rests horizontally is called the magnetic equator. This line exhibits numerous sinuosities in its course around the globe, but does not depart much from a great circle. It crosses the terrestrial equator near the western coast of Africa, attains its greatest southern latitude in South America, where it is 15° south of the geographical equator, crosses the equator again near the meridian of New Zealand, and attains a north latitude of 12° near the southern part of Hindostan.

As we travel northward from the magnetic equator, the north end of the needle inclines downward, and the dip continually increases at the rate of about 1° for 1° of latitude, until we reach the north magnetic pole, where the needle stands vertically, in latitude 70° 5' N., longitude 96° 45' W.

As we travel southward from the magnetic equator, the south end of the needle inclines downward, and this dip continually increases until we reach the south magnetic pole.

That terrestrial magnetism is not produced, in any important degree, by magnetic forces external to the earth is probable, because, if there were an external cause for magnetism, it is scarcely conceivable that some large part of it

would not act in planes parallel to the geographical equator; and if so, its effects at any one place would undergo very great changes in the earth's diurnal revolution, every part of the earth being presented, in the course of the day, in different aspects toward forces so acting. Now the fact is that the diurnal changes are very small, only about $\frac{1}{100}$ part of the whole horizontal force. It would seem certain therefore that external bodies or spaces do not produce any sensible part of the magnetism in the planes to which the earth's axis is normal.

That terrestrial magnetism does not reside, in any important degree, in the earth's surface, is probable, because of the non-magnetic property of the materials of which the earth's surface is composed, and upon the general absence of any perceptible change in magnetism depending on the change of soil.

Humboldt adopted the idea that the principal phenomena of terrestrial magnetism could be explained by the action of a powerful magnet, of limited dimensions, near the center of the earth; but it was found that the theory upon which this idea depended, though well representing the broad facts of terrestrial magnetism, failed in accuracy when applied to many special cases.

Hansteen suggested the theory of two large magnets within the earth, but this failed to meet the facts of observation.

Gauss attempted to explain the cause of terrestrial magnetism by supposing that magnets are distributed irregularly through the earth, and the results of observations generally accord with the necessities of his theory.

Regarding the earth as a heterogeneous compound of different substances, which may possess in some degree the properties of different metals, and conceiving (as is the opinion of many physicists) that there is in the interior a great store of caloric, which may heat the points of contact, some of them steadily and some by occasional bursts of flame, it seems within the range of possibility that such a combination, of heat with dissimilar substances, may be the cause of terrestrial magnetism. But there is no evidence of this beyond mere conjecture. It is worthy of remark that the isothermal lines on the earth's surface bear a striking resemblance to the lines of equal magnetic intensity. On the whole, we must express the opinion that the general cause of the earth's magnetism still remains one of the mysteries of cosmical physics.

A YEAR'S EXPERIENCE IN BOILER INSPECTION.

Last year there were upwards a hundred boiler explosions in the United States and Canada of a nature sufficiently serious to be reported in the newspapers. By these explosions 183 persons were killed and about 200 wounded.

By many, such unhappy occurrences, or the most of them, are regarded as pure accidents, mysterious, unaccountable, and therefore unavoidable. The managers of the Hartford Boiler Inspection and Insurance Company say: No. While it is not always possible to point out the particular cause of a particular explosion, for lack of knowledge in the premises, boiler explosions as general phenomena are not mysterious, and not unaccountable. It is neither wise nor safe to assume occult causes for such effects when known conditions are at least apparently sufficient. Unforeseen and unforeseeable occurrences will arise, the most careful of engineers is liable to make mistakes and oversights; yet they hold that, with proper construction, intelligent management, and frequent thorough inspection, the frequency of explosions can be immensely diminished, possibly, in time, prevented altogether. At any rate, given these conditions, they are willing to assume the risk of an explosion in any case at a low figure.

Their experience certainly gives the opinion of these gentlemen very great weight. During the past year they have collected through their inspectors the results of upwards of twenty-nine thousand boiler inspections (more than a third of the number being thorough internal and external examinations), under a wide range of conditions of structure, age, use, etc. One result of these inspections was the direct condemnation of one hundred and sixty-three boilers as unfit for use, the majority of them worn out beyond repair. The distribution of the defects is exhibited in the following classification, the second term of each couplet denoting dangerous defects, or those in which the liability to accident was so great that a guaranteed certificate could not be issued until the defect was corrected:

Furnaces out of shape 602—108 dangerous; fractured plates 1,127—564; burned plates 867—302; blistered plates 2,368—374; deposits, incrustation, and scale 4,816—645; external corrosion 937—250; internal corrosion and grooving 642—268; water gages defective 548—100; defective blow-out 267—79; safety valves overloaded and defective 343—140; pressure gages defective 1,809—315; without gages 714—26; deficiency of water 78—26; broken braces and stays, and insufficient bracing 685—280. Thus the company's inspectors discovered upwards of three thousand dangerous defects in the boilers under their care, and about five times as many as that would no doubt have become dangerous if neglected. The saving in life and property effected by the timely discovery and removal of these germs of destruction is simply incalculable.

It might be expected that the experience gained in a private undertaking of this sort would be carefully withheld from the public for personal profit. It is not so in this case. The President's annual report, from which our statistics have been taken, gives some twenty large pages to the discussion of the causes of the different kinds of defects, with suggestions for their prevention and cure. Practical engineers can judge the value of observations based upon such an extensive range of experience.

Particular attention is given to the causes of sedimentary deposits, incrustation, and scale, and means for removing them, and considerable space is devoted to the action of solvents. Potatoes are mentioned as having good results, in some instances, as a preventive. Crude petroleum has been used in many cases with uniformly good results. It is not recommended for general and indiscriminate use, for it may do harm. Catechu, nutgalls, oak, hemlock, and other astringents containing tannic acid have also been found of service in removing scale where carbonates are present. They fail, however, with sulphate of lime, and tannic acid is further objectionable in that it is liable to attack the iron of the boiler, though less so than acetic acid. One of the most successful solvents used is carbonate of soda, incrustations of both sulphate and carbonate of lime yielding to it. It should be used in quantities varying from one to two pounds a day. Mixed with catechu, in about the proportion of one part catechu to two parts of soda, the action of this solvent has been particularly happy. Stress is laid upon the necessity of the frequent thorough cleaning of boilers where solvents are used. "If the condition of the boiler is particularly bad, blow out the boiler once a week and remove all portions of scale which have been detached." Generally, solvents should be used under special advice adapted to the local conditions.

In the discussion of the cause of internal corrosion, we find the suggestion that it may be due to galvanic action excited in the presence of acids in the water by chemical differences in the iron of the different plates. "It is well known that iron ore, even from the same mine, is not always chemically the same; certain impurities will be found in some places which do not exist in others. And in the manufacture of boiler iron, there is no doubt but that the sheets are chemically slightly different: hence when the boiler is constructed, the presence of acids in the water may excite galvanic action. This would account for the different manner in which boilers are affected. Some are attacked at the front end, while others will be attacked at the back end, and in other cases the rivet heads will be attacked."

"If it is found that the feed water is from a source that is contaminated, it should be changed at once. Ponds and streams on which cotton and woolen manufactories are located are apt to be very impure from the quantities of refuse and spent dies emptied into them. These generally are bad sources from which to take the feed water of boilers unless it can be brought in pipes from above the factories."

The comments on the bursting of experimental boilers for the discovery of the causes of boiler explosion are severely skeptical. "I would not disparage experiments intelligently made," the President remarks. "The experiments of the Franklin Institute made years ago are valuable to-day; and those made by the late Sir William Fairbairn have laid steam users under great obligations. Later experiments on the strength of materials have decided important questions about which there was much controversy; but to suppose that the cause of boiler explosions, as they occur in different parts of the country, where the boilers are indifferently cared for—fed with bad water and having few or no reliable attachments—is to be definitely settled by bursting experimental boilers, surrounded with none of the conditions to which boilers are subjected in daily use, is investing such experiments with an importance worthy the unbroken silence pervading the councils of the commission appointed by government to expend \$100,000 in gaining information bearing on this subject."

AN ENORMOUS PEACH CROP.

The estimates of the coming peach crop all point to the same being of remarkable magnitude, the aggregate number of baskets being fixed at from eight to ten millions from the Maryland and Delaware peninsula alone. Strenuous efforts are being made to find markets for the yield, and a degree of enterprise is manifesting itself among the fruit growers which can hardly fail to win merited remuneration. A special train will be dispatched daily over the Baltimore and Ohio railroad to carry supplies to the cities of the West; 1,150 cars have been chartered to transport the fruit to New York and other eastern cities, and it is stated that the American Steamship Company of Philadelphia are fitting up huge refrigerators in their vessels, so that from 25,000 to 30,000 baskets may be carried to Liverpool at each trip.

The necessity of transporting so large a quantity of perishable freight in warm weather, quickly, seems to us to offer a good opportunity of practically testing the preservative properties of compressed air. On another page will be found a full description of M. Bert's important discovery. It is a very easy matter to render a portion of a car airtight, and to force in air by a simple hand pump until a pressure of three or four atmospheres is reached. This could without difficulty be maintained over a long trip; and if the effect stated by M. Bert—namely, complete preservation of the material—is obtained, an enormous saving in the cost of ice and in labor may at once be made. We should be glad to learn of the results if any one should adopt these suggestions.

Back Numbers for the Current Year.

We would state, in answer to numerous inquiries whether all the numbers of the SCIENTIFIC AMERICAN can be had for the year 1875, that they can be furnished from January to the present time, in sheets, or in volumes of 416 pages, bound, up to July 1. The price for the bound volume is \$3; in sheets, from January to July, by mail, \$1.60. New subscribers can have all the back numbers if they wish. But, unless requested otherwise, all subscriptions will be commenced at time of receiving the order.

THE PODOMETER.

The annexed engravings show a simple little instrument, sold in many of our New York stores, which, now that pedestrianism is so much in vogue, proves the handiest means attainable for measuring distances walked over. The podometer is no bigger than an ordinary watch, is carried in the vest pocket, and is said to indicate distances with as small a margin of error as five per cent.

The shape is apparent from the illustrations. One side serves as a dial having a single hand, the other may be covered with metal, or, if desired, with glass, to allow the inspection of the interior mechanism. The latter consists of a heavy counterweight, B, secured at the extremity of a lever which oscillates about an axis at A. V is a screw which limits the amplitude of the oscillations, while a small spring acting against the counterweight maintains this last in the position represented in the engraving. A simple counting device, not shown, registers the oscillations of the lever and moves the pointer around the dial.

It is clear that, if the instrument be quickly moved from down up, the inertia of the counterweight overcoming the pressure of the spring, the counterweight will remain down, and the screw, V, will strike the lever. When the instrument returns to its former position, the reverse operation will take place, so that the natural movement of the body in walking will, for every step, cause an oscillation of the counterweight, B, and consequently the advance of the pointer on the dial one degree.

The operator should make preliminary experiments with the instrument between points, the distance of which apart is accurately known. These will give co-efficients with which to multiply (according to the nature and inclination of the road traveled over) the number of steps, to obtain the distance in yards or feet.

A POWERFUL CRANE.

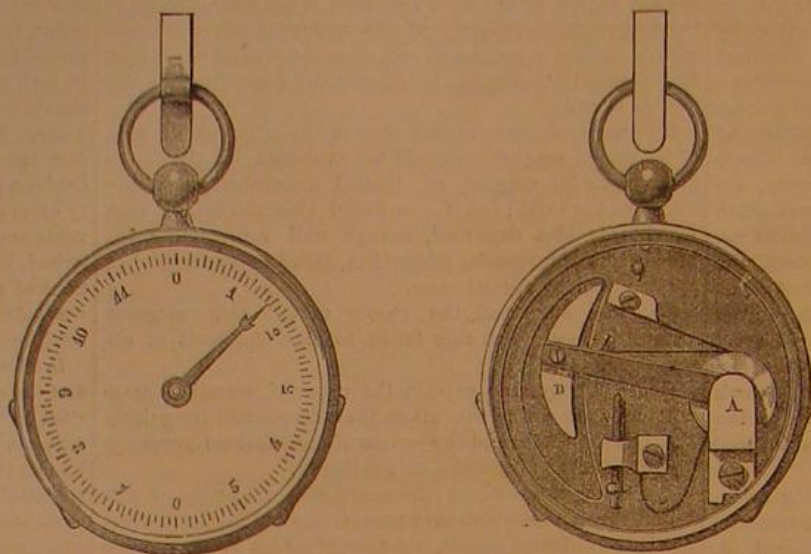
There has recently been erected at Woolwich Arsenal, England, a crane capable of lifting and handling a weight of 85 tons through a height of 60 feet. It is intended for lifting the heavy ordnance now constructed at Woolwich, and 80 tons is considered to be a safe load for it. We publish herewith an engraving of the machine, which has a rake of 47 feet 6 inches from the center of the pivot to the center of the swivel block.

The stipulated speed of lifting the extreme load of 85 tons is fixed at 4 feet per minute, a second speed being provided of about 7 feet per minute for loads up to but not exceeding 40 tons, and a third speed of about 40 feet per minute for raising the unloaded swivel block for any necessary purpose. An auxiliary chain is to be provided, having 3 feet less rake than the main block, this being intended for the purpose of lifting loads up to 8 tons at the rate of about 25 feet per minute. The details of arrangement are shown in the engraving. The speed of turning the crane on its axis is provided to be at the rate of five minutes for the accomplishment of a single complete revolution. These, of course, it is needless to say, are only estimates of the actual working capabilities of the crane now under consideration.

The jib is of wrought iron, 55 feet long, and is attached at the bottom to a platform composed of wrought iron girders mounted upon four pairs of cast iron rollers, which run along the sweep plate or roller path. Two of the pairs have a cogged wheel inside, worked by the hydraulic gear, for revolving the crane within the circle of the roller path; the other rollers are plain. Each pair of rollers is carried in a cast iron roller box, provided with gun metal bearings for the axles to work in. The roller path is of cast iron, and the central pivot or bed, for the crane to work on, of the same material. The latter will be bushed with a gun metal socket for the central pin of the crane, and it will be connected with the cast iron summit length of the 7 feet screw pile by four wrought iron bolts each 3 inches in diameter. The central pin is of wrought iron, and about 13½ inches in diameter. It connects the crane to the center pivot or bed. The platform girders are to be floored on the top with timber, to which, and direct to the girders themselves, the bed plate of the hydraulic engine for winding the chains and revolving the crane will be bolted. The stays for the jib are of wrought iron, and are supported from the jib by other cross stays, as shown in the engraving. The main stays are of cast iron, and trussed together by diagonal stays of the ordinary character. A wrought iron platform, lightly

constructed, is to be suspended at the extremity of the jib, for facilitating the means of access to jib-end sheaves. A wrought iron ballast box, capable of holding about 100 tons of gravel or slag ballast, is to be attached to the platform girders at the back of the crane, for the purpose of counterweighting the full weight of the load. This counterweight, together with the natural stiffness of the crane, will, it is anticipated, be sufficient to overcome the resistance of a far heavier load than 85 tons, the greatest test to which it is intended ever to submit it.

The hydraulic engine, for lifting and revolving, will have



THE PODOMETER, OR WALKING DISTANCE INDICATOR.

three cast iron oscillating cylinders, with cast iron plungers, and will be provided with valves, working gear, and reversing apparatus of the ordinary description. All the shafts for the spur and bevel gearing, for communicating the power of the hydraulic engine to the lifting drums, and to the front rollers for turning the crane, will be provided throughout of wrought iron, and will have gun metal bearings to work in. Wrought iron cupped drums of large and small sizes are provided for the large and small lifting chains respectively, and a separate brake and pawl wheel is connected to each several drum.

The multiplying power of the main lifting block is to be four to one, and the lifting chain for this block to be 1½ inches in diameter, or 4½ inches chain. The auxiliary power

The island had a population of 25,000 people, and was one of the most fertile of the group, producing hemp, sugar, and tobacco of the finest qualities. The base of the mountain has extended so as to cover the entire site of the town of Catarman, which once contained 14,000 inhabitants, but now is a mass of ruins. But a few hundred people remain upon the island, and the fields and groves are choked with new jungle or destroyed by the sulphurous exhalations of the volcano.

Steel Bronze.

No small degree of attention has been attracted throughout military and scientific circles in Europe toward a metal lately used for artillery by General Uchatius, Director General of the Imperial Arsenal at Vienna, and prepared by a process invented by that officer. The name "steel bronze," or "bronze steel," which has been given to the material, is somewhat calculated to mislead, since no steel whatever enters into the composition; and it would appear that the word is used mainly as a synonym for hardness. The metal itself is nothing more than the ordinary bronze, commonly known as gun metal; and to the treatment to which it is subjected it owes its remarkable resisting qualities.

The principal objections to the use of bronze for cannon, as given in standard works on gunnery, are that the work done, in stretching to the elastic limit and to the point of fracture, is less for bronze than for low steel and for wrought iron of maximum ductility; and further, to this defect is added the costliness of bronze, its softness, its injury by heat, and rapid wear and compression. Again, guns cast of bronze, even from the same mass of metal, have

exhibited diversities for which no satisfactory cause could be assigned. All of these disadvantages obviously aggravate each other, and, when taken in connection with rifling and excessive pressures, have been deemed conclusive evidence as to the unfitness of the material to meet the conditions of greatest effect.

General Uchatius' plan is based on the well known principle that, after a certain degree of compression, malleable metals assume their closest and most condensed states. This compression he applies to the interior of the bore, since in bronze guns, under the strain of repeated firing, this portion enlarges without any corresponding alteration of the exterior of the piece. The gun is cast in the usual manner, hollow, and with the bore of a somewhat less diameter than it

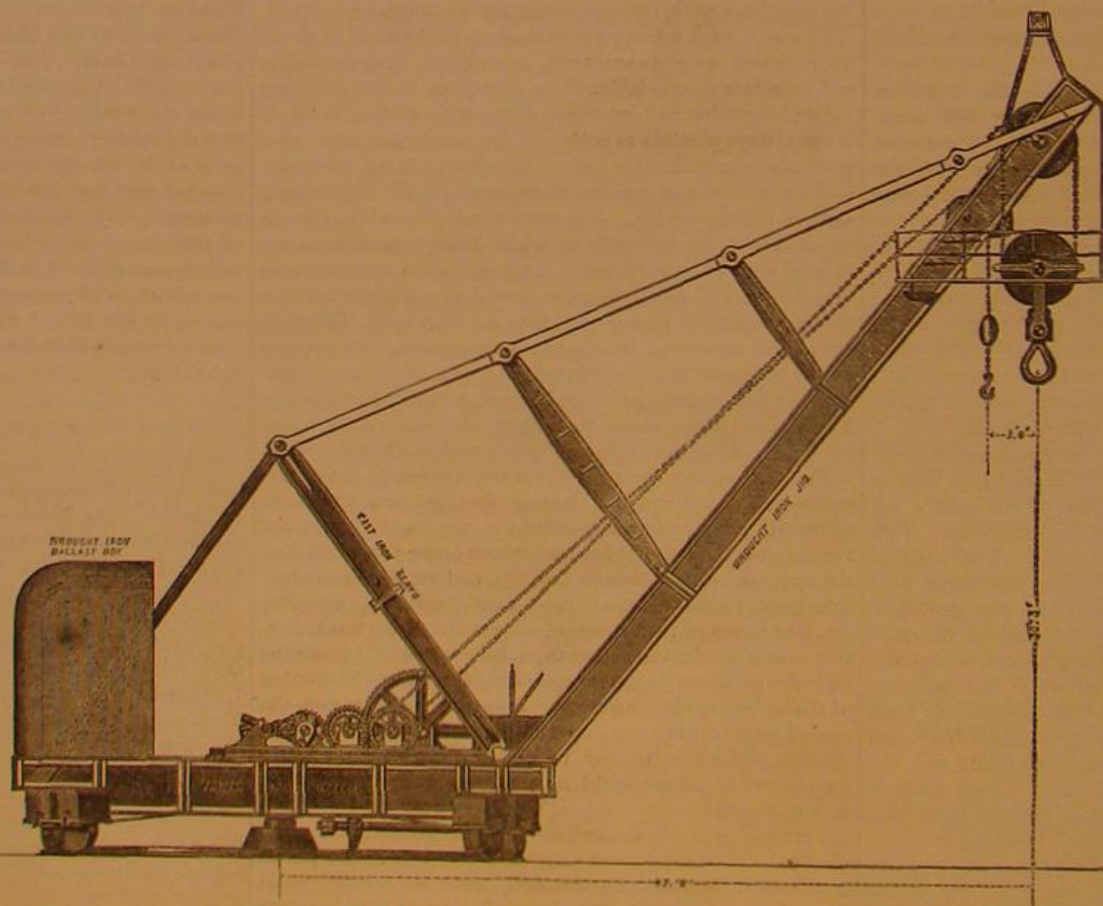
is intended ultimately to be. Thirteen punches, each a bolt of steel, having rounded edges and mounted on the end of a bar of the same metal, are forced through by hydraulic pressure, each punch being slightly larger in diameter than the preceding one. By this means the bore is gradually enlarged, and at the same time the metal subjected to a friction and compression which results in causing it to become extremely hard, and of a nature well suited for the subsequent rifling.

We learn from a well known cannon manufacturer, to whom we are indebted for the foregoing information, that twenty guns thus prepared have been tested in Austria during the past two years. The results obtained have been such that the Austrian Government is now constructing two hundred batteries, or twelve hundred guns, at the rate of six batteries a week. A single gun of steel bronze has withstood 3,000 rounds without any perceptible deterioration, and others, even after being subjected to the severest tests, — shells burst in their bores — appeared to lose nothing in point of accuracy of fire. In

estimating the relative cost of steel bronze guns with those of other metals, the value of the bronze for remelting, after the gun has become worn out, must be taken into consideration. This done, the first cost of the steel bronze cannon is placed at less than half that of a Krupp steel piece, and very much below that of a Whitworth compressed steel gun, which, at a rough estimate, is about twenty per cent more expensive than Krupp's.

There is another important advantage in bronze guns, especially if they are breech-loaders of complicated construction, as compared with steel weapons of similar character, and that is their non requirement of attention during periods of non-usage. Not being subject to deterioration from rust they need little protection, and thus the cost of such care, necessarily considerable in a large armament, is greatly reduced.

The price of artificial alizarin has fallen about 35 per cent



THE EIGHTY-TON CRANE AT WOOLWICH, ENGLAND.

is to be direct without any multiplying power, and the lifting chain for its block is to be 1 inch in diameter, or 3 inches chain. Both the main and the auxiliary lifting chains are to be tested to an endurance of 10 per cent over and above the ordinary Admiralty proof.

The Youngest Volcano.

A new volcano was born on the 1st of May, 1871, and at the present time has attained the height of 1,950 feet. It was recently discovered by the Challenger, in the course of her voyage in the China seas, on the small island of Camiguin, near the coast of Mindanao. For some months previous to the formation, violent earthquakes occurred throughout the islands. These ceased after the first eruption, which gave vent to the imprisoned forces. At the end of four months, the mountain had risen 400 feet and had increased to about a third of a mile in diameter.

The new comer appears to have worked sad desolation.

WICKER COFFINS.

A new use has been developed for the British Duke, a use upon which we are fain to congratulate the British inventor. From his prominent position as an integral portion of the noble and conservative element of the political system of England, the Duke of Sutherland now soars to a loftier height, and takes rank with the daily journals, and the big hand bills, and the banners carried by small boys as a valuable advertising medium. He recently invited the nobility and gentry of London, to a garden party, not to regale them with the festivities peculiar to such gatherings, but to secure their attention to an improved system of wicker work coffins devised by Mr. Seymour Haden, an illustration of which is given herewith. During two days, everybody accepted His Grace's invitation with alacrity, for everybody does not often get invited to a ducal residence. Everybody read a neatly worded circular, setting forth the varied advantages of the invention, poked in his hand on passing the door, and then everybody, after entering the aristocratic precincts of Stafford House, was permitted to moralize *ad lib.* over a heap of oblong baskets displayed upon the grass.

We do not question for an instant that it is most laudable for the nobility of England to encourage the progress of invention. In so doing they simply follow the example of the rich and enlightened world over; but it strikes us as extremely ridiculous that a device which in itself possesses but the merest shadow of novelty, and certainly involves no new discovery or principle, should thus be brought into a notoriety through the medium of ducal advertising, which on its merits it could not attain. Even *Punch* makes a little quiet fun out of the affair by putting the question of "Ah—have you seen the coffins yet?" in the mouth of an inane youth who at a party finds himself at a loss for something to say to his fair companion.

So far as basket burials *per se* are concerned, we fail to see any advantage in a basket packed with moss over a deal box with a few holes bored in it, such coffins as thousands of soldiers were buried in during our war or which now are frequently employed to contain the remains of the unfortunates inhumed in the Potter's Field. A simple perforated chest of some thin non-resinous wood, or, better still, of stout pasteboard unsized, would take very little if any longer than a willow basket to decompose, and certainly would be cheaper.

CASTING STEEL IN ONE TUN INGOTS.

In an article on the progress of our steel industry, which recently appeared in these columns, we took occasion more especially to allude to the advance made in New York State since the exploitation of the Crown Point mine near Lake Champlain. Large quantities of the ore from this deposit, smelted into pig iron, together with iron from other localities, notably Port Henry, Fort Edward, and from the Lake Superior region, aggregating some 100,000 tons per year, we stated, were shipped to the immense works of the Albany and Rensselaer Iron and Steel Company, in Troy, N. Y., where, by the Bessemer process, the metal is converted into steel, the major portion of which is rolled into rails. The finished material is sold at a price considerably below that of the steel produced by English makers imported hither, but nevertheless it yields to its manufacturers a fair profit. The process of making this steel, which is cast in ingots weighing over a ton each, is exceedingly interesting, both from the improved and novel mechanism employed, and from the scale of magnitude on which the various operations are conducted. A recent visit to the establishment above named afforded us an opportunity to witness the latter, and to gather the facts upon which the following description is based:

Three great cupola furnaces at the Albany and Rensselaer Works receive the masses of pig. Into each of the three fiery caverns fifteen tons of material are thrown; and in the course of three quarters of an hour, five and a half tons from each will be melted. For eighteen hours the furnaces are kept in blast. Near by are two reverberatory furnaces in which the spiegel-eisen is prepared, ready to be added at the proper time. Leading from the outlets of these, as well as from those of the cupolas, are gutters which convey the liquid metal to the two converters, which are suspended side by side on the massive framework. One of the great vessels, as we enter the building, is swung over on its side with its bent neck just under the gutter; the other is slightly inclined, and workmen are busily putting in new tweers (cylindrical pieces of fire brick perforated with numerous holes and inserted in the bottom, the orifices serving as air passages), and luting about the bottom plate with a paste made of quartz, sand, and clay.

Some one shouts a warning, and we step aside to avoid the heat of a stream of molten metal which comes pouring down the gutter from one of the cupolas. Hissing and shoot-

ing forth sheets of flame, it falls into a huge ladle, where it is weighed, and then continues its downward rush between the banks of sand in the gutter, around the bends of the same, and finally tumbles, a miniature cataract, into the mouth of the converter. Over six tons soon lie bubbling and seething on the deep side of the inclined vessel. Then a sudden roar and a shower of flame and sparks issuing from the open mouth of the latter announces that the blast is turned on, passing, however, only over the surface of the metal. The monster had eaten his fiery meal, but digestion had not yet begun; slowly, however, the huge caldron is turned upright, and then the torrent of flame, augmented, pours into the ad-

ton and then led from that point to an overflow pipe, so that in one case the piston is raised, and in the other it is allowed to descend. The sensitiveness of the immense crane, with its load, to the merest motion of the valve, and its celerity and certainty of action, are remarkable. From the same platform the converters are manipulated by similar means, water being conducted to sunken cylinders, the pistons of which carry racks, which engage with pinions on the trunnions of the vessels. The blast, which is controlled also from the same point, is supplied at a pressure of 25 pounds to the inch by two horizontal blowing engines, the air cylinders of which are 54 inches in diameter.

The flame from the converter has been growing in intensity and size, until now dazzling in its brilliancy. Suddenly it decreases in length, and becomes reddish, and at that instant the blast is stopped, for the decarbonization is complete. Then the caldron slowly turns on its side, and presently another stream of molten metal comes leaping down the gutter and into the open mouth. This is the spiegel-eisen, which has meanwhile been measured and melted. It mixes at once with the liquid mass in the vessel. Now the mouth of the latter is turned still lower until it vomits forth a dazzling, blinding jet of liquid steel, into the enormous ladle which the crane has swung into position.

While the above has been in progress the workmen have been busily preparing the molds. Six one-ton ingots are to be cast from the contents of the ladle. Each ingot will make three rails. The molds are of iron of the form, and arranged in a nest, as shown in the engraving, Fig. 1. The lower portion, A, consists of a deep platform lined with fire clay and having channels radiating from the center. B is a tube of iron placed over the central opening. Into this the steel is allowed to flow, so that it enters the grooves in the plat-

form and then, escaping through the apertures, rises in the molds disposed above the latter. The tube, B, retains the cinder, and is therefore made somewhat higher than the molds.

As soon as sufficient time has elapsed for cooling, the molds are lifted by a crane, leaving the ingots of steel standing upon the platform. These, still red hot, are at once raised, deposited on a car, and transported to the heating furnaces. Each furnace contains four ingots, which are thus brought to a yellow heat.

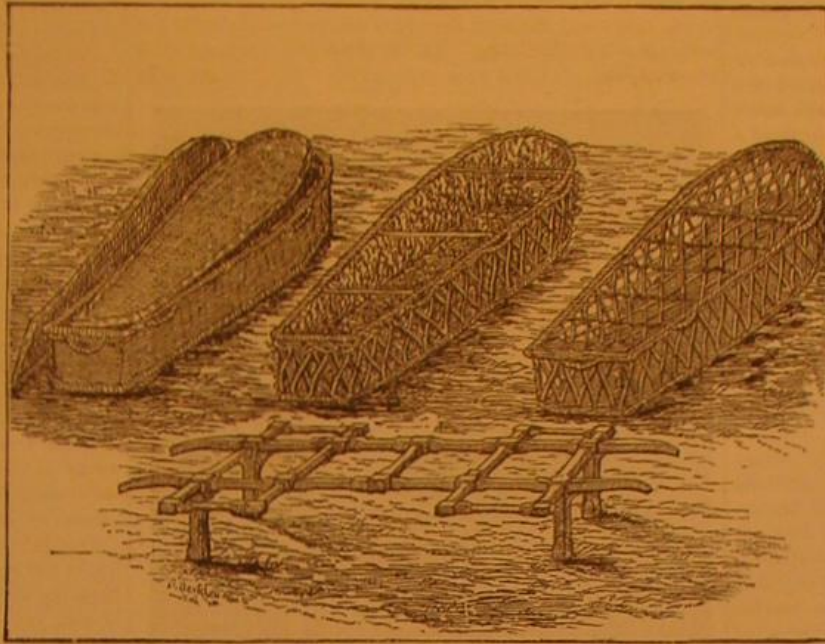
The rolls are some 34 inches between centers and are driven by the main engine. Each ingot passes through twenty-one times. The table upon which the work is conducted to the rolls consist of a number of cylinders rotated by suitable gearing driven by a separate small engine. A piece laid upon these cylinders is quickly moved forward. This table is adjustable vertically, and may be raised up or lowered to present the ingot according to the adjustment and position of the rolls. Between the cylinders and moving longitudinally are a number of fingers arranged as shown in Fig. 2. These are actuated by water power, and serve to turn the ingot over as it is drawn to and fro. A similar combination of mechanism is located on the opposite side of the rolls.

It will be observed that there is no hammering, to the absence of which the homogeneous nature of the steel, and also its uniform quality, may be ascribed. The ingot on entering is some thirteen inches square; on emerging from the rolls after one minute and thirty seconds drawing, it is reduced to about six inches. This entire work, formerly involving the labor of eighteen men, is now conducted with ease by a man and two boys.

Progress of the Centennial.

The exhibition buildings of the Centennial Exposition are now rapidly progressing; and if the funds requisite for the purpose be forthcoming, they will be completed by the first of next January. The granite work of Machinery Hall is nearly finished, and the roofs are being tinned. The plastering and laying of the floors will shortly be begun. The eastern and western wings of the main edifice are completed, and the entire structure, it is expected, will be up by the 1st of October. The glazing of Horticultural Hall is well under way, and nearly all the flooring is laid. Agricultural Hall will be begun as soon as the machinery building is finished. Laborers are now engaged in grading the grounds and digging out the declivity between the United States building and Machinery Hall in order to form a bed, some four acres in extent, for an artificial lake.

The wrought iron observatory to be erected by a Boston company (it is a pity we could not have had Clarke, Reeves, and Co.'s one thousand foot tower) is slowly rising. This will be 170 feet in height and is located at Belmont, a point in Fairmount Park some 200 feet above the Schuylkill. The summit of the edifice will be about 100 feet above the highest spire of the Centennial buildings, over which and the city of Phila-



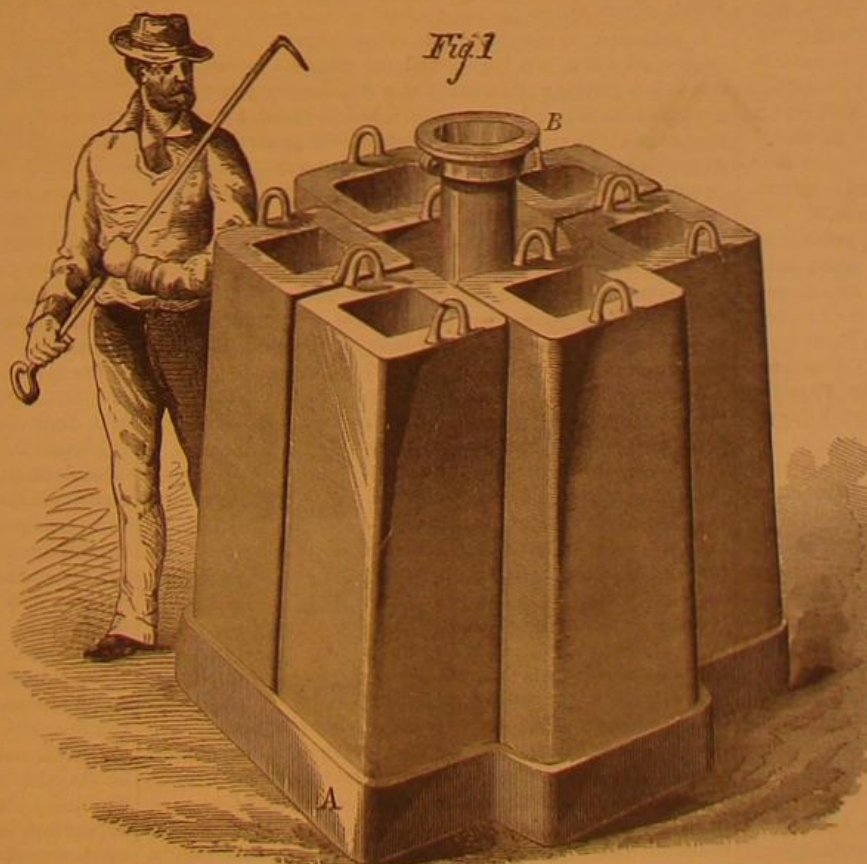
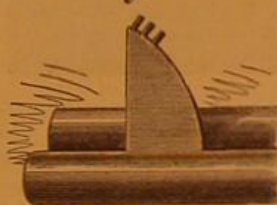
THE DUCAL WICKER COFFIN.

acent chimney. The twenty minutes or thereabouts occupied in the process, we devote to examining the surroundings.

At one end of the immense building is a platform on which is an assemblage of wheels and levers, managed by two or three men, one of whom we are informed is the "blower," the important person upon whom the success of the process depends, for his business it is to watch the flame from the converter and to determine when the blast shall be stopped. Just in front of the two caldrons is a huge crane carrying a ladle. Four other cranes, from the arms of which heavy hooks

are suspended, are also located in the building. Each crane consists of an arm on which is a traveling carriage, attached to a vertical shaft some ten inches in diameter, which forms the piston of a large cylinder at the base. Into the various cylinders water is forced by two hydraulic pumps at a pressure of some 350 lbs. to the square inch, and is governed

Fig. 2



MOLDS FOR CASTING STEEL.—Fig. 1

by valves controlled from the platform mentioned at the beginning of this paragraph. The interior of the valve used is so constructed that the water may be sent under the plat-

delphia and surrounding country, it will afford a fine view. The foundation of the tower is Conshohocken stone, laid in cement and dressed with granite. On the bed plate are fastened ten columns, each seven feet high, and supporting a huge iron ring eight feet in diameter inside and weighing a ton and a half. To this ring the main central shaft is riveted. The top of the tower will be reached by an annular car encircling the shaft and moved upward from the base on the outside of the latter. The car will be made of iron and glass, and be hoisted by a 40 horse power engine. Outside the shaft there will be a truss work of wrought iron. The space at the top of the tower will be capable of accommodating 125 persons. About the base of the structure, an ornamental building is to be erected and used for reception rooms, offices, etc.

A separate building is to be erected for the exhibition of the contributions from the Executive Department of the United States government. The main structure will cover 100,000 square feet, in addition to which will be erected a side building containing 20,000 square feet for a field hospital, the whole covering an area of nearly three acres. The different departments will have especial sections allowed to them. The State Department will exhibit old letters and curious documents from its archives. The Interior Department will show the operation of the Patent Office, and the mode of taking the census, and will probably explain how the Indians are (not) taken care of. The War Department will contribute old and new war munitions, etc., also the United States Cadet Corps, who will encamp for a month or two in Fairmount Park. The Quartermaster's Bureau will furnish specimens of army equipments for transportation, hospital service, etc., and the Subsistence Bureau, specimens of rations and modes of cooking. The Navy Department will contribute the Constitution, or rather a reproduction of the once famous old Ironsides, as the now thoroughly rebuilt vessel does not contain a vestige of the original craft except some wood about the keelson and one of the topsail sheet bits: together with models of various other articles incident to marine warfare. A field hospital after the most approved plan of construction will be erected. Probably one of the most interesting collections contributed by the government will be that of the Smithsonian Institute.

Professor Baird, in connection with this department, will give an exhibition of the propagation of fish of many kinds. An arrangement has been made by which a stream of running water will be introduced, and the method will be shown of hatching the fish from the egg, and statistics will be furnished stating the increase of the fish of the United States by this means, and other facts which may be thought of interest in this connection. Proper means will be taken by the Smithsonian Institute to represent the leading features of the Indian races. Their habitations, manners, and customs will be represented by delegations from the different tribes. They will also exhibit a large collection of specimens of prehistoric remains, comprising stone, iron and copper implements and pottery, dug from the mound hills, the relics of the mound builders, who are supposed to have occupied this continent before the Indians. A complete collection of all the minerals of the United States, prepared under the superintendence of Professor Blake, will not be among the least of these valuable collections. In addition to all these and many others, there will be a zoological collection, the material for which is now being collected from all sections of the country.

Ground has been broken for laying the foundation of the English buildings. There will be two separate structures, each two stories high. The larger one, 90x60 feet, will be used for offices of the Canadian and other colonial exhibitors. The other, 60x20 feet, will be used as residence for attendants required in connection with the British display. The buildings are to be constructed of brick and timber. The architecture will be in the old English style, and the roof will be tiled.

The Japanese commissioners are also preparing to erect buildings after their own style of architecture, and structures will shortly be commenced for Sweden and Morocco.

The questions as regards duty on contributed goods from foreign countries, and also relative to the same being liable to seizure for possible debts of the Centennial commission, have been definitely settled. The Secretary of the Treasury has decided that New York, Boston, Portland, Burlington, Suspension Bridge, Detroit, Port Huron, Chicago, Baltimore, Philadelphia, Norfolk, New Orleans, and San Francisco constitute ports of entry at which goods intended for the exposition will be admitted free of duty. All articles properly marked be will forwarded without examination from the port of arrival to Philadelphia, there to be delivered to the collector of that port. Articles entered at the exhibition may at any time be withdrawn for sale on payment of the duties. The Attorney General of the United States and the Attorney General of Pennsylvania have both given the opinion that goods deposited and placed on exhibition are free from seizure, and are not liable for the debts of the person or corporation thus receiving them.

From the advanced state of the buildings, if from no other indication, the reader may conclude that the time for preparing goods is growing very brief. Several foreign nations have already refused to receive further applications, while the present intention is to close the door to further applications in the American department on September 1 next, since there are already on file requests for considerably more floor room than the area set apart. There is a sifting process to take place, however, by which probably a large number of useless and discreditable entries will be thrown out, so that opportunity may then be given for a few eleventh hour applicants to get their goods in. Those proposing to exhibit should lose no time in filing their applications at once.

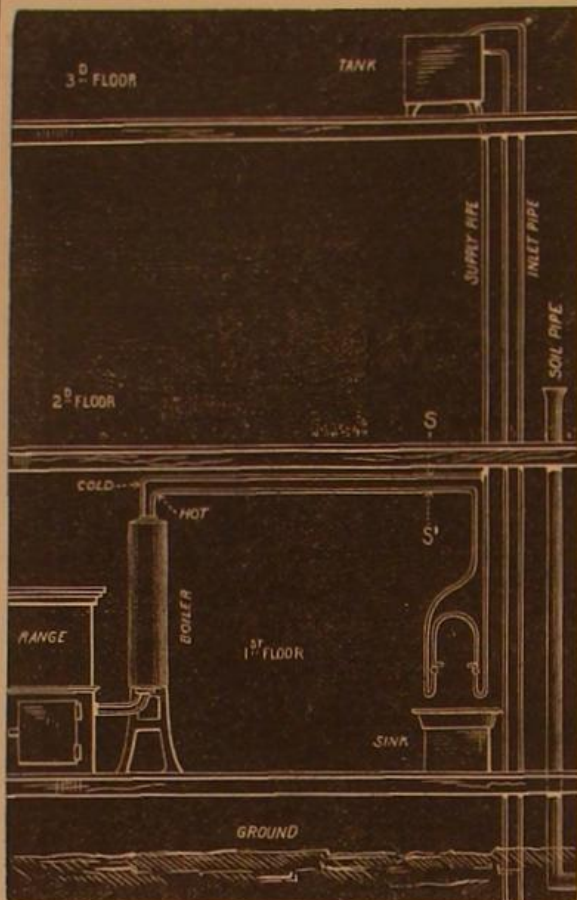
Correspondence.

Remarkable Electric Phenomenon.

To the Editor of the Scientific American:

An electric phenomenon has recently been observed, which I am unable to account for, and I would be grateful if you will help me to an understanding of it.

A house, built of limestone, stands upon a solid bed of the same material. Water is brought to it from a spring on the side of a neighboring hill, across an intervening valley, and poured into a tank on the third floor. An overflow pipe leads from the tank to the barn. The pipe that supplies the kitchen leads from near the bottom of the tank, and is connected to the range and boiler in the usual manner, as shown in the accompanying engraving. All the pipes are in contact with the wall, and are quite near each other. The hot and cold



water pipes are connected at the boiler, and also between the cocks; but of course the pipe is plugged at this point with solder, as usual. During every thunderstorm of any magnitude, frequent and violent electrical discharges are noticed passing from one pipe to the other, at the points marked S and S'. The pipes are all iron, except at the connections to boiler and cocks, where lead is used. I would ascribe the excitement to thermal difference in the pipes, but they are so intimately connected that I cannot see how it is possible. Your opinion would be thankfully received.

THOMAS P. CONARD.

30th and Chestnut streets, Philadelphia, Pa.

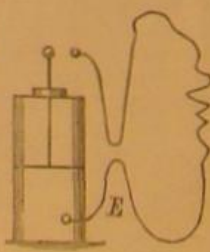
Messrs. Munn & Co.:

In reference to the very interesting observation of Mr. Conard, on which you have asked my opinion, I would say that it is a striking illustration of a well known principle of electricity, to which I have before had occasion to refer in your pages. There was at one time a very general impression that, if two routes of different facility were offered to an electric discharge, it would flow entirely by the better one. This, though (I think) still to be found stated in some text books, is entirely untrue. On the contrary, the fact is that, if two or a hundred routes, differing in facility or conducting power, or, to use a technical expression, "of unequal resistances," are offered to the passage of an electric current or discharge, it will divide itself between them all, in direct proportion to their facility or conducting power.

Among other illustrations of this, I find in Ferguson's "Electricity," 1866, page 63, the following: "A Leyden jar being charged, we have a wire bent, as shown in the engraving, and armed with balls at the ends. One end of this being held against the outside of the jar and the other brought within striking distance of the knob, a spark will pass at E, where the two parts of the wire should be, say, one eighth of an inch apart."

"This evidently is because, while the wire is a far better conductor than the air, yet some of the discharge will even pass through the worst conductor; and the wire being long and the air path short, the difference is not so great but that the fraction passing through the air is an appreciable quantity."

The general principle above stated is one which lies at the foundation of the whole subject of electrical measurements, in which such wonderful results have been reached of late years. Those of our readers who may wish for fuller information on this last subject, we would refer to the article by the present writer on "Electricity," in Johnson's "Encyclopedia," or to Sabine's or Culley's works on the electric telegraph.



After what we have said above, it is hardly necessary to make any personal application to the case before us. No doubt Mr. Conard's tank is near his lightning rod, or in some other way is plentifully supplied with electricity during a thunderstorm. This finds its way to the earth by countless routes, by the walls of the house to a very slight degree, by the various pipes in proportion to their conducting power; and, in the particular case noticed, it finds the hot water pipe so far a desirable road to the copper boiler, and thence to the ground, that part of the current which enters the cold water pipe takes that route. I think it likely that there are some joints on the cold water pipe, between the spark plate, S, and the boiler, cemented with red lead, which is an excellent insulator, or other like body. This would not, however, be essential.

Assuming a difference in the tension of the pipes, S and S', through a difference of their ground connections, induction would exaggerate the same, and aid in this production of the spark; but while this and other actions may no doubt conspire to the effect, the first cause which we have described is, we believe, the main one.

HENRY MORTON.

Stevens Institute of Technology, Hoboken, N. J.

Exit from Public Buildings and Railway Cars.

To the Editor of the Scientific American:

As one of our common humanity, I was pleased to see the attention of the public called to the much needed improvement in the means of effecting an escape from churches and public buildings, in case of fire, accident, or sudden emergency, referring as instances to the Holyoke French church disaster, and the accident at a New York church of a few weeks ago; in fact, almost every paper brings an account of some such horrifying occurrence, with the sacrifice of a greater or less number of human lives.

This brings to mind the frequency of accidents and loss of life in railway cars from a similar cause, as instanced in the Roanoke disaster on the Great Western Railway of Canada of last year; in which, during the burning of a car, the passengers, in their frenzy and haste to escape, jammed the door shut, and could not get it reopened, and several were burned to death, some saving themselves by jumping out of the windows.

These accidents will not become less frequent until some important changes are made to prevent them. As your correspondent of July 3 remarks: "Provision can be made, and it should be compelled to be." There has been in force for some years, in the Dominion of Canada, a law compelling the doors of all churches and public buildings to be opened outwards; and so great was the necessity felt for this that the enactment of the statute was accepted as a great boon, and at once universally complied with.

The same feeling is prevalent, requiring statutory enactment compelling the opening outwards of railway car doors, evinced by the fact that, at each of the two last sessions of the Dominion Legislature, a bill was brought forward with this object in view.

As a late resident of the Old Bay State, I am surprised to learn that you are so far behind in such an important matter; and for the welfare of those who are wont to congregate in our churches, and gather in public assemblies, and the ever constant stream of railway travelers, let us hope that those who have assumed the responsibility with the positions they have accepted, as our lawgivers and legislators, will, at the earliest possible moment, do away with these wholesale man traps.

The facts of the case certainly and practically suggest the remedy: Open the doors of all public buildings and railway cars outwards. This is really what must be accomplished, and the wonder will be that it was not done long since.

W. T. SMITHERS, D.D.

Formerly Rector of Christ Church, Boston, Mass.
Lindsay, Ont.

The Iron Horse.

To the Editor of the Scientific American:

Most of your correspondents, when writing on the application of steam to street cars, seem to take it for granted that the power used must be either horse or locomotive, with no alternative. If by locomotive they mean cylinders connected to the car wheels, or to the wheels of a separate vehicle or machine, I must dissent, and agree with you that the horse is to draw these cars awhile longer; for there are some very important things about drawing a street car that locomotives cannot do practically. For instance, a large truck broke down on a track, and the several cars passing each minute were promptly drawn off the track and around the obstruction on the ordinary Belgian pavement, preventing a serious blockade; and this is not uncommon. However effective locomotives may be on a clear track with good rails, they are worth little off it, and on most street railways they would be off too often.

We think the case demands, not a locomotive, but literally an iron horse, that can, like any horse, be readily attached to and detached from the front of any car, with which it can be drawn off from or on to the track at pleasure, and need not be stopped by ice or mud. The first machine would undoubtedly cost the \$3,000 estimated by Mr. Woodward (page 52, current volume); but if any of the great lines ordered machinery enough to draw all their cars, they could probably be furnished for \$1,500 each. Of course, no company will do this until some one actually brings out the said iron horse, and fully demonstrates his trotting capabilities; for corporations (unlike the Hon. Mortgage Bond) are not so famous for taking "chances," however "big" they may appear.

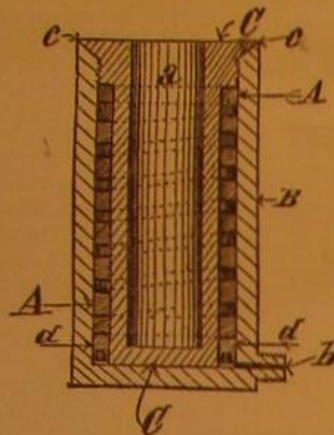
There is a growing demand for a machine of this kind,

and many are looking to see whence it will come—a question for our inventors to answer
F. H. RICHARDS.
New Britain, Conn.

Cold Air Motor No. 2.

To the Editor of the Scientific American:

As cold air motor stock is at a high premium, and capital is going for it blind, a good opening is presented for an enterprising man, and I do not propose to allow Mr. Keely to have an undisputed monopoly of the motor business. I would, therefore, exhibit, for the consideration of those interested, a motor that will accomplish all that is claimed for the Keely marvel in a more simple manner, dispensing with the receiver, standpipe, and pipes, cocks, etc., in the interior of the chamber of the generator of the new element of power. The engraving shows a sectional elevation of the device; it



consists of a cylindrical vessel made of brass, having its side and bottom walls made very heavy, for a purpose that will hereafter appear. Said vessel is in reality made up of two cylindrical vessels, A B, A secured within B, concentric to the same, and of such relative diameter as to allow a space of proper width to intervene between them. In said annular cavity, a ring, d d, is fitted to move under pressure; it is provided with a leather cup packing, attached to its lower end. Above this ring, which acts as a piston head, a powerful spiral spring, a, is placed; the line of junction between the inner and outer cylinders is made on the edge, c c, and if the work is well done it cannot be observed. A strong pipe is connected to the nipple, b; said pipe is provided with a suitable stopcock, and to its free end a powerful air pump is attached. The proper amount of air to obtain 2,000 or 3,000 lbs. to the square inch is pumped in; the receiving inlet must necessarily be very small. When the requisite pressure is on the generator, the stopcock is turned, the air pump disconnected, and an indicating gage attached in its place.

This little operation should be conducted privately before you exhibit the generator to the uninitiated. The cap or cover is now secured in place upon the top of the generator; it should have a stopcock to which is attached about a yard of small gum hose. When exhibited, the operator blows into the hose for a few seconds; the hose is then secured to a hydrant nozzle, and a couple of quarts of water introduced into the chamber, a. This should be well shaken up to expedite the generation of the cold air vapor. If the stopcock in the pipe that the gage is fastened to be now opened, said gage will instantly show a pressure of 2,000 or 3,000 lbs. per square inch. If this device is made of sufficient dimensions (say, 40 inches high and 20 inches outer diameter), an ample quantity of cold air vapor at said pressure can be produced to run a small engine for several minutes, possibly half an hour, and the pressure would be nearly uniform until the vapor is exhausted. Be sure to quit before that event takes place; then take off the top or cover, and show the experts present that there is no humbug about it.

I must candidly state in advance, for the benefit of capitalists desiring to invest in my motor, that there is a possibility of Mr. Keely's invention being substantially the same in construction, and this would bring on an interference in the Patent Office.

WM. P. PATTON.

Harrisburg, Pa.

Fire Escapes Wanted.

To the Editor of the Scientific American:

The communication in your issue of July 3 induces me to propose the following preventive of such horrid human holocausts as the late one at Holyoke. Let all churches and public buildings be made with double door frames, the outer one set fast in the wall and the inner one hinged to it, to open outwards; the doors to be hung in this as usual. When the building is occupied, the inner frame can be slightly fastened, so that the least rush will open it. When the building is unoccupied, it can be made fast. Let every State require, by law, public buildings to be thus made.

Kankakee, Ill.

S. N. MANNING.

(For the Scientific American.)

Cotton Mathematics.

Deduction of a formula for the production of any number of yarn, per spindle, per hour, in decimals of a pound, at any spindle speed.

Let S R = revolutions of spindles per minute.

N = number of yarn in question.

M = multiplier of square root of number, to determine the twists per inch of yarn; then

$\sqrt{N} \times M$ = number of twists per inch, and

S R

= number of inches twisted per minute, and

$\sqrt{N} \times M$

60 S R

= number of inches twisted per hour.

$\sqrt{N} \times M$

The hank measures 30,240 inches.

In a pound of any number of yarn, indicated by N, there are N hanks; hence $30,240 \times N$ = number of inches yarn in question per lb.

$$30240 N : 1 \text{ lb.} :: \frac{60 \text{ S R}}{\sqrt{N} \times M} : \frac{60 \text{ S R}}{30240 N \times \sqrt{N} \times M}$$

S R

= decimal of 1 lb. per spindle per hour of

$504 N \times \sqrt{N} \times M$

N Yarn. In England, the values of M for different descriptions of yarn are as below:

For hosiery yarn, M = 2.5

For doubling, M = 2.75.

For weft, M = 3.25.

For common mule twist, M = 3.75.

For extra mule twist, M = 4.

For super extra mule twist, M = 4.5.

Applying the formula, in illustration, to No. 14 yarn, we have as $\sqrt{14} = 3.741$, with S R = 6,000, and M = 4.

6000

$504 \times 14 \times 3.741 \times 4$ = 0.568 lbs. No. 14 yarn per spindle per

hour; and for 10 hours efficient work, 0.568 lbs. With M = 6, instead of 4, the production in 10 hours will be 0.378 lb. per spindle. The difference is 0.568 — 0.378 = 0.19 lb. per spindle, showing a loss daily from 10,000 spindles of 1,900 lbs. yarn No. 14, from excessive twist.

It must be remembered that, in the low numbers, the English spinners use a staple both shorter and weaker than American uplands, requiring more twist than the American. Yet M often in America is made 5, 5½, and sometimes 6.

By comparing, with the practical result in any mill, the theoretical result, ascertained by the infallible formula, the spinner will be at once advised, whether or not his frames are operated to their maximum capacity.

FORWARDS.

Steam Hay-Making.

It is reasonably certain that only a portion of the annual grass crop becomes converted into hay, and that the aggregate loss due to the spoiling of parts of the harvest by rain-falls amounts to very large sums. There is no process of curing hay so cheap as that of exposure, provided the season continues uniformly dry; but as such is rarely the case, there is clearly an economical advantage to be looked for in efficient machinery which does the work expeditiously and in all times and weathers.

A novel invention for this purpose has recently been exhibited at the Royal Agricultural Society's exposition in England. It is the device of Mr. William A. Gibbs' and its operation, according to the description published in the London Times, points to a high degree of efficiency. The apparatus is of the following form:

A portable stove constructed of plate iron is surmounted by a fan, which is driven by a belt from a three-horse power portable steam engine; the fan draws all the heated air and gases from the coke fire, together with a volume of warmed air, which passes through a chamber surrounding the inner chamber of the stove, and blows the hot current, at a temperature of 400° Fah. or more, into the dryer. This resembles in general shape a straw elevator, consisting of a sheet iron trough 6 feet in breadth, 20 feet long if mounted on wheels as a portable carriage, or 40 feet or 50 feet long if a fixture. The trough is raised at one end at a low angle, so that hay fed in at the upper end furthest from the stove shall slowly travel to the lower end of the stove—this being assisted by a slow reciprocating motion given to the bottom of the trough. A ridge of triangular section running along the middle of the trough divides it into two almost semi-circular channels, so that the hay passes down in two streams; the hot air issues through two slit apertures, one on each side of the base of the middle ridge, and for the entire length of the machine; and the hay is kept continually stirred and lightened up over the hot blast by a number of small iron stirrers, cleverly contrived to imitate the action of forks worked by hand.

"We saw," says the Times, "partly made but wet hay passed through the machine and converted at once into a thoroughly dry condition for the stack; we saw spoilt and musty hay dried into hay of fair apparent quality and pleasant fragrance; and we saw freshly cut grass, saturated with rain from a very heavy thunder shower which poured down at the time, dried into hay of first-class color, and possessing the rich malt odor peculiar to well made hay. With a single twenty-foot machine, the operation is too slow to employ fully one man feeding off a cart and another man removing the product; but with two such machines side by side, or with one fixed machine, of forty or fifty feet length, probably one set of carters and stackers could be kept going. From the experiments made under our supervision, it appears that, while fresh and wet grass loses seventy to seventy-five per cent of its original weight in being made into hay, the quantity of moisture in excess in partially made hay, or hay caught by a heavy rain, may be from ten to twenty per cent. To expel this water from partially made hay requires a consumption of coke in the stove and of coal for the engine not exceeding a cost of 30 cents per ton of hay dried. Preserving freshly cut grass may cost in fuel six or seven times more. With outlay for labor and for wear and tear of apparatus, the total expense, according to Mr. Gibbs' calculations, does not exceed \$1.80 or \$2.00 per ton, which is, indeed, a very

moderate disbursement for saving a loss of perhaps pounds per ton. To make freshly cut grass into the finest hay at one stroke costs about \$10 per ton of the dried hay.

Now, it is possible that in a wet season it may pay thus to preserve grass entirely by artificial heat; but Mr. Gibbs recommends the general use of the apparatus for completing the process of hay-making after the grass has been withered by some exposure, and has lost, say, more than half its original moisture. At this stage it will cost little to clear the field and get the hay safely into stack in the best possible condition, instead of leaving it to the chance of being rained on, involving a great additional expense in the ordinary labor of making, with liability to very great loss in "nose" and color. Another feature is that a small proportion of the artificially dried hay, if mixed with damaged stuff, improves the whole bulk in a manner which could hardly be believed without trial; and another is that a farmer having a drying machine at command is not afraid to open out his hay in dubious weather, and thus no fine hours whatever are wasted in waiting."

In some parts of the United States, where unshine is lacking or wet weather prevails, an apparatus of this kind might be very useful. It could be employed also for fruit-drying and other purposes.

Needed Improvements.

The *Sewing Machine Journal*, published in the interest of the great business indicated by its title, points out the want of the following devices:

1. A ruffler which can be set to gather to a given fulness.
2. A simple embroiderer.
3. An adjustable scroll binder which will not stretch the binding.
4. A practical adjustable hemmer, from the smallest size to an inch wide.
5. A rotary shuttle sewing machine, which will not twist or untwist the thread, and which will sew with great rapidity.
6. A practical tuck folder.
7. A sewing machine which will have, in its working parts, the different attachments which can be thrown in gear with some working part of the machine when the attachment is required.
8. Motive power.
9. A good needle threader.
10. A glass oil bottle which can be sold cheaply, and used to oil the machine instead of the oil can. It must be made so that the oil can be forced out.

Two Inventions Wanted.

We call the attention of inventors and manufacturers to two advertisements in the present issue, in which the advertiser asks for, first, a process by which ten or fifteen copies of freshly written documents can be made rapidly and distinctly on durable paper in ink which will not fade; and second, for a strong, thin, tissue or similar paper which can be used in manifolding with carbon sheets.

It is not difficult to produce several copies of a document by means of devices and materials now in the market; but as a rule, such duplications are blurred and indistinct even when considerable care and skill are employed in producing them. For legal documents, for example, such copies are of little value, and in general, in cases where accuracy and legibility are of importance, press copies are not favored. Again, copying paper in manifold copy books is, as a rule, flimsy and poor stuff, and certainly not the material to which one would wish to commit valuable correspondence were anything better attainable. Messrs. Crane and Co., of Dalton, Mass., make a great variety of special papers for bank notes, bonds, etc., up to a heavy article for machine belting; and we have no doubt that they can make the article required by the advertisements. At all events, the requirements mentioned in the advertisements referred to are well worth the careful consideration of manufacturers generally, as we believe there exists a large demand for the article.

Isaac M. Singer.

Mr. Isaac M. Singer, the well known sewing machine inventor and manufacturer, recently died in England. Mr. Singer was born in Oswego, N. Y., in the year 1811, and in early life worked at the machinist's trade. On the appearance of the sewing machine, he at once turned his attention in that direction, devising an ingenious machine for himself, and subsequently adding improvement after improvement until the now celebrated machine which bears his name was perfected. Mr. Singer obtained a very large number of patents on his various devices, it being his policy to seek such protection as soon as he had demonstrated to himself that any new addition to, or modification of, his machine was essential to its working. His labor and enterprise did not go long unrewarded; and although one of the pioneers in an invention regarding which, as is common with all new ideas, people were at first skeptical, at a comparatively early period in the history of the sewing machine he succeeded in securing the necessary capital wherewith to establish a manufactory.

From that time forward, the fortunate inventor rapidly grew wealthy. The corporation subsequently formed, in which he held a large interest, became one of that powerful combination which practically controlled the entire sewing machine trade of the country, and at the time of his death his private fortune is said to aggregate several millions.

One and two thirds lbs. of coal per horse power, per hour, is the consumption of fuel shown by the steamship Plover, a new boat built at Sunderland, England. She has compound engines indicating 562 horse power.

IMPROVED TOY GUN.

The annexed engraving represents a novel device which may be utilized to "teach the young idea how to shoot," or, in other words, placed in the hands of children as a plaything, or may be employed to kill rats or birds or any other small game. It consists of a gun constructed after the well known pea-shooter plan, that is, the missile is thrown by the contraction of a released elastic band, to moderate distances, with accuracy and considerable force. A general view of the invention is shown in Fig. 1; Fig. 2 shows the trigger mechanism, and Fig. 3, a section the muzzle.

The barrel is slotted longitudinally, the slots forming guides for the sliding piece, A, therein. Extended between stationary hooks, B, at the muzzle, Fig. 3, and the arms of piece, A, which protrude through the slots, are strong rubber springs, C. These are extended when the slide piece is retracted.

The rear portion of the slide piece is provided with a hook or arrow, which catches in the pivoted spring jaws, D, Fig. 2. A slotted piece, E, with V-shaped front end, slides on lateral guide pins and acts on the rear ends of said jaws. The trigger engages in a recess of slide, E, and carries the same forward on being pulled. The rear arms of the spring jaws, otherwise held apart by a rubber spring encircling the front arms, are thereby forced together, and the front part opened. The rear of the slide piece, A, is thus released, and the latter is pulled quickly forward by the contraction of the bands, thus throwing the missile out of the barrel. Elastic cushions, F, Fig. 3, arranged in the ends of the barrel slots, break the force of the shock of the slide as it reaches the muzzle.

On pulling back the slide piece for the next shot, the arrow end spreads the jaws, which carry, by their action on the V-shaped slide, the same and the trigger back, ready for another discharge. Buckshot or bullets may be fired; and to retain the same in place, the forward end of the slide piece, A, is hollowed, and a light spring provided, which grasps the ball and prevents its escaping when the gun is carried muzzle downward.

For dispelling cats in city back yards, we should imagine this invention admirably adapted. It certainly would be a cheap substitute for the air guns now used for target practice. It may also be trusted in the hands of children, to whom it would be dangerous to allow the handling of a weapon charged with powder and ball.

Patented through the Scientific American Patent Agency, May 25, 1875. For further information, relative to sale of patent, address the inventor, Mr. William H. Martin (until 1st of September next), Burnt Ordinary, James City county, Va.; after that date, at Mobile, Ala.

IMPROVED FLOOR CLAMP.

Carpenters, cabinet makers, and others who find it frequently necessary to clamp flooring boards or portions of furniture together are provided, in the device illustrated herewith, with a novel and simple tool especially adapted to such purposes. It consists of a sleeve, A, which at its lower extremity carries a cam, B, Fig. 2, and at its upper end has a handle, C. Passing through the sleeve is a rod having a screw point, D, at its lower end, and turned by the upper handle shown. Attached to a collar on the sleeve, A, is a rearward extending arm, E, the end of which is turned downward and toothed so as to engage with the surface of the joist. F is a slotted and grooved arm which is pressed by the cam against the boards when said cam is suitably revolved by the handle, C. The holding arm, E, prevents any rearward motion of the device, which is still further secured by the screw point, D, entering the wood of the joist.

The invention was patented June 8, 1875, to Mr. W. D. Clark, of Springfield, Ill., to whom inquiries for further particulars may be addressed.

To Distinguish Benzine from Benzol.

Benzol, C_6H_6 , was first discovered by Faraday in the cylinders in which coal gas was delivered to consumers in London many years ago. Much more recently, a volatile substance resembling it in several particulars was found among the products of petroleum refineries, and to this too was given the name benzol or benzene. At length the name benzol became confined to the coal tar product, while in this country the name benzine has generally been limited to the petroleum product; but in England and France both are

machines, which consists in a series of independently operating pressure blocks, arranged on lines parallel with the axis of the rotating cutter. Their object is to hold the lumber while being planed, and in so doing to take the place of the pressure bar or pressure rollers now generally employed. The advantages claimed are that the operator is enabled to feed two boards of different thicknesses at the same time, holding both alike; or he may plane one board on one side of the machine and have it held alike at both edges, thereby securing a uniform thickness and even surface, giving the same

amount of wear on the side of the machine as at the middle, and thus keeping the cutters and bed worn alike and even.

At a suitable distance in front of the cutter head, A, is secured a guide, B, the inner side of which is made circular and concentric with the circle described by the cutters in their revolution. On this guide are hung the independent chip breakers or pressure blocks, C. The latter are constructed in the same curve as the guide, and are held down by the spring, D. In the guide are made suitable recesses for the reception of friction rollers, E, for the blocks to work against with an easy movement.

In rear of the cutter head is a crossbar, F, which holds another series of pressure blocks, G,

which hold the board after it is planed. These are also curved on their inner sides, and the proper amount of pressure is given to each by means of a rubber spring, H. Each block and its spring is held by means of a bolt, as shown. The tendency of the blocks, G, is to bring down the thinner part of a board not planed alike on both edges, and to keep it from vibrating, thereby securing uniformity of thickness and an even surface.

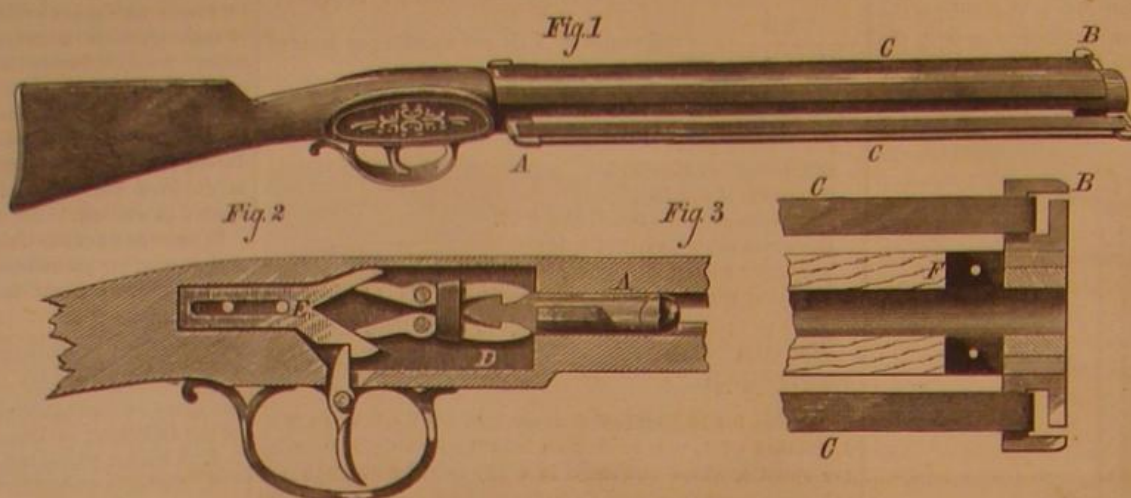
This invention, which the inventor claims in no wise conflicts with the Woodbury patented pressure bar, offers, as has doubtless already been noticed, a means of overcoming several difficulties peculiar to that appliance.

It was patented in the United States May 25, 1875, and also in Canada, to Mr. Chester R. Patterson, of 433 North Main street, Pittston, Pa., to whom inquiries for further particulars may be addressed.

Soda Manufacture.

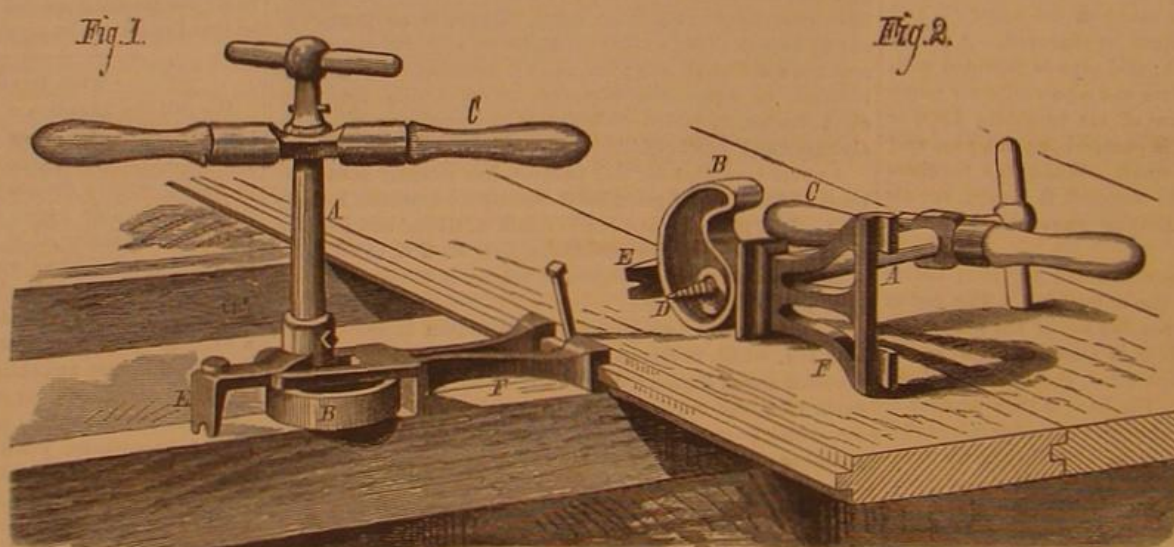
Siebel proposed to make carbonate of soda by fusing together phosphate and nitrate of soda, so as to obtain at the same time nitric acid. Aside from the difficulty that the vessel, in which the fusion was made, would be rapidly destroyed, this process has no practical value, because, in the first place, a number of operations are requisite, and, in the second place, the separation of phosphate from the carbonate of soda is either imperfect, or so expensive on a large scale, that nitric acid, as well as soda, would be much more costly than when prepared in another way. That communication induced the author to publish his process for making nitric acid and caustic or carbonate of soda from Chili saltpeter at one operation, which was patented in Prussia in 1867, in the hope that further experiments or the use of more suitable vessels would render this process a profitable one in industrial chemistry, for obtaining at once, from cheap Chili niter, valuable nitric acid and caustic soda.

In 1805 and 1806 the author had numerous experiments made in his laboratory for the purpose of obtaining nitric acid and caustic soda from Chili saltpeter. It was fused and ignited with various substances like silica, alumina, oxide of zinc, and carbonate of magnesia, but all these required so high a temperature for the decomposition of the nitrate of soda that the greatest part of the liberated nitric acid was completely decomposed, and only a small portion of it was obtained. The least heat was required with carbonate of lime. The author mixed fine chalk with Chili saltpeter in nearly equivalent proportions, with a slight excess of the former. The mixture was heated first in an iron retort, afterwards in large iron pans under a stone vaulted cover, until no more gas was evolved, and the mass be



MARTIN'S TOY GUN.

known as benzine. The former is much more valuable than the latter, since it is employed in the manufacture of aniline and the aniline dyes. There is great similarity in color, odor, etc., and the benzine is sometimes sold as benzol, or mixed with it. Dr. Hagar distinguishes the two by means of iodine. A small crystal of iodine, placed in a test tube containing the liquid to be tested and gently agitated, dissolves and imparts to benzol a violet red color; to benzine it imparts a raspberry red color. In a mixture of the two, the color of the solution is also a mixture of violet red and raspberry red,



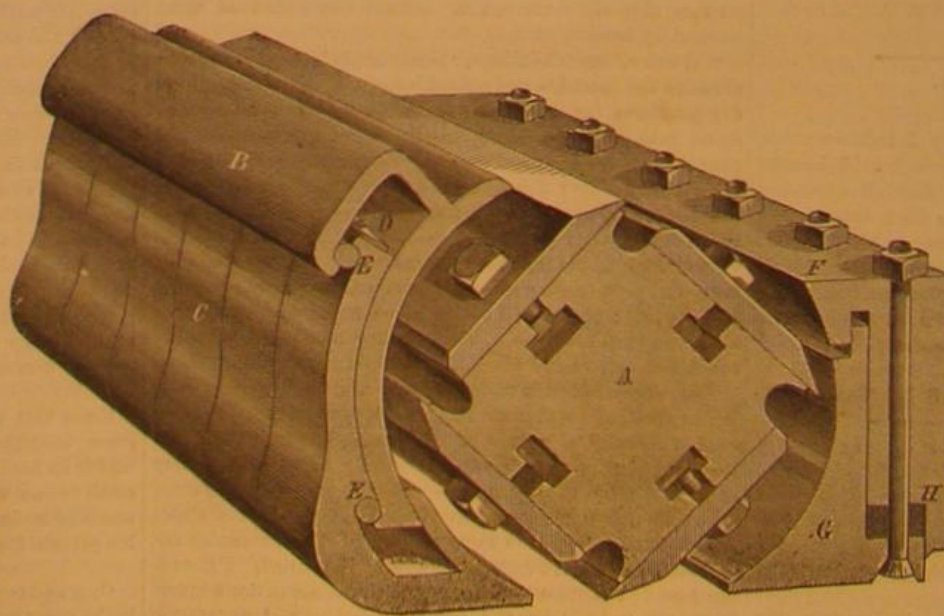
CLARKE'S FLOOR CLAMP.

the latter prevailing, so that the addition of the smallest quantity of benzine to benzol can be detected in this way. A few experiments will soon enable a person to judge of the amount of adulteration.

IMPROVED PRESSURE BLOCKS FOR PLANING MACHINES.

We illustrate herewith a novel improvement in planing

machines, which consists in a series of independently operating pressure blocks, arranged on lines parallel with the axis of the rotating cutter. Their object is to hold the lumber while being planed, and in so doing to take the place of the pressure bar or pressure rollers now generally employed. The advantages claimed are that the operator is enabled to feed two boards of different thicknesses at the same time, holding both alike; or he may plane one board on one side of the machine and have it held alike at both edges, thereby securing a uniform thickness and even surface, giving the same



PATTERSON'S PRESSURE BLOCKS FOR PLANING MACHINES.

came pasty and thick. The gases were conducted through a system of stone flasks containing water, and in this way at first three fourths, afterwards eleven twelfths, of the nitric acid in the saltpeter was obtained. As the common salt in the saltpeter is not decomposed by carbonate of lime, at least at the temperature employed, the acid obtained was perfectly free from chlorine. The thick sirupy mass was drawn out of the pan while still hot, and the pan charged again. The mass, which contained caustic lime and carbonate of soda, when cold, was boiled with water to obtain caustic soda, the carbonate of lime being precipitated.

Since all the soda in the nitrate of soda is obtained in the form of caustic soda, and as a rule this covers the total cost of the saltpeter and chalk employed, this process would be a profitable one were not the costly vessels rapidly destroyed, as an eight months' experience proved, the operation often being interrupted to renew the pans.—*Carl Lieber.*

To Make Gold and Silver Inks.

Good bright gold, silver, and bronze inks are seldom met in the market; they are almost always of a dull color, do not flow easily from the pen, and the writing remains sticky. Hence architects and artists mostly prefer to use shell gold and shell silver (*Muschel-Silber*), instead of the corresponding ink. The latter, however, is so much easier and safer to use that I will describe its preparation.

For gold ink it is best to employ genuine gold leaf, but owing to the expense this is seldom used; sometimes mosaic gold (sulphide of tin) or iodide of lead is employed, but almost always Dutch leaf.

Owing to the relatively low price of silver, genuine silver foil is used for silver ink, false silver foil is seldom used, and is not so good. For other metallic inks, commercial bronze powders are employed. The genuine and false foils are also sold in a finely pulverized state; they are made from the waste of the gold beaters by rubbing it in metallic sieves to an impalpable powder.

In consequence of the beating between gold beater's skin, it has particles of grease and other impurities attached to it which must be removed before it can be used for ink. For this purpose the whole sheets, or the commercial bronze powder, are triturated with a little honey to a thin magma on a glass or porphyry plate with a pestle, as carefully as possible, as the beauty of the ink depends essentially on this. The finely rubbed paste is rinsed into a thin glass beaker, boiled for a long time with water containing a little alkali, frequently stirred, decanted, well washed with hot water, and dried at a gentle heat. By boiling this powder with water containing sulphuric, nitric, or hydrochloric acid, different shades can be imparted to it.

Next, a solution of 1 part of white gum arabic in 4 parts of distilled water is mixed with 1 part of potash water glass, and triturated with the requisite quantity of purified metallic powder. Gold ink will bear more liquid than silver ink, since gold covers much better; on rough paper more metal is necessary than on sized paper; on light paper more than on dark, to make the color of the ink appear equally intense.

In general 1 part of foil is enough for 3 or 4 parts of the above liquid. In preparing large quantities of ink, a low porcelain measure is used for transferring it to the small glass vessels where it is to be kept, and it must be continually and thoroughly stirred so that it will always keep well mixed. It requires frequent stirring also when in use. It is best to mix the dry powder with the liquid immediately before using. The ink can be used with a common steel pen, and flows very well when writing slowly, but it is better to use a pencil.

I consider the use of potash water glass of great importance. It greatly increases the metallic luster on paper, prevents its looking dead, protects the writing from being discolored by the action of the atmosphere, and also prevents its penetrating too far into the pores of the paper, without rendering it very viscid. Although the writing of itself possesses a high metallic luster, it may be increased by gently polishing with a polishing steel. Inks made with mosaic gold, mosaic silver, iodide of lead, etc., are not nearly so beautiful.—*C. H. Viedt.*

HARDY AZALEAS.

These are flowers so fresh and fragrant that they ought to



be more generally grown in shrubby borders than they are. The colors are rose, buff orange, and orange buff; and when intermixed with tender young foliage, it is difficult to ima-

gine anything more beautiful. In every variety of this plant, when grown well in any deep rich soil, intermixed with rhododendrons, the different tints of yellow, red, and orange have a pleasing effect among the white, rose, and purple tints of the latter plant. Another attraction possessed by these azaleas is that the foliage becomes bright yellow and crimson in the autumn. Our illustration represents the so-called Ghent azalea, a fine specimen of the hardy class.

COTTAGE ARCHITECTURE.

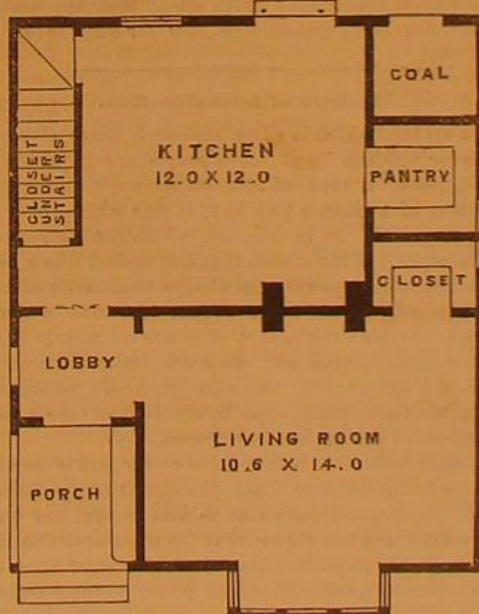
The accompanying view and plans (Fig. 2), designed for a gardener's cottage, show a building, small, but very picturesque in appearance. It would be very suitable for a gate



AN ORNAMENTAL COTTAGE.

lodge or a sea-side or summer cottage, and would look extremely well among the trees of a camp ground. The porch (with its seat) is large and roomy; the living room is of good size, well lighted by a square bay window. The kitchen is well supplied with closets. This first floor could be very much improved by adding a one-story kitchen at the rear, making the living room into a parlor, and the kitchen into a dining and sitting room; the additional cost would be very small. The second floor contains three bed rooms, very con-

Fig. 2.



veniently arranged and each provided with a closet. The two downstairs rooms and the large front bed room are supplied with open fireplaces, the value of which for ventilation is so often overlooked in cheap houses; besides this, there should be ventilating tubes or shafts in the chimney sides, with registers opening from each room, thus insuring a good system of ventilation. The roof should be ventilated by openings under the projecting eaves. The estimated cost of this building is from \$1,200 to \$1,800, according to locality and style of finish.

The view and plans are taken from "Wooden and Brick Buildings," the latest and best work published by Messrs. A. J. Bicknell & Co., of 27 Warren street, New York.

Smith College.

By the endowment of a charitable lady, now deceased, a new and splendid college for the higher education of young women has lately been constructed at Northampton, Mass. The students, instead of congregating in one large boarding house, are divided into small families, residing in separate cottages, scattered about the college grounds.

The general character of the institution has been determined by its founder, whose will provides that the trustees shall furnish young women the "means and facilities for education equal to those which are afforded in our colleges to young men." The fund for the institution was not given to establish an ordinary school, but to found, in the truest sense of

that term, a college, which should give young women an education as high and thorough and complete as that which young men receive in Harvard, Yale, Amherst, and other colleges.

The college was dedicated in July last, under the presidency of Professor L. Clark Seelye, formerly of Amherst College, Mass.

On the Paraffins of Pennsylvania Petroleum.

Morgan, under Schorlemmer's direction, has made an examination of the normal hexane and heptane from Pennsylvania petroleum, to test the question of the presence of isomers. The normal paraffins were chlorinated, and then converted into olefines by treatment with alcoholic potash. These olefines were treated with cold hydrochloric acid, each of them being thereby separated into two fractions, one of which dissolved in the acid, while the other did not. The latter fractions yielded secondary alcohols when suitably treated, that from the hexane being methyl-butyl carbinol and that from the heptane being methyl-pentyl carbinol. It hence appears that the derivative olefines are normal, and have the constitution $\text{CH}_2=\text{CH}-\text{C}_n\text{H}_{2n+1}$. The former olefines, or those soluble in hydrochloric acid in the cold, yielded alcohols which appeared to be secondary, but which need further investigation.

In some remarks upon this paper, Schorlemmer says that the above results do not necessarily prove the presence of a third isomeric heptane in petroleum. Heptane when treated with chlorine yields one primary, and may yield three secondary, chlorides. If the heptenes from two of these combine with hydrochloric acid in the cold, the alcohols from them would yield on oxidation ethyl-butyl ketone and dipropyl ketone. These on further oxidation would yield propionic and butyric acids. Since Morgan obtained the latter, and as the acetic acid he obtained came probably from the presence in his heptane of a lower boiling isomer, it is probable that, owing to the method he employed, the propionic acid was overlooked. To decide the question, an absolutely pure paraffin is necessary; and the author proposes to make additional experiments with hexane from mannite.

Snuff for Insects.

The so called tobacco meal, the *Kölnische Zeitung* says, has been successfully used in agriculture for the destruction of noxious insects, but it has not yet been applied largely on account of its high price, which is caused by heavy import duty. The only obstacle lies in the fact that the meal might be used for the manufacture of snuff.

COMBINED PORTABLE AQUARIUM AND WARDIAN CASE.

The accompanying illustration, selected from the *English Garden*, represents a simple and tasteful little parlor aquarium, in which many small exotic aquatics and some of our native water weeds will grow as well as in a contrivance of greater dimensions. It consists simply of a glass vessel, similar in shape to an ordinary bell glass, but furnished with a stand, and covered either with another bell glass or an ordinary glass shade. A handful of sandy soil or gravel and a few shells at the bottom serve to hold the roots of *Vallisneria*, *Aponogeton*, *Chara*, and other water plants. Soft water is best for filling the glass if it can be obtained, and one or two goldfish add brightness and life to such an arrangement, and give motion to the water. Aquatic plants, or such of them as will grow in a vase of small dimensions, very rarely produce flowers; and in order to counteract this want of brilliancy, a vase of cut flowers may be introduced, as



shown in our engraving, and they will last fresh and beautiful for a much longer time than when they are fully exposed to the heated atmosphere of the sitting room.

The Meteorite of February 12, 1875.

BY ARTHUR W. WRIGHT.

This meteorite fell in Iowa county, Iowa. It is of the stony kind, not greatly differing in its general appearance from others of the same class. Numerous small grains of metallic iron and of the magnetic sulphide of iron, or troilite, are scattered through the mass, the iron grains ranging in size from the finest particles, like mere powder, to those of the size of a fig seed, with occasionally one as large as a grape seed. The mass of which the meteorite probably once formed a part was of great size.

The recent investigations of Professor Newton, Schiaparelli, Oppolzer, and others, in respect to some of the great meteoric streams, have resulted, on the one hand, in establishing the identity of their orbits with those of certain well known comets, and on the other, in showing that the bodies belonging to these streams are probably of the same nature as the sporadic or occasional meteorites. It seems probable, therefore, that an examination of the gases yielded by a freshly fallen meteorite would be likely to furnish important information respecting the tails of comets, and these anticipations were found to be not unwarranted by the results.

The examination showed that the gaseous contents differed in a marked degree from those obtained from iron meteorites hitherto examined, inasmuch as they contained a very large percentage of carbon dioxide, with a smaller proportion of carbonic oxide, and a large residue of hydrogen, the two oxides of carbon making about one half of the gaseous mixture.

The whole amount of gas given off was about two and one half times the volume of the solid portion of the meteorite employed, but this was not the whole, for the heat was discontinued before its evolution had entirely ceased. If referred to the iron alone, it would be about twenty times its volume.

The following table gives a comparative view of the relative proportions of the gases obtained at different temperatures, the nitrogen being determined as a residue:

	At 130°.	At 250°.	Below red heat.	At low red heat.	At full red heat.
CO ₂	95.45	92.32	42.27	33.82	5.56
CO	0.002	1.72	5.11	0.49	0.00
H	4.54	5.86	48.06	58.51	87.53
N	0.00	0.00	4.56	5.18	6.91
	100.00	100.00	100.00	100.00	100.00

No hydrocarbon compounds of the olefin series, capable of absorption by fuming sulphuric acid, were found, nor any marsh gas. A very small percentage of the latter would have been readily detected. Tests were applied for sulphurous oxide, hydrogen sulphide, and chlorine, but there was no indication of the presence of these gases. A small amount of water vapor was drawn off by the heat, but not apparently more than the ordinary quantum of hygroscopic moisture which such a substance would absorb from the air.

It will readily be seen, on reviewing the above results, that they showed a marked distinction between the iron and the stony meteorites, as to the gases they contain. For, while hydrogen is the principal gas of the irons, in the Lenarto specimen amounting to 85.68 per cent, in those of the stony kind, if the one examined may represent the class, the characteristic gas is carbon dioxide; and this, with a small proportion of carbonic oxide, makes up more than nine tenths of the gas given off at the temperature of boiling water, and about half of that evolved at a low red heat.

The spectrum of the gases was observed by means of a vacuum tube, of the kind ordinarily used for spectroscopic work, attached to the apparatus. As was to be expected, it consisted of the hydrogen and carbon spectra together, bearing a general resemblance to those of gases from iron meteorites, but differing from them in the greater relative intensity of the parts due to carbon compounds. At a few millimeters pressure, indeed, the hydrogen spectrum was almost overpowered by them, and was relatively weak. The three middle carbon bands, those in the yellow and green, were very bright, that in the green being most intense of all. In the broad part of the tube these constituted nearly the whole of the spectrum visible, the green hydrogen line being discernible with difficulty, and the others not at all.

These are precisely the three bands observed in the spectra of some of the comets, and they have the same relative order of intensity. This is a very significant fact, for it shows that it is quite unnecessary to assume the existence of volatile hydrocarbons for the explanation of cometary spectra, as is done by some writers, and that the presence of the two oxides of carbon in such quantity is quite sufficient to account for all that has been observed, taking into consideration the circumstance that the tension of the gases in the cometary appendage must be extremely small, and the energy of the electric discharge very feeble.

There is a high degree of probability that, if a large comet should hereafter approach near enough to the sun to have its nucleus intensely heated, the hydrogen lines will be found in its spectrum, in addition to the bands heretofore observed. One cannot help regretting that a comet like Donati's should have departed into space just early enough to escape observation with the spectroscope.

The spectrum of bright lines or bands indicates that the gas gives out some light directly, in addition to that which it reflects. The most obvious, and also the most probable, cause for this luminosity is electricity. Certainly a disturbance of the electrical equilibrium would result from the heating effect of the solar rays, and a change of electrical potential, with consequent discharges, would be produced by the motion of the gaseous molecules from the nucleus and from each other, as also by the change in the distance from the sun, provided either of the bodies possessed an electrical charge as can hardly fail to be the case.

There is another supposable cause for the light, which suggests itself, however, in the property of gaseous bodies, that they emit light of the same character as that which they absorb. It is not altogether improbable that the solar radiations absorbed by the gaseous matter, though for the most part converted into heat, would also in part be emitted again as light, and that in the case of volumes of gas filling many cubic miles, the intensity might be sufficient to give a distinct spectrum of bright bands or lines, even though, on the scale of any possible experiment, no trace of such an action can be detected.

These results have thus an important bearing upon the theory of comets and their trains; and if this meteorite may be taken as a representative of its class, they warrant the following conclusions:

1. The stony meteorites are distinguished from the iron ones by having the oxides of carbon, chiefly the di-oxide, as their characteristic gases, instead of hydrogen.
2. The proportion of carbon dioxide given off is much greater at low than at high temperatures, and is sufficient to mask the hydrogen in the spectrum.
3. The amount of the gases contained in a large meteorite, or a cluster of such bodies, serving as a cometary nucleus, is sufficient to form the train as ordinarily observed.
4. The spectrum of the gases is closely identical with that of several of the comets.

We consider a comet, then, as merely a meteorite of considerable magnitude, or a swarm of many of lesser size, containing large quantities of carbon dioxide, with some carbonic oxide and hydrogen, and giving off these gases under the influence of solar heat. The gaseous substance in streaming away forms the train, which is visible, partly by reflected sunlight, and partly by its own light, due to some molecular or electrical action, which causes it to give the spectrum of the carbon compounds. The form of the train points to a repulsive influence of some kind, as has been shown by Professor Norton, but whether this is due to a specific action of the sun's rays, as is held by Faye, or is electrical in its nature, as maintained by Zöllner, must still be regarded as a subject for investigation.

The loss of the gaseous contents by the action of solar heat readily explains the loss of the tail and diminution of brightness observed in the case of several comets in their successive revolutions; and their final disappearance from sight will follow as an inevitable consequence, the number of revolutions necessary to deprive them of their gaseous contents depending principally upon their size and the nearness of their approach to the sun at their perihelia.

The combustion of the hydrogen and carbonic oxide contained in meteorites, when liberated by the heat caused by their entrance into the atmosphere, must contribute greatly to increase the intensity of the heat, and both in this way, and by the consequent sudden expansion of the imprisoned gases, may have much to do with the bursting of the masses, and the violent detonations which attend their appearance.—*American Journal of Science and Arts*, for July, 1875.

Mothers of Scientific Men.

It is a saying, which is often repeated, that "clever men have clever mothers," and when people are inquiring into the pedigree of a man of intellectual mark, the question "what sort of a mother had he?" is one which may well arise in the mind. It is one, too, which not unfrequently elicits in reply the declaration that the mother was a person of some intellectual power—not always necessarily of a high degree of education, but still a woman who made a mark on the society in which she moved, of whatever rank in life she may have been. Genius and talent are, fortunately, not confined to any one station, although there are undoubtedly some circumstances much more favorable than others to the development of the intellectual powers.

The notion that clever fathers have clever sons is not nearly so popular as the one that brain power is inherited from the mother. Mr. Francis Galton, as is well known, has undertaken to show, and has shown, that the popular notion is, to say the least, an imperfect one, and that clever men have often transmitted great intellectual power to their children, although the manifestations have not been always of the same kind in succeeding generations. In his most recent work on "Scientific Men and their Nature" (D. Appleton & Co.), Mr. Galton takes up a special class of distinguished men, and, by the help of information received from themselves, he gives an account of the influences which have been at work in the determination of their character, and in the direction of their intellectual tastes. He draws a large number of very sound educational deductions, which we would strongly commend to the attention of all those who have anything to do, either as parents or as educators, with the direction of the mental life of children possessed of unusual capacity, or of a decided bent in any special scientific direction.

Among the influences brought to bear upon the nature and nurture of scientific as of other men, undoubtedly that of the mother has much to do. Accordingly we find that many of the scientific men record of their mothers that they were possessed of considerable intellectual power; and one or two state that their first impulses toward the pursuit of Science were decidedly derived from their mothers, and distinctly fostered and encouraged by them. On the other hand, however, Mr. Galton remarks that, of all intellectual men, those following Science are least indebted to the maternal influence; in fact it may almost be said that the mother's influence in turning the son's mind in the direction of Science is scarcely felt at all. He declares that this could not be said so far as men distinguished in literature or in certain

professions are concerned, and he ascribes the marked absence of the mother's influence over scientific men to the fact that the feminine mind does not care for Science, and that the ways of thinking of scientific persons are not those which commend themselves most to women's habits of thought. The fact is rendered all the more noteworthy because, in the great majority of instances, the influence of the father in directing the son's mental tendencies is clearly acknowledged.

It is to be noted that, where feeling, refinement, and even ambition are concerned, mothers have greatly influenced their sons; but where exact thought and patient investigation are involved, their influence seems to have been wanting. Instances being, however, on record that sometimes there has been a mother whose love for natural objects has had an effect on the mind of her son, it may be inferred that, were women generally of more scientific tendencies than they are now, the maternal influence might be as distinctly shown as in the cases of non-scientific men of intellect.

Science certainly has not at present the same attractions as literature for women, except in a few cases here and there. Perhaps that may result from the circumstance that so few possibilities of scientific instruction or work have, as yet, been open to them. But as time passes on, and chances of scientific education develop, women may come to find in the pursuit of Science something which will afford them interest, and will open up to them vast fields of intellectual usefulness, quite within the range of their powers. The day may come when some future Mr. Galton, making statistical inquiries as to the nature and nurture of scientific men of his time, will have to record that the maternal influence in the direction of the minds of scientific men is not, as now, conspicuous by its absence.—*Home Journal*.

Another Flying Machine.

A new air ship has been invented by Mr. W. F. Schroeder, which, so far as we are able to judge of it by the much muddled descriptions of the daily journals, appears to be a combination of all the various principles on which attempts at aerial navigation have heretofore been based. The inventor has been successful in obtaining pecuniary support, and therefore, unlike most schemes of similar nature, this one bids fair to exist elsewhere than on paper. At all events, we are promised a practical trial in the middle of next month, during the course of which Mr. Schroeder proposes to travel between New York, Philadelphia, Baltimore, and Washington, and finally, if successful, to crown his exertions with a transatlantic voyage, without the aid and assistance of that much discussed easterly current.

So far as we can make out the construction of the invention, it includes a boat, made of oiled canvas and wire, 65 feet long. This has two masts of steel, each 28 feet high, between which is extended an egg-shaped balloon, the points of the latter being held in a wire network. Around the middle of the balloon are girdles and nettings, the last of which come down and support the car, which, we suppose, is the boat. At each end of the boat is a propeller, also of wire and canvas. One screw pulls and the other pushes. These are independent, and drive the boat in either direction.

Besides, there are two large rudders, one at each end, and also independent. On each side of the boat is fastened by hinges a wing 35 feet long by 15 feet wide in front, 10 feet wide behind, and concave beneath. These wings are driven at the rate of 170 flaps per minute and the propellers at 1,200 revolutions, by an 8 horse hydraulic engine located in the car. We do not pretend to understand what generates the motive power. An engine run by water is the natural inference from the above; but whence the water pressure is to be obtained, we are unable to conjecture. Is it the Keely motor?

The whole machine is to weigh 1,800 pounds and the balloon to hold 80,000 cubic feet of gas; 12,000 pounds of load are to be transported at the rate of 70 miles an hour in still air, and the ocean is to be crossed in 50 hours. To the foundation for all of which assertions we shall be happy to bear witness after seeing the machine work.

Steam Street Car Construction.

Mr. Henry F. Knapp, in a paper recently submitted to the Rapid Transit Commission now in session in this city, makes some very practical and excellent suggestions relating to the subject of steam-impelled street cars and their machinery. Mr. Knapp is opposed to trains of vehicles, and believes that each car should be built to carry from 50 to 100 passengers, and be self-propelling. The machinery he would place beneath the floor, so as to leave the entire area of the latter unobstructed. The heat radiated from the generator would be shielded from the bottom of the car in summer, while in winter it could be utilized to warm the interior.

The only way of getting rid of exhaust steam, that terror of horses and bugbear of inventors, is to run it into a fan blower where it will be mixed with two or three times its volume of atmospheric air, which subtracts its heat and reduces it to water so quickly that a fine mist is ejected from the blower. The products of combustion (smoke), consisting of carbonic acid, carbonic oxide, steam, and such portions of carbon as may have escaped unburnt, may be most completely reduced by being forced through a reservoir or tank containing milk of lime by the blast that is used for feeding air to the boiler furnace. The lime takes up in combination all the carbonic acid, for which it has great attraction, and retains the particles of escaped carbon, clinders, etc., in suspension, besides entirely condensing the steam of the smoke to a liquid state, thus leaving nothing but free and invisible nitrogen to escape into the atmosphere.

The Antiseptic Properties of Compressed Air.

The investigations of M. Paul Bert relative to the properties of compressed air, details of which have already been described in these columns, were the means of discoveries as unexpected as they were important. So far from accelerating respiration and consequently vital activity, as was predicted, the gas caused an enfeeblement of all the natural functions, and, in cases of sufficient compression, death. With pure oxygen, like results were observed, with the difference, however, that the pressure might be five times less than that of compressed air in order to produce a given effect.

Starting from the point thus reached, and adopting the theory according to which fermentations are ascribed to the development of minute elementary organisms, M. Bert has recently undertaken to determine the question of whether air or oxygen in a compressed state does not constitute an antiseptic agent. The experiments made have led him to an affirmative conclusion. Meat submitted for a month to the action of compressed air became yellow and acquired a slightly acid reaction, but all its nutritive properties were found thoroughly preserved. The investigator cooked and ate mutton chops similarly treated and was unable to observe any signs of tainting. It is a curious fact that meat once submitted to the compressed air as above keeps indefinitely after the pressure is removed, care only being required to exclude the atmospheric dust capable of determining putrid phenomena. The only explanation which appears possible for this circumstance is that the compressed oxygen acts on the elementary organisms, in similar manner as upon animals and higher vegetables, and kills the animalcules already formed within the apparatus, or the matter from which, by processes still unknown, they may be developed.

M. Bert placed some *mycoderma vini* on the surface of wine and applied the compression. The germs were killed instantly and fell to the bottom of the vessel, while the alcoholic properties of the liquid remained unimpaired. Cherries, strawberries, and other fruits, and also wet bread, were equally well preserved. Milk presented an interesting peculiarity. While the germs to which lactic fermentation is ascribed were destroyed, coagulation was not retarded. An explanation of this is perhaps found in the fact already noted concerning the slightly acid reaction observed in meat. A solution of glucose, however, to which brewer's yeast had been added, produced alcohol despite the compressed gas, and urine containing a fragment of a filter impregnated with uric ferment produced ammonia. It appears in these cases that the oxygen could not act quickly enough to kill the ferment before the latter had affected the material.

The subject would certainly have remained incomplete if the fermentation term diastatic—that is to say, determined by soluble ferments—had been neglected. M. Bert has studied saliva and pancreatic juice, and others of like nature, and finds that all, without a single exception, retain their activity in the compressed oxygen. So that a valuable means of preservation of numerous important medicaments is found in simply enclosing them in a tube with the compressed gas.

From these facts, M. Bert suggests, some light may be thrown upon physiological problems now very obscure. It is a question, for example, whether accidents caused by the inoculation of diseased blood are due to the organisms contained therein or to matter analogous to diastatic ferments. Both views are strongly defended; but it will be seen that the effect of compressed air will at once determine the matter, since the organisms, if existing, would be destroyed, while the diastatic ferments would be unimpaired.

In the absence of the complete record of M. Bert's experiments, we are left in the dark as to the degree of pressure to which he subjects the articles to be preserved. This learnt, it seems that we are at once provided with a means of keeping food, far easier to put in practice than any yet devised.

The hold of a ship, for instance, could easily be turned into airtight compartments and filled with meat, fruit, or other perishable material. These could be kept filled with compressed air by a simple air pump, at a uniform pressure, indicated by gages. This pump, if the vessel were a steamer, could easily be run by the engine. Similarly, airtight cars could be made, and the atmosphere within kept at a given pressure. The discovery would thus enable Australian or Texas beef to be transported over the longest sea voyages, and the fruit of the tropics could be brought to the most distant markets. Similarly it allows of the preservation of the dead for any length of time. The body, instead of being put by the undertaker on ice, would simply be enclosed in an airtight case, into which air or oxygen would be pumped and then all openings hermetically sealed. The results of M. Bert's investigations are certainly of a very high degree of importance. If, as appears probable, they are found susceptible to the extended applications suggested, they will bring the exactions of extortionate ice companies to a sudden conclusion, for ice as a preservative will no longer find an employment.

Importance of Mathematics.

In the recent eloquent dedicatory address of President Seelye, of Smith College, Mass., the importance of mathematical knowledge was illustrated as follows:

"It would be easy to show the increasing importance of mathematics to practical life, the assistance it gives the sailor and the engineer, and our indebtedness to it for the most highly prized comforts of our civilization. But it is not for its practical utility that I advocate its place in the higher education. That utility, indeed, is due to the study, which had no thought of practical results. Nor does it owe its place to its importance as a mental discipline, although the testimony of many generations of educators bears witness to

its value as an intellectual exercise. Rather would I justify the prominence of mathematics in the higher education because it is the study, above all others, which gives us a knowledge of the mind in Nature. To it, more than to any other source, we are indebted for what we know of the physical sciences. Long ago its importance in astronomy was recognized. It made familiar to our common schools the secrets of the earth's motion, of day and night, of the changes of the moon and the tides. Problems in the starry firmament, about which the wisest sages for centuries were hopelessly puzzled, mathematics has enabled school boys to solve. Yet its triumphs in astronomy represent only a fragment of what it has accomplished in the physical sciences. Sound, light, electricity, heat, have all become subject to mathematical formulas; and algebraic signs explain to us not only how the subtle forces, unrecognized by any human sense, make the music of the spheres, but how they interpret for us the music which we hear, the colors which we see, the warmth which we feel. So wonderful have been the results of mathematical analysis that modern scientific discovery has been forced to introduce it into all departments of physical science."

Four Million Horse Power from a Coffee Mill.

Many years ago, a civil engineer suggested to the French Academy the possibility of submarine railroads, claiming that, at a certain depth in the ocean, beyond the reach or influence of storms, the water is so dense that nothing of a tubular form can possibly sink. His idea, then, was to construct a double track railroad across the Atlantic ocean through a circular tunnel floated at this depth, and send trains thundering back and forth, to the consternation of the big fish and mortal terror of the little ones. But there was one insurmountable obstacle to the success of his grand enterprise at that time, which was that the smoke of the locomotives would suffocate the occupants of the train in that close, dark, and airtight tube. The advocate of this railroad cable claimed that, this difficulty being removed, there could not be a doubt as to the success of the undertaking, and all that was necessary was enough capital to construct the novel work. Since smoke-consuming engines have been invented, the only scientific drawback to the construction of a railroad to Europe has been removed. But now we have the solution of the problem which leaves no excuse why a submarine railway should not be the enterprise of the near future. The key to the French engineer's dream has been discovered—the Keely motor. There you are. A piece of machinery about the size of a coffee mill, with one teaspoonful of water administered once a year, or less frequently if you happen to forget it, and you have four million horse power continually on hand. No smoke, no vapor, no howling and screeching of steam, no beating the atmosphere from here to Europe with tuns of coal. Just spit in a little iron cylinder, if water is not handy, and leave the brakeman to do the rest. Now is the time for that French engineer to come forward. He was too fast for his age, but the age has caught up with him. All that is wanted now is the tunnel and the railroad track, which will require some capital. And just to dream, in this hot weather, of flying like a streak of lightning under the waters of the ocean, through a cool, comfortable tunnel three thousand miles long, in palace cars, rocking dreamily with the motion of those floating pipes! The idea reconciles us to summer, and cools us like an iced drink.—*Baltimore News*.

English vs. American Watches.

Sir Edmund Beckett, a scientific horologist, who is, perhaps, the highest English authority upon the subject, in his work upon "Watches, Clocks, and Bells," says:

"The liability of a watch, like any other piece of mechanism, to require repair is in the ratio of the number of separate parts which make up its unity. The English watch, with its fusee and chain, is composed of 638 more pieces than the American watch. Dispense with these 638 additional chances of breakage, and it is easy to infer the superiority of American watches, in this one respect at least. The fusee and chain are rejected in the Waltham watch, and the direct action of the mainspring adopted, because the fusee and chain add greatly to the cost of a watch, and its tendency to injury, and are of no practical value for good time-keeping. This change is advocated on the ground that there is greater simplicity of action, less friction in the transmission of motive power, increased facility for using a lighter and more uniform spring, and more room for play in the other parts of the movements."

In support of this view, Sir Edmund Beckett speaks very favorably of the American principle of omitting the chain. After alluding to what he calls the mischievous and common accidents of chain-breaking, and noting the tendency of advanced watch-making to do without fusee and chain, he says: "Accordingly, both in Switzerland and America, which are gradually stealing away our common watch trade, the fusee and the chain are almost universally omitted."

The Boat Race, the Horse Race, and the Human Race.

There are many good people who will not go to a horse race, because it is in their estimation vulgar and low, because bets are made on the speed of the horses, because liquor is consumed by the people who bet, and because the horses that run are strained and overstrained in order to make them accomplish the wonderful feats which are expected of them.

We have not much to say in favor of the horse race, even though the British Parliament take a holiday in order that its members may have an opportunity of joining in the general jam, and betting on their respective favorites; but we want to know exactly how much worse a horse race is than

a boat race. There is much about boating that is delightful, healthful, and profitable. The idea in which collegiate boating originated was a grand one. Our young collegians had been denied proper exercise. They had slept in unventilated and gloomy dormitories, some of them hardly fit for lodging places for bats or owls. They had consumed midnight oil and eyesight and brain in pouring over their studies. They were growing lank and sour and nervous and dyspeptic. They were cramming themselves with learning, and not keeping up enough physical force to hold the learning in. It was seen that a change was necessary. Wealthy men gave gymnasiums to colleges. Boys bought boats. Professors opened windows. Pure air and exercise were discovered to be compatible with knowledge. Muscles were strengthened. Stooping shoulders were made erect. Flabby nerves were toned up. Flat chests, whose lungs had never known a healthy inspiration, were inflated. Spare arms became brawny. Vigor took the place of lassitude, and physical culture took its position alongside of mental.

This was well. But we American boys cannot do a thing well without being so well pleased with it as to overdo it. The mischief of overdoing is what we have fallen into. There is as much betting and gambling on the strength of our collegiate boat races as there is at horse races. At horse races there is said to be cruelty to animals, in the urging of horses to run at a rate beyond their natural speed. We would like to hear the voice of the horse on this. We suspect that up to a certain reasonable point the horse enjoys running races. It is its natural habit. But in boat racing we have a palpable instance of cruelty to men, and some young men have been killed by it, while others have been wrecked physically for years or for life. We do not see that the Columbia College was a whit more of a college during the past year because its crew came out in last year's race a boat's length ahead of the crews of other colleges. Nor would we now take our boys from any other college to send them to Cornell, because the splendid athletes of that institution, came off victorious in the race about which so much interest has just centered.

There are to-day hundreds of college youths who are not taking half the exercise they ought to. They are those who see no probable success in their attempts at boat rowing, and who, therefore, row no boats at all. It would be well if the exercise were averaged more evenly. The desire for healthy exercise is noble. Exercise itself is magnificent. But let us have something which will tend to the development of healthy constitutions, rather than that which will hurry our ohung men into their graves, and saturate our institutions of learning with the accursed spirit of gambling.—*Christian at Work*.

BOILER INCORUSTATIONS.—Protzen recommends the introduction of a piece of zinc into the boiler. This determines a galvanic current which protects the iron against oxidation and corrosion, and causes the mineral ingredients of the water to be deposited as a fine loose mud, entirely preventing the formation of "crock."

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)

From June 4 to July 5, 1875, inclusive.

ROCK DRILL.—G. H. Reynolds, New York city.
SACK SEWING MACHINE.—H. P. Garland, San Francisco, Cal.
SELF-BALANCING BERTH, ETC.—W. Von Auer, Flatbush, N. Y., et al.
SEWING MACHINE.—R. Ashe, Boston, Mass.
SEWING MACHINERY.—J. E. Folk, Brooklyn, N. Y.
SPRING PLATES.—W. H. Porter, Bridgeport, Conn.
STEAM ENGINE, ETC.—E. D. Taylor, Jersey City, N. J., et al.
SUSPENDED BERTH, ETC.—T. P. Ford et al., Brooklyn, N. Y.
SWIMMING SCUT.—Life-Saving Suit Company, New York city.
TELEGRAPH.—R. K. Boyle, New York city.
TELEGRAPH CIRCUIT.—W. E. Sawyer, Washington, D. C.
TOY.—W. Rose, New York city.
VENTILATING TUNNELS.—J. Dixon (of New York city), London, England.
WATCH CASE MACHINE, ETC.—C. L. Thierly, Boston, Mass.
WATERPROOF BAG, ETC.—L. F. Requa, New York city.
WATERPROOF COMPOUND.—L. F. Requa, New York city.
WORM DESTROYER.—G. W. Davis, Boston, Mass.

Recent American and Foreign Patents.**Improved Floodway for Warehouses.**

John H. Morrell, New York city.—Pipes extending up through the building have the openings, in combination with sinks, covered by gratings upon each floor. The said pipes communicate with the caves pipe above, the sewer pipe below, and with all of the sinks through the openings. In case of fire breaking out on any floor or room of a building, the damage by water may be confined thereto, as the water thrown into such room readily finds its way of escape into the sinks and down the pipes, thus keeping the floor of such room or compartment sufficiently free from water to prevent soaking through to the next floor below.

Improved Dryer.

Joseph F. Gent, Columbus, Ind.—This invention consists of an open hollow conveyor trough, and in a conveyor shaft having brushes (one or more) attached to it to sweep the surface of the trough, the heat for drying being supplied by exhaust steam discharged into the trough.

Improved Smoking Pipe Cover.

Frederick L. Suter, Brooklyn, N. Y.—This guard, retains the tobacco securely in the pipe, while allowing the free access of air and the ready compressing of the tobacco during smoking. The invention consists of a cover and guard, of bent wire, and provided with top handle and downward-extending spring-holding legs.

Improved Fastening for Egg and Fruit Box Covers.

Wendelin Wels, St. Paul, Minn.—The invention consists in providing the recessed side strips of the lid with double-acting band spring hooks, which are retained by cross wires and locked to staples of the side strips of the box.

Improved Case for Exhibiting Yarn.

Henry John Millmann, Milwaukee, Wis.—This is a case for keeping (secluded from dust) zephyr worsted, knitting cotton, and similar kinds of goods, for exhibiting them for sale, so that such goods may be examined without being handled until sold.

Improved Rotary Stool.

Aaron Rice, Fitchburg, Mass., assignor to Walter Heywood Chair Company, same place.—This invention consists in a socket, provided with grooved arms, ribs, and a recessed flange, to adapt it to receive the legs and the screw or pivot of the seat.

Improved Method of Producing Etchings on Glass.

Ernest Dalletine, New York city.—This method of producing etched glass plates consists mainly in transferring the design from the original or positive plate to a second or negative plate, coated with varnish and bichromate of potash, then removing the ground by means of turpentine, then using the negative to produce the ornaments, in similar manner, on any number of glass plates, and finally etching the same with fluorid acid.

Improved Head Rest.

Otis C. White, Hopkinton, Mass.—An extensible rod holding the cushion is stepped at the lower end in a socket of a plate, to which the attaching rods are jointed for connecting the rod to the seat back, and for staying or supporting the upper part of the rod by a yoke. This yoke is connected with the rods by ball-and-socket joints, the balls being on the ends of the yoke, and the sockets in the rod. In order that the yoke may swing up close to the seat back, to carry the cushion forward when wanted without obstruction by these joints, a crook is made in the rod adjacent to each ball, to hold the yoke upright, while the portions of the rod entering the openings of the sockets extend out horizontally from the sockets. To make these sockets cheaply, the pattern for the rod is made so as to cast them in two parts. A ring passes down on and binds the parts snugly on the ball.

Improved Circuit Closer for Railway Signals.

Samuel Weeks, New Orleans, La.—This is a circuit-closing device, to be arranged at different points of the track for indicating the approach of the train or the position of the same at the station, bridge, crossing, or other place, for the purpose of controlling the running of trains over the road. The invention consists of a metallic spring plate or connector, that is supported at both ends by spiral springs, and brought by the train in contact with a central plate arranged below the same on a post connected to the earth.

Improved Car Coupling.

Rocco Misso and Bishop J. Warner, Macon, Miss.—A coupling link, on being pushed into the bumper, strikes a ball and pushes it back. A horizontal bar attached to the ball and extending outside the bumper is thus turned, so that another bar can drop through a notch, allowing the coupling pin to drop through the cavity of the coupling link, coupling the cars.

Improved Planing Machine.

Julian K. Smith, Burrillville, R. I.—This is an improved device for matching boards, to be used separately or in connection with a planer, and to which boards of any width, with parallel or tapering edges, may be fed and matched with a saving of lumber and time. The invention consists of a swinging and weighted arm, with the revolving matcher at the outer end, moving in an arc-shaped opening in the bed plate or table, and adjusting the matcher, by a pivoted guide piece, to the size of the board.

Improved Pump Chain Adjuster.

James B. Brown, Hannibal, Mo.—This consists of an adjusting chain with long links, or of a continuous rod of suitable length, provided with a grappling hook at one end, and a spear-shaped head at the other. It is to be used for raising the pump chain, in connection with a conductor of flexible wire, that is passed through the chain tube and attached to a cord of suitable length. The device is lowered by the spear head until forced beyond the shoe of the tube, where it is grappled, so that the cord may be employed for drawing the chain down through the tube, and up again for repair and adjustment.

Improved Axle Protector.

Charles G. Cowell, M. D., Plainfield, Ill.—To the hub of the flaring wheel is secured a cap, the rim of which projects over the wheel and over a sand band, so that its edge may be close to the end of the hub, or to the flange of the sand band, attached to the said end. Upon the lower portion of the cap a portion of its rim is cut away, to receive the end of the scraper. The scraper is so formed as to fit upon the outer surface of the flaring sand band, and scrape off any substance that may find its way in between the said cap and the inner end of the hub.

Improved Hog-Ringing Apparatus.

Silas Sparks and John W. Sparks, Bowensville, Ohio.—This apparatus consists of a pliers, the jaws of which are grooved and slotted, and a doubled wire having an inverted cone at one end and an opening at the other. To insert the wire, the cone is held to the pliers. When the wire has been passed through the slit, so that the double wire between the opening and the cone is confined in the slit, the pliers take hold of the wire, and the jaws of the pliers are brought together, and the wire which forms the opening is crushed, which securely fastens the wire, as the inverted cone prevents its withdrawal in one direction, and the top of the tie in the other.

Improved Hub.

Edward F. Friend, Marianna, Ark.—The skein is made with a shoulder near the plane of the inner edges of the spokes, to allow the inner part of the axle arm to be made larger, and consequently stronger. There is a second shoulder at the inner end of the hub, to allow the axle arm to have a farther enlargement upon its upper side. Upon the outer side of the skein is formed a ring flange, which serves as a shoulder for the inner end of the hub to bear against. The part of the skein that projects beyond the inner end of the hub is strengthened by a ring flange. The axle box is made with a shoulder to fit against the first shoulder of the thimble skein. Upon the axle box are formed two ring flanges, at sufficient distance apart to receive the inner ends of the spokes between them. Wedge-shaped partitions are cast solid with the flanges, and of such a size as to fill the space between the spokes, and thus form sockets for said spokes.

Improved Metallic Butter Package.

Moses C. Roberts and King D. Briggs, Great Bend, N. Y.—To the cover are attached strips of sheet metal, which are bent at right angles, so as to pass through loops attached to the upper band. The ends of the strips are bent up over the loops when it is desired to fasten the cover. This fastening holds the cover securely in place, and at the same time the said cover can be readily removed. This construction of a butter package prevents the moisture from soaking out of the butter, and the air from having access to it, so that the butter will keep sweet for a long time. The body is strengthened by metallic hoops.

Improved Barber's Chair.

William Hoehn, New York city, assignor to Adam Schwaab, of same place.—In this barber's chair the back is adjusted by a screw bolt pivoted thereto in connection with an operating nut, secured to a pivoted guide socket or tube of the seat of the chair. By turning a hand wheel in either direction, the back is quickly set as required without the noise usually incident to the crank and gear wheel devices.

Improved Eyeglass.

John J. Bausch, Rochester, N. Y.—This eyeglass is provided with self-adjusting nose pieces closed at both ends.

Improved Smoking Case.

Henry W. Dann, West Troy, N. Y.—This is an improved smoking case, that provides readily accessible compartments for tobacco, matches, and pipe. It consists of an oval case with central and end compartments, and hinged lids for the different articles, one of the end compartments being arranged with a tubular extension projecting into the central compartment for storing the pipe and pipe stem.

Contrivance for Loading and Unloading Wagons.

Montgomery C. Meigs, H. L. Meigs, Romney, Ind.—The invention consists in attaching a skid at the front as well as the rear of the wagon, in providing two end-notched bars that are pivoted to bolsters in front so as to hold up the wagon body for a short turn, and in a peculiar mode of drawing apart the longitudinal halves of bottom for discharging the load.

Improved Air Supply Attachment for Carbureters.

John M. Cayce, Franklin, Tenn.—The invention relates to methods of furnishing air to carbureters by automatic devices, and consists in passing a uniform quantity of air through hydrocarbon to the burner, thus rendering the flame steady and unvarying, by means of a weight or spring.

Improved Truck.

B. L. Pratt, Le Raysville, Pa.—The invention relates to means whereby a warehouse truck may be wheel-locked, to afford greater facility in loading; and consists in racking the inner edge of wheels and applying a detent pawl upon each side, said pawls being both attached to the same head, held aloof from the wheels by the same spring, and provided with the same movable stem.

Improved Fixture for Carriage Curtains.

D. R. Wright, J. M. Ripple, Waynesboro', Pa.—The invention consists in several features of improvement by which the curtain is prevented from being bulged and strained by the glass, the spring so arranged as to economize space, and the curtain kept laterally stretched as well as compelled to move up and down without puckering. The case, mechanism, and roll are also supported in a novel and more effectual manner, while the action of the spring is arrested for the detachment of roll in an ingenious and convenient way. With these improvements, the curtain may be readily drawn down and held by a spring latch, and when unlatched will rise automatically to its place.

Method of Forming Piles or Fagots of Old Railway Rails.

Joseph Downing, Sr., Allentown, Pa.—This consists of a pile of old railroad rails, constructed of one whole rail and two part rails divided by cutting longitudinally along the middle of web. The web portion of said parts are placed in the pile, so as to abut against the web of the whole rail, and the interstices are filled with extra pieces of metal.

Improved Middlings Purifier.

Jacob C. Knoebel and Fred C. Knoebel, Belleville, Ill.—This invention consists of two chambers separated by a vertical partition, in one of which compartments is a series of cant boards arranged one above another at suitable distances apart on the partition, and canting downward and nearly to the face board. The latter has openings for air and steps to prevent the direct descent of the middlings which enter at the top. The other compartment consists of a dividing and ascending suction passage, into which the light and impure matters are taken from the front compartment through passages in the partition regulated by dampers, there being a passage for each space between the cant boards.

Improved Safety Clevis.

Charles N. Poundstone, Grand Ridge, Ill.—The object of this improved clevis is to connect the doubletree and whiffletrees with each other. It is so constructed that it cannot become accidentally detached, and it has no loose parts. The clevis is formed of two hook-shaped parts pivoted to each other at their bends, and a pin swiveled to the long arm of one of the said parts, working loosely in the long arm of the other part.

Improved Automatic Feed Water Regulator.

Joseph Wertheim, Frankfurt-on-the-Main, Germany.—This device is operated by steam entering a tube, when the water level falls below a lower orifice thereof, and expands the metal of the same. This, through a series of levers, opens a feed cock and admits water to the boiler from a reservoir, in which the water is heated by a coil in which the exhaust steam from the cylinder circulates. Mechanism is provided which renders the apparatus very sensitive. The gradual discharge of the water and the cooling off of the reservoir produces, by the condensation of the steam, a partial vacuum, and fills thereby the reservoir with water from the suction pipe.

Improved Fastening for Butter Tubs.

Henry C. Carter, New York city.—Two ears are fastened to the upper part of opposite sides of the tub, and are slotted to receive the fastening hooks. A plate is attached to the top of the cover, and has a hook formed upon its outer edge, the cavity of which is so formed as to act as a cam upon the rounded bar of the ear, to draw the cover down snugly upon the tub. To the opposite side of the top of the cover is attached a plate, which has two projections formed upon its outer edge, which project to the edge of said cover, and have elongated recesses formed in their under sides to receive the pivots of a clasp hook, and thus allow the fastening to adjust itself to any warping of the tub.

Improved Mold for Shaping Wax Comb Guides for Hives.

John F. Ervin, Vinton, Iowa.—This mold is composed of tin, fitted to a groove of conical form in a piece of wood. The metal extends out from the groove in each direction. The melted wax is poured into the mold through the funnel. The mold has a plate across the lower end, which stops in wax, so that the mold fills, and the wax adheres to the frame as the mold is withdrawn.

Improved Ironing and Kitchen Table.

Andrew Aitkin, Wells River, Vt.—This is a combination of a table and a swinging frame pivoted for folding into a sliding drawer, with an ironing board supported on the frame and table. When the ironing is completed, the board is detached and the frame released from the table and folded down into the drawer until required again for use.

Improved Wire Stretcher.

Henry Miles, Springdale, Iowa.—This is an improved device for drawing the wires of wire fences and other wires taut to take up the slack, or to draw the ends of a broken wire together, to enable them to be fastened.

Improved Bale Tie.

Edwin D. Chadick, Denison, Tex.—This invention consists in a bale tie consisting of the tubular T-shaped buckle, in combination with a wire band. One end of the wire is passed through the hollow of the buckle, is bent back along the outer side of the said buckle, and is wound around itself. This construction allows the buckle to be turned upon the wire. The other end of the wire is turned back upon itself, and is twisted around the body of the said wire to form a loop, to be passed over the hook arms of the buckle. The loop is passed over the hook arms of the buckle by turning the said buckle partly around. The buckle is then turned back to bring the loop below or above, and, as the bale expands, the loop will be drawn snugly upon and held securely by the said buckle.

Improved Automatic Music Recorder.

Gustave Landrien, Brussels, Belgium.—This invention consists of a clock train supported suitably below the key board for moving forward the music paper, stretched and guided by rollers over a bridge. The keys of the key board are connected by sliding pins with fulcrumed and jointed levers, which act on pencils of a lateral guide board above the music paper, and depress the same to designated places on the staffs of the paper as the keys are struck. The musical expression is registered by means of stops above the key board and connecting levers, which act on a series of pencils of the board, marking by distinctive signs at fixed points of the paper the various expressions and other accessories. A pedal connection, with marking lever and pencil, marks the bars of the measure in conjunction with the value of the notes as obtained by the longer or shorter contact of the pencils with the continually-advancing paper.

Improved Combined Lamp and Oil Can.

William Roberts, Quincy, Ill.—This combined lubricator and lamp is composed of a tube, in which there is a cross partition which divides the tube into two parts, one of which contains the lubricating oil, the other contains the lamp oil. Air is admitted through a tube, which tube is closed by the spring thumb lever. By this device, the oiling and lighting may be done with one hand while the operator supports himself with the other hand.

Improved Ice-Breaking Attachment for Vessels.

Joseph T. Martin, New York city.—By suitable construction, as a shaft revolves slowly, other shafts slide longitudinally through the holes in the said shaft and strike the ice with the heads formed upon their ends, so as to break the ice in pieces in front of the vessel, each shaft sliding twice at each revolution of the main shaft. The sliding shafts have rubber blocks placed upon them to receive the jar should the ice not be firm enough to check their momentum.

Improved Plane Iron.

William Young, Mabon, Nova Scotia.—This invention relates to an improved mode of applying the cap piece to the plane iron so that it can be quickly adjusted and locked for giving the plane more iron. The invention consists of a slotted plane iron, to which the cap piece is locked by an eccentric lever pivoted to a post of the same.

Improved Hydrant.

Walter Scott, Passaic, assignor to Joseph Chadwick, Boiling Spring, N. J., and Henry Dale, New York city.—The stand pipe has a branch connection with the main, and a horizontal discharge pipe at the top. A plug valve is arranged in the branch, outside of the stand pipe, with its stem through the pipe for its upper bearing. This arrangement enables the utilization of the extra passage of a three-way cock for opening an escape passage, which is also provided in the shell of the cock for opening when the main passage is closed, to let the water escape from the stand pipe.

Improved Centrifugal Machine for Making Paper Barrels.

William G. Pennypacker, Wilmington, Del.—This is a combination of rotary centrifugal cylinder and circumjacent case, both made in sections that open and close longitudinally. By the action of strikes, the pulp is distributed evenly over the entire surface of the cylinder, and the cylinder is allowed to revolve until a sufficient quantity of water has been thrown off through the sides, when the cylinder is stopped. The strike is contracted and raised out of the cylinder, and the casing and cylinder are opened and the barrel is removed entire. The cylinder and casing are then closed, and the operation is repeated.

Improved Pocket Book Frame.

Bart M. J. Blank, Jersey City Heights, N. J., assignor to Morris Rubens, New York city.—By this invention, the marking and wearing out of the inclosing leather flap of the pocket book are avoided, and a neater shape of the frame obtained. It consists of the indenting of the middle part of the jaws to the length of the clasp, so that the same closes thereon at a level with the adjoining parts of the jaws.

Improved Brush Binder.

John Blair, Boston, Mass.—This invention consists of one continuous piece of soft rubber, which is attached by a cylindrical band in the bristles below the ferrule, and by connecting the perforated yoke part to the ferrule and handle. The ferrule has side openings, which allow the head of the brush to be grasped. The binder is used with the brush until the bristles are worn down, preserving in the mean time the upper part of the bristles in their original condition.

Improved Table-Leaf Lifter and Supporter.

Tilton E. Smith, Attica, Mich., assignor to himself and Charles J. Locker, same place.—This invention is for raising and supporting the leaves of dining and other tables, and it consists of a movable bar, which is connected with two sliding lifters by means of hook rods and a center pin. When the bar is thrown from right to left, the lifters, by means of the rods, will be moved outward from the opposite sides of the table, and will lift the table leaves and support them when they are up flush with the table top.

Improved Device for Raising and Lowering Cattle Racks on Platform Scales.

Preston C. Dockstader, Lyndon, Ill.—On plates which are fastened to each corner of the rack are pins, which extend below the plate. To the latter a slide is dovetailed, which carries a wheel and axle. When the rack is lowered, the pins enter holes in the scales, buttons being removed from ribs of the slides. When the rack rests in this position on the scales, the wheels hang above the scales. When the rack is raised, rocking buttons are made to engage with the ends of the ribs, and the weight of the rack rests on the wheels, and the rack may be rolled off, as may be desired.

Improved Apparatus for Raising Sunken Vessels.

Joel Nelson Furman, Patchogue, N. Y.—This invention consists of a couple of tanks to be sunk along the sides of the sunken vessel by filling with water. They are inclined on the bottom so as to heel over from the vessel, and have contrivances by which they are locked together at each end of the vessel, so that, when they rise, by having the water discharged or air pumped in, they swing up against the sides of the vessel and gripe it firmly, so as to hold on without any other fastening.

Improved Candy Spinner.

Stewart B. Hymer, Terre Haute, Ind.—The object of this invention is to provide an improved machine for spinning candy into sticks from the plastic mass, and it consists in the combination of three wheels set at about equal angles with respect to each other, and having faces of vulcanized rubber or other non-conducting and non-adhesive material, the said faces being of such pattern as it may be desirable to spin the sticks into.

Improved Baking Stand.

John A. Watson, Lexington, Mass.—This invention consists in a circular plate, with apertured lugs at suitable intervals, and with rollers journaled in swiveled bearings, so that it can conveniently be turned by a hooked rod.

Improved Plow.

Jacob B. Sample, Liberty, Miss.—This invention relates to certain improvements in plows, and it consists in the peculiar construction and arrangement of parts of which the points are both reversible and invertible, and rendered by such adjustment self-sharpening.

Business and Personal.

The Charge for Insertion under this head is \$1 a Line.

Manufacturers of Machinery for all purposes will confer a favor by mailing their Circulars to Geo. A. Coburn, Manufacturer's Agent, Middletown, Pa.

Metallic Pattern Letters and Figures, to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N. Y.

Headley Portable Engines. R. H. Allen & Co., New York, Sole Agents of this best of all patterns.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

\$17 Foot Lathes. Geo. F. Shedd, Waltham, Ma.

Says a late issue of the Philadelphia City Item: "Ingenuity has been taxed to find the surest and most direct means of reaching the public, and the business man who would advertise a specialty, and get the greatest good out of the greatest number, in the shortest space of time, is compelled to go to Geo. F. Shedd & Co., of New York, for advice. Why to this house? Because it is the head and front of the advertising business. It is prompt, methodical, and clear in its transactions, and possesses the confidence of all the houses which advertise most."

Side Wheel Steamer, 21 ft. by 5; can earn \$15 to \$25 a day. Address Geo. F. Shedd, Waltham, Mass.

A Self-Acting Trap, to rid out all Rat and Animal Creation. Agents wanted. No trouble to sell. For Traps, &c., address John Dilline, Limestoneville, Montour Co., Pa.

Scale in Boilers Removed—No pay till the work is done. Send for 34 page pamphlet. George W. Lord, Philadelphia, Pa.

I, 2, & 3 H.P. Engines. Geo. F. Shedd, Waltham, Ma.

Any person desiring a Patent Salesman, address, stating article, P. O. Box 282, Cuba, Alleghany Co., N. Y.

Agents! The Patent Artificial Fish, a beautiful ornament for lamps, warranted to prevent explosion and breakage of chimneys. \$2 per doz.; \$3 per 50c. "Thousands" for Agents. Address S. S. Kirk, Washington, D. C.

For Sale, at Great Bargains—One 18x36 second hand Green's Patent Automatic Cut-off Engine, also one 18x36 Slide Valve; both in perfect order. Apply to Todd & Bafferty Machine Company, 10 Barclay St., New York, and Paterson, N. J.

Spoke Machinery Wanted. E. D. Eames, Grand Rapids, Mich.

Parties having Greasy Cotton Waste and Mix Rags for Sale, address, with price, Box 62, Lee, Mass.

For Sale—Large lot second hand Machinists' Tools, cheap. Send for list. I. H. Shearman, 45 Cortlandt Street, New York.

Foot Lathes—Wm. E. Lewis, Cleveland, Ohio.

Small Gray Iron castings made to order. Hotchkiss & Ball, Foundrymen, West Meriden, Conn.

Windmill rights and royalties for sale cheap. Mill tested and proved a success. See cut in Scientific American, April 10th. For circular, terms, &c., address E. S. Smith, Good Hope, McDonough Co., Ill.

Reciprocity! Wanted: Machinery to hull, clean and polish 300 or 400 lb. rice per hour in the best possible style. State full particulars to E. Lindemann, Wallua, Sandwich Islands.

Patterns, Patent Office and Experimental Models, made by Crook & Herring, 36 Center St., New York.

Barry Capping Machine for Canning Establishments. T. R. Bailey & Vail.

Second Hand Steam Engines, Pumps, and Iron-Working Machinery. Catalogues free. E. E. Roberts, 119 Liberty Street, New York.

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price \$4, with good Battery. F. C. Beach & Co., 246 Canal St., New York, Makers. Send for free illustrated Catalogue.

Boul's Paneling, Moulding and Dovetailing Machine is a complete success. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

For best and cheapest Surface Planers and Universal Wood Workers, address Bentel, Margendant & Co., Hamilton, Ohio.

For Tri-nitroglycerin, Mica Blasting Powder, Frictionless Electric Batteries, Electric Fuses, Exploders, Gutta Percha Insulated Leading Wires, etc., etc., result of seven years' experience at Hoosac Tunnel, address Geo. M. Mowbray, North Adams, Mass.

Wrought Iron Pipe—For water, gas, or steam. Prices low. Send for list. Bailey, Farrell & Co., Pittsburgh, Pa.

Hotchkiss & Ball, West Meriden, Conn., Foundrymen and Workers of Sheet Metal. Will manufacture on royalty any Patented articles of merit.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven, Conn.

"Lehigh"—For information in regard to emery wheels, their uses, &c., address L. V. Emery W. Co., Weisport, Pa.

American Metaline Co., 61 Warren St., N.Y. City.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Peck's Patent Drop Press. Still the best in use. Address Milo Peck, New Haven Conn.

Faught's Patent Round Braided Belting—The Best thing out—Manufactured only by C. W. Army, 301 & 303 Cherry St., Philadelphia, Pa. Send for Circular.

Three Second Hand Norris Locomotives, 16 tons each; 4 ft. 8 1/2 inches gauge, for sale by N. O. & C. R. R. Co., New Orleans, La.

Genuine Concord Axles—Brown, Fisherville, N.H.

Temples and Oilcans. Draper, Hopedale, Mass.

Price only \$3.50.—The Tom Thumb Electric Telegraph. A compact working Telegraph Apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key, and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 246 Canal St., New York.

For 13, 15, 16 and 18 inch Swing Engine Lathes, address Star Tool Co., Providence, R. I.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa. for lithograph, &c.

All Fruit-can Tools, Ferracute W. K's, Bridgton, N. J.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, now and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street New York.

Notes & Queries

J. N. W. will find directions for brown-ing gun barrels on p. 11, vol. 32.—L. M. F. H. and A. L. B. will find a description of an artificial ice process on p. 54, vol. 31.—W. M. B. should test his engine with an indicator.—E. A. K. and H. T. M. do not send sufficient data.—F. B. will find descriptions and illustrations of well-boring apparatus on p. 54, vol. 31.—R. and N. T. should consult Molesworth's "Pocket Book" as to tractive power required to move a vessel.—F. J. H. can brass or bronze iron castings by the process given on p. 233, vol. 31.—J. H. W. will find a recipe for black-board composition on p. 91, vol. 30.—M. L. will find a recipe for paste for fixing labels on tin on p. 233, vol. 30.—S. L. will find a recipe for bluing on p. 219, vol. 31.—J. W. C. will find recipes for hard soap on pp. 331, 379, vol. 31.—R. W. and P. P. S. can water-proof canvas by following the directions on p. 347, vol. 31.—F. L. and O. E. D. will find that the horse power of an engine was explained on p. 33, vol. 33.—D. L. will find a description of bisulphide of carbon on p. 144, 233, vol. 30.—W. R. B. will find information as to the hydrogen in water on p. 81, vol. 33.—R. D. B. can blue iron and steel by the process detailed on p. 123, vol. 31.

(1) J. D. R. asks: What is the maximum strain per square inch upon the drawbar of the locomotive attached to one of the largest passenger trains? A. It is the tractive force of the locomotive divided by the area of cross section of the drawbar. The maximum tractive force of a locomotive is the square of the diameter of the piston in inches $\times$ the length of stroke in inches $\times$ the greatest pressure in the cylinder in lbs. per square inch $\div$ the diameter of the driving wheel in inches.

(2) R. B. F. says: I have seen an engine that runs by superheated steam produced by water falling, drop by drop, upon a white hot iron surface. After the superheated steam has been used, it is turned into the fire and there is decomposed, and the hydrogen burned, the oxygen promoting the combustion. Is superheated steam decomposed on striking an open fire? A. Yes, if the temperature is high enough.

(3) G. C. S. asks: 1. What proportion of gunpowder by weight should there be to the bullet in a rifle? A. The proportion varies with the character of the shooting. 2. How large should a bullet be for a breechloading rifle, the bore of which is 0.31 inch in diameter? A. Almost equal to the diameter of the breech.

(4) W. P. says: I have a house of which the lower story is of stone (30 inches), and the upper story of brick, located on high ground. We had a destructive rain storm, and the rain drove with great force against the north end of the house, soaking through to the paper on the inner wall, causing the paper to mildew, and creating an unhealthy odor. The moisture is in the wall yet. How can I remedy it? A. The joints in the interior of the wall were probably not closely filled with the mortar, and the wall itself not provided with strips on the interior to isolate the plastering. Get a good mason to examine the wall closely on the exterior and point up again all joints that are not smooth and tight; the brick work might have two coats of paint in addition; see also that there is no means of entrance for water at the roof cornice. On the interior, if the plastering has been applied directly to the wall, the surest remedy will be to have it replastered upon strips nailed upon the present plastering.

(5) P. J. M. asks: Do we increase the friction by increasing the surface, supposing no weight to be added? A. Within ordinary limits the amount of friction is independent of the surface.

(6) W. asks: Is the back reducing gear, on a common engine lathe, any addition to the power of the machine, or is it only a convenient method of using the power as taken from the motor? A. The back gear enables heavier work to be done, and takes more power to drive than does the direct use of a belt; but the latter runs more easily and delivers a higher speed to the work.

(7) A. W. L. asks: Can a steam engine be run with water that is strongly saturated with soap? A. It might be done, but it would not be advisable.

(8) J. H. R. asks: What are the diameters of the car wheels used on the eastern roads, the width and thickness of flanges, and the weight? A. Diameter from 30 to 33 inches, width of tread and flange 5 1/2 inches, weight from 450 to 500 lbs.

(9) W. M. M. asks: What metals are there in the eagle pennies manufactured in 1858? A. Copper and nickel.

(10) J. L. says: There is a dispute in regard to the power of an eight inch stroke steam engine. Is it possible to build an engine with an 8 inch stroke that will produce 100 horse power? A. Yes.

(11) J. C. P. says: I am making a piston blower of a square box 8x3 inches inside, in which the piston will work, being driven by a belt wheel and pulley by hand, with a balance wheel on the crank shaft. The piston will have a 6 inch stroke. There is a valve in the bottom of cylinder with 1 inch opening for ingress of the air. What size of pipe and valve do I want for the discharge of air into the receiver from the cylinder? It will make about 300 revolutions per minute. A. A pipe 1/4 inch in diameter will answer. 2. How many lbs. pressure to the inch can I compress into the receiver with this machine? A. Six or seven. 3. Will it make a sufficient blast for a common blacksmith's forge? A. It will not be as efficient as some other devices.

(12) N. W. H. asks: Can live steam be seen in a boiler by inserting a glass in a hole 1 to 2 inches in diameter? A. No.

(13) J. W. asks: 1. I have a flat bottomed steamboat, 12 feet wide by 35 feet long, with a stern wheel 8 feet in diameter by 7 feet long. It makes very good time in still water and down stream, but not so well against a heavy current. Can I change the wheel to advantage? A. We could not tell you without having more data. 2. If I wish to drive it by the engine at the bow, would a shaft and bevel gear answer better than a belt and pulleys? A. You will find that gearing makes the most satisfactory connection.

(14) G. M. says: I have a packing house, and melt the heads and scrap in an iron tank, putting them in quite fresh and clean, using live steam at about 40 lbs. pressure. The lard is of a good white color, but has a burnt smell with it. How can I take it away? A. Use steam of lower pressure in future. We scarcely think that you can remove the smell from that already made. Some of our readers, however, may be able to help you with their experience.

(15) E. R. M. asks: With magnetized iron or lodestone, does the attraction vary as the square of the distance? A. Yes.

Can it be truly said that water raised by the Archimedeal screw flows down a series of inclined planes? A. Yes.

Has the question of a cannon on a train, fired in an opposite direction, been discussed in the SCIENTIFIC AMERICAN? A. Yes. See p. 273, vol. 32.

(16) C. K. asks: In working a suction and force pump, all in good order, will it force more water through a hose 2 inches in diameter without a nozzle on than with a 1 inch nozzle? A. No, unless the pump leaks.

(17) H. H. W. asks: Why is a thimble skein wagon more easily drawn through mud or sand than an iron axled wagon of smaller dimensions? A. When this is the case, it must be due to difference of fitting. We doubt if it is universally true.

(18) W. P. C. asks: At what angle above the horizon should a hose be held for the furthest horizontal play? Is there a rule for calculating the relation between the vertical and horizontal play of the same stream? If a pipe is held to play vertically, and throws a stream 200 feet in that position, and is then inclined to play horizontally, how far should it throw? A. There are rules, approximately correct, to be found in any good treatise on hydraulics. The experimental data on which these rules are founded are, however, rather limited.

(19) J. F. G. asks: 1. What is the proper name for a loop in a pipe, to allow for expansion? A. An expansion joint. 2. I have made an engine of 2 1/2 inches bore by 4 inches stroke. Can you give the horse power? A. See p. 33, vol. 33.

(20) A. W. A. says: I want to run a circular saw mandril; saw is 60 inches diameter, at right angles to line shaft. To accomplish this I have thought of three modes. 1. By bevel gear. 2. By running a half twist belt from line to countershaft, countershaft running directly over line shaft, at a distance of 12 feet. The pulleys on both shafts are to be 30 inches in diameter and of 15 inches face. 3. To turn a corner by means of two loose pulleys in a perpendicular shaft belt (12 inches wide) to run direct from line round loose pulleys to countershaft. Do you think either of these plans is practicable? A. Try the second plan, if the countershaft can easily be arranged.

(21) H. C. D. asks: How many lbs. to the square inch of heated air will it require to run a sewing machine? How large should be the cylinder? What should be the size of the air chamber, and will a kerosene lighted wick be sufficient to expand the air to get the required pressure to run said machine? A. Your questions are too indefinite. It must be evident to you that either the pressure of air, or the size of cylinder, must be fixed as a preliminary operation. We do not think that you can get along with a kerosene lamp unless it is of very unusual dimensions.

(22) W. J. says: 1. I think of making an upright boiler, 13 inches in diameter and 3 feet high, with 28 smoke tubes of 1 inch diameter and 1 foot long, arranged around the circumference of the boiler, and 58 circulating tubes 1 foot long, 1 inch diameter, dropping into the fire, screwed well into the crown sheet. The crown sheet is to be stayed to head sheet with four 1 inch stays, 4 1/2 inches apart, and there is to be 1 inch water space around the fire stayed with 5/8 inch stays, 3 inches apart. Shell is to be of 3/8 iron, crown and head sheets of 1/2 iron. Is this a good way to build a boiler to put in a skiff 13 feet long by 4 feet 6 inches beam? A. The boiler will answer very well. 2. What pressure steam can I safely carry? A. You can carry 100 lbs. of steam. 3. What size of engine (slide valve) will it furnish with steam? A. One 3 inches diameter by 3 inches stroke. 4. If it would drive an engine 3 inches diameter by 3 inches stroke, would it be better to put in two cylinders whose united area would equal the single cylinder? A. The single engine will be best. 5. What size and pitch of wheel would you recommend? A. Use a propeller with pitch of 2 1/2 or 3 feet.

(23) F. D. G. asks: How can I clean finger marks off ground glass? A. Try rubbing the spots for some time with a little tripoli or benzole.

(24) E. S. D. and others.—The zinc in the battery is the positive element and the copper the negative.

(25) C. P. E. says: I have an upright boiler 20 inches in diameter by 60 inches high, with 6 two inch tubes 33 inches long. The grate is 4 inches in diameter. I am building an engine 5x5 inches; is boiler large enough for it? A. No.

(26) S. K. H. asks: Will a piece of bronze statuary, placed on a granite monument exposed to the weather, stain the granite? A. Yes; slightly.

(27) C. W. A. asks: What is the simplest galvanometer that will determine the relative intensities of the different galvanic elements? A. Take an ordinary pocket compass and wind a hundred feet of No. 18 insulated copper wire around it.

(28) E. M. B. says: I have an office telegraph of three stations, using No. 18 gage uncovered copper wire. When first put up, the wires were run as much as possible in the air, and the bell sounded fairly; but the wires being unsightly, I took them down and ran them round on the mop board; then the bell sounded, first faintly, then not at all. Battery is three Leclanché cells. I put a handful of sal ammoniac in the jar, adding water as it evaporates; the porous cell is sealed, so I have not troubled that. What is the matter? A. Insulate your wires by fastening them to porcelain knobs. 2. I have read the article on lightning on p. 145, vol. 31. Shall I connect my main lightning conductors with my 1 inch lead water pipe in the cellar, which is distant from the 9 inch iron street main about 20 feet; or shall I connect through the roof with the feed pipe of water tank which is in the attic, and of course is a continuation of the main feed pipe from cellar? A. Connect with both. The more earth connections you have, the better.

(29) W. B. H. asks: Please give a list of the metals in the order of their ability as electric conductors. A. Silver, copper, gold, aluminum, zinc, cadmium, platinum, cobalt, iron, steel, nickel, tin, thallium, lead, arsenic, antimony, mercury, bismuth, sulphur. Of alloys, brass is between cadmium and platinum, and German silver between tin and thallium. Graphite is between bismuth and sulphur.

(30) G. S. says: I am building a screw press, for which I have a worm wheel of 24 inches diameter and 2 inches pitch. The worm is 6 inches in diameter. With such a worm and wheel, how large a screw shall I require to lift 100 tons to sustain the load for 1 hour? A. This depends on the amount of power applied to the worm. 2. How can I calculate the power required to work such a press? A. Consult Haswell's "Pocket Companion." 3. Is a cast iron table 6 inches thick, 15 inches wide, and 36 inches between supports, able to bear 100 tons in the middle? A. Not with safety.

(31) E. L. C. says: 1. I am building an elliptic spur gear wheel to work on fixed centers; transverse axis is 14 inches, conjugate axis 8 inches. The wheel has 12 teeth. I soon found that the string trammels and compasses would not do for the curve, being too flat, as the pitch curves must touch on the line of centers throughout the revolution, the distance between centers being 11 inches. A. Consult Camus "On the Teeth of Wheels." 2. What is the best shape for the teeth? A. Make epicycloidal teeth.

(32) D. F. C. asks: 1. What is the proper way to set a thread tool to cut a gas pipe tap? A. By the taper. 2. If I use a lathe with a taper attachment, should the tool be set by the taper or by the face plate? A. By the taper. 3. Suppose I use a common lathe without a taper attachment, should the tool be set by the end of the tap or by the taper? A. By the taper.

(33) H. H. C. asks: Will a horizontal copper boiler, 4 inches in diameter by 10 inches long, supply a cylinder 1 1/2 x 1 1/2 inches, with sufficient steam to drive a boat 8 1/2 feet long at 4 miles an hour? A. No.

(34) M. R. says: A friend holds that a crank pin revolves on its axis when the engine is in motion, inasmuch as it is impossible for a body to present the same side first up and then down without turning on its axis. Will you give an explanation and set the matter at rest? A. We think you might find some more profitable subject for discussion. It is a very easy thing, however, to try the experiment, attaching a pointer to some part of the crank pin, if such a demonstration is required to convince any one.

(35) S. G. W. W.—It is best to have the valve of a steam engine close quickly, but it is well to have the ports closed when the piston has completed 1/2 of the stroke at the farthest.

(36) E. H. asks: 1. How can I prevent fish oil from congealing in cold weather? A. The best method is to keep the vessel containing it enveloped in some non-conducting substance, such as straw, sawdust, woolen fabrics, etc. 2. By what process can I transform it into paint oil? A. If you will send us a sample of the oil you mention, we shall be better able to answer your question. You do not state the variety.

(37) E. E. K. says: I have a well of water which is perfectly clear and has a very slight mineral taste. It is extremely hard, and rusts off the iron hoops on well buckets at a surprising rate; when boiled in an iron tea kettle, it leaves a thick rusty coating. It is found in a stratum of hard blue sandstone. What kind of water is it, and is it likely to be wholesome? A. Send us a sample of the water in question, marked plainly with your name and address, and we will test it for you.

(38) J. H. N. asks: 1. How is nitroglycerin exploded? A. It is exploded by means of electric fuses and by fulminates. 2. Is it sure to explode if struck a heavy blow? A. Yes. 3. How are the following exploded: Mercury fulminate, pyroxylin, picric acid, potassium picrate, barium picrate, strontium picrate, lead picrate? A. All these are exploded either by friction or percussion.

(39) H. A. H. asks: 1. If the conducting power of platinum is 100, what is the relative conducting power of an ordinary carbon? A. 0.0246. 2. In making a silver solution by battery process, a spongy substance was found at the cathode. What is its chemical composition, and how can I avoid its formation? A. Quantity of current too small for the solution. Increase the surface of the zincs.

(43) A. D. B. asks: How can I prepare sperm oil so as to prevent its becoming gummy and sticky when used on light machinery? A. It may be purified by agitating 100 parts oil with 4 parts chloride of lime and 12 water; a small quantity of decoction of oak bark is afterwards added to remove all traces of gelatinous matter which it retains, and the mixture is left to settle. The clear oil is afterwards agitated with a small portion of sulphuric acid, again clarified by subsidence, and washed to remove adhering sulphuric acid.

(41) W. W. B. asks: I. How can I renovate a Philadelphia pressed brick front, which has become soiled with the weather? A. Very dilute sulphuric acid and a stiff brush are sometimes used for this purpose. 2. I tried to make the cement which you recommend as waterproof for repairing glass, namely, white shellac dissolved in $\frac{1}{4}$ its weight Venice turpentine, but it will not dissolve. How can I do it? A. Melt them together by heat.

(42) J. M. McC. asks: How can I make marking ink of the following colors, violet, blue, green, and black? A. The various colored inks in use can be made as follows: Violet ink: 8 parts logwood and 64 parts water; boil down to one half, strain, and add 1 part of chloride of tin. Blue ink: triturate best Prussian blue, 6 parts, with solution of oxalic acid in 6 parts water, and, towards the end of one quarter of an hour or so, add gradually gum arabic 1½ parts, white sugar 1 part. Green ink: digest 7 to 10 parts of the blue ink with 1 part of gamboge. Black: Fine glue 2 ozs., water 12 ozs., ivory black 1 oz. Stir well.

(43) J. C. T. asks: How can I melt old rubber car springs? A. Dissolve them in bisulphide of carbon.

(44) G. W. L. asks: What are the igniting or explosive parts of torpedoes made of? A. They are commonly made of fulminating mercury mixed in with a few pebbles, and, in some cases, a little gunpowder.

(45) J. M. says: I put a coat of boiled linseed oil on some woodwork wanting a hard surface, but it will not get hard. How can I remedy it? A. If the oil is properly thinned with spirits of turpentine, you should have no difficulty with it. The oil was probably applied while in too viscous a condition. Try again.

(46) J. H. E. says: 1. We received some sheet zinc some time since, that has large white spots on it. Is there anything that can be used to clean the zinc? A. Try a little oxalic acid or oxalochloride of zinc. If these do not answer, try a little very dilute sulphuric acid. 2. Is there anything used in soldering tin instead of acid, that will not color the tin as acid does? A. A strong solution of oxalochloride of zinc is used for this purpose, although many prefer the resinous acids.

(47) W. K. J. asks: How can I harden paraffin sufficiently to enable me to turn it in a lathe? A. We know of no satisfactory method of accomplishing this.

(48) H. E. E. says: 1. In the case of the prisoners who got away from the working gang, and took charge of a passing freight train, compelling the engineer to get off, how is it that the pump caused the bursting of the cylinder heads? A. If the pump continued working, it soon filled the boiler, and then the water was carried over into the cylinders, filling the steam pipe and steam chest, so that either the engine must stop or the cylinder be broken to allow it to escape.

(49) J. M. R. asks: How can I preserve celery through winter? A. Place it in the ground so deep that the frost will not touch it, and cover with straw.

(50) C. M. & S. say: If there is one pump with piston and suction pipe having the same area, say 4 square inches each, piston to be lifted 10 feet per second, and another pump, suction pipe same area as above, 4 square inches, piston 40 square inches moving 1 foot high per second, there being the same space to be filled (40 square inches) in each pump in the same time, one piston moving 10 times faster than the other: What difference would there be in the required driving force? A. Disregarding the friction of the piston and stuffing boxes, the two pumps would require similar amounts of power for their operations.

(51) O. B. & D. say: We would like you to tell us what size of cylinder of engine will be required to tongue and groove 6,000 feet of 6 inch yellow pine flooring, and to run a siding saw to split 6,000 feet of 1 inch lumber 6 inches wide into siding, per day of 10 hours? A. You will require an engine capable of exerting from 12 to 15 effective horse power.

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

G. M. A.—The globular formation is marcasite white iron pyrites. The other mineral contain silica, alumina, potassa, soda, magnesia, iron, car bon, and water. We judge it to be a variety of slate. No silver was found in it. Use the cupel to determine the amount of silver in an ore.—A. D. M.—Your coal with spots on it gave none of the indications of paraffin.—S. S.—It is most probably a medicinal preparation. It is principally a compound of zinc. Consult the *Dispensary* as to the application and medical uses of the zinc salts.—R. A. M.—It is calcite. For its uses consult an encyclopedia.—R. P.—No. 1 is decomposed quartz rock colored by oxide of iron. No. 2 is carbonate of lime and magnesia.—W. H. D.—They are aragonite (carbonate of lime). The primary form of crystallization of carbonate of lime is the rhombohedron; in these specimens the crystals are six-sided prisms, and consequently dimorphous.

M. & O. say: We have been heating a die which was faced with steel $\frac{1}{4}$ inch thick, on iron.

The steel became of a bright red, and the iron was still perfectly black, forming a distinct line around the die at point of welding. Can you give us a reason for the same?—G. G. F. asks: What will remove the gloss that black cloth is subject to by wear?—W. C. C. asks: How can I prepare cotton netting to prevent its shrinking and stretching when exposed to the weather?—L. B. H. asks: Is it possible to make brook trout lay their spawn when confined in a well, if they have a suitable gravel bed?—E. L. P. asks: How are the pivot jewels of watch arbors applied and set?

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 Potato Bug. By P. Y.
On Cider. By A. P.
On the Keely Motor. By S. B.
On the Origin of Life. By J. B. P.
On Meteorology. By J. H. T.

Also inquiries and answers from the following:

W. A. S.—J. H.—C. H. P.—O. P. S.—J. D. S.—
T. N. M.—S.—O. B.—W. A. C.—M. N.—A. B. C.—
A. T. W.—J. W.

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.

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

Hundreds of inquiries analogous to the following are sent: "Who makes hand organs? Whose is the best boiler incrustation preventive? Who sells the best covering for boilers and steam pipes? Who sells stills, suitable for distilling oil of sassafras? Who makes water motors? Who buys sumac for tanning and dyeing? Who sells iodate of calcium? Who sells nickel plates and salts? Who sells spectroscopes? Who sells stenciled designs for freezing? Who sells match-making machinery? Who publishes a book on fruit culture? Who sells hand pumps? Who sells mica in plates? Who sells boilers made of corrugated iron? Who sells bicycles? Who sells gas blowpipe nozzles? Who sells machines for steaming feathers?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week ending

July 13, 1875,

AND EACH BEARING THAT DATE.

(Those marked (r) are renewed patents.)

Acids, carrier for, F. H. Kaldofsch.	165,590
Acids, concentrating sulphuric, G. A. Hagemann.	165,567
Alarms, circuit for electric, G. C. Maynard.	165,602
Aquarium, J. Wenmackers.	165,639
Auger handle, F. Wertz.	165,522
Bag holder, J. James.	165,586
Bale tie, P. R. Dawson.	165,497
Barrels, tapping, J. Barrett.	165,467
Basin faucet, J. F. Sheridan.	165,621
Basket, grain, H. C. Jones.	165,417
Baskets, stove, H. C. Jones.	165,416, 165,418, 165,419
Battery, galvanic, G. L. Leclanche.	165,432
Bearing, circular roller thrust, M. C. Bullock.	165,538
Bed lounge, T. Q. Hall.	165,571
Bedstead, folding, H. Kriete.	165,492
Bee hive, H. Penoyer.	165,501
Billiard cue tip fastener, C. Gravelius.	165,562
Boiler feed apparatus, N. Yagu.	165,435
Bolt trimmer, A. Graham.	165,445
Bolt die, J. B. Clark.	165,542
Book support, W. Patton.	165,530
Boot-crimping machine, J. P. Mitchell.	165,605
Boot peg cutter, G. L. Ellis.	165,411
Boot stretcher, O. F. Garvey.	165,556
Boot fronts, cutting, J. T. Harper.	165,572
Boot jack, A. N. De Baun.	165,493
Boots, machine for pegging, T. T. Prosser.	165,612
Boring and mortising machine, H. Seemann.	165,495
Bracket stand, A. B. Denison.	165,549
Brick, air-dried, J. Wurzel.	165,649
Broom, corn, A. Maurer.	165,601
Broom corn-stalk machine, A. Walrath.	165,458
Brushes, attaching handles to, Hood & Joseph.	165,582
Bucket, elevator, J. B. Cline.	165,545
Buckle, W. Leser.	165,422
Buckle, trace, A. G. Dodds.	165,551
Bureau and washstand, W. S. Moses.	165,494
Burner, vapor, J. Benson.	165,468
Button fastener, P. Hues.	165,518
Buttons, manufacture of, R. H. Isbell.	165,444
Car brake, J. E. Worthman.	165,648
Car coupling, W. E. Bell.	165,529
Car coupling, J. Dinmore.	165,484
Car coupling, E. M. Law.	165,450
Car coupling, Outland & Thomas (r).	165,459
Car spring, J. E. Wooten.	165,647
Car ventilators, regulating, G. W. Birmingham.	165,465
Cars, door for grain, F. J. Kimball.	165,499
Carburetor, air, Gray & Lusby.	165,564
Cellars, etc., ventilating, J. E. Frick.	165,486
Chain cable, C. A. Chamberlin.	165,541
Chair, barber's, J. Ott.	165,493
Chair, reclining seat for, W. W. St. John.	165,516
Chairs, disintegrating, Goodenough & Drennen.	165,560
Clock, calendar, A. A. Cowles.	165,548
Clock, calendar, W. A. Terry.	165,434
Cloth-cutting machine, A. Warth.	165,626
Clo., etc., steaming, W. Heddon.	165,576

Coal chute, W. M. Thompson.	165,622
Coal scuttle, R. M. Steele.	165,515
Cooler, lard, F. E. Rockstroh.	165,617
Cooler, liquid, B. F. Shaw.	165,490
Corn stalks, cutting, T. O'Bryan.	165,496
Corset, M. K. Bortree.	165,534
Cracker machine, G. W. Baker.	165,527
Culinary vessel, J. Demoss.	165,483
Cultivator, Dunnivant & Hampson.	165,552
Digger, potato, J. W. Haag.	165,566
Door check, J. Naughten.	165,607
Door spring, J. B. Starkweather.	165,626
Dredging machine, R. H. Osgood.	165,589
Drilling machine, rock, M. C. Bullock.	165,589
Drilling machine, E. S. Winchester.	165,646
Duster, feather, H. L. Harrison.	165,574
Egg beater, T. Earle (r).	6,542
Egg beater, J. Howes.	165,585
Elevator, H. W. Brinkerhoff.	165,474
Engine house gong, R. Bragg.	165,498
Engine, hydraulic hoisting, G. M. Gerriah.	165,558
Engine, rotary, S. Gibson.	165,559
Envelope machine, J. Ball (r).	6,540
Erasor holder, W. H. Bennett.	165,581
Exhaust mechanism, G. Bonker.	165,487
Eyeglass, I. Kahn.	165,589
Fabrics, imitation, C. H. Kneller.	165,420
Fare box, G. J. Hill.	165,579
Fence, portable, M. Burtless.	165,439
Fence post, E. Geer.	165,557
Fence wire stretcher, Brown & Cramer.	165,536
Filter, H. F. Scherr.	165,512
Fire lighter automatic, M. Curran.	165,499
Fire place, M. Fitzpatrick.	165,440
Fire place, J. McHenry.	165,604
Floor clamp, E. Hickman.	165,446
Flower stand, S. Vanstone.	165,456
Furnace, metallurgic, W. Swindell.	165,490
Furnace, smelting, H. C. Creal.	165,477
Furnaces, nozzle for hydrocarbon, H. Stacey.	165,451
Furnaces, blast pipe for, G. H. Goodsell.	165,561
Game board, C. R. Edwards.	165,410
Gate, automatic, O. P. Clinton.	165,475
Gate, automatic, K. G. Knuteson.	165,449
Goods, etc., transmission of, D. Brown.	165,475
Grave cover, R. H. Sipes.	165,622
Gun stocks, checking, J. A. Blake.	165,404
Handle attaching device, Hood & Joseph.	165,583
Harrow, A. W. Davis.	165,480
Harvester, C. Wheeler, Jr.	165,460
Harvester dropper, T. McDonough.	165,454
Harvester safety seat, W. E. Mattison.	165,424
Hatchway, self-closing, J. Fensom.	165,534
Heel polishing machine, W. Westcott.	165,640
Hinge, F. L. Sanderson.	165,619
Holdback, W. H. Harvey.	165,575
Hoops, machine for cutting, H. Fowler.	165,535
Hose coupling, W. M. Henderson.	165,415
Hose, India rubber, T. J. Mayall (r).	6,545
Hubs to axles, attaching, W. E. Pratt.	165,504
Hydrocarbons, test for, J. Ponton.	165,612
Ice cream freezer, J. M. Condon.	165,645
Ice cream freezer, W. Redheffer.	165,615
Ice plow, R. W. Sanborn.	165,427
Jack, lifting, Fayette & Meeker.	165,485
Ladder, firemen's extension, A. Ames.	165,525
Ladder, firemen's extension, J. D. Rowland.	165,618
Lamp and gas machine, G. T. Parry.	165,499
Lamp, nursery, Gorham & Culey.	165,444
Lamp reflector, street, C. Robinson.	165,509
Lathe, metal turning, H. M. Quackenbush.	165,425
Lemon squeezer, A. C. Weeks.	165,608
Life preserver, J. F. Peck.	165,610
Liquids, drawing effervescent, C. Greiner.	165,565
Liquids, evaporating, G. A. Hagemann.	165,568
Lock, W. H. Taylor.	165,631
Locomotive head light, Ray & Ham.	165,426
Lock shells to cases, fastening, H. Winn.	165,644
Loom, pile fabric, S. Sanford.	165,428
Lock picking mechanism, D. M. Collins.	165,408
Measuring apparatus, liquid, J. M. Hopkins.	165,447
Measuring distances, etc., E. C. Roberts.	165,616
Meat cutter, H. P. Goddard.	165,442
Meat cutter, A. B. Good.	165,445
Metal punching machine, D. W. Baer.	165,466
Miner's tools, Holmes & Quirin.	165,580
Molding instrument, D. Walther.	165,583
Mop, Johnson & Barnes.	165,588
Mowing machine, D. Lockhead.	165,458
Mowing machine, C. Wheeler, Jr.	165,461
Muff, E. Winkler.	165,645
Nail for shoemaking, L. R. Blake.	165,470
Nail rolling machines, conductor for, R. E. Cady.	165,474
Neck tie, A. Hellenberg.	165,577
Neck tie, A. Landes.	165,585
Neck tie, S. Solomon.	165,625
Neck tie fastener, J. H. Harrington.	165,488
Needle sharpener, T. D. Cashin.	165,514
Needles, polishing eyes of, J. Berry.	165,532
Newspaper file, F. B. Alderson.	165,401
Ore concentrator, G. W. White.	165,462
Ore separator, H. P. Minot (r).	6,738
Paper clip, C. E. Ramus.	165,614
Paper weight, F. E. Whitney.	165,465
Pavement, H. R. Bellamy.	165,530
Pegging machine, T. T. Prosser.	165,620
Piano forte damper mechanism, E. Porter.	165,503
Pick, T. B. Pinks.	165,502
Pipes, thawing frozen water, R. E. Dietz.	165,550
Planting machine, miter, J. Mannebach.	165,600
Planter and cultivator, corn, P. S. Starnes.	165,513
Plow, W. S. Lawrence.	165,451
Plow, gang, H. Opp.	165,497
Plow mold boards, making, J. Holmes.	165,581
Pneumatic machine, G. A. Hagemann.	165,569
Press, J. P. Kefauver.	165,491
Printing press, M. A. Pendleton.	165,611
Protractor, A. Swasey.	165,519
Pump, S. B. Strong.	165,629
Pump, bilge, J. F. Sneathells.	165,623
Pump, rotary, H. A. Barber.	165,528
Pump luk. L. W. and C. Olds (r).	6,543
Reaping machine, E. Benjamin.	165,496
Saccharine solutions, filtering, Watson & Co.	165,607
Safe door, N. Macneale.	165,599
Saw guide, band, Young and Ferguson.	165,523
Sawing machine, band, B. D. Whitney.	165,463
Saw mill, W. T. Wayne.	165,521
Saw set, J. E. Whiting.	165,464
Scales, trileaf, Crane and Miner.	165,478
Seed drill, W. A. McClintock.	165,600
Seed sower, J. Burke.	165,498
Separator, grain, W. S. Clymans.	165,544
Sewing machine shuttle, C. E. Billings.	165,405
Sewing machine, shoe, E. P. Richardson.	165,506
Shaft coupling, A. B. Cook.	165,546
Sheet metal spouts, making, M. S. Ledy.	165,506
Ship's galley, Lusby and Smith.	165,423
Shoemaking, nails for, L. R. Blake.	165,470
Shoe sole machine, J. W. Lefferts.	165,595
Signals, circuit for electric, Hall and Snow.	165,570

Skiving and splitting weirs, J. W. Fifield.	165,412
Sleighs, lance for propelling, A. Corbett.	165,547
Sleighs, runner for, H. Smith.	165,624
Snow plow, E. G. Graves.	165,563
Soap, S. Strunk.	165,637
Soap, transparent advertising, S. Strunk.	165,628
Spindle, lubricating, A. M. Wade.	165,499
Spoon socket, J. B. Blatt.	165,485
Stamps, etc., attaching, E. T. Thomas.	165,520
Stone and cement, A. Boag.	165,522
Stone and marble dressing, O. Abell.	165,524
Stool, G. C. Winchester.	165,454
Stove, J. L. Roberts.	165,508
Stove and heat radiator, N. H. Lenhart.	165,597
Stove, heating, H. G. Giles.	165,414
Stove pipe drum, B. F. Stockford.	165,517
Straw cutter, C. F. and M. Stewart.	165,514
Table, folding, J. Walton.	165,457
Table, ironing, C. Rumens.	165,511
Table slide, extension, L. N. Willard.	165,642
Tables, slider for extension, A. Weaver.	165,459
Teeth protector, A. Hopfen.	165,584
Telegraph, automatic electric, W. E. Sawyer.	165,620
Telegraph lines, underground, D. Brooks.	165,525
Telegraph, fire alarm, J. W. Kates.	165,591
Telegraph relay, pocket, Hill and Schneider.	165,573
Thermometer, electric, E. J. Frost.	165,413
Thermometer, registering, J. V. Raymond (r).	6,544
Ticket case, W. H. Crowther.	165,478
Ticket case, Crowther and Collins.	165,479
Tobacco mouth piece, B. Morahan.	165,606
Trap, animal, H. H. C. Arnold.	165,506
Trap, animal, J. M. Wilkinson.	165,643
Tree box, E. Russell.	165,455
Valve, globe, H. P. Buffon.	165,537
Valve, stop, J. O. Morse.	165,493
Vehicle spring, S. E. Foster.	165,441
Vehicle spring, W. F. Whitney.	165,641
Vehicle wheel, S. L. Bond.	165,471
Vehicle wheel, C. Jeantaud.	165,578
Velocipede, ice, C. M. Day.	165,481
Wagon brake, Garth and Rosser.	165,478
Wagon brake, W. Lackman.	165,592
Wagon or sleigh, dumping, J. Pattison.	165,609
Washing machine, J. H. Harris.	165,573
Washing machine, J. D. Lawlor.	165,421
Washing machine, S. P. Loomis.	165,598
Washing machine, E. H. F. Schneider.	165,479
Watch key combination tool, O. D. Warfield.	165,605
Water closet seat, F. Fahj.	165,523
Water closet, I. Riley.	165,507
Weather strip, Hoffman and Shoemate.	165,499
Wick trimmer, D. T. Bates.	165,482
Windmill, W. Walker.	165,634
Windmill apparatus, etc., Richardson & Co.	165,505
Window frame, E. Roth.	165,510
Window scaffold, A. T. Large.	165,594
Wood, machine for splitting, J. A. Conover (r).	6,511

DESIGNS PATENTED.

8,476 to 8,480.—CARPETS.—J. Webster, Philadelphia, Pa.
8,481.—LAMP PEDESTALS.—N. Bradley, West Meriden, Ct.
8,482.—PAPER WRIGHT.—H. Lee, New York city.
8,483.—HEATING STOVE.—R. Scorer & Co., Troy, N. Y.
8,484.—STOVE COVER LIFTER.—H. Brown, New York city.
8,485.—PRINTING TYPE.—A. Little, New York city.
8,486.—RUBBER ERASER.—C. Roberts, Newark, N. J.
8,487.—BROOM HEAD NECK.—C. Van Slyck, Schenectady, N. Y.

SCHEDULE OF PATENT FEES.

On each caveat.	\$10
On each Trade mark.	\$25
On filing each application for a Patent (57 years).	\$15
On issuing each original Patent.	\$20
On appeal to Examiners-in-Chief.	\$10
On appeal to Commissioner of Patents.	\$20
On application for Reissue.	\$30
On filing a Disclaimer.	\$10
On an application for Design (34 years).	\$10
On application for Design (7 years).	\$15
On application for Design (14 years).	\$30

Advertisements.

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

Practical Draughtsman's Book of INDUSTRIAL DESIGN AND MACHINISTS' & ENGINEERS' Drawing Companion.

Forming a Complete Course of Mechanical, Engineering, and Architectural Drawing. From the French of M. Armand the elder, Professor of Design in Conservatoire of Arts and Industry, Paris, and MM. Armand the younger, and Amoureux, Civil Engineers. Rewritten and arranged with additional matter and plates, selections from and examples of the most useful and generally employed mechanism of the day. By William Johnson, Assoc. Inst. C. E. Illustrated by fifty folio steel plates, and fifty wood cuts. A new edition, 4to. . . . \$10

Among the contents are: Linear Drawing, Definitions, and Problems. Sweeps, Sections, and Moldings. Elementary Gothic Forms and Rosettes. Ovals, Ellipses, Parabolas, and Volutes. Rules and Principal Data. Study of Projections. Elementary Principles. Of Prisms and other Solids. Rules and Practical Data. On coloring sections, with applications. Conventional Colors, Composition or Mixture of Colors. Continuation of the Study of Projection—Use of Sections—details of machinery. Simple applications—spindles, shafts, couplings, wooden patterns. Method of constructing a wooden model or pattern of a coupling. Elementary applications. Rules and Practical Data.

THE INTERSECTION AND DEVELOPMENT OF SURFACES, WITH APPLICATIONS.—The Intersection of Cylinders and Cones. The Delineation and Development of Helices, Spirals, and Serpentine. Application of the helix—the construction of a staircase. The Intersection of Surfaces—applications to stop cocks. Rules and Practical Data.

THE STUDY AND CONSTRUCTION OF TOOTHED GEAR.—Involute, cycloid, and epicycloid. Involute. Cycloid. External, epicycloid, described by a circle rolling about a fixed circle inside of it. Internal epicycloid. Delineation of a rack and pinion in gear. Gearing of a worm with a worm wheel. Cylindrical or Spur Gearing. Practical delineation of a couple of spur wheels. The Delineation and Construction of Wooden Patterns for Toothed Wheels. Rules and Practical Data.

CONTINUATION OF THE STUDY OF TOOTHED GEAR.—Design for a pair of bevel wheels in gear. Construction of wooden patterns for a pair of bevel wheels. Involute and Helical Teeth. Contrivances for obtaining differential Movements. Rules and Practical Data.

BLIND STAMPING.—PATTERNS OF SHADOWS.—Shadows of Prisms, Pyramids, and Cylinders. Principles of Shading. Continuation of the study of Shadows. Tuscan Order. Rules and Practical Data.

APPLICATION OF SHADOWS TO TOOTHED GEAR.—Application of Shadows to Screws. Application of Shadow to a Boiler and its Furnace. Shading in Black—Shading in Colors.

THE CUTTING AND SHAPING OF MACHINERY.—Rules and Practical Data. Remarks on Machine Tools. THE STUDY OF MACHINERY AND SKETCHING.—Various applications and combinations: The Sketching of Machinery. Drilling Machines; Motive Machines; Water Wheels. Construction and Setting up of water wheels. Delineation of water wheels. Design of a water wheel. Sketch of a water wheel. Overshot water wheels. Water Pumps; Steam Motors; High-pressure expansive steam engine. Details of Construction; Movements of the Distribution and Expansion Valves; Rules and Practical Data.

OBlique PROJECTIONS. PARALLEL PERSPECTIVE. TRUE PERSPECTIVE.—Elementary principles. Applications—four mill driven by belts. Description of the mill. Representation of the mill in perspective. EXAMPLES OF FINISHED DRAWINGS OF MACHINERY.

THE above, or any of our Books, sent by mail, free of postage, at the publication price.

SELECT LISTS OF BOOKS ON Metals, Metallurgy, Strength of Materials, Chemical Analysis, Steam and the Steam Engine, Practical, Scientific, and Economic Subjects, with prices, sent free on application.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 3vo., sent free to any one who will furnish us address.

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS AND BOOKSELLERS, 406 WALNUT STREET, Philadelphia.

J. M. CARPENTER, Manufacturer of Pawtucket, R. I.

THE IMPROVED NIAGARA STEAM PUMP, 33 1/2 Pearl St., Brooklyn, N.Y. Agency at 40 John St., New York.

Hubbard & Aller, Sole Manufacturers, Engines and Boilers, Pulleys, Shafting and Hangers, a Specialty.

FOR SALE, or Exchange for LAND—A Valuable patent for Marine and Stationary Engines—already introduced and in use on board of over twenty steam ships—requires but small capital, not expensive, and in the hands of a live man would yield a large profit. Satisfactory reasons given for selling. Apply, by letter, to Box 37, Baltimore P. O.

PIANOFORTE IRON PLATES A SPECIALTY.—All operations, from casting to ornamental finish, done in our own establishment. For prices, address T. SHIVER & CO., 225 East 56th St., New York.

FOOT POWER TENONING MACHINES FOR SALE, by S. C. HILLS, 31 Cortlandt St., New York.

ADVERTISERS WHO DESIRE TO REACH COUNTRY READERS in the West, can do so in the best and cheapest manner by using one or more sections of Kellogg's Great Newspaper Lists. Apply to A. N. KELLOGG, 79 Jackson St., Chicago, Ill.

Blind Stile Mortising and Boring Machine will mortise two blind stiles at once for Fixed Stiles, in all kinds of wood, regardless of knots, making 50 per minute, leaving them clear of chips, and will bore for rolling stiles, 150 per minute. M. BUCK, Lebanon, N. H.

PATENT WOOD WORKING MACHINERY, PLANING & MATCHING, MOULDING, MORTISING, TENONING, RESAWING, SHAPING, BAND & SCROLL SAWS &c. &c. J. A. FAY & CO., CINCINNATI, O.

FIRE PROOF SHUTTERS.

CLARK & CO'S SELF-COLLING ROLLING STEEL SHUTTERS (Burglar Proof), For Store Fronts and Rear Windows, require no machinery or balance weights, and can be applied to any opening; also Rolling Wood Shutters for Stores and Dwelling. Thousands are in daily use, and are acknowledged the best shutters in the world. Send for Catalogue to JAMES G. WILSON, Manager, 215 West 25th St., New York, and at London, Paris, Vienna, and Berlin.

For Inventors and the Trade, made into any pattern at short notice, by F. H. HOLTON, 43 Gold St., New York. Established in 1863.

INDIA RUBBER, For Inventors and the Trade, made into any pattern at short notice, by F. H. HOLTON, 43 Gold St., New York. Established in 1863.

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

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

10 DOLLARS PER DAY AGENTS WANTED to sell SHUTTLE Sewing Machine. Address Johnson, Clark & Co., Boston, Mass.; New York City; Pittsburgh, Pa.; Chicago, Ill.; or St. Louis, Mo.

SHAKER SASH BALANCE—SUPERSEDES WEIGHTS AND BOXES. Easily attached to any window. Samples complete by mail, \$1.50. W. J. MCGOWN, South Union, Ky.

Excelsior Latest Improvement. Double Treadle, including one doz. Saws, thirty imitatable Fly Sawing Patterns & Prepared Wood to the value of \$4. A new device for tightening Saw, Power Drilling attachment, Wrench, Oil cup, and Screw driver. Speed 80 strokes per minute. Saws 1 1/2 in. thick. Price, complete, cash and delivered on board cars, or at Express office, \$12. SMALL STEAM ENGINES, with copper Boiler, to drive light Lathes, Scroll Saws, &c. 100 Scroll Work. Designs free on receipt of GEO. F. ABEY, Buffalo, N. Y.

Portable Engine, 4, 5, 6, 8 h.p. Something new, best for price. Circulars, CHAS. PLACE, 103 Reade St., N. Y.

NEW METHOD OF ENGRAVING Moss Process. Photo Engraving Co., 62 Courtlandt St. New York.

Relief Plates for Book, Newspaper, Catalogue and Circular Illustrations Cheaper than Wood Cuts. The Scientific American uses our plates. Send stamp for Illustrated Circular.

LeCount's Patent MACHINIST'S TOOLS. Reduced Prices. Set Iron Dogs, 2 to 2 1/2 in. . . . \$1.50

Set Iron Dogs, 2 1/2 to 3 in. . . . \$2.00
Set Iron Dogs, 3 to 4 in. . . . \$2.50
Set Iron Dogs, 4 to 5 in. . . . \$3.00
Set Iron Dogs, 5 to 6 in. . . . \$3.50
Set Iron Dogs, 6 to 8 in. . . . \$4.00
Set Iron Dogs, 8 to 10 in. . . . \$4.50
Set Iron Dogs, 10 to 12 in. . . . \$5.00
Set Iron Dogs, 12 to 14 in. . . . \$5.50
Set Iron Dogs, 14 to 16 in. . . . \$6.00
Set Iron Dogs, 16 to 18 in. . . . \$6.50
Set Iron Dogs, 18 to 20 in. . . . \$7.00
Set Iron Dogs, 20 to 22 in. . . . \$7.50
Set Iron Dogs, 22 to 24 in. . . . \$8.00
Set Iron Dogs, 24 to 26 in. . . . \$8.50
Set Iron Dogs, 26 to 28 in. . . . \$9.00
Set Iron Dogs, 28 to 30 in. . . . \$9.50
Set Iron Dogs, 30 to 32 in. . . . \$10.00
Set Iron Dogs, 32 to 34 in. . . . \$10.50
Set Iron Dogs, 34 to 36 in. . . . \$11.00
Set Iron Dogs, 36 to 38 in. . . . \$11.50
Set Iron Dogs, 38 to 40 in. . . . \$12.00
Set Iron Dogs, 40 to 42 in. . . . \$12.50
Set Iron Dogs, 42 to 44 in. . . . \$13.00
Set Iron Dogs, 44 to 46 in. . . . \$13.50
Set Iron Dogs, 46 to 48 in. . . . \$14.00
Set Iron Dogs, 48 to 50 in. . . . \$14.50
Set Iron Dogs, 50 to 52 in. . . . \$15.00
Set Iron Dogs, 52 to 54 in. . . . \$15.50
Set Iron Dogs, 54 to 56 in. . . . \$16.00
Set Iron Dogs, 56 to 58 in. . . . \$16.50
Set Iron Dogs, 58 to 60 in. . . . \$17.00
Set Iron Dogs, 60 to 62 in. . . . \$17.50
Set Iron Dogs, 62 to 64 in. . . . \$18.00
Set Iron Dogs, 64 to 66 in. . . . \$18.50
Set Iron Dogs, 66 to 68 in. . . . \$19.00
Set Iron Dogs, 68 to 70 in. . . . \$19.50
Set Iron Dogs, 70 to 72 in. . . . \$20.00
Set Iron Dogs, 72 to 74 in. . . . \$20.50
Set Iron Dogs, 74 to 76 in. . . . \$21.00
Set Iron Dogs, 76 to 78 in. . . . \$21.50
Set Iron Dogs, 78 to 80 in. . . . \$22.00
Set Iron Dogs, 80 to 82 in. . . . \$22.50
Set Iron Dogs, 82 to 84 in. . . . \$23.00
Set Iron Dogs, 84 to 86 in. . . . \$23.50
Set Iron Dogs, 86 to 88 in. . . . \$24.00
Set Iron Dogs, 88 to 90 in. . . . \$24.50
Set Iron Dogs, 90 to 92 in. . . . \$25.00
Set Iron Dogs, 92 to 94 in. . . . \$25.50
Set Iron Dogs, 94 to 96 in. . . . \$26.00
Set Iron Dogs, 96 to 98 in. . . . \$26.50
Set Iron Dogs, 98 to 100 in. . . . \$27.00

IRON CASTINGS for Machinery, &c., made to order. Will contract to furnish quantities at very low prices. T. SHIVER & CO., 225 East 56th St., N. Y.

STENCIL DIES For cutting business Stencils, all sizes. Also complete outfits for cutting Stencils and any checks, with which young men are making from \$5 to \$20 a day. Send for Catalogue and samples to S. M. SPENCER, 117 Hanover St., Boston, Mass.

STILWELL'S Patent Lime Extracting HEATER AND FILTER Is indispensable to an Economical Use of Steam. Parties purchasing this heater are, by the late decision of the U. S. Court, assured of protection in its use. Beware of imitations. New Illustrated pamphlets free. STILWELL & BIERCE MFG CO., DAYTON, OHIO.

NEW PATENT CAR FOR INCLINED PLANES, conveniently arranged to carry Passengers and Vehicles at the same time. Descriptive Circular sent on application. Address J. EARNSHAW, Civil Engineer, N. W. Cor. 4th and Race Sts., Cincinnati, Ohio.

TWIST DRILL GRINDING MACHINES, EX- tending Boring Bars, Self-Feeding Hand Drills, Rotary Shapers, Planers, Drilling Machines. C. VANHAGEN & CO., makers of Improved Machine Tools, Phila.

FEUCHTWANGER & CO., Chemists, manufacture and import many rare chemical productions, Soluble Glass, Fluoric Acid, Nickel Salts, Marble Putty, Sulphides, all Metallic Oxides; keep Fluorspar, Felspar, Flint, and finest Silica; Manganese crystals, granulated, and powder of the highest grade. For sale at 150 Fulton Street, New York.

Stone Channeling OR Quarrying Machine, WARDWELL PATENT, FOR CUTTING STONE INTO VARIOUS SIZES AND DIMENSIONS IN ALL KINDS OF QUARRIES. STEAM STONE CUTTER CO., RUTLAND, VT. SOLE PROPRIETORS AND MANUFACTURERS.

Small Tools of all kinds; also GEAR WHEELS, parts of MODELS, and materials of all kinds. Castings of Small Lathes, Engines, Slide Rests, &c. Catalogues free. GOODNOW & WIGHTMAN, 25 Cornhill, Boston, Mass.

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACH & CO., 122 Canal St., New York. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

Book, WALTER ENGINE. Compact, Substantial, Economical, and Easily Managed. Guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, &c., with shipping boxing, at the low price of 3 Horse Power . . . \$252 00

4 1/2 " . . . 363 50
6 " Put on Cars at Springfield, Ohio. Address: JAS. LEFFEL & CO., Springfield, Ohio; or 100 Liberty St., New York City.

FOR SALE—In Danbury, Conn., near two R. R. Depots, a well established business and Manufactory, together with Engine, Boiler, and Machinery of every description, for manufacturing Sash, Doors, Blinds, Mouldings, Lumber Planing, Band and Circular Sawing, and Wood Turning. Business is of 20 years successful operation, and an unsurpassed country location. Buildings and land attached will be rented or sold with above, if desired. It is a rare opportunity to obtain a prosperous business on easy terms and good inducements. Those who want business and particulars will address D. STEVENS, Box 43, Danbury, Conn.

\$50 to \$10,000 Has been invested in Stock Privilege and paid 50 per cent. profit. "How to do it." A book on Wall Street, sent free. TUMBRIDGE & Co. Bankers, 3 Wall St., N. Y.

AGENTS WANTED. Men or women. \$34 a week. Profit furnished. Business pleasant and honorable with no risk. A 16 page circular and valuable Samples free. A postal card on which to send your address costs but one cent. Write at once to F. M. REED, 87th St., NEW YORK.

TELEGRAPH Extra inducements to learn. Address J. P. ARBUTHNOT, Sept., Cleveland, O.

AGENTS WANTED. Men or women. \$34 a week. Profit furnished. Business pleasant and honorable with no risk. A 16 page circular and valuable Samples free. A postal card on which to send your address costs but one cent. Write at once to F. M. REED, 87th St., NEW YORK.

PUNCHING AND DROP PRESSES. For the Best and Cheapest address THE STILLB & PARKER PRESS CO., MIDDLETOWN, CONN.

John Cooper Engine Mfg Co., MOUNT VERNON, OHIO, MANUFACTURERS OF FIRST CLASS STATIONARY ENGINES, 5 to 40 H. P., PORTABLE ENGINES, CIRCULAR SAW MILLS, STEAM BOILERS, ROTARY BOILERS, MILL AND FACTORY MACHINERY, &c. BUILD GRIST MILLS, guaranteeing 50 BARRELS FLOUR WITH ONE TON BEST COAL, or 50 BARRELS FLOUR WITH ONE CORD BEST WOOD; also, Engines to run on 2 lbs. coal per hour per indicated horse power. Send for circulars.

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

PILES Instant relief and sure cure. Trial box free F. W. PUTNAM, 35 East Broadway, N. Y.

A. S. GEAR, BOSTON, furnishes all kinds of Machinery & Mechanical Supplies at popular prices.

YALE IRON WORKS, New Haven, Conn., Builders of the YALE VERTICAL, the best and most Economical, either for land or marine use; also HORIZONTALS, with or without the Rider Cut-off. SPECIAL TOOLS made to order, all at prices that defy competition. Send for Circular.

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

PATENT Planing & Matching, and Molding Machines, Gray and Wood's Planers, Bedding Saw Arbors, and other wood-working machinery. S. A. WOOD'S MACHINE CO., 121 Liberty St., N. Y. Send for Circulars, etc. 161 Sudbury St., Boston.

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

THE FIRE on the Hearth Improved in appearance, convenience, and efficiency. Combines all the advantages of the Open Fire with those of the best Warm Air Furnaces. Adapted to the use of Coal, Coke, Wood, or Peat. Send for Circular to THE OPEN STOVE VENTILATING CO., 107 Fulton Street, New York.

TO ELECTRO-PLATERS. BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instructions for Gold, SILVER, or NICKEL PLATING. THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.

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

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

8,000 in Use! Blake's STEAM PUMPS for every possible duty. Send for Illustrated Catalogue. GEO. F. BLAKE MFG CO., 46 & 48 Liberty Street, New York, 50 and 52 South Canal St., Chicago, Ill.

Machinery of Improved Styles for making SHINGLES HEADING, AND STAVES Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars address TREVOR & CO., Lockport, N. Y.

GLASS MOULDS, for Fruit Jars, Lamps, Bottles, Ink Stands, etc., made by H. BROOKER 15 years Cor. WHITE and CENTRE STS., N. Y. For any thing new in glass, you will require a mould (or die). Every description of moulds for glass, rubber, zinc, etc. Send model or drawing. Inclose stamp.

IRON CASTINGS for Machinery, &c., made to order. Will contract to furnish quantities at very low prices. T. SHIVER & CO., 225 East 56th St., N. Y.

STENCIL DIES For cutting business Stencils, all sizes. Also complete outfits for cutting Stencils and any checks, with which young men are making from \$5 to \$20 a day. Send for Catalogue and samples to S. M. SPENCER, 117 Hanover St., Boston, Mass.

STILWELL'S Patent Lime Extracting HEATER AND FILTER Is indispensable to an Economical Use of Steam. Parties purchasing this heater are, by the late decision of the U. S. Court, assured of protection in its use. Beware of imitations. New Illustrated pamphlets free. STILWELL & BIERCE MFG CO., DAYTON, OHIO.

NEW PATENT CAR FOR INCLINED PLANES, conveniently arranged to carry Passengers and Vehicles at the same time. Descriptive Circular sent on application. Address J. EARNSHAW, Civil Engineer, N. W. Cor. 4th and Race Sts., Cincinnati, Ohio.

TWIST DRILL GRINDING MACHINES, EX- tending Boring Bars, Self-Feeding Hand Drills, Rotary Shapers, Planers, Drilling Machines. C. VANHAGEN & CO., makers of Improved Machine Tools, Phila.

FEUCHTWANGER & CO., Chemists, manufacture and import many rare chemical productions, Soluble Glass, Fluoric Acid, Nickel Salts, Marble Putty, Sulphides, all Metallic Oxides; keep Fluorspar, Felspar, Flint, and finest Silica; Manganese crystals, granulated, and powder of the highest grade. For sale at 150 Fulton Street, New York.

Stone Channeling OR Quarrying Machine, WARDWELL PATENT, FOR CUTTING STONE INTO VARIOUS SIZES AND DIMENSIONS IN ALL KINDS OF QUARRIES. STEAM STONE CUTTER CO., RUTLAND, VT. SOLE PROPRIETORS AND MANUFACTURERS.

Small Tools of all kinds; also GEAR WHEELS, parts of MODELS, and materials of all kinds. Castings of Small Lathes, Engines, Slide Rests, &c. Catalogues free. GOODNOW & WIGHTMAN, 25 Cornhill, Boston, Mass.

THE SCIENTIFIC AMERICAN

Circulation larger than that of all the weekly and monthly publications devoted to Science, Manufactures, Mechanics, Inventions, and Engineering combined, published on this Continent; therefore its value as an advertising medium cannot be over-estimated. It goes into all the machine and workshops in the country, and is taken at the principal libraries and reading rooms in the United States and Europe.

A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth \$3.75 per line to advertise in one of forty-five thousand.

We invite the attention of those who wish to make their business known, to the annexed rates:

Back Page, - - - \$1.00 a line
Inside Page, - - - .75 a line
Business and Personal, .50 a line

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

If you wish anything in the mechanical line, advertise or it in the SCIENTIFIC AMERICAN.

If you have patents or machinery to sell, advertise in the SCIENTIFIC AMERICAN.

Address the publishers.

Munn & Co.,

37 Park Row, New York.

Engine, Spindle, & Cylinder Oil. E. H. KELLOGG, 11 Cedar St., N. Y., manufactures the best. Established '58.

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

Diamond Solid Emery Wheels.
Prices—6 in. \$1.25; 8 in. \$2.25; 10 in. \$3.50; 12 in. \$5.00; 14 in. \$7.00; 16 in. \$9.00; 18 in. \$11.00; 20 in. \$13.00; 22 in. \$15.00; 24 in. \$17.00; 26 in. \$19.00; 28 in. \$21.00; 30 in. \$23.00; 32 in. \$25.00; 34 in. \$27.00; 36 in. \$29.00; 38 in. \$31.00; 40 in. \$33.00; 42 in. \$35.00; 44 in. \$37.00; 46 in. \$39.00; 48 in. \$41.00; 50 in. \$43.00; 52 in. \$45.00; 54 in. \$47.00; 56 in. \$49.00; 58 in. \$51.00; 60 in. \$53.00; 62 in. \$55.00; 64 in. \$57.00; 66 in. \$59.00; 68 in. \$61.00; 70 in. \$63.00; 72 in. \$65.00; 74 in. \$67.00; 76 in. \$69.00; 78 in. \$71.00; 80 in. \$73.00; 82 in. \$75.00; 84 in. \$77.00; 86 in. \$79.00; 88 in. \$81.00; 90 in. \$83.00; 92 in. \$85.00; 94 in. \$87.00; 96 in. \$89.00; 98 in. \$91.00; 100 in. \$93.00; 102 in. \$95.00; 104 in. \$97.00; 106 in. \$99.00; 108 in. \$101.00; 110 in. \$103.00; 112 in. \$105.00; 114 in. \$107.00; 116 in. \$109.00; 118 in. \$111.00; 120 in. \$113.00; 122 in. \$115.00; 124 in. \$117.00; 126 in. \$119.00; 128 in. \$121.00; 130 in. \$123.00; 132 in. \$125.00; 134 in. \$127.00; 136 in. \$129.00; 138 in. \$131.00; 140 in. \$133.00; 142 in. \$135.00; 144 in. \$137.00; 146 in. \$139.00; 148 in. \$141.00; 150 in. \$143.00; 152 in. \$145.00; 154 in. \$147.00; 156 in. \$149.00; 158 in. \$151.00; 160 in. \$153.00; 162 in. \$155.00; 164 in. \$157.00; 166 in. \$159.00; 168 in. \$161.00; 170 in. \$163.00; 172 in. \$165.00; 174 in. \$167.00; 176 in. \$169.00; 178 in. \$171.00; 180 in. \$173.00; 182 in. \$175.00; 184 in. \$177.00; 186 in. \$179.00; 188 in. \$181.00; 190 in. \$183.00; 192 in. \$185.00; 194 in. \$187.00; 196 in. \$189.00; 198 in. \$191.00; 200 in. \$193.00; 202 in. \$195.00; 204 in. \$197.00; 206 in. \$199.00; 208 in. \$201.00; 210 in. \$203.00; 212 in. \$205.00; 214 in. \$207.00; 216 in. \$209.00; 218 in. \$211.00; 220 in. \$213.00; 222 in. \$215.00; 224 in. \$217.00; 226 in. \$219.00; 228 in. \$221.00; 230 in. \$223.00; 232 in. \$225.00; 234 in. \$227.00; 236 in. \$229.00; 238 in. \$231.00; 240 in. \$233.00; 242 in. \$235.00; 244 in. \$237.00; 246 in. \$239.00; 248 in. \$241.00; 250 in. \$243.00; 252 in. \$245.00; 254 in. \$247.00; 256 in. \$249.00; 258 in. \$251.00; 260 in. \$253.00; 262 in. \$255.00; 264 in. \$257.00; 266 in. \$259.00; 268 in. \$261.00; 270 in. \$263.00; 272 in. \$265.00; 274 in. \$267.00; 276 in. \$269.00; 278 in. \$271.00; 280 in. \$273.00; 282 in. \$275.00; 284 in. \$277.00; 286 in. \$279.00; 288 in. \$281.00; 290 in. \$283.00; 292 in. \$285.00; 294 in. \$287.00; 296 in. \$289.00; 298 in. \$291.00; 300 in. \$293.00; 302 in. \$295.00; 304 in. \$297.00; 306 in. \$299.00; 308 in. \$301.00; 310 in. \$303.00; 312 in. \$305.00; 314 in. \$307.00; 316 in. \$309.00; 318 in. \$311.00; 320 in. \$313.00; 322 in. \$315.00; 324 in. \$317.00; 326 in. \$319.00; 328 in. \$321.00; 330 in. \$323.00; 332 in. \$325.00; 334 in. \$327.00; 336 in. \$329.00; 338 in. \$331.00; 340 in. \$333.00; 342 in. \$335.00; 344 in. \$337.00; 346 in. \$339.00; 348 in. \$341.00; 350 in. \$343.00; 352 in. \$345.00; 354 in. \$347.00; 356 in. \$349.00; 358 in. \$351.00; 360 in. \$353.00; 362 in. \$355.00; 364 in. \$357.00; 366 in. \$359.00; 368 in. \$361.00; 370 in. \$363.00; 372 in. \$365.00; 374 in. \$367.00; 376 in. \$369.00; 378 in. \$371.00; 380 in. \$373.00; 382 in. \$375.00; 384 in. \$377.00; 386 in. \$379.00; 388 in. \$381.00; 390 in. \$383.00; 392 in. \$385.00; 394 in. \$387.00; 396 in. \$389.00; 398 in. \$391.00; 400 in. \$393.00; 402 in. \$395.00; 404 in. \$397.00; 406 in. \$399.00; 408 in. \$401.00; 410 in. \$403.00; 412 in. \$405.00; 414 in. \$407.00; 416 in. \$409.00; 418 in. \$411.00; 420 in. \$413.00; 422 in. \$415.00; 424 in. \$417.00; 426 in. \$419.00; 428 in. \$421.00; 430 in. \$423.00; 432 in. \$425.00; 434 in. \$427.00; 436 in. \$429.00; 438 in. \$431.00; 440 in. \$433.00; 442 in. \$435.00; 444 in. \$437.00; 446 in. \$439.00; 448 in. \$441.00; 450 in. \$443.00; 452 in. \$445.00; 454 in. \$447.00; 456 in. \$449.00; 458 in. \$451.00; 460 in. \$453.00; 462 in. \$455.00; 464 in. \$457.00; 466 in. \$459.00; 468 in. \$461.00; 470 in. \$463.00; 472 in. \$465.00; 474 in. \$467.00; 476 in. \$469.00; 478 in. \$471.00; 480 in. \$473.00; 482 in. \$475.00; 484 in. \$477.00; 486 in. \$479.00; 488 in. \$481.00; 490 in. \$483.00; 492 in. \$485.00; 494 in. \$487.00; 496 in. \$489.00; 498 in. \$491.00; 500 in. \$493.00; 502 in. \$495.00; 504 in. \$497.00; 506 in. \$499.00; 508 in. \$501.00; 510 in. \$503.00; 512 in. \$505.00; 514 in. \$507.00; 516 in. \$509.00; 518 in. \$511.00; 520 in. \$513.00; 522 in. \$515.00; 524 in. \$517.00; 526 in. \$519.00; 528 in. \$521.00; 530 in. \$523.00; 532 in. \$525.00; 534 in. \$527.00; 536 in. \$529.00; 538 in. \$531.00; 540 in. \$533.00; 542 in. \$535.00; 544 in. \$537.00; 546 in. \$539.00; 548 in. \$541.00; 550 in. \$543.00; 552 in. \$545.00; 554 in. \$547.00; 556 in. \$549.00; 558 in. \$551.00; 560 in. \$553.00; 562 in. \$555.00; 564 in. \$557.00; 566 in. \$559.00; 568 in. \$561.00; 570 in. \$563.00; 572 in. \$565.00; 574 in. \$567.00; 576 in. \$569.00; 578 in. \$571.00; 580 in. \$573.00; 582 in. \$575.00; 584 in. \$577.00; 586 in. \$579.00; 588 in. \$581.00; 590 in. \$583.00; 592 in. \$585.00; 594 in. \$587.00; 596 in. \$589.00; 598 in. \$591.00; 600 in. \$593.00; 602 in. \$595.00; 604 in. \$597.00; 606 in. \$599.00; 608 in. \$601.00; 610 in. \$603.00; 612 in. \$605.00; 614 in. \$607.00; 616 in. \$609.00; 618 in. \$611.00; 620 in. \$613.00; 622 in. \$615.00; 624 in. \$617.00; 626 in. \$619.00; 628 in. \$621.00; 630 in. \$623.00; 632 in. \$625.00; 634 in. \$627.00; 636 in. \$629.00; 638 in. \$631.00; 640 in. \$633.00; 642 in. \$635.00; 644 in. \$637.00; 646 in. \$639.00; 648 in. \$641.00; 650 in. \$643.00; 652 in. \$645.00; 654 in. \$647.00; 656 in. \$649.00; 658 in. \$651.00; 660 in. \$653.00; 662 in. \$655.00; 664 in. \$657.00; 666 in. \$659.00; 668 in. \$661.00; 670 in. \$663.00; 672 in. \$665.00; 674 in. \$667.00; 676 in. \$669.00; 678 in. \$671.00; 680 in. \$673.00; 682 in. \$675.00; 684 in. \$677.00; 686 in. \$679.00; 688 in. \$681.00; 690 in. \$683.00; 692 in. \$685.00; 694 in. \$687.00; 696 in. \$689.00; 698 in. \$691.00; 700 in. \$693.00; 702 in. \$695.00; 704 in. \$697.00; 706 in. \$699.00; 708 in. \$701.00; 710 in. \$703.00; 712 in. \$705.00; 714 in. \$707.00; 716 in. \$709.00; 718 in. \$711.00; 720 in. \$713.00; 722 in. \$715.00; 724 in. \$717.00; 726 in. \$719.00; 728 in. \$721.00; 730 in. \$723.00; 732 in. \$725.00; 734 in. \$727.00; 736 in. \$729.00; 738 in. \$731.00; 740 in. \$733.00; 742 in. \$735.00; 744 in. \$737.00; 746 in. \$739.00; 748 in. \$741.00; 750 in. \$743.00; 752 in. \$745.00; 754 in. \$747.00; 756 in. \$749.00; 758 in. \$751.00; 760 in. \$753.00; 762 in. \$755.00; 764 in. \$757.00; 766 in. \$759.00; 768 in. \$761.00; 770 in. \$763.00; 772 in. \$765.00; 774 in. \$767.00; 776 in. \$769.00; 778 in. \$771.00; 780 in. \$773.00; 782 in. \$775.00; 784 in. \$777.00; 786 in. \$779.00; 788 in. \$781.00; 790 in. \$783.00; 792 in. \$785.00; 794 in. \$787.00; 796 in. \$789.00; 798 in. \$791.00; 800 in. \$793.00; 802 in. \$795.00; 804 in. \$797.00; 806 in. \$799.00; 808 in. \$801.00; 810 in. \$803.00; 812 in. \$805.00; 814 in. \$807.00; 816 in. \$809.00; 818 in. \$811.00; 820 in. \$813.00; 822 in. \$815.00; 824 in. \$817.00; 826 in. \$819.00; 828 in. \$821.00; 830 in. \$823.00; 832 in. \$825.00; 834 in. \$827.00; 836 in. \$829.00; 838 in. \$831.00; 840 in. \$833.00; 842 in. \$835.00; 844 in. \$837.00; 846 in. \$839.00; 848 in. \$841.00; 850 in. \$843.00; 852 in. \$845.00; 854 in. \$847.00; 856 in. \$849.00; 858 in. \$851.00; 860 in. \$853.00; 862 in. \$855.00; 864 in. \$857.00; 866 in. \$859.00; 868 in. \$861.00; 870 in. \$863.00; 872 in. \$865.00; 874 in. \$867.00; 876 in. \$869.00; 878 in. \$871.00; 880 in. \$873.00; 882 in. \$875.00; 884 in. \$877.00; 886 in. \$879.00; 888 in. \$881.00; 890 in. \$883.00; 892 in. \$885.00; 894 in. \$887.00; 896 in. \$889.00; 898 in. \$891.00; 900 in. \$893.00; 902 in. \$895.00; 904 in. \$897.00; 906 in. \$899.00; 908 in. \$901.00; 910 in. \$903.00; 912 in. \$905.00; 914 in. \$907.00; 916 in. \$909.00; 918 in. \$911.00; 920 in. \$913.00; 922 in. \$915.00; 924 in. \$917.00; 926 in. \$919.00; 928 in. \$921.00; 930 in. \$923.00; 932 in. \$925.00; 934 in. \$927.00; 936 in. \$929.00; 938 in. \$931.00; 940 in. \$933.00; 942 in. \$935.00; 944 in. \$937.00; 946 in. \$939.00; 948 in. \$941.00; 950 in. \$943.00; 952 in. \$945.00; 954 in. \$947.00; 956 in. \$949.00; 958 in. \$951.00; 960 in. \$953.00; 962 in. \$955.00; 964 in. \$957.00; 966 in. \$959.00; 968 in. \$961.00; 970 in. \$963.00; 972 in. \$965.00; 974 in. \$967.00; 976 in. \$969.00; 978 in. \$971.00; 980 in. \$973.00; 982 in. \$975.00; 984 in. \$977.00; 986 in. \$979.00; 988 in. \$981.00; 990 in. \$983.00; 992 in. \$985.00; 994 in. \$987.00; 996 in. \$989.00; 998 in. \$991.00; 1000 in. \$993.00; 1002 in. \$995.00; 1004 in. \$997.00; 1006 in. \$999.00; 1008 in. \$1001.00; 1010 in. \$1003.00; 1012 in. \$1005.00; 1014 in. \$1007.00; 1016 in. \$1009.00; 1018 in. \$1011.00; 1020 in. \$1013.00; 1022 in. \$1015.00; 1024 in. \$1017.00; 1026 in. \$1019.00; 1028 in. \$1021.00; 1030 in. \$1023.00; 1032 in. \$1025.00; 1034 in. \$1027.00; 1036 in. \$1029.00; 1038 in. \$1031.00; 1040 in. \$1033.00; 1042 in. \$1035.00; 1044 in. \$1037.00; 1046 in. \$1039.00; 1048 in. \$1041.00; 1050 in. \$1043.00; 1052 in. \$1045.00; 1054 in. \$1047.00; 1056 in. \$1049.00; 1058 in. \$1051.00; 1060 in. \$1053.00; 1062 in. \$1055.00; 1064 in. \$1057.00; 1066 in. \$1059.00; 1068 in. \$1061.00; 1070 in. \$1063.00; 1072 in. \$1065.00; 1074 in. \$1067.00; 1076 in. \$1069.00; 1078 in. \$1071.00; 1080 in. \$1073.00; 1082 in. \$1075.00; 1084 in. \$1077.00; 1086 in. \$1079.00; 1088 in. \$1081.00; 1090 in. \$1083.00; 1092 in. \$1085.00; 1094 in. \$1087.00; 1096 in. \$1089.00; 1098 in. \$1091.00; 1100 in. \$1093.00; 1102 in. \$1095.00; 1104 in. \$1097.00; 1106 in. \$1099.00; 1108 in. \$1101.00; 1110 in. \$1103.00; 1112 in. \$1105.00; 1114 in. \$1107.00; 1116 in. \$1109.00; 1118 in. \$1111.00; 1120 in. \$1113.00; 1122 in. \$1115.00; 1124 in. \$1117.00; 1126 in. \$1119.00; 1128 in. \$1121.00; 1130 in. \$1123.00; 1132 in. \$1125.00; 1134 in. \$1127.00; 1136 in. \$1129.00; 1138 in. \$1131.00; 1140 in. \$1133.00; 1142 in. \$1135.00; 1144 in. \$1137.00; 1146 in. \$1139.00; 1148 in. \$1141.00; 1150 in. \$1143.00; 1152 in. \$1145.00; 1154 in. \$1147.00; 1156 in. \$1149.00; 1158 in. \$1151.00; 1160 in. \$1153.00; 1162 in. \$1155.00; 1164 in. \$1157.00; 1166 in. \$1159.00; 1168 in. \$1161.00; 1170 in. \$1163.00; 1172 in. \$1165.00; 1174 in. \$1167.00; 1176 in. \$1169.00; 1178 in. \$1171.00; 1180 in. \$1173.00; 1182 in. \$1175.00; 1184 in. \$1177.00; 1186 in. \$1179.00; 1188 in. \$1181.00; 1190 in. \$1183.00; 1192 in. \$1185.00; 1194 in. \$1187.00; 1196 in. \$1189.00; 1198 in. \$1191.00; 1200 in. \$1193.00; 1202 in. \$1195.00; 1204 in. \$1197.00; 1206 in. \$1199.00; 1208 in. \$1201.00; 1210 in. \$1203.00; 1212 in. \$1205.00; 1214 in. \$1207.00; 1216 in. \$1209.00; 1218 in. \$1211.00; 1220 in. \$1213.00; 1222 in. \$1215.00; 1224 in. \$1217.00; 1226 in. \$1219.00; 1228 in. \$1221.00; 1230 in. \$1223.00; 1232 in. \$1225.00; 1234 in. \$1227.00; 1236 in. \$1229.00; 1238 in. \$1231.00; 1240 in. \$1233.00; 1242 in. \$1235.00; 1244 in. \$1237.00; 1246 in. \$1239.00; 1248 in. \$1241.00; 1250 in. \$1243.00; 1252 in. \$1245.00; 1254 in. \$1247.00; 1256 in. \$1249.00; 1258 in. \$1251.00; 1260 in. \$1253.00; 1262 in. \$1255.00; 1264 in. \$1257.00; 1266 in. \$1259.00; 1268 in. \$1261.00; 1270 in. \$1263.00; 1272 in. \$1265.00; 1274 in. \$1267.00; 1276 in. \$1269.00; 1278 in. \$1271.00; 1280 in. \$1273.00; 1282 in. \$1275.00; 1284 in. \$1277.00; 1286 in. \$1279.00; 1288 in. \$1281.00; 1290 in. \$1283.00; 1292 in. \$1285.00; 1294 in. \$1287.00; 1296 in. \$1289.00; 1298 in. \$1291.00; 1300 in. \$1293.00; 1302 in. \$1295.00; 1304 in. \$1297.00; 1306 in. \$1299.00; 1308 in. \$1301.00; 1310 in. \$1303.00; 1312 in. \$1305.00; 1314 in. \$1307.00; 1316 in. \$1309.00; 1318 in. \$1311.00; 1320 in. \$1313.00; 1322 in. \$1315.00; 1324 in. \$1317.00; 1326 in. \$1319.00; 1328 in. \$1321.00; 1330 in. \$1323.00; 1332 in. \$1325.00; 1334 in. \$1327.00; 1336 in. \$1329.00; 1338 in. \$1331.00; 1340 in. \$1333.00; 1342 in. \$1335.00; 1344 in. \$1337.00; 1346 in. \$1339.00; 1348 in. \$1341.00; 1350 in. \$1343.00; 1352 in. \$1345.00; 1354 in. \$1347.00; 1356 in. \$1349.00; 1358 in. \$1351.00; 1360 in. \$1353.00; 1362 in. \$1355.00; 1364 in. \$1357.00; 1366 in. \$1359.00; 1368 in. \$1361.00; 1370 in. \$1363.00; 1372 in. \$1365.00; 1374 in. \$1367.00; 1376 in. \$1369.00; 1378 in. \$1371.00; 1380 in. \$1373.00; 1382 in. \$1375.00; 1384 in. \$1377.00; 1386 in. \$1379.00; 1388 in. \$1381.00; 1390 in. \$1383.00; 1392 in. \$1385.00; 1394 in. \$1387.00; 1396 in. \$1389.00; 1398 in. \$1391.00; 1400 in. \$1393.00; 1402 in. \$1395.00; 1404 in. \$1397.00; 1406 in. \$1399.00; 1408 in. \$1401.00; 1410 in. \$1403.00; 1412 in. \$1405.00; 1414 in. \$1407.00; 1416 in. \$1409.00; 1418 in. \$1411.00; 1420 in. \$1413.00; 1422 in. \$1415.00; 1424 in. \$1417.00; 1426 in. \$1419.00; 1428 in. \$1421.00; 1430 in. \$1423.00; 1432 in. \$1425.00; 1434 in. \$1427.00; 1436 in. \$1429.00; 1438 in. \$1431.00; 1440 in. \$1433.00; 1442 in. \$1435.00; 1444 in. \$1437.00; 1446 in. \$1439.00; 1448 in. \$1441.00; 1450 in. \$1443.00; 1452 in. \$1445.00; 1454 in. \$1447.00; 1456 in. \$1449.00; 1458 in. \$1451.00; 1460 in. \$1453.00; 1462 in. \$1455.00; 1464 in. \$1457.00; 1466 in. \$1459.00; 1468 in. \$1461.00; 1470 in. \$1463.00; 1472 in. \$1465.00; 1474 in. \$1467.00; 1476 in. \$1469.00; 1478 in. \$1471.00; 1480 in. \$1473.00; 1482 in. \$1475.00; 1484 in. \$1477.00; 1486 in. \$1479.00; 1488 in. \$1481.00; 1490 in. \$1483.00; 1492 in. \$1485.00; 1494 in. \$1487.00; 1496 in. \$1489.00; 1498 in. \$1491.00; 1500 in. \$1493.00; 1502 in. \$1495.00; 1504 in. \$1497.00; 1506 in. \$1499.00; 1508 in. \$1501.00; 1510 in. \$1503.00; 1512 in. \$1505.00; 1514 in. \$1507.00; 1516 in. \$1509.00; 1518 in. \$1511.00; 1520 in. \$1513.00; 1522 in. \$1515.00; 1524 in. \$1517.00; 1526 in. \$1519.00; 1528 in. \$1521.00; 1530 in. \$1523.00; 1532 in. \$1525.00; 1534 in. \$1527.00; 1536 in. \$1529.00; 1538 in. \$1531.00; 1540 in. \$1533.00; 1542 in. \$1535.00; 1544 in. \$1537.00; 1546 in. \$1539.00; 1548 in. \$1541.00; 1550 in. \$1543.00; 1552 in. \$1545.00; 1554 in. \$1547.00; 1556 in. \$1549.00; 1558 in. \$1551.00; 1560 in. \$1553.00; 1562 in. \$1555.00; 1564 in. \$1557.00; 1566 in. \$1559.00; 1568 in. \$1561.00; 1570 in. \$1563.00; 1572 in. \$1565.00; 1574 in. \$156

SCIENTIFIC AMERICAN

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

Vol. XXXIII.—No. 8.
[NEW SERIES.]

NEW YORK, AUGUST 21, 1875.

\$3.20 per Annum,
[POSTAGE PREPAID.]

HELL GATE IMPROVEMENT.

During the last twelve months, the work of excavating the rock which forms the great obstruction to entering the East River by way of Long Island Sound has been progressing steadily, but very slowly, on account of an unwise delay on the part of Congress in furnishing the necessary funds. The interest on the money already expended on this important operation amounts to a large sum annually, and hindering the progress of the work, by only doing small sums in a niggardly and parsimonious manner, is surely unwise, and ultimately will be expensive. However, the carrying out of the work, under the able superintendence of General Newton, leaves little to be desired; and as public interest in the matter has been in no way diminished by the delay, a short description of the work will be acceptable to our readers.

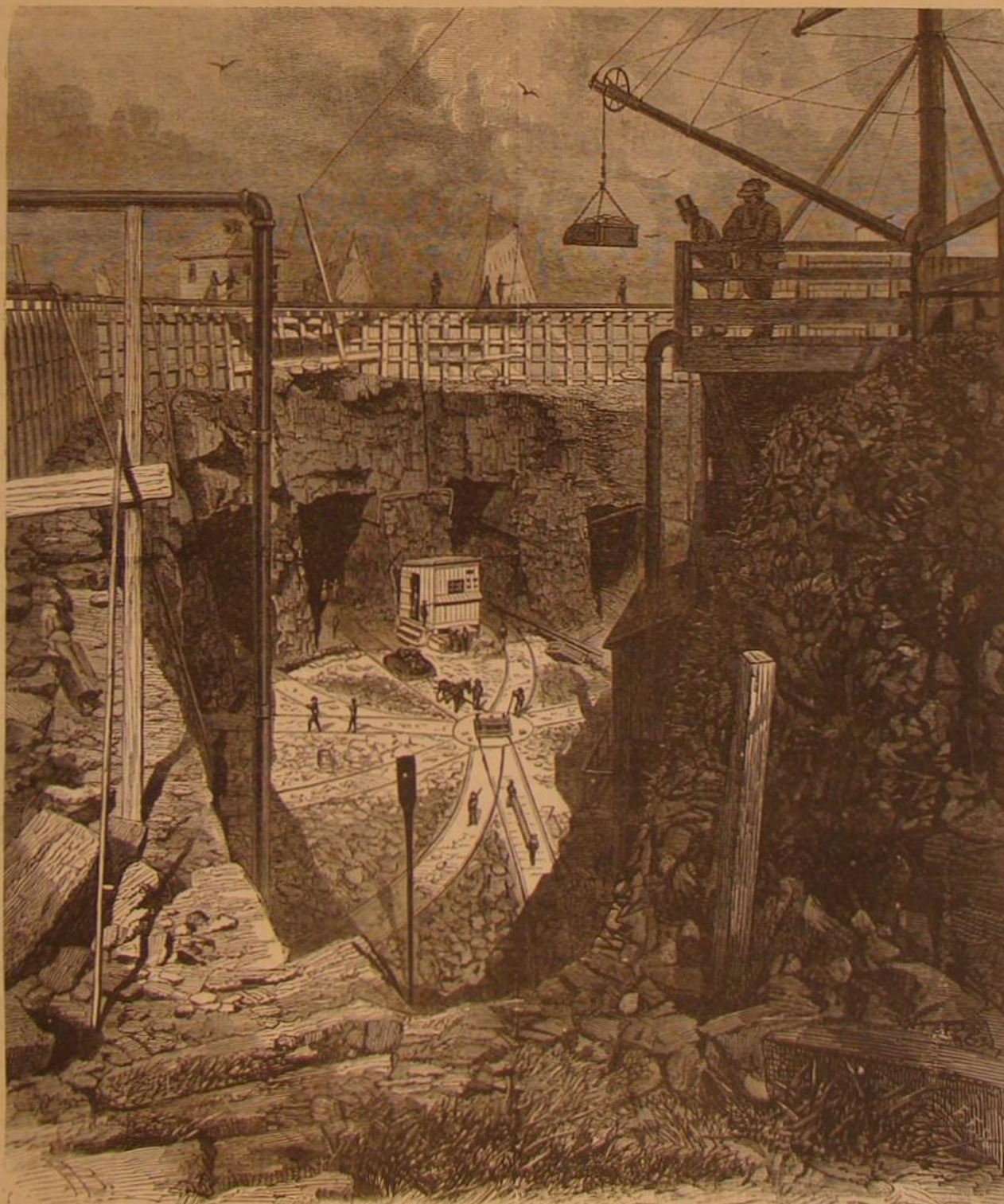
The large central shaft, shown in our larger illustration, has been sunk at the extreme edge of Hallett's Point, the rocks of which are bare at low water. The hole is 32 feet deep, and is surrounded by a coffer dam, on the parapet of which persons are shown walking. From this shaft, ten headings or tunnels radiate, under the rock which it is proposed to remove, and these are connected by galleries, circular in form and concentric with the center of the shaft. From these headings and galleries, twenty-eight smaller headings have been driven, and altogether the immense area of twenty-two and a half acres have been undermined, a mile and a half of tunneling having been executed.

To perform this labor in safety, of course the superincumbent rock must be in no danger of falling; and to ascertain its thickness all over the area, soundings at a distance of one foot only from each other have been made all over the rock that is to be removed. Twenty-two thousand times has the lead been sunk in this work; and in places where shale was met with, the sounding instrument was driven through to the bed rock by boring.

The consumption of blasting materials has been very large. Nitro-glycerin has been much used, but latterly vulcan powder, made by mixing 30



VIEW OF HELL GATE FROM TOP OF COFFER DAM.



THE HELL GATE SUBMARINE OPERATIONS

parts nitro-glycerin with 70 parts gunpowder, has been employed. Explosives equivalent to 100,000 lbs. nitro-glycerin have already been consumed. For the final burst, which is to rend asunder all the columns and walls of rock between the tunnels, and let the roof fall, 40,000 lbs. nitro-glycerin, it is said, will be required.

It is expected that the work will be completed, and the channel open to vessels drawing 26 feet of water, by August 1, 1876.

Remarkable Effects of Arctic Cold on Man.

Lieutenant Payer, the Austrian arctic explorer, has been laying some of the results of his explorations before the Geographical Society of Vienna. Referring to the influence of extreme cold on the human organism, he related that on March 14, 1874, he and his companions made a sledge journey over the Semiklar glacier, in order to make observations of Francis Joseph Land. On that day the cold marked 58° Fah. below zero. Notwithstanding this intense cold, M. Payer and a Tyrolean went out before sunrise to make observations and sketch.

The sunrise was magnificent; the sun appeared surrounded, as it does at a high degree of cold, by small suns, and its light appeared more dazzling from the contrast with the extreme cold.

The travelers were obliged to pour rum down their throats so as not to touch the edge of the metal cups, which would have been as dangerous as if they had been red hot; but the rum had lost all its strength and liquidity, and was as flat and thick as oil.

It was impossible to smoke either cigars or tobacco in short pipes, for very soon nothing but a piece of ice remained in the mouth.

The metal of the instruments was just like red hot iron to the touch, as were some lockets, which some of the travelers, romantically, but imprudently, continued to wear next the skin.

M. Payer says that so great an amount of cold paralyzes the will, and that, under its influence, men, from the unsteadiness of their gait, their stammering talk, and the slowness of their mental operations, seem as if they were intoxicated.

Another effect of cold

is a tormenting thirst, which is due to the evaporation of the moisture of the body.

It is unwholesome to use snow to quench the thirst; it brings on inflammation of the throat, palate, and tongue. Besides, enough can never be taken to quench the thirst, as a temperature of 35° to 58° below zero Fah. makes it taste like molten metal. Snow eaters in the North are considered as feeble and effeminate, in the same way as is an opium eater in the East.

The group of travelers who traversed the snow fields were surrounded by thick vapors formed by the emanations from their bodies, which became condensed, notwithstanding the furs in which the travelers were enveloped. These vapors fell to the ground, with a slight noise, frozen into the form of small crystals, and rendered the atmosphere thick, impenetrable, and dark.

Notwithstanding the humidity of the air, a disagreeable sensation of dryness was felt.

Every sound diffused itself to a very long distance, an ordinary conversation could be heard at a hundred paces off, while the report of guns from the tops of high mountains could scarcely be heard. M. Payer explains this phenomenon by the large quantity of moisture in the arctic atmosphere.

Meat could be chopped, and mercury used in the shape of balls.

Both smell and taste become greatly enfeebled in these latitudes; strength gives way under the paralyzing influence of the cold; the eyes involuntarily close and become frozen.

When locomotion stops, the sole of the foot becomes insensible.

It is somewhat curious that the beard does freeze; but this is explained from the air expired, falling, being immediately transformed into snow. The cold causes dark beards to become lighter; the secretion of the eyes and nose always increases, while the formation of the perspiration altogether ceases.

The only possible protection against the cold is to be very warmly clothed, and to endeavor as much as possible to prevent the condensation of the atmosphere, while the much vaunted plans of anointing and blackening the body are pronounced to have no real value.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS.

One copy, one year, postage included.....\$3 20
One copy, six months, postage included..... 1 60

Club Rates:

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

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

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

VOLUME XXXIII, No. 8. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, AUGUST 21, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

Air, pressure and heat of (14).....	125
Answers to correspondents.....	124
Ants in trees (21).....	125
Architecture, studying (3).....	125
Bale tie, improved.....	125
Battery acid liquor (4).....	125
Battery cells, joining up.....	125
Bells, double and single (20).....	125
Bilge pump, steam jet.....	125
Boiler explosions, commission on.....	125
Bone black, making (2).....	125
Boric acid, tempered.....	125
Bottle stoppers, removing (1).....	125
Bridge building, new system of.....	125
Bridge, the St. Louis.....	125
Business and personal.....	125
Cattle, queer.....	125
Coffee plague in Ceylon, the.....	125
Cold, arctic, effects of.....	125
Drilling in the lake.....	125
Dyeing leather.....	125
Electric fan machines.....	125
Engines and boilers, small (12).....	125
Fire-fly, the chemical.....	125
Flow clamp, improved.....	125
Flying machinery, progress of.....	125
Friction, velocity, progress of (11).....	125
Fuel, a new source of, etc.....	125
Gliding, progress of.....	125
Half round bit.....	125
Hill gate, improvement, the.....	125
Hygrometer, a new.....	125
Igniting explosives (9).....	125
Induction coil, the.....	125
Inventors' convention, etc. (5).....	125
Magnetic locomotives.....	125
Metal, inoxidizable white.....	125
Milidams, proportions of (19).....	125
Moths, the current and raspberry.....	125
Nature, the uses of.....	125
Nitrification of earth, the.....	125
Oak stain.....	125
Ocean level, constancy of the.....	125
Ordinance, American.....	125
Paper plants.....	125
Patented car improvements.....	125
Patents, American and foreign.....	125
Patents, list of Canadian.....	125
Patents, official list of.....	125
Patents, the Commissionership of.....	125
Perspiration (4).....	125
Phonometer, the.....	125
Phosphorus, oxygen an antidote for.....	125
Potato bug, the Colorado.....	125
Practical mechanism—No. 20.....	125
Protosulphide of carbon, the.....	125
Reaping and mowing machinery.....	125
Recipes, useful.....	125
Refrigerator, the Fisher.....	125
Russian metal industries.....	125
Screws, drawing tight.....	125
Shingles, preserving (17).....	125
Silk harvest of the world.....	125
Sugar-cutting machinery, new.....	125
Telegraph pole, new.....	125
Tides in the Gulf of Mexico.....	125
Trees, great, in California.....	125
Vise, sudden grip.....	125
Water, raising, by ejector (16).....	125
White lead, discoloration of (13).....	125

THE USES OF NATURE.

Nature has kindly filled the world with attractions which are rich enough to suit the tastes of the most fastidious, and varied enough to gratify the wishes and supply the wants of all. These were made for those who need them and would be benefited by them; and it is but justice to such to protest against the practices of those who monopolize the places of popular resort, and uses them only for the sake of personal gain.

At Niagara, for instance, not one of Nature's wonders, that is capable of being concealed can begin to attract attention,

before man's cupidity closes it from view, or obstructs the way to it and says: "You can't see Nature's exhibition till you pay me for it." So at Natural Bridge, a grasping individual has built a high, close fence around all the places that command a good view of that grand structure, and he must be paid before the benevolence of the God of Nature can be enjoyed. At every eligible locality on the sea beach, at mineral springs, on mountain peaks, hotels are erected and the appearance of the place is modernized till men have destroyed, as far as in them lies, the primitive beauty and wild grandeur of Nature. But the places are made attractive and convenient for visitors, and should not be too severely criticised.

All these instructive and ennobling works of Nature are so manifestly designed for the free benefit of all that no man can appropriate them to private use, to the exclusion of others, without doing a gross injustice to the rest of mankind. The spirit that leads men to such perversion of the gifts of Nature would prompt them to shut up, if they could, the sun which dispenses light, warmth, and vitality to rich and poor alike, the gorgeous beauty of the sunset, the flowers, and the fields, the grandeur of the ocean and its tributaries; and dole them out, by careful measure, only to those who would pay the price which selfishness and avarice had set upon them. We can look upon and enjoy a neighbor's finely proportioned horse, the skillful architecture of his house, the taste displayed in beautifying his grounds, his rich and waving fields of grain and grass, his trees laden with foliage and fruit, and he never thinks of charging us for the delicious pleasure we have received. He would consider it an insult if we should offer to pay him. But by his own skill and toil he has afforded us happiness, and therefore benefit, and would have the right, if the disposition prompted, to receive pay for the benefit given. But what right has any man to extort money from those who enjoy the free beauties of Nature, when he has expended nothing to make those beauties, and when the enjoyment which they give to others does not harm or discommode him? What is it but the very quintessence of smallness and meanness, an abomination in the sight of God and man?

In most pleasing contrast to the devices of those grasping moneymakers at Nature's expense, appear the parks, museums, horticultural and botanical gardens, where Nature, by the skillful and painstaking hand of benevolence, is displayed in all her beauty and instructiveness. And do not those who thus adorn and cultivate Nature to instruct and bless mankind, receive, after all, the richest reward—the most lucrative pay? Is not Shaw, of St. Louis, worthy of all honor for generously opening, free to one and all, and keeping in order at enormous private expense, his gardens, rich in the vegetation of all climes? Will not the great American Museum of Natural History, in the Central Park, when completed, be one of the grandest benevolent institutions ever established? It is doubtless true that the lamented Agassiz, by his enthusiasm in studying and teaching Nature, and by creating popular interest in her revelations, has added greatly to the pleasure and profit of those who spend their vacations at some of the attractive summer haunts. And if any one could justly demand pay for enhancing the delights which Nature affords, it would be he. But instead of that, he spent his fortune and his vigorous life in building up one of the grandest museums in the world, and has thrown open its doors free to every one, whether he wish to spend a pleasant hour or to study for years. And when, on one occasion, he was offered a rare opportunity to make a small fortune, he replied: "Gentlemen, I have no time to make money."

It is possible for an enterprise to pay a large dividend, and yet return but little money to its originator; and it would be well if the world could learn that money is not the only thing worth living and laboring for. It is too true that, by the great majority of mankind, the money maker, if he succeeds, is envied and respected more than he who gives his life to the study of Nature, and reveals her wealth of mystery and beauty to his fellow men. This is emphatically a utilitarian age. Its all-absorbing question is: "Does it pay?" And while this, in its broad sense, is one of the wisest queries a responsible being can make, in its restricted sense it is one of the most shortsighted. One collecting natural history specimens is always sure to attract, more or less, the attention of the curious; and their first questions will be: "Are you hunting for gold?" and: "Can you make much at that business?" And on being answered in the negative (which is correct only with their conceptions), there is always certain to follow an ominous silence, when the interrogator is absorbed in deep thought, and—probably for the first time in his life—is seriously moralizing; and the substance of his cogitations, when plainly interpreted, is just about this: "That man must be a fool to spend so much time, and work so hard, for nothing but pieces of broken rock, and insects, and shells, and flowers, just what we should expect a child to be pleased with." Just in point here is an amusing story told of Professor Agassiz. While driving along the road one day, he saw a choice natural history specimen; and calling a boy to hold his horse, he was off, over the fences, through the fields, and into the bushes to capture it. A man passing asked the youth whose horse he was holding. "I don't know," said the lad, "only he is a crazy Dutchman who has run off out of sight after a butterfly."

Most of the great scientific achievements of the world have been simply labors of love; and many a scientist has made an invention or a discovery that would bring him a fortune if he were to patent it; but he declines to use it for any other purpose than to advance the cause of Science. The world is made richer and happier, and his sufficient reward is the consciousness of the good done, and the credit of doing it.

THE UNITED STATES COMMISSION ON BOILER EXPLOSIONS.

The death of the late distinguished Professor Winlock has left vacant the chairmanship of the Commission on Steam Boiler Explosions. This vacancy will probably be filled by the appointment of President F. A. P. Barnard, LL.D., of Columbia College, New York city. The previous announcement of the appointment was premature, but it has now been made by the Secretary of the Treasury, and is expected to have been confirmed by the Secretary of the Navy, who, with the former, constitutes the appointing power. President Barnard has long been known as one of the ablest and most distinguished of those few scientific men who have always been interested in the practical applications of Science, and he will here have one of the noblest fields, in which to exercise his talents and make his scientific attainments practically useful, that could be offered.

The country is to be congratulated that the two cabinet officers making this appointment, Messrs. Bristow and Robeson, have made so excellent a choice. We know of no man in our own country or in Europe better fitted by scientific attainments, by an acknowledged position among the leading men of his class, by official position, age, and experience, for this position. Those of the readers of the SCIENTIFIC AMERICAN who desire to know something of the methods by which scientific knowledge can be made practically available may find pleasure and profit in the study of Dr. Barnard's report "On the Machinery and the Industrial Processes Illustrated at the Paris Exhibition of 1867."

The Commission now consists of President F. A. P. Barnard, Columbia College, Chairman; Professor R. H. Thurston, Stevens Institute of Technology; Messrs. C. W. Copeland (New York city), J. R. Robinson (Boston), and I. Holmes (Mount Vernon, Ohio).

The commissioners are at work, and we shall hope that much good may be done by them in the dissipation of some of the superstitions beclouding the subject in the minds of many, even among professional and practical engineers, in spreading abroad a knowledge of already ascertained facts, and in the acquirement of some additional knowledge. In the latter direction, they can be probably effectively aided by other men of Science, and by such experienced practical men as are numbered by hundreds among our readers.

QUEER CATTLE.

This is a prolific year for insect pests, and among those that have thriven remarkably well are the aphides, or plant lice. In some parts of New England, we have seen the foliage of fruit and other trees almost completely destroyed by them, to the great injury if not the total ruin of the fruit; and we have been told that in other localities the orchards have a sere and yellow look as though scorched by fire. Unroll a bunch of the curled-up leaves, and, if they are not wholly dead and dry, you will find the inner under sides of the leaves swarming with lice.

They are insignificant looking creatures, yet they are among the most interesting and most extraordinary of insects. The injuries caused by them are enormous, and their natural history is remarkable in the highest degree. Their generic name *aphis* describes their character; it is from a Greek word, signifying to exhaust. In their wingless state, their appearance is familiar to every one who has ever had anything to do with plants. Their bodies are short, oval, soft, and are furnished at the hinder end with two tubes for the passage of a sweet fluid secreted from the stomach. (It is this honey dew, as it is called, which causes certain ants to domesticate them, as we do cattle.) Their heads are small, and armed with a long, tubular, three-jointed beak, by means of which they attach themselves to succulent leaves and other parts of plants, and suck out their juices. Their eyes are globular; their antennae long and tapering; their legs slender and long; their feet two-jointed. The males and females are winged, and also the last brood of asexual individuals; but the early summer brood are usually wingless.

The difference between the different broods is perhaps their most striking characteristic, illustrating as it does that anomalous system of generation, known as *parthenogenesis*, observed among a few species of insects and also in the jelly fish. By Steenstrup the phenomenon is called "alternation of generations." In ordinary generation the offspring resembles the parent: in this extraordinary mode there is a series or circle of individuals, with one or more unlike forms always coming between like forms. Among plant lice, the series begins in the fall by the pairing of male and female individuals. The males die; the females also, after laying their eggs, which are hatched as soon as sap begins to flow in early spring. This brood is sexless and, in the great majority of cases, wingless. Though with undeveloped sexual organs, these individuals are capable of reproducing their kind by a sort of budding process. Contrary to the rule among insects, their second generation is viviparous: the young lice are brought forth alive, and may be either winged or wingless, or both. The third generation resembles the second, the fourth resembles the third, and so on, the number of successive broods of the sort having no certain limit, but depending, so far as known, entirely upon the temperature and the supply of food. According to Kyber, a colony of *aphis dianthi* continued to propagate for four years, in a warm room, without the intervention of males. On the setting in of cold weather, however, or in some cases on the failure of nourishment, the weather being still warm, true males and females are produced, "he females always wingless, the males sometimes with, sometimes without, wings. It is by the pairing of these perfectly sexed individuals that the series begins."

The advantage of this method of propagation is thought to be the facility which the summer broods afford for the rapid multiplication of individuals. It is certain that they

are enormously prolific. In five generations, according to the calculation of Réaumur, the progeny of one aphid will amount to six thousand millions; and Duval obtained eleven generations in seven months, when the approach of cold weather killed his specimens. Though individually weak, their capacity for rapid multiplication under favorable conditions makes them a formidable enemy to vegetation.

If it were not for certain other insects, which prey upon the plant lice and keep down their numbers, they would soon make agriculture impossible. Chief among the lice eaters to whom we are so much indebted are the larvae of the little spotted lady bugs (*coccinella*); and all children should be taught to treat them gently, when they say the nursery rhyme: Lady bug! lady bug! fly away home.

In this connection we may observe that children also sometimes enter the list of lice enemies unwittingly, when they gather from young sumac bushes and other succulent plants the juicy swellings which they call "may apples." These hollow warts are produced by the strings of plant lice, and their interiors will usually be found full of a mealy substance thrown off by the lice, mixed with multitudes of the lice.

Reference has been made to the honey-like secretion of plant lice and the fondness of ants for it. One of the first indications of the colonizing of a plant by these parasites is the double column of ants that will be seen running up and down the stem: those ascending lank and eager, those descending full-bellied and lazy. The lice remain on excellent terms with the ants, and seem to enjoy the caresses by which the latter provoke the excretion of the coveted honey. In return, the ants busily drive away the insect enemies of the lice, clear away their cast-off skins, and sometimes build mud walls around, or earthen domes over, the lice, to monopolize or protect them. The ants have also been seen to colonize the lice on the roots of plants, carefully fetching the larvae home and planting them in little herds, bestowing upon them the same care and attention that they show their own offspring, carrying them to places of safety when they are disturbed and when they migrate: treating them in short as we do our cattle, and reaping a similar reward, as the sweet fluid so abundantly supplied by the lice forms the chief nutriment of their keepers. No reports have been received of any society for the prevention of cruelty, etc., among the ants, probably because the fornic cattle keepers treat their stock kindly without compulsion.

The injuries caused by plant lice are mainly such as naturally follow the withdrawal of sap from roots, stems, or leaves before it can contribute to the nourishment of the plant. If the root is first attacked, the whole plant puts on a sickly appearance, and soon dies from exhaustion. When the leaves are attacked, they curl up, cease to grow, and, if the lice are sufficiently numerous, perish and drop off prematurely. In other cases tumors are produced on the leaves or stems, similar to oak galls. There are about thirty species of aphides known in this country.

CONSTANCY OF THE OCEAN LEVEL.

The upheavals and depressions of the earth's crust were already recognized by the philosophers of antiquity. Aristotle found it necessary to correct some philosophers of his day, who imagined that the surface of the ocean was becoming lower by the gradual drying-up of the water. He says: "Only those of narrow views and small experience attribute local changes to an overthrowing of the whole globe. In support of their view, they bring forward the drying-up of seas and the existence of land where formerly it was not; and give authentic facts, from which, however, they deduce false conclusions. It is true that certain spots, heretofore covered with water, now form portions of the continent; but the contrary is also the case, and any one who studiously examines the facts will find that the sea has invaded and submerged several parts. Such is the explanation of Deucalion's flood, the ravages of which were more especially felt in Greece, and which, among other provinces, was most terribly felt in ancient Hellas, at that time inhabited by the Selles, and by the people named Greeks, but now called the Hellenes."

So far Aristotle. His theory evidently was that the amount of water in the ocean, and therefore the level of its surface, is constant, but that the land is ascending in one spot and descending in another. The latter is most forcibly illustrated by the historical accounts of the Straits of Gibraltar, which are evidently, as well as the British Channel, a conquest by the ocean over the gradually sinking land. Avienus quotes a measurement, on the authority of Democritus of Amphipolis, which (reduced to our unit, the mile) makes the width of the Straits at the narrowest place not quite three miles. Then he quotes a subsequent measurement, made by Euctemon of Athens, who found it four miles. Next we find that Scymnus of Chios measured it, in the year 143 before our era, and found it 13 miles at the Atlantic outlet, between Spartel and Trafalgar, which now is 26 miles in width. Turanius Gracilis, about 50 years before our era, gives the width of the narrowest place, from Mellaria in Spain to Cape Blanco in Africa, as 4½ miles. Strabo gives the greatest breadth as nearly 7 miles, while Pliny, who had been in Spain and had visited the Strait, gives it at 7½ miles for the narrowest part, and about 10 miles for the widest part. Bishop Victor measured the distance in the year of our era 500, and found it to be 12 miles; while the present Spanish measurement is 14 miles.

Besides the evidence of a gradual widening and probable sinking of the land of both shores, we find the positive evidence of the sinking in the account of Avienus, who speaks of the two wooded isles in mid-channel, on which were built a temple and altars in honor of Hercules. These were the

celebrated Pillars of Hercules of the ancient authors. The Carthaginians "were obliged to build flat-bottomed vessels, so as to be able to sail over the shallow water of the Straits," according to Avienus, who also says that Hannibal had reported that there was "a bottomless and boundless sea farther to the west," which, as it corresponds to the Atlantic Ocean, puts the locality intended to be described beyond doubt.

Pliny visited the Straits, and speaks of a low lying island, covered with wild olives, and upon which were the remains of the Temple of Hercules. Pomponius Mela, a Spaniard, living several centuries later, and to whom these regions were very familiar, describes the Straits as a channel broken by a number of small islands. At present they have all disappeared, and the largest ships sail freely over every portion of these waters.

In 1728, there happened a very low tide, and on this occasion the remains of the famous Temple of Hercules were distinctly seen in the oceanic part of the Strait, and some souvenirs were even obtained for preservation.

Ignacio Lopez de Ayla mentions, in his "History of Gibraltar," that the sea covers the greater part of the land on which stood the ancient city of Mellaria. In the bay of Gibraltar, the sea has engulfed a part of Carteia and Algeiras. Nine miles west of Tarifa was the city of Belon, at the shore of the Strait; and this is now engulfed, while the traces of its existence are seen below the waves.

Lastly Colonel James, in his "History of the Straits of Hercules," mentions that during an earthquake, the site of Cales disappeared, together with the small islands opposite the city of Bactes, near Tarifa; and a rock named "La Perle," once an island, sank, and is now covered with more than 12 feet of water at low tide.

The gradual sinking in this neighborhood is balanced by upheavals in other regions: which are very marked, well established by observation, and carefully measured in the northern part of Sweden and Norway, where the sea, especially the northern part of the Baltic, appears to retire from year to year, and leaves villages, formerly situated at the shore, a few miles inland. The Azores are rising, so is the island of Santorin, and the island of Julia. The former sea port of Aigues Mortes is now nine miles from the shore; while the celebrated Temple of Serapis, at Puzzuoli, for many centuries engulfed, is now uncovered, and is visited by travelers and tourists.

EXPERIMENTAL STEAM BOILER EXPLOSIONS.

The work of the United States Commission on the causes of explosions of steam boilers, which was (as we have elsewhere explained) interrupted by the death of the late chairman, has been recently resumed.

The Commission have two stations, one at Pittsburgh and the other at Sandy Hook, at each of which are a considerable number of steam boilers which are to be devoted to the various purposes comprehended in the programme of investigation. Some experiments were recently made at Sandy Hook, and others are to be made later in the season at Pittsburgh. As the Commission have been informed by counsel that they may be held legally responsible for any injury which may happen to visitors during their experiments, they permit no spectators to be present, and reporters are compelled to obtain their information as best they can. The members reserve the details of their experiments for their official report; but we are able to present to our readers some interesting particulars respecting the later work at Sandy Hook.

The work in hand was a series of experiments on the overheating of boilers, arising from low water. The Committee on the Sandy Hook station have had preparations for the summer work going on for some weeks. On July 9 the committee, Mr. Copeland and Professor Thurston, commenced the work of comparison of instruments, and of preparation of details preliminary to this special investigation, and on Saturday, July 11, had completed their task. On the following Tuesday, July 13, the Commission met at Sandy Hook, and experiments were at once commenced, and occupied two days. The boiler experimented upon was a plain cylinder boiler, set in brickwork in the usual manner. In each experiment, the boiler was filled with water, a fire started, and, when the fire was in good order and the steam at the right point, all water was blown out; the boiler was allowed to become heated to the desired temperature, as indicated by a pyrometer inserted within it, and, at the proper moment, the feed water was introduced by a force pump. It was only on the second day that this severe usage produced the destruction of the boiler. At each occasion, on the introduction of the water, the steam pressure jumped up suddenly, the safety valve opened, and, the water still continuing to enter, the boiler pressure dropped almost as rapidly as it had risen, and the boiler cooled down on each occasion (except the last) without apparent injury, and without having even started a seam, although the metal had been red hot.

The last experiment resulted in the explosion of the boiler and the destruction of its setting, and interrupted the work. The succession of phenomena was precisely as already described; but the temperature of the boiler was higher, probably a bright red on the bottom, and the pressure of steam was about 60 lbs. when the explosion occurred. It had fallen somewhat from the maximum, attained the moment before.

These experiments illustrate the facts which we have often presented to the readers of the SCIENTIFIC AMERICAN, in our remarks upon the method by which low water in steam boilers becomes an element of danger. When the boiler is strong, of good tough iron, and not too seriously overheated, it may not be exploded on the introduction of water. But there is invariably a development of steam im-

mediately upon the entrance of the feed water, producing a rise of pressure which will be directly in proportion to the weight of iron overheated, and the excess of temperature attained; and the suddenness of this rise will be proportional to the promptitude with which the boiler iron discharges its heat into the water first entering. This rise may be so sudden and so great that the safety valve cannot relieve the pressure promptly, in which case the boiler, if not very strong, may be exploded. Again, the plates, if heated to a red heat, lose a large proportion of their strength; and the boiler, thus weakened, may explode at the ordinary or a lower pressure. Still another conspiring cause of injury may be the sudden and irregular contraction, causing strains which assist even a low pressure to produce explosion.

The debris on the Sandy Hook Station is now cleared away, and, before our remarks meet the eyes of our readers, we presume that the Commission will have completed this interesting series of experiments. Engineers have long been desirous of knowing where the limit between imminent danger and comparative safety is to be found in cases of low water, and we hope that these experiments, which are on a large scale, and are more nearly illustrative of the conditions of ordinary practice than those made, forty years ago, by the Committee of the Franklin Institute, may go far toward determining that limit. Still, that point becoming known, we shall not advise those of our readers who handle steam boilers to carry their water low in the conviction that they can keep within the dead line.

SCIENTIFIC AND PRACTICAL INFORMATION.

OXYGEN AN ANTIDOTE FOR PHOSPHORUS POISONING.

MM. Threinesse and Casse have found that injections of oxygen into the veins neutralize the toxic effect of phosphorus. The gas must be pure, and free from all admixture with air, and must be introduced very slowly. The precise apparatus used is not described; and it appears that the quantity of gas required is very large, several cubic feet being administered to an animal weighing twenty pounds. The results, however, were in every way successful.

THE NITRIFICATION OF ARABLE EARTH.

Recent experiments of MM. Boussingault and Schloesing are of considerable importance with reference to the theories of fertilization of soils and the utilization of manures, since they bring to light a number of interesting facts, which are summarized in the following conclusions: 1. Arable earth does not become nitrified at the expense of the nitrogen gas in the atmosphere. Agriculture has nothing to expect, from that source, which will tend to the profit of the crops. 2. The theory of a nitrification resulting from the combination of nitrogen gas and oxygen, in the presence of matters rich in hydrogen and carbon, according to the experiments above noted, is no longer sustainable. 3. The source of nitrogen of nitrates formed in the soil should be considered, in the absence of positive proof to the contrary, as reposing only in the nitrified organic matters combined with the mineral elements of the soil. 4. Nitrates in decomposing in the soil, under the influence of a reducing atmosphere, yield but a small fraction of their nitrogen, under the form of ammonia retained by the earth by virtue of its absorbing power. The balance of the nitrogen of the nitric acid returns to a gaseous state, and thus becomes lost to the crops.

THE DISCOVERY OF PROTOSULPHIDE OF CARBON.

It is generally well known that, chemically, oxygen and sulphur greatly resemble each other. The sulphide of carbon, however, analogous in properties and composition to carbonic acid, has hitherto been considered the sole sulphuretted compound of carbon, there being nothing recognized corresponding to carbonic oxide to the sulphur series. M. Sidot has recently made the important discovery of protosulphide of carbon, which compound he obtains by subjecting bisulphide of carbon to sunlight, when the liquid undergoes a profound decomposition. Half of the sulphur separates to be again dissolved in the bisulphide not yet altered, and at the same time a black powder is precipitated, which is the protosulphide sought for. This, washed and purified, is destitute of taste or odor, and is absolutely insoluble in neutral solvents. Acids act upon it, giving rise to more or less complex products. The author proposes to undertake a series of extended investigations into the properties of the new body.

TEMPERED BORACIC ACID.

Tempered glass submitted to the polariscope exhibits centers, having a kind of activity under the light, but which disappear when the glass is annealed. According to M. de Luynes, boracic acid, cast and submitted to hardening, acts like glass, with the difference, however, that the peculiar property above noted is not dispelled on annealing. When submitted to moist air, a small lens of the acid undergoes curious internal modifications, resulting in two cones, disposed apex to apex, being formed within, which offer the most varying accidents of shape. M. de Luynes suggests that an analogous swelling may take place in other vitreous substances, and points out that certain geological phenomena may be traced to such cause.

EXPECTED RESIGNATION OF THE COMMISSIONER OF PATENTS.

The New York Tribune states that Commissioner Thacher is about to resign the office, and is to be succeeded by R. Holland Duell, Esq., of Courtland county, N. Y., formerly a Member of Congress. Mr. Duell is a gentleman of ability and varied attainments, possessing rare capabilities for the administration of Patent Office affairs. He ought to make a good Commissioner, and we think he will.

THE ST. LOUIS BRIDGE.

We give herewith a perspective view of the west abutment, and about two sevenths of the shore span of the stupendous bridge across the Mississippi river at St. Louis, Mo. This engraving will give our readers a much better idea of the magnitude and beauty of this remarkable work than anything yet published. The proportions of the bridge may be inferred by comparing them with the figures on the side of the river beneath the arches. The individual standing with his back against one of the small piers, with arms folded, surveying the father of waters as he rushes past the city, is only about as high as two and a half courses of the granite masonry of the pier, and he stands about 40 feet below the carriage way of the bridge. Seventy feet above him the iron horse is seen with its cloud of smoke emerging from the sandstone arcade which surmounts the five stone arches that carry the viaduct over the St. Louis wharf. The railway tracks are below the carriage way and foot walks, and the steam trains in no manner interfere with the local traffic of St. Louis, as the bridge is connected with a tunnel under the city.

The towers, which terminate the bridge proper at each end of the structure, contain elevators and stairways for the convenience of pedestrians on the wharfs on both sides of the river.

The St. Louis bridge will be found, if compared with other great bridges of the world, to surpass them all in several important particulars. In the massiveness of its masonry and the depth of its foundations, it stands alone. One of its channel piers and one abutment pier stand on the marble rock over 100 feet below the river's surface. In the length of its spans there is nothing equal to it in existence, except in suspension bridges. Its two shore spans are 500 feet each in the clear, and are built of masonry, and the middle one is 520 feet.

In capacity it far excels all others yet constructed or designed. The Brooklyn suspension bridge, one of the remarkable works of the age, with its 1,600 feet span, is only designed to accommodate local traffic, and will not possess sufficient strength to sustain steam trains. The suspension bridge about to be constructed over the Hudson, at the Highlands, is only calculated to carry one railway track across the river on its grand span of 1,600 feet; but the business that will be borne across the Mississippi by the St. Louis bridge will greatly surpass that of any other. Already thirteen important lines of railway, says *Engineering*, are preparing to throw their traffic across its arches; and above their trains, on a wide street, now rolls the domestic commerce of the largest inland city in America. One of the widest and most central avenues of St. Louis is extended by it directly across the Mississippi, thus connecting, by a common highway, two of the most prosperous and fertile States in the Union, Illinois and Missouri.

The Fisher Refrigerator.

We have to acknowledge the receipt of a very finely constructed refrigerator, forwarded to us by the inventor, Mr. J. Hyde Fisher, of Chicago, Ill. It is the tangible result of three excellent devices, patents for which were obtained through the Scientific American Patent Agency, and which together render the refrigerator one of the best both in principle and construction that we have ever examined. The first patent covers the principle of separating the cold and warm air, keeping the latter at the top of the cooling room. This is done by the cold air from the ice chamber entering the cooling room at a point below that at which the warm air escapes. There is a constant circulation so long as any ice remains. The other patented additions are a very ingenious latch for the doors and a tap hole protector, which is so constructed that, when the door is closed, no cold air can escape from the re-

frigerator around the faucet. We learn that meats, vegetables, and fruit have been kept in the cooling chamber for periods of several months at a time in perfectly sweet condition. The preserving properties of the invention have been put to a very severe test in its application to refrigerator cars, of which several, constructed on the principle described by Mr. Fisher, have for some time past been used as a means of transporting western fruit, etc., to eastern markets. For fish dealers who freeze

Magnetic Railway Locomotives.

In an arrangement lately devised by M. Burgin, the entire axle, with its wheels, is made into one electromagnet. The wire is wound with increasing thickness from the middle towards the wheels, in the case of external cranks, but uniformly in the case of internal. With coupled wheels the wire is so arranged that there is an alternation of poles, the piece of rails between two poles forming the armature. A locomotive model (without engine or boiler), having three



THE WEST ABUTMENT OF THE GREAT BRIDGE AT ST. LOUIS, MO.

a large stock of fish, in order to keep the same over considerable lengths of time, the system has proved itself eminently suitable, since it has already been successfully adopted in the construction of several large cooling houses in western cities. These last mentioned receptacles have been, and we are informed will in future be, built under the direct supervision of the inventor.

The manufacturer of portable refrigerators and boxes is Mr. H. C. Van Schaack, Jr., of 991 Michigan avenue, Chicago, Ill., who may be addressed there for further information.

pair of wheels and internal cranks, was placed on a line with 30 per cent incline. Five Bunsen elements supplied the force, and a weight of 25 lbs., with cord, passed round the axles. The machine weighed 18 lbs., and, with no current flowing, the wheels merely slid on the rails in position; but when the circuit was closed, the model ran up the incline. When the brake was applied (and weight detached), the model could be held on the steep incline if the current were passing; but if not, the wheels began to slide and the locomotive went downwards with increasing pace; but this descent was promptly stopped when the current was made to flow again.

SMITH'S IMPROVED BALE TIE.

The invention illustrated herewith is a new tie designed to secure the wires used for binding hay bales. The usual mode of fastening these wires is wasteful, since about a foot on each end is employed to twist together and tuck under, so that, of the number of bands usual on each bale, fully six feet remain unutilized. Again, considerable wire is lost by cutting the bands rather than wasting the time necessary to untwist them. The present device is intended to prevent this waste, by using no more wire than is just necessary to secure the simple fastening, and, at the same time, to afford the latter of such a form as may be quickly and easily loosened.

Fig. 1

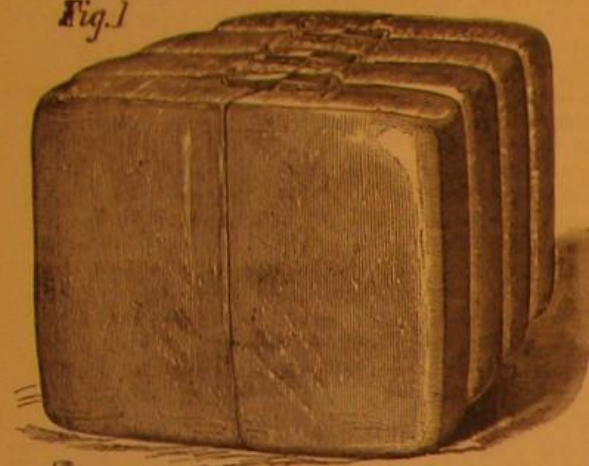
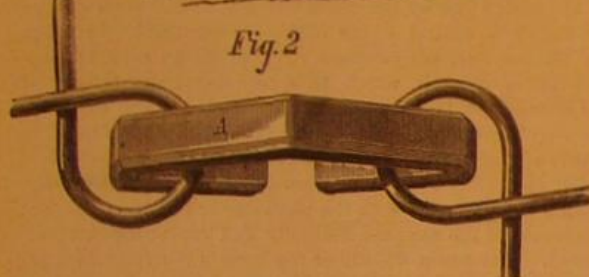


Fig. 2

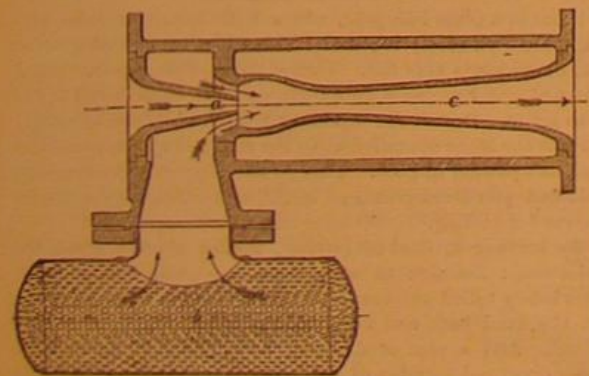


The invention consists of a double hooked piece, A, Fig. 2, having V-shaped jaws, into which the wire (size from 10 to 14) is secured. Small loops are first made on the ends of the wire, and these are slipped over the hooks while the bale is still in the press. The expansion of the bale, on its removal, draws the bands tight, and the jaw of the coupling is so constructed as to prevent the wire slipping. The ends of the wire are turned under the standing part so as to be out of the way, and are not liable to catch in transporting the bale. To unfasten the tie, it is only necessary to seize the ends of the wire with pincers and bend them back, when they will readily slip from the holes. Fig. 1 shows the bands in place on the bale.

For further particulars address the inventor, Mr. Isaac T. Smith, 1,532 Main street, Richmond, Va.

KÖRTING'S STEAM JET BILGE PUMP.

The application of an ejector to throw the water out of a ship's hold is an expensive way to attain this purpose. For the amount of steam necessary for working an ejector is found to be ten to fifteen times the amount used to do the same work by a donkey pump, or by the ordinary bilge pump in connection with the large engines. But on the other hand, it is an ascertained fact that such ejectors may be relied upon as to their never-failing surety in working, and in this respect they are most decidedly superior to most pumps in use. All those parts that oftentimes proved to be fatal to the prompt application of ordinary pumps in case of need are unnecessary for these ejectors.



In the annexed engraving a section of Körting's steam jet oil pump is shown, the arrangement being so very simple that it hardly requires any explanation. The steam coming from the boiler enters through a nozzle, a, and forces the bilge water, after having passed the suction filter, b, through the diverging tube, c, whence it is discharged into the sea by means of a pipe through an opening in the ship's side. The arrows indicate the directions of steam and water.

The Currant and Raspberry Moths.

A correspondent of the *English Mechanic* writes as follows: "A destructive pest among the fruit bushes is the *agrotis grossulariata*, known under the name of the gooseberry caterpillar, the magpie, or the currant moth. This moth and its caterpillar are shown in Fig. 1, and will, doubtless, be easily recognized when it is mentioned that the wings are whitish with black markings, and a few yellow blotches or

stripes here and there; the caterpillar is yellow and black. The larvae of this moth spin the leaves together in the autumn and winter, in position ready to devour the leaves as soon as they appear in spring. The remedy for this is to remove all the dead leaves from the bush in winter and burn them, or else dig, close handy, a hole at least two feet deep, into which you may rake the fallen leaves, and then remove



from underneath the bush about two inches of the top soil, putting it on the leaves in the hole, and then filling up with the soil previously removed. Tan and decayed manure, with a dusting of lime, may then be put under the bush, and the result will be found satisfactory, in freedom from early attacks of the pest, and a good crop of fruit. If, however, the bush should become infested with larvae hatched from eggs deposited by the moth which has arrived at the perfect stage on some neighbor's domain, the best remedy is a dusting with powder of white hellebore, which is easily laid on and under the leaves by means of a muslin bag. Like most of the other garden pirates, this insect can be exterminated, as far as one's garden is concerned, by a little energy at the proper time.

Another insect, *lampronia capitella*, also attacks currants. This moth is the raspberry grub, and is shown in various stages in Fig. 2. It is a pretty little moth, and its larva is unmistakable, being a bright red. If, on examining the young buds or shoots of the raspberry canes, we find a larva of *l. rubicella* on slit open a bud or shoot, it will be tolerably correct to conclude that all the buds which appear to be in a similar condition are occupied by one of these destructive little pests. It will be sufficient if a sharp pinch is administered to the bud between finger and thumb, because that method has the merit of leaving the shoot to assist in elaborating the sap. The buds thus affected will not yield fruit:



but by carefully destroying all the larvae, we take a good many steps towards obtaining a crop in the next season. Like the rose fly and the sesia on the currants, it is impossible to detect the presence of the enemy till the mischief has been done—the egg being placed in position during the preceding autumn, its presence becoming manifest only by the effects. A very good way of forestalling these and similar pests is to top dress the ground in early autumn with soot, and to dust that pungent substance freely about the fruit quarters, over leaves and everything. It is unsightly and unpleasant, but it seems to keep off a host of insects, and it is valuable as manure."

JOINING UP CELLS OF BATTERIES.

The little instrument, of which the following is a description, may be useful to some of our amateur electricians. It is a switch for joining-up cells for quantity or intensity by one movement. The engraving shows one for two cells, but it could be made for any limited number.

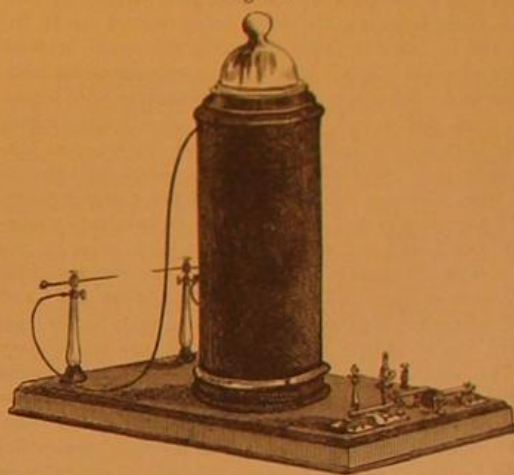
To the four binding screws are attached the wires from the cells, the line wires being fastened to the outer screws. The connections on the switch are marked in single dotted lines: the double lines represent those under the wooden slab on which the switch turns. When it is moved to the right, it joins the cells for intensity, and vice versa. The small circles are brass knobs (tipped with platinum, if preferred). The rest explains itself. It may be of use on the lecture table.—A. Trotter.

PICRIC ACID dyes leather a good yellow without any mordant; it must be used in very dilute solution and not warmer than 70° Fah. Anilin blue modifies this color to a fine green.

THE ELECTROSTATIC OR INDUCTION COIL.

It has been proved by experiments that the quantity of electricity traversing the secondary wire of an induction coil is the same whether the current is produced by the closing or by the opening of the primary circuit. The difference between the two currents, in respect to their electromotive force, is, however, very marked, that of the opening current being far greater than that of the closing one, although, as above stated, the actual quantity of electricity is the same in both cases. The reason of this is that, when the primary or battery circuit is closed, it is opposed by the extra or self-induced current, and hence the former requires a certain length of time to attain its full force. When, however, the primary circuit is broken, the extra current is in the same direction, and therefore does not delay the action to the same extent as in the first instance. The primary current disappears almost instantaneously, or at all events in much less time than is required for it to attain its full strength. The duration of the induced or secondary current corresponds with the time occupied in the charging or discharging of the primary wire by the battery current. As the same quantity of electricity is produced in the secondary wire in each case, it is obvious that it must necessarily pass through the circuit in a shorter time at the breaking than at the closing of the primary circuit, and thus its potential or electro-motive force must be correspondingly greater.

Fig. 1.



The most striking example of this action is afforded by the electro-magnetic induction coils of Ritchie, Ruhmkorff, Ladd, and others, which are now made to produce the most powerful electrostatic effects, far surpassing those of the frictional electric machine.

The discovery of the electrostatic properties of the induced or secondary current was made by Professor C. G. Page, of Salem, Mass., who (in 1836) published the first account of an induction apparatus, consisting of a primary coil with a secondary coil wound upon it, of many times its own length. Professor Page was also the originator of the automatic circuit breaker, and of the devices for rendering the same adjustable. Ruhmkorff, of Paris, constructed in 1851 the coils which bear his name. By careful insulation of the secondary wire, he succeeded in producing sparks of nearly one inch in length, capable of charging a Leyden jar with great rapidity. Ritchie, of Boston, in 1857, vastly improved the induction coil, and in successive instruments obtained sparks of 6, 10, and 12½ inches. The cause of the superiority in Ritchie's coils is due chiefly to an improved method of winding the fine wire coil, by which it has been found possible to use with success a wire of several hundred thousand feet in length, while the limit in the instruments as constructed by Ruhmkorff was about ten thousand feet. Fig. 1 shows the external appearance of one of Ritchie's medium sized coils, giving a spark of nine or ten inches in length.

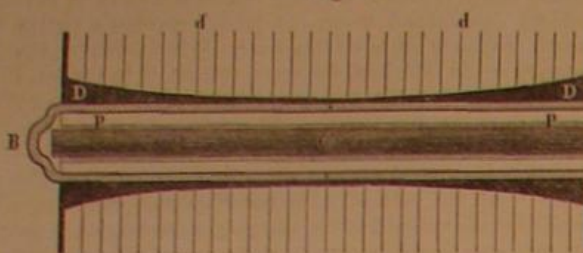
The chief parts of this apparatus are the primary and secondary coils, an interrupter to the primary circuit, and the condenser. In the instrument shown in Fig. 1, about 68,000 feet of silk-covered wire, 0.012 of an inch in diameter, is wound upon the exterior coil. The primary or inducing coil consists of about two hundred feet of copper wire, one seventh of an inch in diameter (No. 9), the ends of which terminate in binding screws upon the base. A heavy glass bell, seen at the top of the coil, insulates the primary from the secondary circuit, its foot being turned outwards by a flange as wide as the thickness of the coil. The induction coil, for more perfect insulation, is also encased in thick gutta percha. The ends of this coil are carried by gutta-percha-covered conductors to the two glass insulating stands, seen at the rear of the instrument, where they end in sliding rods, pointed with platinum at one end, and having balls of brass at the other. The interrupter devised by Mr. Ritchie consists of a toothed wheel, which raises a spring hammer, the blows of which fall upon an anvil, breaking contact between two heavy pieces of platinum. The European induction coils are usually provided with an automatic circuit breaker, but comparative trials have shown that there is an advantage in varying the rapidity of the interruptions, according to the class of effects to be produced, and that a certain time is requisite, for the complete charge and discharge of the soft iron wires which form the core, longer than the automatic circuit breaker allows.

The object of the condenser is to destroy by induction the greater part of the force of the extra current, which would otherwise materially diminish the power of the apparatus. In the instrument shown in the figures, the condenser consists of 144 square feet of tin foil, divided into three sections (two of 50 and one of 40 feet), carefully insulated by triple folds of oiled silk and placed within the base of the instru-

ment. The battery force needed to operate this instrument consists of two or three large-sized Bunsen cells.

Fig. 2 shows the internal construction of one of the large horizontal coils of recent construction, arranged upon Ritchie's plan, which has been adopted with slight modifications by the leading instrument makers of every country. C is the core, consisting of a bundle of soft iron wires. This is separated, by a thin layer of some suitable insulating material, from the primary coil, which usually consists of two or more layers, contained in the space, P P. The two coils are

Fig. 2.



separated by two heavy glass tubes, B B, closed at the outer ends, while their open ends meet in the middle of the coil. D D is a hard rubber bobbin, the tubular portion of which is thinnest in the middle and thickest near the ends, as shown in the figure. A great number of thin insulating disks, d d, of which only a few are shown in the figure, divide the bobbin into compartments, the wire being wound up in flat spirals, two or more of these occupying the space between each two adjacent disks. The various compartments communicate with each other, so that the secondary wire is continuous from end to end. The coating of silk and varnish upon the wire affords sufficient insulation between the convolutions in each compartment, and the disks prevent the sparks from striking through between the compartments. The coil may thus be said, as it were, to be insulated wholesale and retail, and the separation from each other of the different parts is complete. In regard to the external insulation, less is required in the compartments in the middle of the coil, where the tension is smallest, and there is the least danger of the electricity breaking through into the primary coil. The greatest tension is found in the compartments nearest the two ends of the coil, which is the reason why the tube is made thinnest in the middle and thickest at the ends. Another reason is that the thickness at the ends lessens the inductive Leyden jar action between the ends of the primary coil.

The largest induction coil yet made is that of the Royal Polytechnic Institute, of London. The length of this coil is 9 feet 10 inches, diameter 2 feet, weight 15 cwt., including 477 lbs. of hard rubber. The core is 5 feet long, and 4 inches in diameter, of No. 16 iron wire. The primary coil consists of 145 lbs. = 3,770 yards, of No. 13 wire. The secondary coil consists of 150 miles of wire, weighing 606 lbs., and having a resistance of 33,560 ohms. The condenser is in six parts, each containing 125 square feet of tin foil. With five large Bunsen cells, the spark is 12 inches in length, and with 50 cells this has been increased to 29 inches.

The induction coil constructed by Ritchie for the Stevens Institute of Technology, at Hoboken, N. J., has a primary coil consisting of 195 feet of No. 6 wire. The secondary coil is over 50 miles in length, of No. 36 wire. The core is composed of a bundle of No. 20 iron wires, wrapped in oil silk and cloth. With three large bichromate cells, this coiled has given sparks 21 inches in length, capable of piercing through solid glass three inches in thickness.

Correspondence.

The Colorado Potato Bug.

To the Editor of the Scientific American:

In a letter in your paper, on page 52 of your current volume, on the Colorado potato beetle, by Thomas A. Cotchett, I discover the writer's want of knowledge of the habits of this insect pest; with which if he were better acquainted, he would readily admit that his plan, so far as driving this pest from our land, would be a perfect failure. The potato beetle does not depend upon the potato or on any one vegetable for its food, but will feed and thrive equally well upon the tomato and the thistle, and on various weeds which are as numerous as the insect pest itself. From the experience of the past three years in the ravages of this beetle, I will say that the following is so far the easiest and most practical way of avoiding injury and saving labor and the potato crops.

1. Let each farmer plant a small patch of potatoes quite early, on which the beetles will readily gather; and let there be vigilance and thoroughness in capturing all of the early or first crop of bugs, either by hand or by the use of Paris green. This done, large fields may be then planted without their being molested by the bugs, to any extent that will injure the crop. This mode is being universally adopted in the West, where we have suffered severely for the past few years.

When our much dreaded pest gets his foot upon England's shore, our friend in London can practice his theory; but we in this land cannot be induced to try it, to the evident detriment of a large portion of planters.

Grand Rapids, Mich.

C. J. DIETRICH.

A New System of Bridge Building.

To the Editor of the Scientific American:

Being a constant reader of your valuable paper, I have noticed occasionally that, in replying to some of your correspondents, you state that it is a great deal more easy to

build on paper than to accomplish the practical part. You may think that this project emanates from the mind of a lunatic; however, a great many more absurd propositions have not only been advanced, but have been worked out with material results.

The following is a specification for a bridge that can be constructed for railroad or other purposes, over a body of unfathomable water, from one to five hundred miles in length: The bridge is to consist of a submerged pontoon (made in sections) of sufficient carrying capacity to sustain the weight of the roadway or superstructure, and is to be so constructed that, should one section become damaged, it can be repaired or replaced without in any manner disturbing the other portions or the bridge. The pontoons are to be anchored where possible, and where impossible, steam power is to be used for holding the structure in position and to counteract the force of the wind. The superstructure or roadway is to be made of light but substantial material, and can be elevated from ten to sixty feet above the surface of the water as circumstances may require. It can be made so as to be opened at any navigable point, from one to two miles in length (using steam power), in fifteen minutes, or opened and closed in thirty minutes.

JOSEPH SLUSSER.

47 West Water street, Cincinnati, Ohio.

The Tides in the Gulf of Mexico.

To the Editor of the Scientific American:

I have noticed in all the Gulf ports of Louisiana, Florida, and Texas, the very small rise and fall of the tide. In some of them there is but one flood and one ebb tide in each 24 hours, the high water occurring when the moon crossed the upper meridian, and the low water 12 hours later. In other parts, a full tide occurred when the moon crossed the upper meridian, falling off to mean low water in six or seven hours, and a half tide occurred when the moon passed the opposite meridian. The influence of the wind very much affects the rise, fall, direction, and velocity of the currents. It would seem that, from the shape and apparent condition of things, there would be a natural current running up the western shore, following the northern shore around and down the eastern shore; yet, according to my little experience, such is not the case. The reasons why, I should think, the currents would run as I mentioned are probable and natural.

The trade winds are the cause. The northeast and southeast trade winds form their average line of contact at about two or three degrees north of the equator, and their united force forms the equatorial current, which is forced along the northern shore of South America, through the Caribbean Sea, until it strikes the western land and is turned northward up into the Gulf of Mexico, carrying a temperature of about 80°, which accounts for the high temperature of the Gulf Stream. After passing the Campechy banks, the current turns easterly, running between Cuba and the Bahama banks on one side and the Florida reef on the other, forming the starting point of the Gulf Stream which passes out through the Straits of Florida with considerable velocity, and joins again the waters of the Atlantic Ocean, following the line of soundings on our coast and passing along the southern edge of the banks of Newfoundland; whence its course is nearly east, and its velocity and temperature are very much reduced, the latter being 10° or 12° lower. After passing the banks, this stream is joined by a natural current from the north. The two currents join and run in a southeasterly direction, until near the coast of Africa, and are then known as the Guinea current. It draws down towards Cape De Verde, whence the current runs more easterly, and again feels the effect of the northeast trade winds, which again accelerate the motion and keep up the grand circle.

This is my crude idea and opinion in regard to the causes of the Gulf Stream, and these conclusions I have arrived at from my own observations in the premises.

In regard to the Gulf of Mexico, there is a remarkable feature in that gulf, which is worth some study and experiment. It is said to be possible to keep the sea from breaking by pouring on oil. In some parts of the Gulf of Mexico the oil is supplied. From Ship Island westward, I have often sailed through large patches of this oil down to the Campechy banks, and down the coast of Texas to the Rio Grande river. In passing through these oil spots, the surface is comparatively smooth, and the strong petroleum-like smell will tell you in the night of the presence of the oil, although you cannot see it. Now it seems to me that, underlying this part of the Gulf, there must be tremendous oil deposits, which, in some places, have broken through and risen to the surface in quantities for years. For on the coast of Texas, at Brazos, Santiago, Padre Island, and Deckrose Point, there is to be found what the Texans call "sea wax," it washes ashore on the beaches in considerable quantities, and I have picked up large quantities at various times. It resembles pitch, and is found among the sand in pieces, some of them as large as a man's hand. It will float, melt, and burn as well as pitch, and has the same petroleum-like smell as the oil patches. I have no doubt in my own mind about the sea wax being formed by the sun's shining on this vast mirror, extracting the gases and leaving the residue in the condition in which it is found. In the course of time it drifts ashore on the coast of Texas.

Stratford, Conn.

TRUMAN HOTCHKISS.

EQUAL parts of American potash and pearlash, 2 ounces each to about 1 quart water, give a good oak stain. Use carefully, as it will blister the hands. Add water if the color be too deep.

The Phonometer.

A new system of fog signaling at sea has recently been invented in England by Captain W. E. Harris, by which vessels in thick weather are enabled to make known to others their whereabouts, and thus materially to decrease the danger of collision. Although signals from fog horns, bells, or steam whistles may be perfectly audible, the condition of the atmosphere is very frequently such as to render it impossible to determine correctly the quarter whence the sound comes. If, however, the people on the meeting vessels are informed, by the peculiar nature of the signals, of the course each is steering, the question of keeping clear is very greatly simplified. The apparatus, to which the name of phonometer has been given, consists, says the *London Times*, of the mechanism of a clock placed in a horizontal position under a special dial. The seconds are arranged near the outer circumference of the dial, which is about eight inches in diameter, while the hour and minute dial is about two inches in diameter, and is placed on the lower part, where the seconds dial of a watch is usually sunk. There are four seconds hands placed at right angles to each other and radiating from the center of the main dial. Outside the seconds circle are marked five black segments, with intervals between them. One segment measures ten seconds in length, and the other four five seconds each, with intervals of three seconds. Outside the glass which protects the dial, and pivoted at its center, is a brass segment plate, so arranged as to obscure those segments on the dial not required for immediate use, and thus to prevent error in signaling. Around the dial and outside it is a flat ring of metal about two inches broad, on which all the points of the compass are marked.

The apparatus is placed on a stand with the upper part of the dial toward the head of the ship, the stand being fixed on the bridge just by the steam whistle, so that both are under the direct control of the officer in command. In using the phonometer, the compass ring, or dumb card, as Captain Harris terms it, which is a very important feature of the instrument, is moved round until the true point on which the ship is sailing is in line with the ship's head, all the true points of the horizon being thus indicated. These points being accurately known, it follows that all steamers in each other's vicinity fitted with the phonometer will have the true quadrants of the compass distinctly and concordantly represented. The steam whistle or fog horn is the important adjunct of the phonometer, and it is the duration of each whistle or blast and their number that indicate the course of the ship. The black segment covering ten seconds of space is a measure of ten seconds of time, the other segments indicating periods of different duration; and a whistle of ten seconds' duration indicates that the vessel is steering within the quadrant from north to east quarter north.

Assuming this to be the course of the vessel, the brass covering segment would exclude all the other black segments, and the officer would wait until one of the four seconds hands entered that segment. He would start the whistle and hold it on during the time the hand traversed that segment, and shut off steam the moment the hand reached the end of that segment. This operation must be repeated at intervals during the continuance of the fog.

Another ship coming within sound would at once know the course of the first, and would indicate her tack in like manner. Following out Captain Harris's code, two blasts each of five seconds' duration, with an interval of three seconds, represents from east to south quarter east. Three blasts of similar duration and intervals represent from south to west quarter south, while four blasts of the same length and spaces indicate from west to north quarter west. The special object of the four seconds hands is to enable the operator to reply readily to the signals from other ships, which could not be done if the revolution of a single hand had to be waited for. By the peculiar construction of the dial, the necessity of counting the seconds when signaling is entirely obviated.

Process of Gilding.

Place in a plate leaf gold, add a little honey, stir the two substances carefully together with a glass stopper, the lower end of which is very flat. Throw the resulting paste into a glass of water mixed with a little alcohol; wash it and leave it to settle. Decant the liquid and wash the deposit again. Repeat the same operation until the result is a fine, pure, and brilliant powder of gold. This powder, mixed with common salt and powdered cream of tartar, and stirred up in water, serves for gilding.

As another method of gilding, Boutet Mouvel gives the following: Dissolve in aqua regia one grain of fine gold, previously rolled out very thin, in a porcelain capsule heated on the sand bath and concentrated till it is the color of ox blood. Add a pint of distilled water, hot, in which have been dissolved 4 grains of white cyanide of potassium. Stir with a glass rod, and filter the liquid through unsized paper. To gild with this liquid, it is heated a little above lukewarmness, and the articles to be gilt are immersed in it and supported upon a piece of very clean zinc.

G. R. McK. says: "I have been a subscriber to the SCIENTIFIC AMERICAN for several years. I take a dozen other papers and periodicals, but derive more pleasure and benefit from the SCIENTIFIC AMERICAN than from all the rest combined."

J. J. H. says: "I owe half my income to the information I obtained from the SCIENTIFIC AMERICAN."

A NEW hygrometer consists of strips of paper dipped in a cobalt salt solution containing common salt and gum arabic. In dry weather, it is blue, and in wet, rose red.

PRACTICAL MECHANISM.

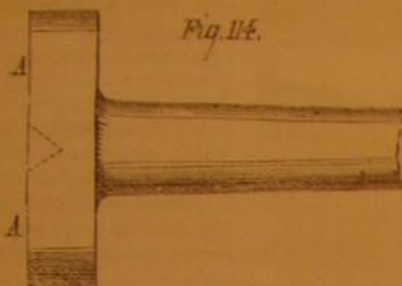
BY JOSHUA ROSE.

NUMBER XXIX.

DRILLING IN THE LATHE.

We have next to consider drilling tools as they are employed in the lathe. For boring very small holes, as in center drilling, it is usual and advisable to revolve the drill and use the dead center and its gear as a feed motion. For small lathes, a small chuck (shown in Fig. 114) is provided. The flat surfaces of such work as may require to be drilled are placed against the face, A A, and a small conical recess, denoted by the dotted lines, is cut in the center of the chuck to relieve the point of the drill when it emerges through the work.

It is obvious that, as a lathe possesses no facilities for chucking work upon the tail stock, work which requires



chucking, or is too heavy to be held conveniently in the hand, can only be drilled in the lathe by being chucked and revolved, the drill remaining stationary, and fitted into the socket in the tail stock spindle, or else suspended by being held by the work at the cutting end and by the dead center at the other end, and prevented from revolving by the aid of a drilling rest or a wrench. If the work revolves, it must of course be set to run true; and since the setting involves more work than would be required to hold it upon a drilling machine table, it follows that the lathe is only resorted to for drilling purposes in cases in which it is imperative to use it. These instances may be classified as follows:

1. Those in which very straight and true holes are required, and in which the point of ingress and egress may be centerpunched, in which cases (the back center of the lathe being placed in the centerpunch mark, and the point of the drill in the other) the drilling is sure to be true.

2. Those in which the work, being very long, can be got into the lathe in consequence of the movable tail stock, when it could not be got into the drilling machine.

3. Those in which, there being turning to be done besides the boring or drilling, the whole may be performed in the lathe.

4. Those in which the holes require to be very true, the work being chucked in the lathe.

The class first mentioned refers to small and light work only, and requires no comment, save that the work should be slowly revolved on the lathe center while the drilling is progressing, so that the work will not drill out of true in consequence of its weight. The second will be treated of under the heading of the cone plate, or cone chuck, as it is sometimes termed; and the third (which usually comprises the fourth) we will proceed to discuss.

The spindle in the tail stocks of lathes are usually prevented from revolving by having a narrow groove along them, into which a small lug, stationary with, and projecting through, the bearing of the spindle, fits. If, therefore, a heavy strain, tending to twist the socket (as would be the case if a drill of a comparatively large size were held by it), is placed upon it, the groove, from its comparatively small wearing surface, soon gets worn as well as the lug, and the edge of the groove bulges, causing the socket to bind in its guide. Tail stock spindles are not, in fact, usually designed to perform such heavy duty; hence it is an error to assign it to them, unless, as is the case in some special lathes, the tail stock spindles, and hence their bearings, are made square to suit the spindles to carry drills for heavy duty. But drills above a half inch in diameter should be held by a center in the shank end of the drill, into which the back or dead center of the lathe may fit: the drill, if a round one, being held by a lathe dog fastened to it and resting against a piece of metal fastened in the tool post of the lathe, thus relieving the tail stock spindle of the torsional pressure. If the shank of the drill is square, a wrench may be substituted for the dog or carrier.

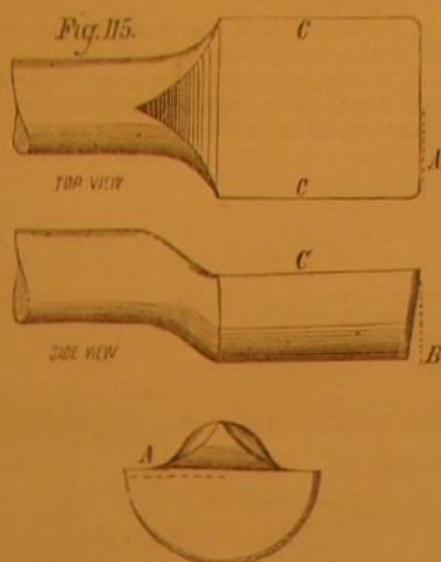
HALF ROUND BITS.

For drilling or boring holes very true and parallel in the lathe, the half round bit shown in Fig. 115 is unsurpassed.

The cutting edge, A, is made by backing off the end, as denoted by the space between the lower end of the tool and the dotted line, B, and performing its duty along the radius, as denoted by the dotted line in the end and top views.

It is only necessary to start the half round bit true, to insure its boring a hole of any depth, true, parallel, and very smooth. To start it, the face of the work should, if circumstances permit, be made true; this is not, however, positively necessary. A recess, true and of the same diameter as the bit, should be turned in the work, the bit then being placed in position, and the dead center employed to feed it to its duty; which (if the end of the bit is square, if a flat place be filed upon it, or any other method of holding it sufficiently tight be employed) may be made as heavy as the belt will drive. So simple, positive, and effective is the operation of this bit that (beyond starting it true and using it as

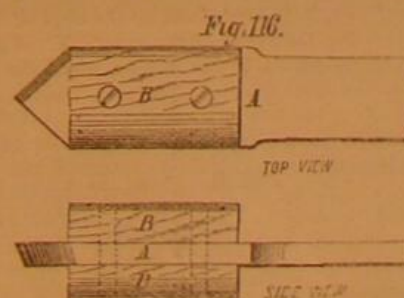
a moderate cutting speed, with oil for wrought iron and steel) no further instructions need be given for its use. It is made as follows:



Forge it as near to the required size as possible, leaving stuff sufficient to true it up, and from square steel, if it is obtainable. Disregard the question of the cost of material, which, in a tool of this kind, does not represent six per cent of the cost of the finished tool; whereas the difference in quality is as three to one. In order to turn the cutting end between the lathe centers, so as to have the center at the shank end quite true with the turned pair, it must be forged at the end to more than half the diameter, so as to leave sufficient metal to receive the center hole and countersink whereon to turn it. The shank end should be forged square, and should, when center drilled, have a deep countersink. The cutting end must be turned true and smooth, being quite parallel, if to be used for parallel holes, and of the desired taper for taper holes. For parallel holes, all the cutting is performed by the end face, A; but in taper holes, the side edges, C, of the top face also perform cutting duty, and hence the necessity of having the turned end of an exact thickness of half a diameter. After turning, and before removing it from the lathe, a tool having a point should be fastened in the slide rest, its point being made to bear lightly against the turned face, close to one of the edges, C; and the rest should then be passed along so that the point will scribe a line true with the center upon which the tool has been turned, which line will form a guide for filing the top face down to make the tool of the required thickness of one half of its diameter. The edge, A, should be perfectly square with the side or diametrical edges, C C. The circumference of the turned part should have the turning marks effaced with a very smooth file, by drawfiling the work lengthwise, care being taken to remove an even quantity all over. The rake of the tool, as denoted at the dotted line, B, should not be greater in proportion than is there shown.

This tool should be tempered to a straw color and employed at a cutting speed of about 15 feet per minute, and fed at a coarse feed by hand. For use on parallel holes, no part should be ground save the end face; whereas, in the case of taper ones, the top face may be ground, taking as little off as will answer the purpose. It should be borne in mind that, as the steel expands (and therefore becomes larger in diameter) by the process of hardening, the necessary allowance, which is about the one hundredth of an inch per inch of diameter, should be made when turning it in the lathe. Tools of this description, which have a turned part to guide them, or those which depend upon the trueness of their outline or cutting edges to make them perform their duty, and which are apt, in the process of hardening, to get out of true (for all steel alters more or less during the operation of hardening), may be made true after the hardening or tempering by a process to be described in our future remarks on reamers, since it applies more directly to those tools than to half round bits.

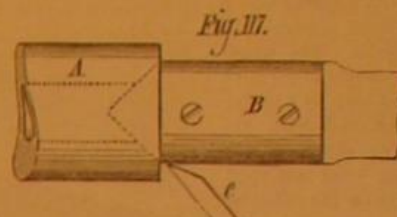
To enlarge holes and true them out, the flat drill shown



in Fig. 116 is employed. It is an ordinary drill made out of flat steel, having pieces of hard wood fastened to the cutting end, A being the steel, and B B the pieces of wood, held on by screws. When the drill has entered the hole, far enough to make it of the diameter of the drill, the pieces of wood enter and fit the hole, steadying the drill and tending to keep it true. It is necessary, however, to true out the hole at the outer end before inserting the drill; for if the drill enters out of true, it will get worse as the work proceeds. The drill is fed to its duty by the back lathe center, placed in the center upon which the drill has been turned up.

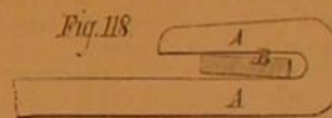
The pieces of wood should be affixed before the drill is turned up, and so trued up with the drill, which should then

be lightly drawfiled on the sides; and the cutting end, having the necessary rake filed upon it, should be tempered to a straw color, the pieces of wood being, of course, temporarily removed. For use on conical holes, the sides must be made of the requisite cone, and the cutting speed in that case reduced (in consequence of the broad cutting surface) to about 10 feet per minute. (This speed will also serve in boring conical holes with a half round bit.) Such a drill is an excellent tool for ordinary work, such as pulleys, etc., because it will perform its duty very rapidly and maintain its standard size; and it requires but little skill in handling. It is more applicable, however, to cast iron than to any other metal. After the outer end of the hole has been turned true, and of the required size to receive the drill, and when the latter is inserted for operation, it is an excellent plan to fasten a piece of metal, such as a lathe tool, into the tool post, and adjust the rest so that the end of the tool has light contact with the drill, so as to steady it. The lathe should be started, and the tool end wound in by the screw of the rest, until, the drill being true, the tool end just touches it, as in Fig. 117.



The dotted lines denote the hole in the work and the drill point; A represents the work, B the drill, and C the tool end, fastened in the lathe rest, and having its end beveled so as to have contact with the drill as close to the entrance of the hole as possible, in which position it is the most effective. In all cases, when a drill is used in the lathe and remains stationary while the work revolves, this steadying implement should be employed, since it operates greatly to correct any tendency of the drill to spring out of true.

To hold flat drills, or those having square ends, and prevent them from revolving, a hook may be employed, either at the front end of the drill immediately behind the wood, or at the other end near the dead center, the shape of the



hook being as in Fig. 118. A A is the hook, and B the drill shown in section, and in the position in which it is held by the hook when in operation. The end, C, of the hook may be made to fit and be held by the tool post, or it may be made long enough to rest against the lathe rest saddle. It is as well to start the drill true with the guide, C, shown in Fig. 117, and, when the drill has entered, say to its full diameter for a quarter or three eighths of an inch in depth, to take out the guide from the tool post and insert the hook in its place, keeping it as near to the outer end of the hole as practicable.

Electric Fall Machines.

These are for demonstrating the laws of falling bodies. In one arrangement, a brass ball is hung by a thread some eight above the ground. Under it, at distance = 1, are two metallic balls connected with the poles of an electric machine; they are so far apart that a spark cannot pass between them, but if the suspended ball drop between them a spark will pass. Further down, at distance = 4, then = 9, etc., are similar pairs of balls. The thread of the suspended ball being burnt, the latter falls between the successive pairs, giving passage at each pair to the current, and simultaneously the spark in another part of the circuit strikes a revolving soot-blackened drum, making a mark. The distances between successive marks are found to be equal. In a second arrangement, there are two cylindrical conductors, insulated and vertical, with a metallic ball suspended between them at the top, hardly filling the interval, and sufficient to enable a spark to pass between the cylinders, which are connected with the poles of an induction (secondary) coil. One of the cylinders has a coating of soot-blackened paper. The thread is burnt, and the ball falls; sparks are made to pass at regular intervals of time, by means of clockwork, interrupting the battery current. Each spark leaves its mark on the blackened surface; and thus are shown the spaces passed over in equal times.—M. Waldner.

The Silk Harvest of the World.

According to a report, just published by the Syndicate of the Lyons Union of Silk Merchants, the silk crop of Europe last year was, in round numbers, 9,050,000 pounds of raw silk, while there were exported from Asia, 11,500,000 pounds, making upwards of twenty and a half million pounds of raw silk available for European consumption. The countries included in the report are Italy, France (with her dependencies, Corsica and Algeria), Spain, Greece, the Turkish Empire, Georgia, Persia, India, Japan, and China. The first and the last together supply four fifths of the silk used in Europe. China exported, chiefly from Shanghai, upwards of 8,000,000 pounds. The crop of Italy amounted to 6,300,000 pounds. France supplied 1,600,000 pounds; Spain, about 310,000 pounds; Greece, less than 30,000 pounds; the Turkish Empire, 1,180,000 pounds; Georgia and Persia, together 880,000 pounds; India (from Calcutta), 925,000 pounds; Japan, something over 1,200,000 pounds.

IMPROVED FLOOR CLAMP.

We illustrate herewith an improved floor clamp, which, by a single operation, is tightly secured to the joist while caused to push the flooring boards together. By a reverse proceeding, the pressure on the latter is removed and the joist clamp unfastened simultaneously. The device may be advantageously used for the clamping of doors, sashes, etc., as well as floors. It may be also employed as a lifting jack by placing it endwise on a suitable support.

A is the driving screw, which is rotated so as to cause the clamp, B, to move in or out by means of the bevel gear actuated by the crank handle shown. The screw works in the rear end of the straight piece, C, a nut being cut to receive the thread, and the interior being hollowed so as to serve as a shield for the screw. D is a toothed cam, the shaft of which is provided with a spring which throws the teeth against the side of the joist. The upper extremity of the shaft carries a short arm, and this, by a spring joint, is connected with the catch, E. The object of the spring in the joint last mentioned is to throw the catch inward, to the position represented.

The mode of adjusting the device is clearly shown. On rotating the handle so as to drive the screw outward, thus pushing the boards together, the rearward motion which the apparatus first takes causes the cam, D, to be partially turned and its teeth to bite against the joist; so that the latter becomes tightly jammed between said cam and the stationary jaw on the opposite side of the bed plate. On reversing the motion of the screw, the straight piece, C, engages with the shoulder of the catch, E, and carries the latter to the rear with it, thus turning the cam shaft and so loosening the same. This continues until the catch strikes the inclined side of the stop, F, which pushes it out of engagement with the piece, C, when the catch is carried back by its springs to its former position.

It will be seen from the above that the device has the merit of simplicity both in construction and in operation. It is necessary only to place the apparatus in position and begin turning the handle at once, its automatic attachment and loosening saving the expenditure of time usually devoted to securing the clamp in place.

For further particulars address Mr. George William Wood, 3,412 North 19th street, Philadelphia, Pa.

IMPROVED SUDDEN GRIP VISE.

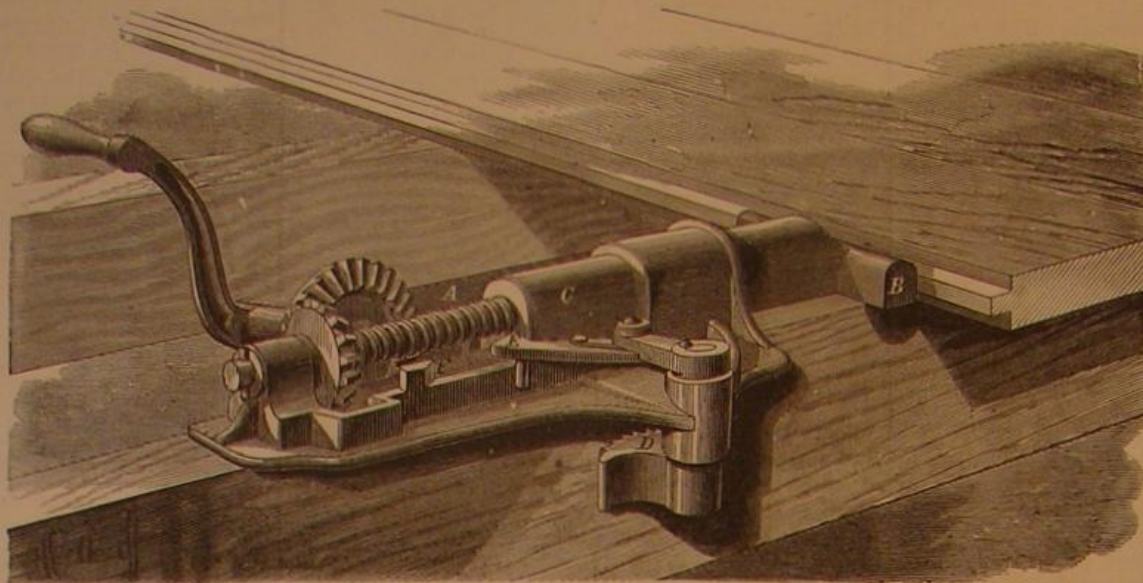
The improved form of parallel vise, a perspective and a sectional view of which are given herewith, is adapted to the uses of all classes of mechanics. It possesses the advantages of rapidity in action and of being able to clasp any sized piece of work within its capacity through the one motion of the hand. It has a self-acting swivel, which allows of its adjustment to any desired position, so that it may be used with the right or left hand with equal facility. The holding mechanism, as will be seen from the following description, is constructed so as to apply the power with great advantage, and the position of the handle is such that, while it is convenient to operate, it is turned out of the way of the workman after the jaws are caused to embrace the work. The various parts are interchangeable, and therefore, in case of injury or loss, easily duplicated; and finally, the castings and other portions are made with a view to the highest strength and durability.

From Fig. 1 the general appearance of the implement, and the mode of operating the lever which determines the movement of the jaws, will readily be comprehended. The interior mechanism is shown in detail in section in Fig. 2. B, in the latter engraving, is the stationary jaw through which the movable jaw, A, the straight part of which is cored out, passes. P is the bed plate, made in two pieces so as to be adjusted into the dovetail formed by the lower portion of the jaw, B. To retain said plate in place, a wedge, W, is driven in between the sections, spreading the same just sufficiently to make a neat fit with the jaw base. Above the plate, P, and held in front and rear by the lower portions of B, is a steel rack plate, H. The rear end of this is secured, and the entire plate prevented from rising by the screw, N.

The lever handle has cast, on each of the sides of its inner end, a disk. These disks are inserted in a socket in the outer extremity of jaw, A, and held in place by friction straps, T, which are adjusted to hold said disks loosely or tightly by means of the set screws, S. On the inner portion of the disks is a pin, K, which, when the lever is raised as shown, presses down the end of a pivoted bar, J, located inside the hollow jaw. Said bar thus raises the toothed clutch, G, and disengages the teeth of the same from the rack, H. Under these conditions, it will be

seen that, by pulling or pushing on the handle, the jaw, A, may be drawn out or shoved in very easily, and so adjusted in contact with the work.

As soon as this last is done, the lever handle is pushed down. The effect is to release the lever, J, and so as to allow clutch, G, to drop, and also to draw a bar, D, which is pivoted to the handle disks, outward; and thus the end of said bar acts as a wedge to push down the toggle joint, E E, and so to force the clutch, G, forward, to act against the rack

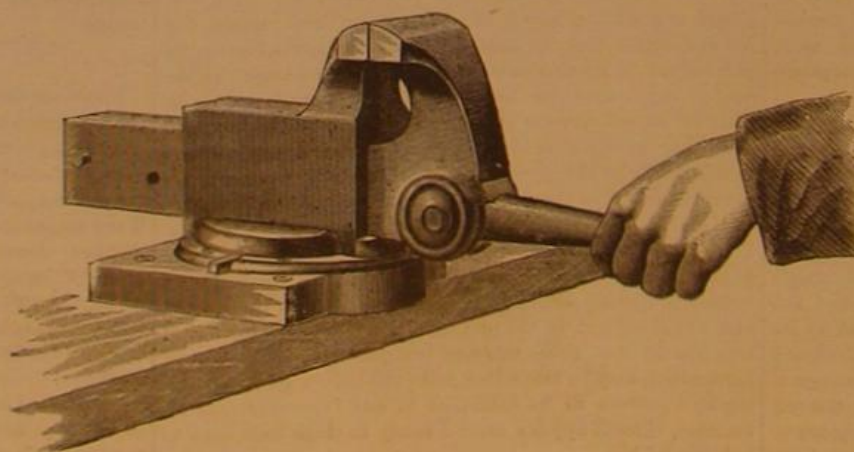


WOOD'S FLOOR CLAMP

teeth. As the part, E, of said clutch bears against the bar, R, which is cast with the jaw, A, it is evident that, acting on the bar, R, as an abutment, the extension of the toggle joint tends to carry jaw, A, inward, with great force, and so to grasp the object inserted between the jaws very tightly. As soon as the lever is raised to loosen the work, the coiled spring, L, acting on the upward turned end of the clutch, G, carries the latter to the rear, and so removes it from the rack teeth, and, at the same time, returns the toggle joint to its normal position.

A moment's consideration will show that the tendency of the downward as well as rearward thrust of the toggle joint is to raise to the jaws. The screw, N, prevents the raising of the rack by the clutch teeth. The same downward action is also utilized to prevent the swiveling of the vise after the grip is put on. That is to say, as the lower portions of the jaw, B, embrace the bed plate, P, the latter acts as a center of rotation; but when the lever is carried down, the force of the toggle joint jams the above parts together, and prevents motion of the swivel.

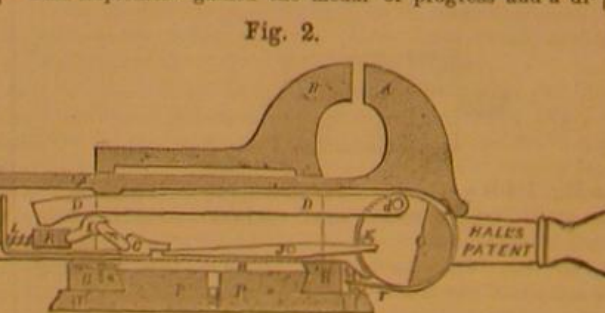
The handle, when turned down, it will be noticed, is entirely out of the way of the workman, and is very quickly operated. The apparatus is secured to the bench by the screws, Y. In a later model of the vise than that represent-



HALL'S SUDDEN GRIP VISE.—Fig. 1.

ed, the base of jaw, B, is carried out to the edge of the bed plate, thus covering the heads of the screws, Y. A gate, in such portion, gives access to the screws, when the vise is turned so that the opening comes over each head in succession.

This implement gained the medal of progress and a diploma of honor at the Vienna Exposition, such awards being, we are informed, higher than those given to any other vise. It also took the highest premium at the Fair of the Franklin Institute in Philadelphia in 1874.



Patented in the United States, Canada, and in the principal foreign countries. For further particulars relative to sale of rights, etc., address Mr. Thomas Hall, 411 Fulton street,

Brooklyn, N. Y., or Mr. Charles Parker, manufacturer, Meriden, Conn.

English Sugar-Cutting Machinery.

It is with sugar as with a great many other articles of commerce: the appearance of the goods, without any reference to its intrinsic quality, largely influences the sale. Sugar neatly divided into regular lumps, each one presenting a clean, crystalline, and brilliant surface, is certainly more attractive than a mass of fragments resembling bits of chalk;

while the uniformity of the pieces renders its use much more convenient. The mode of cutting up the sugar, as practiced in this country, is to saw the loaf crosswise into slabs, and then to stab the latter on both sides with a number of spikes, breaking the mass into fragments of varying sizes. A new apparatus, called Burton's diamond sugar-cutting machine, has lately appeared in England, which, according to the *London Grocer*, cuts the loaf into perfect forms with great rapidity. The machine, says our contemporary, stands above four feet high, is over six feet long, and about three feet wide. At one end, on a sort of platform, a man is engaged in placing the loaf of sugar horizontally, with its base pressing against the mid-

dle of the machine, where a circular saw, worked by steam power, cuts the loaf into slabs. These, being round, of course run by themselves on to a pair of rollers fitted with longitudinal knives, between which they are cut into splints or sticks. Much quicker than it takes to tell, these again, watched by a boy, pass down an inclined plane into grooves, and fall vertically from a smaller pair of knife rollers into a hundredweight box prepared to receive them. They are now quite ready for service on the table, and, surrounded by a blue paper lining, present an endless variety of sparkling cubes, triangles, and diamonds, that can be dropped into the cup at a word to suit the different likings of tea and coffee drinkers. On each side of the box is placed a receiver, one for the fine pulverized powder that falls from the saw, the other for a more gritty substance that comes from the knives. Both are put into bags to be sent where they meet the freest purchasers. A more minute examination of the cut portion shows plainly enough that, while four sides glisten from the action of the knife, only two bear evidence of the marks of the saw; and such a result being the very reverse of that produced by the French *modus operandi*, it must be admitted that the new sugar cutter, in point of cleanliness, neatness, and rapidity, leaves scarcely anything to be desired. Just imagine a whole loaf being cut up entirely in about two minutes, which is at the rate of five hundred cwt. an hour, or three tons in a working day of twelve hours, without stopping, and say if such a thing was ever known before! And the same engine that drives this machine can also be employed for grinding pepper, roasting coffee, cleansing rice, etc.

New Style of Telegraph Poles.

There has lately been erected at the junction of Broadway and 23d street, in this city, an example of a new form of telegraph pole, of iron. It is said to be lighter than a wooden pole of the same height, stronger, and capable of supporting a greater weight. It is constructed of a number of wrought iron bars, rolled out the entire length of the pole, which bars are placed around light cast iron cores, arranged at proper intervals from each other. The cores have seats or notches to hold the bars in their places to prevent their moving sideways, and the bars also have notches, into which the cores fit to keep them from moving up or down. Around the outside, where each core is placed, a ring or band of wrought iron is tightly fitted, which holds the bars firmly in their places, and thus forms the whole into a light, open, and graceful column. Any number or any size of bars may be used, but it is found that six very light bars of angle iron arranged in this way afford a strength that fully meets that required for a telegraph pole of fifty feet in height. The cores are large at the base and are made smaller as they approach the top, which gives the column a graceful taper, and the whole is surmounted by a suitable crosshead to hold the arms for the wires. Such a column is very simply constructed and is without a rivet throughout its entire length. No machinery or shop labor is required to put it together, other than the making of the outside rings or bands by an ordinary blacksmith, so that the pole may be ordered in pieces and put together at the point where it is to stand. The column is suitable not only for telegraph poles but for masts for iron ships, derrick masts and booms, stringers for bridges, lamp posts, and a variety of other purposes.

Pour preserves into jars and seal while hot

NEW REAPING AND MOWING MACHINERY.

We illustrate below some improved reaping and mowing machinery manufactured by Messrs Burgess & Key, London, England. No agricultural machine has had so much attention devoted to its improvement as the reaper and mower—especially the former. The difficulties under which such machines have frequently to work, coupled with the necessity that exists that the work shall be done in the very best and simplest manner, render it no easy matter to design a proper machine; and each year sees some new improvement brought forward at one or another of the various agricultural fairs. Owing, therefore, to these progressive strides, many excellent machines by various makers are now to be obtained at no very extravagant outlay of cash. Machines of this type are now made more compact, lighter and stronger, and, moreover, the dangerous parts are better protected and fenced in.

The reaper for home use shown in our first illustration is a strong two-horse machine, whose weight has been reduced down to 10 cwt.; the tyre of the main driving wheel is wrought iron and of extra width, which at once increases the driving bite and better sustains the machine in soft ground. The fingers, being open at the back, do not clog. The finger beam is made of rolled steel to combine lightness and strength, and the guide cam is so altered and improved as to bring the rakes closer to the ground, so as the better to deal with laid crops. The fingers, which of necessity are exposed to very severe and sudden strains, are now made of cold blast crucible iron, which is about the strongest description of cast iron to be had.

Our second illustration shows the reaper, in which increased simplicity and the substitution of wrought for cast iron have reduced the weight of the mower from $7\frac{1}{2}$ cwt. to $6\frac{1}{2}$ cwt., without reducing the strength, while the repairs bill is also reduced. The second improvement consists in giving the hinge shoe end of the cutter bar a greater space to rise and fall with the undulations of the ground, without disturbing the movement of the main wheel when it sinks in a furrow or in soft land. However carefully rolled, the surface will always present inequalities, therefore any provision to allow for them, such as the above, is of great importance. The cutter bar is provided with a wheel at each end, and the mechanism for elevating the knife is so designed that, by means of a compensating tongue and slide box, it is always kept parallel with the ground surface, and the fingers are thus kept from plowing into the earth. The method of lubrication is so designed that the oil applied to the bearings runs from them to the teeth of the gearing.

Another improvement is in the manner of jointing the knife to the connecting rod by means of a spring bolt pin. This pin secures itself, and no split pins, leather, etc., are needed; while any pressure of the thumb on the spring bolt at once releases the pin. A third improvement is in the method of inclining the fingers and recessing them so that the knife does not become clogged with dirt. In this mechanism, the crank shaft bracket not only secures the crank shaft bearings, but also the spindle of the bevel wheel, both bearings being bushed; and the bushes being the only parts that wear, they are easily and cheaply replaced in time of need. The bracket fences in the gearing and preserves it from dirt.

Paper Plants.

A good deal of interest has been excited by the recent reports on the paper-making grass of Algeria, the so-called *alfa* or *stipa tenacissima*, which covers hundreds of thousands of acres in that country. But the *Agricultural Gazette* of India states that another plant is to be introduced into Algeria, of still greater commercial value. This is the *hibiscus esculentus*, the use of which as a fibrous plant has long been recognized. The plant, though indigenous to the West Indies, has long been naturalized in India. Its pods produce the common vegetable known as okra by the English, gomto by the French, chintomo by the Spanish, and benditeai, in India, where it is so much esteemed for its mucilaginous thickening for soups. The pods are gathered green and pickled like capers. The seeds may be boiled like barley, and the mucilaginous matter they contain is both demulcent and emollient. They have also been recommended when roasted as a substitute for coffee. A patent has now been taken out in France for making paper from the fiber, and for this purpose it is to be introduced into Algeria. The fiber is prepared solely by mechanical means in a current of water, without any bleaching agent, and the pulp, washed and bleached, is reported to make a strong, handsome paper, equaling that from pure rags. It is called banda paper.

The Coffee Plague in Ceylon.

The Director of the Royal Botanic Gardens in Ceylon has just prepared a statement of the result of the latest investigations into the nature and development of the leaf fungus (*hemileia vastatrix*), which has for several years so affected the coffee trees of the island. He can report nothing to indicate its probable disappearance, or diminution of its intensity. Though requiring careful inspection for its detection, he unfortunately found it present upon all the coffee trees which he examined. With the help of a microscope, it is found at all times to pervade the greater part of the stem and older leaves in the form of very fine, branching filaments, its effect being apparent in numerous somewhat translucent spots,

top lying on the ground is over 100 feet in length. The other trees in the vicinity are not as large, but all are of immense girth.

A New Source of Fuel and Its Utilization.

There is no doubt but that the cutting down of forest trees, simply for the sake of the wood as fuel, is a practice which cannot and should not be continued in any civilized country. The forests are far more valuable standing, inasmuch as their destruction, as we have repeatedly pointed out, involves climatic alterations and changes in the nature of soil which seriously affect agriculture. But the necessity for a cheap fuel, cheaper than coal, still remains; and probably until that want is supplied from other sources, no amount of warning and argument will confine people to using simply the dead wood and prevent their felling the growing trees. It so happens that there is a source for cheap fuel, which only waits for the invention of a means for its utilization. And this source is found in the grass which withers on the prairie, the seaweed which decays along the coasts, the dry leaves of the forest, and in all such vegetable refuse. If a quantity of straw, hay, or leaves be spread out in loose masses and set on fire, the result is rapid combustion; but if the same material be compressed into a solid bale or block, the combustion becomes little more than a gradual smoldering. It is hardly necessary to dwell upon these facts, since they are well known to every farmer who has transacted the slow burning of an old hayrick with the rapid ignition of the dry leaves, swept loosely together from roads and paths, and fired to get rid of them. In the latter case, there is a free draft through all the interstices of the mass, and hence an immense supply of oxygen; in the former the compression obstructs the draft, and checks the oxygen supply, and, as a necessary consequence, retards combustion.

It will naturally occur to the thoughtful reader at the outset that the needed invention must be one in the shape of a furnace in which the light materials may be burned in this compressed form. Western settlers have anticipated the idea by twisting straw and hay into ropes and burning the same during the long months of past winters, after the grasshopper devastations had deprived them of the necessary means wherewith to procure wood for their households. But this has proved but a partial solution of the difficulty, and the prairie grass ropes, though burning slower than the loose hay, are still consumed too rapidly to be of much advantage where a steady heat is required.

Whether a new invention which has recently appeared is to be the means of solving this important question, we are not prepared positively to state; but so far as the construction and principle of the same extend, it seems to be a valuable and ingenious device. It consists of a box of stove sheet iron, in which is a heavy press follower, which by simple mechanism can be moved up and down, and thus arranged to maintain a steady pressure upon the hay or similar material placed in the fire chamber. A feeder allows of the supply of fuel being kept constant, and there is apparatus for adjusting the grate relatively to the follower, according to the quantity of material placed between them.

It will be readily understood that, when the pressure is upon the fuel, the flame cannot act upon the mass either at top or bottom. Combustion, says the inventor (Mr. Alexander Hamilton, of Cresco, Iowa) can go on only around the sides to which the heat and air have access; so that the consumption of fuel is very slow, and can be easily graduated by the draft supplied. It is further said that one hundred pounds of hay or straw per day will be sufficient to feed the stove during the coldest weather, and that six or seven tons of the material will suffice for an entire winter. If the invention substantiates in practice the advantages foreshadowed, it will serve at least as a step in advance toward a most important utilization of a now wasted material, and at the same time it will accomplish such progress certainly in a mode much simpler than that involved in the majority of straw-burning furnaces now extant.

New Inoxidizable White Metal.

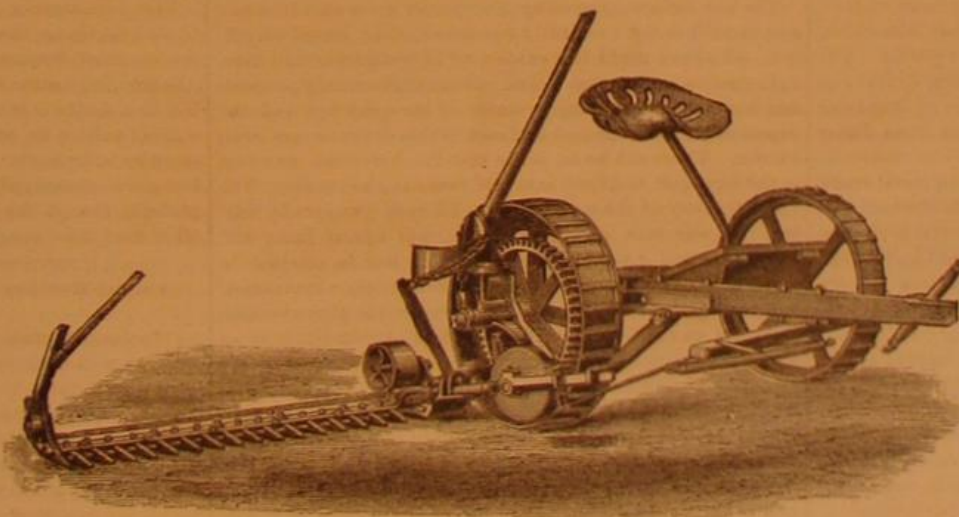
According to M. Marlié, an inoxidizable white metal may be made of iron 10 parts, nickel 35 parts, brass 25 parts, tin 20 parts, and zinc 10 parts. The alloy is cast and cut in pieces, and the latter are tempered at white heat in a mixture of sulphuric acid 60 parts, 1 nitric acid 10 parts, muriatic acid 5 parts, and water 25 parts.

An obdurate screw may sometimes be drawn by applying a piece of red hot iron to the head for a minute or two, and immediately using the screw driver.



BURGESS AND KEY'S REAPER.

which may be observed by holding up one of the leaves against the light. The direct injury so caused to the coffee tree is, however, very slight as compared with the effect produced when the fungus attacks the young leaves, causing them to fall prematurely. As the presence of the fungous filaments in such abundance on the outer surface of the tree is amply sufficient to account for phenomena, which it was at first thought were attributable to a poisoning of the juices of the tree, by an absorption of the fungous matter through its roots, that idea must be abandoned, and the disease considered as external, except when it appears within the tissue of the young leaves. Subsequently, from these enclosed masses of filaments, short branches are produced, which emerge from the pores, and bear the conspicuous orange-colored



BURGESS AND KEY'S MOWER.

spores, or reproductive bodies. Some of these spores have been observed to germinate on the outside of the leaf, producing branched filaments of exceeding tenacity, which grow with marvelous rapidity all over the surface of the leaf, and beyond it to the stems. The ends of some of these filaments, too, have been observed to enter the pores of the leaf, and there to form fresh plague spots and fresh crops of spores. It is to be hoped, now that the nature of the malady is better known and more accurately defined, that some effective cure may speedily be found for this disease, which is so greatly damaging the Cingalese coffee crop.—*London Grocer*.

Discovery of Another Grove of Great Trees in California.

This grove is situated in a basin at the head waters of the San Lorenzo and Boulder creeks. One of the trees eclipses all that have been discovered on the Pacific coast. Its circumference, as high as a man can reach, standing and passing a tape line around, is a few inches less than 150 feet. This is beyond the measurement of any tree in the Calaveras Grove. The height is estimated at 160 feet, and a part of the

Russian Metal Industries.

While Russia will not through her government contribute to the Centennial, for reasons about which there are so many contradictory rumors that it is difficult to assign any as the truth, there is a fair probability that through private enterprise her industries will make a display which will, in a measure at least, typify her enormous natural resources. In the United States, little is known concerning industrial progress in Russia, other perhaps than that the advancement of the same must necessarily have been rapid, in view of a great civilized empire to-day existing where, one hundred and fifty years ago, there was little more than a nation of barbarians. From the death of Peter the Great in 1725, Russian manufactures have steadily pushed onward, until now in several branches they enter into competition with those of far older countries.

In some districts the manufacture of cutlery and hardware forms the sole occupation of the entire male population. A kind of two-bladed pocket knife is made, at the rate of 10,000 dozen per year, and sold at the annual Fair of Nijni Novgorod. Locks and trunks manufactured in the Pavlovo district find their way all over Asia. Some thirty or forty settlements in the Pavlovo district make nothing but knives, scissors, swords, and various edge tools. There are two large firms which employ 600 men each. The raw materials are English steel and a native product obtained from the government works on the Ural River. A large portion of the Semenoff district is engaged in the manufacture of fishing tackle and metal bolting cloth for mills, and 40,000 scythes per year are made at the Artinsky works in the Zlatoust district of the Ural. The Russian edge tools differ from those of English make in many respects. The common spade, for instance, is made chiefly of wood and simply tipped with iron; it is of small size, rounded at the edge, and has a plain curved handle. The ax is much larger than those of western manufacture. In the hand of a Russian workman, it is used for all kinds of carpenter's work. It answers as a plane, and as a hammer; even as a saw, for the last very useful tool is rarely employed by the Russian mechanic. He can wield the ax more easily, and cut through thick logs of wood with incredible precision and rapidity.

Russian iron is now largely employed in the cut nail manufacture, a growing industry carried on near Moscow. Silesian and Swedish irons are made into telegraph wires. The manufacture of iron holds a very important position, although the quantity produced is insufficient to supply the demand; besides, Russia is unable to compete in the cheaper qualities of that metal, owing to the expensive process of using wood fuel in its manufacture, coal being rarely used. Sheet iron is produced to a great degree in large private establishments; but steel-making is yet in its infancy, the metal being made almost entirely by one or two government foundries; it is applied chiefly to the manufacture of cannon. Breech-loaders, introduced by the Americans and adopted in the Russian army, cartridges, and swords are manufactured also by government works.

Colonel Amosoff, of the Zlatoust Government Works in the Ural, has discovered, it is said, the secret of the ancient Damascus steel. The Russian imitation is a particular modification of cast steel of peculiar crystallization, which last character betrays itself through corrosion by acids (the process of bringing out figures on steel) by acting more violently between the interstices of the structure than elsewhere, thus tracing out the arrangement of the crystals. The sword blades are made to pass a test, being bent double and back again several times. A well tempered saber of Damascus steel will readily sever bars of iron and the most flimsy kerchief as it floats in the air.

Samovars are a leading article of the Russian metal trade. These are a kind of tubular boilers, with little charcoal furnaces, and are used for making tea. The material is copper, which is almost exclusively used among the well-to-do classes for cooking utensils. Tin ware, hollow cast iron vessels, and pewter are little employed. The peasants still eat with wooden spoons and bowls.

Harness fittings of European pattern are made, but in very limited quantities, those used upon Russian harness being of different construction. Horseshoes are produced by hand at the rate of 30,000,000 per year. Bell-making is carried on with especial success, the bells being remarkable for the immense size and richness of tone. This is one of the ancient industries of the country.

It may be said, writes a correspondent of the *Ironmonger*, to whose exhaustive letter we are indebted for the main facts given above, that Russian manufactured goods have for the most part attained a high degree of excellence; but many of them are enormously dear. The interests of the immense mass of the Russian people who consume are thus sacrificed to increase the wealth of the comparatively small class who manufacture. But it must be remembered that the greater number of iron-manufacturing consumers were only a few years ago in a state of serfdom.

Patented Car Improvements.

The mechanical requirements of railroads are a perpetual stimulus to invention. An unceasing demand exists for new or improved devices. The two great essentials of safety and economy are never so perfectly realized as to satisfy either the road managers or the public. The burden of nearly all the talk when engineering and mechanical associations meet for consultation is how to remedy existing defects by the use of better methods and appliances. This, with the inherent capacity of railways for development, offers an inviting field to inventors, which they have not been slow to cultivate. The consequence is that a multitude of inventions are pressed upon the attention of railroad men, some of which are intrinsically good and meritorious, while the vastly great-

er number are absolutely worthless. But so long as inventors persist in patenting the products of their ingenuity, railroads must pay for the right to use them, or not use them at all. A discrimination must also be made, in order to select such as are really valuable; and this can be done in no other way than by careful experimental testing, uninfluenced by the interests or claims of patentees.

The discussions of the Car Builders' Association at its last and previous meetings evince a sensitiveness on the part of some of the members in regard to the use of patented devices, which is not calculated to secure the advantages to be derived from them. The impression seems to prevail with some that such devices are not only inadmissible as legitimate topics of discussion, but that the many needed improvements in the construction of cars must be provided, as far as possible, without paying tribute to inventors. Now this would unquestionably be a very good thing for the roads, if it were at all practicable. There is, however, a very serious obstacle in the way of carrying out such a programme. Inventors, as a class, are no exception to the general run of humanity. They are quite willing to receive remuneration for the time and money they expend in getting up good and useful contrivances for making cars run easily and comfortably. If they have anything to sell which is salable, they do not blush to name a price; and they would just as soon make a livelihood out of railroad earnings as in any other way. It is purely a business transaction between buyer and seller. In this view of the case, it is evident that no very valuable improvements in the design and construction of cars are likely to be discovered and applied independently of patents and patentees. It would, therefore, seem to be right and fitting that all patented inventions for such purposes should be freely discussed by car builders at their yearly and monthly meetings, as the only way of ascertaining what is worthy of being adopted. Any practicable plan for better ventilation, any radical improvement in drawing and buffing attachments, brakes, framing, coupling, etc., must work a saving in expenditure, or augment the comfort and safety of passengers to a degree which will more than justify the cost of the right to use, or else such improvements are hardly worth a trial.

We are aware that there is a difficulty attending the discussion of the merits of rival inventions, or, indeed, any patented invention having relation to cars. If this, that, or the other device is approved or condemned, a suspicion is apt to be aroused that undue influences have been brought to bear, that somebody's ax is being ground, or somebody's fortune made or unmade, while others, equally worthy or unworthy, do not get what is their due. It is hardly possible that entirely disinterested action can be secured in such cases; but action of some sort cannot very well be evaded. It is obviously not the business of the Car Builders' Association to make or unmake the fortunes of inventors, or to discriminate between rival claims, except on the score of actual merit; but it is certainly bound to recognize inventions, and pass upon their respective merits, so far as the interests of railways within the limits of the car departments are affected thereby.—*National Car Builder*.

American Ordnance.

The low estimate placed by Europeans upon cast iron as a gun metal has not been fully concurred in by American officers, who have made it a subject of investigation and careful experiment for many years. Since 1849 a steady progress has been made in the improvement of its qualities, and the experiments of Wade and Rodman in this direction are well known. There can be no doubt that the American gun iron is the strongest and best cast iron made in the world. The mean tenacity of the metal of the 15-inch guns made during the war was about 36,000 lbs. per square inch, and in some cases reached 40,000 lbs. The iron is smelted in small charcoal furnaces with cold or moderately warm blast, and from pure rich soft limonites. The crude pigs are subjected to one and sometimes two preliminary meltings in an air furnace with sand bottom. The guns for the army are cast hollow, and cooled from the interior by a water core, while those for the navy, with the exception of the 15-inch, are cast solid. A wood fire is kept up in the pit for several days during the cooling. The water core is at length removed, and water is circulated in the naked bore until the gun is quite cold. The initial tension thus produced is considerable, though in very rare cases excessive. The degree of tension is determined by cutting off an annulus from the sinking head or muzzle and planing a radial cut. Just before the cut has passed through the annulus, the rings snap, and the amount of gape gives the relative tension. Guns which do not conform to the requirements of these tests are rejected.

The only gun in the United States service upon which much reliance has been hitherto placed, and which is capable of really heavy work, is the 15-inch smooth bore. There are innumerable smaller guns mounted along the sea coast, but they are each considered as a *locum tenens* awaiting a heavier armament. While the 15-inch smooth bore is very far inferior to a 10-inch rifle in range and in penetrating power against heavy armor, it is by no means an insignificant weapon. This gun was designed in 1867 and 1868 to fire a maximum of 50 lbs. of powder and a 350 lb. shell, but its present charge is a solid shot of 450 lbs., with a maximum of 120 lbs., and a service charge of 100 lbs., of powder. The muzzle velocity with the heavier charge is about 1,700 feet, with the lighter about 1,590 feet, while the corresponding pressures, as recorded by a Rodman internal gage, are 21,000 lbs. respectively.

This great increase in power points of course to a great improvement in the means of controlling the action of the

powder. Experiments upon gunpowder have been very numerous and thorough in the United States indeed we may say that that country is not behind any other nation in this respect. From the experiences gained, the experimenting committees have settled quite definitely for the present the gunpowder which will be used, and with the results obtained they appear quite satisfied. We are not at present in a position to publish the exact details respecting the powder recently adopted into the service, but we may state in general terms that the new powder is a large pellet consisting of two truncated hexagonal pyramids, base to base. They are pressed into this form between bronze plates which contain cavities, corresponding to the truncated pyramids, arranged in honeycomb fashion. The powder comes out in large sheets, which are easily broken up into pellets. There is nothing in this particular form of pellet, except that it is the most convenient for making, easily and cheaply, a powder which fulfils the following conditions:

1. The grains must be of sensibly uniform size and shape.
2. They must be homogeneous in respect to density; not only must the density of each and every grain be the same, but there must be no hard and soft portions in any single grain.
3. The ratio of surface to mass should be as small as practicable.
4. All angles should be as obtuse as possible.

This shape of grain apparently fulfils the foregoing requirements better than any other which has been devised, excepting possibly the prismatic, to which, however, it appears to be equal, and is certainly cheaper and more convenient to manufacture. It is called the hexagonal powder, and its most satisfactory features are very low pressures with good velocities and remarkable uniformity of action. In the 15-inch gun the variations of pressure are not worth mentioning, and under the constant pressures of 15,000 lbs., or even 20,000 lbs., the endurance of these guns would be practically indefinite. The Rodman internal gage for recording pressures is exclusively used in the United States, where it is much preferred to Noble's crusher. The latter, indeed, appears to be strongly condemned among the artillery officers of the United States, although they are fully alive to the imperfections of the former. The gage ordinarily used consists of the well known cutter placed in a cylindrical steel box, the piston rod being exposed by a hole in the cover. The whole is tied to the bottom of the cartridge bag, and buried in the powder. It is usually left in the bore after the discharge, or drops in the sand a yard or two from the muzzle. Sometimes the external gage is used in connection with it, and, notwithstanding the prevailing belief to the contrary, the two gages show a very reasonable agreement.

In consequence of the increased powder charges employed, buffers have been introduced into the American carriages, for the fifteen inch gun with 100 lbs. of powder is very lively on its carriage. For some years a pair of cylinders fixed to the front end of the chassis have been employed; they are a little less than 8 feet long and 13 inches diameter, and the recoil pulls out the piston rods compressing the air in the cylinders. They work very well, but are bulky and costly, and experiments are being made with hydraulic buffers, similar to those in use in this country.

The instruments for recording velocities in use in the United States are the Schultz and Boulengé's chronographs, the one most frequently employed being the former. This (the Schultz) instrument has been almost abandoned in Europe but in America it is supposed to have failed here through want of skill in its use, for when well handled it is a very superior instrument. United States' artillery officers have become so thoroughly accustomed to it that they generally prefer it, though the Boulengé and Benton chronographs are often used for "rough and ready" work.—*Engineering*.

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

[We desire to state that the recipes which are given herewith, as well as those which have appeared in our columns from time to time, are not vouched for by us as absolutely correct, since it is manifestly impossible for us to submit all or even a fraction of them to the test of personal experience. They are selected, however, with much care from a wide and reliable range of sources, both domestic and foreign. Many are kindly furnished us by correspondents, and such we are especially gratified to receive. In this connection, we beg again to remind our readers that our columns are always open to them for the publication of such results of their own observation and experience as they may be pleased to communicate. We cannot repeat old facts, nor present trivial ones, but there is hardly a person who may read these lines who cannot send some hint or suggestion, sure to be new and valuable to some one else. Never mind the writing or the spelling; send us the bare facts, and thus pay off the moral debt owing to those who have already contributed their knowledge for your benefit. We intend this column of recipes especially for such suggestions; and if every one of our subscribers will but contribute one good fact a year, a volume of this paper will contain 45,000 recipes and valuable suggestions, not obtainable in books or from any other source.—Eds.]

Yellow stains commonly called iron mold are removed from linen by hydrochloric acid or hot solution of oxalic acid. Wash well in warm water afterward.

To fasten emery to leather, boil glue very thin, add a little milk, raise the pile of the leather, and put on the glue with the brush. Then sprinkle on the emery, and let it cool.

To preserve soap grease, fill a cask half full of good strong lye and drop all refuse grease therein. Stir up the mixture once a week.

The best fattening material for chickens is said to be Indian meal and milk.

A remedy for caterpillars, which is used on a large scale in France, consists in a solution (1 part in 500) of sulphide of potassium, sprinkled on the tree by means of a hand syringe.

The best and most durable insulation for electric wires is to tin them and cover with pure rubber.

Javelle water, used for turning white the dirtiest linen, and removing stains, is composed of bicarbonate of soda 4 lbs., chloride of lime 1 lb. Put the soda into a kettle over the fire, add 1 gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. Use when cool. This is good for removing fruit stains from white underwear.

Borate of soda dissolved in water, used as a lotion, will remove prickly heat.

The average yield of corn cobs is 7.62 parts of carbonate of potash in 1,000 parts of the cobs, which is nearly twice as much as is furnished by the best specimens of wood. The corn crop of this country will supply 15,400,000,000 lbs. cobs, from which 115,500,000 lbs. of potash might be made.

The way they boil rice in India is as follows: Into a saucepan of 2 quarts of water, when boiling, throw a tablespoonful of salt; then put in 1 pint rice, previously well washed in cold water. Let it boil 20 minutes, throw out in a colander, drain, and put back in the saucepan, which should be stood near the fire for several minutes.

Save the corn cobs for kindlings, especially if wood is not going to be plentiful next winter. To prepare them melt, together 60 parts resin and 40 parts tar. Dip in the cobs, and dry on sheet metal heated to about the temperature of boiling water.

Equal weights of acetate of lime and of chloride of calcium, dissolved in twice their weight of hot water, is a fireproofing mixture for fabrics.

The ammoniacal solution of oxide of nickel will dissolve silk; that of copper dissolves cotton also.

[For the Scientific American.]

THE CHEMICAL FIRE-FLY.

BY PROFESSOR C. W. WRIGHT.

Of all the elements, there is none which presents such a diversity of forms as phosphorus, and not one that presents such a variety of properties which are so apparently contradictory. The number of allotropic forms assumed by this element, and the peculiar part which it plays in the conditions essential to the manifestation of sensation and intelligence, together with the fatal effects which often result from its introduction into the system, give it an interest not exceeded by that of any other form of matter whatever. A distinguished professor of this city, who was in his day a most attractive teacher, maintained that the chief element of success in a lecturer consisted in the power to address the eye, experimentally when possible, and by a well drawn mental image when the subject under discussion did not admit of physical demonstration. In other words, he contended that nothing should be left to the imagination of the student. There can be no doubt that a single, well selected experiment, skillfully executed, is more instructive than an hour's talk without illustration. Phosphorus may be selected as a means of illustrating the two methods of presenting a subject. Thus, the average text book informs the reader that phosphorus is luminous in the dark, or, in other words, phosphoresces when exposed to the air; and this is about all that is stated in reference to a property of this element, which is the most important of any connected with it. Upon this property, or one closely allied to it, is the poisonous quality of this agent based. Destroy this power of phosphorescence, and this element is no longer a deadly poison, either when swallowed, or by the action upon the bones of the upper and lower jaw. The phosphorescence of this element is accompanied by the development of ozone, and any substance which has the power of destroying ozone will arrest the luminosity of phosphorus, and, what is of still greater importance, destroy its poisonous action. In fact, phosphorus is not of itself a poison, but the ozone which it has the power of developing out of the oxygen of the air is the sole cause of the fatal results which follow its introduction into the system. This I have repeatedly demonstrated by experiments on the lower animals; and in two cases of accidental poisoning in human beings, the same facts have been proven. This is a subject, however, that properly belongs to the medical profession, and I will simply state that ten or fifteen drops of spirits of turpentine, mixed with an ounce or two of sweet oil, or any liquid fat, will prove an efficient antidote to elementary phosphorus, or any substance, such as the tips of matches or certain rat poisons, with which it may be incorporated. Other volatile oils, such as sassafras, may be employed when turpentine is not at hand. It is not every specimen of turpentine that will prove antidotal to phosphorus. Any substance that has the power to instantly destroy the luminosity of this body will prove effectual as an antidote; and the only assurance we have of the efficiency of any agent is to test it beforehand.

Phosphorus is, then, not of itself capable of producing inflammation of any tissues of the body; but ozone, which it has the power of evolving from the oxygen of the air, is the cause of all the local mischief which results from its contact with certain parts of the body. That this body may produce certain general effects when it finds its way into the circulation, we do not doubt, but these are distinct from its local action.

To prepare the chemical fire-fly, by which some of the most characteristic properties of phosphorus can be demon-

strated, select a two ounce phial which has been well annealed, and introduce into it sweet or almond oil, till the bottom is covered to the depth of half an inch (lard will answer, if nothing better can be procured), and to this add fifteen or twenty grains of phosphorus, and then cork it loosely. After this, place the phial in a pan of cold water, and set it on a stove or other warm surface till the phosphorus melts, then shake the phial till the oil has dissolved as much of it as it is capable of holding in solution. Three or four vigorous shakes in the course of ten minutes will answer. That quantity of oil will not dissolve the whole of the phosphorus, which is not desirable. The cork must not be a closely fitting one, but must be forced into the phial so as to nearly prevent the escape of the oil when inverted. It is best to give the cork more of a conical shape than those in use by druggists. When experimenting, the phial must be warmed about as hot as the hand can bear, and slightly agitated or inverted, taking care, when doing this, to have the cork well secured; it may afterwards be loosened a little. When the cork is properly adjusted, which can be easily accomplished by a little practice, the whole interior will light up every few seconds, in rhythmical succession, and continue to do so for hours, provided the proper temperature is maintained. At the conclusion of the experiment, the apparatus should be put away in a dark place, and a tightly fitting cork introduced into the phial. A number of these phials, properly adjusted in a darkened room at different points, and several set swinging by means of strings suspended from the ceiling, produce a singular and weird impression, that grows upon the observer the longer the experiment is observed; and after a time it is difficult to divest oneself of the idea that the light is evolved by a living, moving creature. For impressiveness, there is no experiment in chemistry that makes such an enduring image upon the observer. Of course every precaution should be taken to avoid breaking the apparatus or spilling the oil. No damage, however, need be apprehended provided the directions are strictly followed. In experimenting with phosphorus, the inexperienced should always be provided with a large vessel of water in which a few drops of turpentine have been diffused. When burning phosphorus has been extinguished by this water, there is little or no danger of its re-ignition, which is very apt to occur when it is extinguished in the ordinary way. The phosphorescence of this element, when a solution of it is spilled upon any object, as well as its disagreeable odor, are instantly destroyed by a small quantity of turpentine suspended in water.

Under no circumstances should children or careless persons be permitted to experiment with phosphorus; not that it is anything like as dangerous as coal oil and many other articles handled daily, but there is no substance that so completely demoralizes the understanding, in case of an accident, as this.

The glow-worm may be imitated by transmitting bubbles of air through glass tubes containing the phosphorized oil. In fact, there is no end to the number and variety of experiments that can be devised by a person of inventive genius.

The phosphorescence of the fire-fly and glow-worm is due to slow combustion or oxidation; and the phenomenon is arrested in them, as it is in phosphorus, by placing them in a negative gas, such as nitrogen, for example. Phosphorescence is not always, however, the result of oxidation. This fact can be demonstrated by exposing the diamond to direct sunlight for a few minutes, and then transferring it to a darkened room, when it will emit a beautiful light for several seconds.

The phosphorescence of the fire-fly is not due to the slow combustion of phosphorus, nor is it an amatory display on the part of that insect. The species are perpetuated under different circumstances, and in the daytime. The fire-fly is a carnivorous insect, and the object of the illumination is to attract small insects, which are quickly devoured.

If the ear be placed near the vessel of phosphorized oil at the moment of illumination, a slight hissing noise will be perceived, produced by a sudden rush of air into the phial, in consequence of the partial exhalation (one fifth) of the air in the phial, by the abstraction of oxygen, which unites with the phosphorus. This fact is instructive. It demonstrates to us, in a striking manner, that a vessel which may be impervious to a liquid may permit the entrance or exit of a gas or vapor; and it accounts for the decomposition of spirits, conserves, extracts, etc., that are put up in vessels that are supposed to be hermetically sealed, simply because they do not permit of the escape of their liquid contents.

Louisville, Ky.

Progress of Flying Machinery.

A new steering balloon by Smither is being exhibited, suspended in the middle of the Alcazar in Paris. The measurement is only 6,000 cubic feet, but the balloon is so light that, when filled with pure hydrogen, it must float. A considerable sum of money has been invested in it, and great ability has been displayed in the construction. Although no practicable result in open air may be hoped for, it is a wonderful piece of clockwork. In connection with this subject, it is stated that, for several months past, a firm of engineers have been experimenting privately at the Crystal Palace with an aerial steamer of a novel and promising character, weighing 160 lbs. Experiments are stated to have proved the capability of two vertical screws, each 12 feet diameter, to raise a weight of 120 lbs.; the steam engine, with water and fuel, forming part of the weight so raised to the extent of 80 lbs. The power exerted by it is equal to two and a half horses. The communication of motion is given by a vertical axis emanating from the car.—*Nature*.

Recent American and Foreign Patents.

Improved Dumping Car.

Benjamin Slusser, Sidney, Ohio.—This invention makes a considerable change in the frame of a dumping car or wagon, so that the contents may be discharged with little expenditure of manual force, and yet with great facility, the tail board being made to open automatically.

Improved Fifth Wheel.

Jacob Hodge, Springfield, Ill.—The fifth wheel is a circular iron disk, the face of which is slightly convex, and which has lugs formed upon its sides to receive the clips, by which it is firmly secured to the axle. In the center of the disk is formed a hole to receive the hub on the circular disk of the head block. The lower side of the head block has a circular recess to fit upon the fifth wheel, the face of which is slightly convex, so as to bring the bearing toward the center. Upon the head block is a transverse rib, upon which rests a spring. Upon the rear side of the head block are formed two flanges, and an arm or projection, having slight flanges formed upon its side edges to form a seat for the reach, the forward end of which abuts against the rib of said head block. The connection between the reach, head block, fifth wheel, and axle is strengthened by two metal straps.

Improved Gas Generator.

James C. Mitchell, Lancaster, N. H.—This invention relates to certain improvements in the manufacture of illuminating gas, designed to utilize any kind of fuel for the production of the gas, and applicable to limited manufacture, as for private families, etc. It consists in a retort placed within a furnace, or a common stove if desired, and having an airtight door of peculiar construction, and a communication direct with the furnace, by means of which construction the gaseous contents of the retort may be drawn into the furnace and burned, when the airtight door is to be opened for drawing and recharging the retort. It also consists in the combination with the feed pipe to the gas holder of a ball valve to prevent back pressure.

Improved Cotton Chopper.

Wm. D. Evans, Society Hill, S. C.—The invention consists in a rotary chopper having interlaced sets of knives on two drums arranged on a single shaft, so as to chop out two rows simultaneously.

Improved Egg Tester.

Wm. W. Wilson, Parkville, Mo.—The invention consists in an egg tester consisting of a case in whose center is placed a lamp, and in whose side is a horizontal tube having an egg-holding cap at the outer end.

Improved Gang Plow.

A. Schrader, Walla Walla City, Wash. Ter.—The invention relates to that class of gang plows whose frames are supported on swiveled castor wheels so as to regulate the depth of furrow, and consists in an improvement by which the front and rear wheels are simultaneously graduated by the driver, so as to determine the exact depth of furrow required.

Improved Post Hole Borer.

Obadiah Love, Saxenburg, Pa.—The object of the invention is to expedite and diminish the cost of post-hole digging by making the blades form a cage, tapering in an upward direction, and causing the soil to crumble and discharge itself.

Improved Automatic Car Coupler.

F. W. Nash and S. S. Kirk, Washington, D. C.—This coupler is adjustable to any car, and couples with any other coupler, by simply bringing the cars in contact. It can be uncoupled from side, top, or platform of car, avoiding the necessity of the attendant ever going between cars. It is claimed to combine simplicity, utility, durability, strength, and cheapness. For further particulars, apply to S. S. Kirk, Washington, D. C.

Improved Vehicle Tongue Support.

George W. Burnside, Prairieburg, Iowa.—By suitable construction, when the draft is applied, the downward pressure of a chain upon a pulley raises the tongue, and supports it, so as to relieve the horses' necks from its weight, and hold it raised so long as the draft strain is continued.

Improved Foot Treadle.

Daniel E. Lillis, Lockport, N. Y.—The invention relates to the construction of swinging foot treadles for sewing machines and others, in which an adjustable foot plate is bolted on to the hanging bar, for shifting forward and backward on the bar to balance the feet relatively to the pivot. Ribs are cast on the edges of the foot plate, in combination with the notched hangers, to assist the binding screw in holding the foot plate fast.

Improved Lamp Fount.

Edward Brown, New York City.—The lamp fount is provided with a thin circular outwardly and downwardly projecting flange around an inner conical cavity, a space being left between the flange and body of the fount to receive the fastening screw of a bracket.

Improved Bessemer Converter.

Almon S. Dunsing, Joliet, Ill.—The invention consists of a converter, the nose of which is constructed at the front part in straight or flattened shape. By the removal of the projecting angle or curved convexity, the sectional area of outlet is greatly increased, and consequently the force and velocity of the blast diminished. Thus any metal rolling up will fall back. The invention states that he has made about twenty thousand tons of steel under this improvement, and with not one fourth the usual overflow.

Improved Harrow.

Joseph Rieth, Mount Sterling, Ill.—The harrow frame is made in two parts. Each part consists of three or more parallel bars, connected. The two parts may be adjusted closer together or farther apart, as may be desired. The outer ends of the outer bars of each part have rings secured to them. To the draft bar are attached five staples. Two draft chains, the forward ends of which are hooked into two of the staples, are equally distant from the center of the draft bar. The chains are passed through forward rings, and are hooked into rear rings, or are turned back upon themselves and hooked into their own links. The draft may be applied to the other side of the harrow. By detaching the chains, the parts of the harrow may be folded together, so that it may be drawn upon its side in passing to and from the field.

Improved Blind Stop.

Charles E. Steller, Milwaukee, Wis.—This consists of a plate of metal, arranged between the inner edge of one of the stiles of the blind and the end of one or more slats, so as to oscillate a little. It has a cam button on the stile, so combined with it that, by turning the button against the plate, the latter will be pressed against the slats, so as to hold them by friction in any position in which they may be set. It was fully described and illustrated on page 70, current volume of this journal.

Improved Combined Grave, Coffin, and Monument.

Leland M. Speers and Abraham Clark, Newberry, S. C.—This device is so constructed as to prevent the escape of odors and the entrance of water, while allowing the features of the dead to be viewed whenever desired. The invention consists in a combined grave, coffin, and monument, formed of the recessed lower part, the grooved cover made thicker at its head end, and having an opening formed through it, in which is cemented a glass plate and the cover for said opening.

Improved Blind Stop.

Thomas T. Duffy, Dubuque, Iowa.—By suitable construction, by turning a rod, a cord will be wound upon the said rod, and the said rod will be drawn down, opening the slats to any desired extent, where they will be held securely by a ratchet wheel and pawl. By withdrawing the pawl from the ratchet wheel, the elasticity of a spring will raise the rod and close the slats.

Improved Stove Grate.

Jonathan Moore, Jr., Brooklyn, N. Y., assignor to J. L. Mott Iron Works, New York city.—This is a combination of a laterally shaking and dumping bottom section, provided with clinker-breaking points, with the stationary top section, also having breaking points.

Improved Smoking Pipe.

Carl J. Jonasson, Warren, Pa.—In this smoking pipe the stem may be readily folded down to the bowl, so as to occupy a small space in the pocket, be less liable to get broken, and easily taken apart for being cleaned. The stem is hinged by ball and socket joint and connecting link.

Improved Flower Pot.

Joe Sephus Johnson, Somerville, Tenn.—This is an earthen flower pot consisting of body, hollow base, and perforated partition, all made up in one piece. With this construction the earth will be kept properly and uniformly moist, and will not be soaked or leached, as it is liable to be when the plants are watered by pouring water upon the earth in the flower pot.

Combined Cigar Tip Cutter and Watch Charm.

Emil F. W. Eisenmann, New York city.—The invention consists of the combination of a watch charm with a cigar-tip-cutting device. The stem end of the cutter is guided in the barrel in such a manner that, in pressing on the same, the cutter is carried down between the rims and cuts off the tip.

Improved Seed Planter and Fertilizer Distributor.

David F. Valentine, Mount Gallagher, S. C.—An arm projects into such a position that it may be struck by pins attached to a wheel. In the bottom is an opening for the seed to escape, which opening may be partially covered to regulate the amount of seed discharged by a plate. To the hopper is attached a narrow bar, the rear edge of which projects into the said hopper, and has saw teeth formed upon it to take hold of the seeds or fertilizer as the bottom rises, and cause them to pass out through the opening in said bottom. By this construction the bottom will be constantly moving up and down, keeping the seed or fertilizer in the lower part of the hopper loosened, and causing it to pass out regularly.

Improved Egg Box.

William H. Holdam, Crab Orchard, Ky.—The device consists of a box, having detachable egg holders, provided with subadjacent spacing and supporting end pieces, so that each may be conveniently placed on a floor or table, and filled with eggs before being inserted.

Improved Vehicle Wheel.

Sobieski L. Bond, Columbia, S. C.—A nut screws on the outer part of the hub, against keys under the spokes, to wedge them out for tightening the tyre. The face plate screws on the nut against the sides of the spokes, to wedge the latter firmly in the mortises of the hub. There is a wedge between the ends of the felly, and a screw for drawing it up to fill up the opening made by wedging out the spokes and tightening the felly. The wheel can thus be tightened up as often as required merely by turning the screws with proper wrenches.

Improved Stove.

James L. Roberts, Brunswick, Ga.—This invention consists of a flue on the under side of the top plate of the stove, for carrying the heat around directly under the pots in a continuous stream, so as to heat them more, and quicker, and the other parts of the stove less, than with the common arrangement. It also consists of two openings in the bottom of the stove, making a passage directly through for cleaning out the soot.

Improved Smelting Furnace.

Henry C. Creal, Cheyenne City, Wyoming Ter.—The ore melting furnaces are located one on each side of a central heating furnace, and communicate therewith by means of openings in the vertical side walls. The three furnaces, together with the flue, are arranged in the form of the Latin cross. Fire places located directly under the floor communicate directly with central fire place. The ore to be melted is placed on the concave floor of the side furnaces, and the same is melted by the heat from the central furnace and the fire places. The products of combustion from the side furnaces pass into the central furnace by means of the openings in its side walls, and, mingling with the products of combustion in the latter, pass to the chimney.

Improved Jar Lifter.

William W. Brower, New York city.—This is a jar lifter consisting of two rods made adjustable at the point of intersection, and bifurcated below, forming legs, which carry rubber-faced arc jaws made fast to the inside of their lower ends.

Improved Chuck for Rock Drills.

Joseph C. Githens, New York city.—A key is fitted into a groove in the piston rod. The inner edge of the key has a half-round groove formed in it, to correspond with the bottom of the groove in the piston rod, so that when the key is in place a cylindrical hole will be formed to receive a bit. The key has a swell formed upon the outer side of its middle part, which is notched transversely, to receive the bend of a U bolt, the arms of which pass through the enlargement of the piston rod upon the opposite sides of the groove in said piston rod, and have nuts screwed upon their ends. By this construction, the end parts of the key bearing upon the bit and the U bolt grasping the middle part of the key, there will be a slight yield or spring to the key, which will cause it to hold the bit more firmly.

Improved Car Coupling.

Charles E. Ramage, Sherman, Tex., assignor to himself and Wilhelm Heyde, of same place.—When the cars come together for coupling, the end of the link strikes an arm, which raises the other arm and the coupling pin. The link passes into the drawhead beyond the pin, the arm struck slips off the link, and the cars are coupled automatically. An angle plate is attached to the front of the car directly above the drawhead, and acts as a spring. Devices are added so that when the car runs off the track, and is partially turned over, the drawhead will be withdrawn from the car.

Improved Device for Regulating Car Ventilators.

George W. Birmingham, New York city.—The operating lever is fulcrumed to a supporting bracket. The opposite arm is jointed by a pivoted link to the pivoted ventilator. The central part of the lever bears against a brake spring attached to the ventilator frame, and is held by the friction of the same firmly in any position.

Improved Airtight Can.

Stephen Joyce, New York city.—The cover is made of two parts soldered together. In one part a groove is made, in which groove is a band of rubber which projects outward, and when forced down it is crushed and expanded by its contact with the flaring end of the can. The joint is made airtight and water tight. Bars left on the top of the flange are, when the cover has been forced down airtight, bent over the edge of the cover, so as to securely fasten and keep the cover in place.

Improved Portable Boiler.

George F. Johnson and Daniel Wilde, Washington, Iowa.—A barrel is hung on gudgeons in a kind of wheelbarrow. It is open at the top, and in the center of its bottom is a galvanized iron cylinder. In the lower part of the cylinder is a grate. To the upper end of the cylinder is attached a cover, and in the cover is formed a hole for the escape of the smoke. The grain or other feed to be cooked is placed in the barrel around the stove, so that it may receive the full heat of the fire. A conical shield is placed around the cylinder to keep clothes, when the same are boiled in the barrel, from coming in contact with said cylinder. To the shield, a little above its lower end, is attached a perforated flange, which projects nearly to the sides of the barrel, to keep the clothes up from the bottom.

Improved Fire Place.

William Tweeddale, Brooklyn, N. Y., assignor to J. L. Mott Iron Works, New York city.—This fire place is composed of a back plate inclined forward at the top, forward and outward at the sides, and provided with an opening to the chimney, and flanges which support the middle plate and damper. The middle plate is inclined forward at the sides and top, and provided with an opening also to the chimney. The front plate is secured to the middle and back plates.

Improved Pitman.

John R. Taylor, Eagle Point, Ill.—This is an improved pitman connection for connecting the driving power with the sickle bar of mowers, reapers, and harvesters, so constructed as to enable the wear to be taken up at the pivoting and working points.

Improved Metal Cap for Posts.

John Davenport, Stamford, Conn.—The metal cap is made in two parts, and secured by bolts being inserted from the under side of a flange, forming a cornice. The nut is confined by a lug cast on the inner wall. The upper part overlaps the lower part, so as to prevent the rain from getting inside.

Improved Paddle Wheel.

James Salter, Brooklyn, E. D., N. Y.—This invention consists of paddles composed of entire plates the whole length and breadth, with taper-pointed outer ends connected to a thin metal ring, and the inner ends connected to the hub. By the tapered form the paddles enter and leave the water much easier and smoother. The invention also consists of the paddles made in two plates, which match at the inner edge with an arm having a groove on opposite sides, in which the plates are confined by a band of metal applied between the rim and the hub, to fasten them to the arm, while the inner ends enter mortises in the hub.

Improved Leather Belting.

Charles H. Alexander, Henry W. Alexander, and Edward P. Alexander, Philadelphia, Pa.—It is proposed to cut the hide along the middle for belts of two or more plies, and turn the back edges, that is, the edges formed by so cutting it, outward, and the side edges inward; and for belts too wide to be made by the two pieces so cut, one or more middle pieces are introduced, taken from the center of a side. Thus the firmest texture is placed at the edges of the belt, and the softer and more yielding texture in the middle, which makes the edges hug the lower portions of the face of the pulley, while the middle stretches over the crown, and thus the belt acts with due effect throughout its whole breadth.

Improved Show Case.

William B. Smith, New York city.—When the door is closed, a cleat inside the bottom strikes the lower edge of a rubber, and turns it up and confines it against a rabbet, and thereby excludes all dust from the show case.

Improved Harvester Cutter.

Thomas R. Arnold, Knoxville, N. Y.—In the back of the cutter bar is a groove, and on the side of the knives is a lip. This lip rests in the groove, while the knife rests flat on the face of the cutter bar. The knives are brought in contact with each other on the front of the cutter bar. The backs of the knives rest against the shoulder of the cutter bar, so that the knives are kept rigidly in place. The clamping bar is attached to the cutter bar with screws which pass between each pair of knives. The corners of the knives, having corresponding pieces cut out of each corner, form rearwardly opening spaces on each corner edge of the shank. By loosening these screws the knives may readily be removed and replaced.

Improved Automatic Shut-off Attachment for Water Closets.

James Cavanaugh, New York city.—This is an automatic shut-off attachment for water closets, by which the supply of water is instantly interrupted as soon as the hinged cover of the same is released, and the supply of water regulated as desired; and by the ready access and easy lubrication of the parts, few repairs are rendered necessary. The invention consists of the connection of the stopcock of the supply pipe by a crank lever and adjustable rod with the hinged and weighted cover of the bowl, so that the opening of the same produces the closing of the supply cock, which is provided with a waste pipe and a lubricating pipe attached by a fastening nut to the flange of the bowl.

Improved Knock-Down Bureau and Wash Stand.

William S. Moses, Lebanon, N. H.—The front rails for the support of the drawers are divided in two parts longitudinally, and the front portion is permanently attached to the front of the bureau. The other portion forms part of a removable frame for the support of the drawer. The front sides and back connect by dovetail joints sliding together vertically, and are locked by the top, which slides in the sides, over the back, over and against the front, and is fastened by cams concealed inside. No joints are visible.

Improved Machine for Catching and Destroying Potato Bugs.

Ceylon E. Mathewson and Harvey T. Mills, Franklin Corners, Pa.—The construction is such that, as the machine is drawn forward between two rows of potatoes, the vines will be drawn into the spaces between guards and side bars, where they will be struck by wings. The blows of the wings knock the bugs against a partition, from which they fall upon a bottom, slide down, and pass out through the discharge opening, where they are crushed by rollers.

Improved Oiler.

Henry E. Bohm, Herman Stuhr, and Peter J. Joecken, Cleveland, Ohio.—The bottom plate, top plate, and glass cylinder of the cup are secured by a center bolt, which screws into the cup and also passes through a clamping band and fastens it to the cup.

Improved Saw Mill.

William T. Wayne, Conyngham, Pa.—This invention consists of a vertical guide roller, turning in a sliding standard frame, adjusted by rack, sector pinion, and lever mechanism. The lever is locked by a spring latch to an arc-shaped rack, and adjusted with the sector pinion to the exact position of a horizontal supporting roller by set screws of the supporting hangers.

Improved Hens' Nests.

Julia P. Clement, Williamston, S. C.—A box is divided longitudinally into two equal parts, by a division board extending from the peak of the roof to the floor. The interior is divided up into nest spaces by boards extending up to the roof. The hens, when they enter, pass through an end passage, enter a side passage upon the opposite side from that at which they entered, and take possession of any unoccupied nest. No one can obtain access to the nests in any other way than by opening the hinged parts of the roof.

Improved Hydraulic Press.

John F. Taylor, Charleston, S. C.—This invention relates to certain improvements in cotton presses; and it consists in the combination, with the platen and cross head, of continuous links of tenacious wrought metal, which encompass said platen and cross head lengthwise, and constitute of themselves the frame, and receive all the strain of the press, whereby the construction of the press is greatly simplified and rendered capable of standing a much greater strain than the ordinary cast frames. It also consists of a cushion of woods interposed between the links and the contained platen and cross head.

Improved Sewing Machine Fan Attachment.

Isaac A. Abbot, New Orleans, La.—This invention consists of a standard arranged to fasten on the top of the sewing machine tables and having a rotary fan and a balance wheel mounted on a crank, shaft. On the crank of the latter is a long connecting rod extending down to the treadle, with which it is to be detachably connected, so that the fan attachment can be readily put on and taken off at any time, and when on may be worked by the treadle by which the machine is worked.

Improved Potato Digger.

George W. Haag, Milton, Pa., assignor to himself and Pembroke Churchill, same place.—The device includes two sets of teeth, which are pressed into the ground and close under the roots by the forward movement of the machine. Said teeth are mounted on endless chains, traveling on horizontally elongated ways. The teeth are constructed in fluted or grooved transverse section.

Improved Lifting Jack.

John B. Fayette and Lorenzo Meeker, Oswego, N. Y.—A tubular standard contains a movable tube of smaller diameter. A pin passes transversely through the lower part of the tube, and the ends project so as to pass through slots in the standard, so that, by dropping the pin into the proper slots, the tube may be supported at any desired height. A short rod fits into and slides up and down in the upper part of the tube, and has a head attached to its upper end to receive the object to be raised. To the rod is pivoted a short connecting rod, the lower end of which is pivoted to a lever. By suitable construction, the rod is lowered by raising the free end of the lever, and is raised by lowering the free end of the said lever. In using the jack, the rod is lowered and the tube is adjusted to the proper position in the standard. The jack is then placed beneath the object to be raised, and the free end of the lever is lowered till it passes the perpendicular, which raises the object and locks the jack until the lever is again raised.

Improved Wagon Brake.

George S. Garth and William H. Rosser, Mill Hall, Pa., assignors to George S. Garth, same place.—This invention relates to the means for connecting the lock or brake bar to the hounds, and guiding it as it is moved up to or away from the wheels. Metal plates are bolted to the rear hounds for a lock bar to rest upon. The said plates serve as guides to the said lock bar as it is moved forward and back. To the lock bar is bolted a metal block, which may be made with short slots to receive the bolts, and is made of the thickness of the plates.

Improved Band Saw Guide.

Lewis K. Young and Charles M. Ferguson, Bridgeport, Conn.—This is a guide for band saws, which will be durable and will hold the saw at the desired point. It consists in the use of glass, dovetailed or set in either wood or metal, to form the wearing surface.

Improved Detachable Seat for Chairs.

William W. St. John, Pisgah, Mo.—This is a seat of a chair, stool, or settee, strained and made detachable by means of slats. To keep the two lower slats in position (the two upper slats being kept by the lower), a removable cross bar is applied to one of the slats by a pivot fastening at one end, and a hook at the other end.

Improved Gang Plow.

Henry Opp, Belleville, Ill.—By suitable construction, by loosening nuts, the forward ends of the plow beams may be adjusted at any desired distance apart, and, by loosening a rear bolt, the plow beams may be adjusted to take or leave land, as may be desired. The plow beams are made of different lengths, so that the forward plow may always be out of the way of the furrow slice turned by the following plow. The rear ends of the plow beams may be adjusted to correspond with the adjustment of their forward ends. By operating a lever, the plows may be raised from the ground and lowered to work at any desired depth. A pawl holds the plows to their work and prevents them from running out when plowing hard ground, while a chain prevents them from entering the ground too deep when plowing loose.

Improved Straw Cutter.

Charles F. Stewart and Milton Stewart, Muncie, Ind.—This is an improved straw cutter with reciprocating feed box. It consists of a revolving cutting knife, in combination with a reciprocating feed box, that moves the straw forward by a ratchet wheel and pawl connection of the feed rollers with an actuating lever and cams of the supporting main frame. The upper feed roller turns in bearings of a compressing front gate, and is forced on the straw by springs of suitable power.

Improved Washing Machine.

Jesse Wise and Peter Lane, Elwood, Ind.—This invention includes a device which enables the rubbing cylinder to be oscillated to rub any part of the clothes that requires extra rubbing. The operator can hold the clothes with one hand while working the cylinder with the other.

Improved Machine for Attaching Stamps and Sealing Letters.

Eddy Taylor Thomas, Boston, Mass.—A box-shaped casing, about the size of the envelopes mostly in use, is provided at its front part with a letter-opening device, a moistening device, which consists of a middle sponge holder and upper and lower guide plates: the lower for the purpose of passing the gummed flap of the envelope through the same, and moistening the mullage, and the upper, for moistening the envelope at the place where the stamp is to be affixed. With each stroke of the lever, a stamp is carried to the moistened place of the envelope and attached thereto, while the pressure of the plate seals the flap.

Improved Device for Attaching Hubs to Axles.

Warren E. Pratt, Chesaning, Mich.—The object of this invention is to provide convenient means for fastening the wheels of a vehicle on the axle without the use of screw threads or the ordinary burr or screw nut; and it consists in leaving the ends of the axle or skein square or polygonal, and fastening on the end thereof a washer, to which is attached a key box, having an orifice to fit the axle, the same being fastened to the axle by means of keys and springs.

Improved Steam Rock Drill.

Joseph C. Githens, New York city.—The steam cylinder moves up and down in ways in a shield, which is swiveled to the frame work, and is strengthened by long bolts passing through lugs formed upon its ends. The bolts are extended upward beyond the upper end of the shield, and to their upper ends are attached the ends of a cross bar, to the center of which is swiveled the feed screw, which passes through a screw hole in a lug, formed upon the rear part of the upper end of the cylinder, so that, by turning the said screw, the cylinder may be moved down as the drill works its way into the rock and moved up when the hole has been sunk to the required depth.

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

A. J. H.—Package labelled No. 1 contained a quantity of fine sandstone, a crystal of carbonate of lime, calcite, and a specimen of marcasite or white iron pyrites. They are of little value. Package No. 2 has not been received.—M. J. D.—No. 1 is mica schist in sandstone. No. 2 is principally magnetite. No. 3 is agate imbedded in quartz. No. 4 is quartz. No. 5 is hematite. No. 6 is hornblende and mica. No. 7 is aragonite. No. 8 is fine white sandstone. No. 9 is sandstone. No. 10 is a variety of light colored shale. No. 11 is dark limestone. No. 12 is decomposed slate. No. 13 is sandstone. The Indian arrowhead is of flint.—S. D. M.—Your communication in regard to formations on specimens of coal sent by you will be answered in full shortly.—J. W. C.—These insects are not described in our works on entomology. We would require more of them for further investigation, as these were few in number and much mutilated.—N. B. W.—No. 1 does not contain silver; it consists chiefly of galena. No. 2 is principally marcasite. No. 3 is baric sulphate. No. 4. The amount of alumina is too large for it to rank with other analyses of kaolin. No. 5 is sulphide of iron.—G. B. McE.—They are of no value. The bright metallic appearance is due to mica.

E. P. says: I have a surveyor's steel chain, the links of which are not soldered or brazed. Can you inform me of the simplest method by which it can be done? C. B. L. asks: How can I color and polish the sections of walnuts to make them look like jet?

COMMUNICATIONS RECEIVED.

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

On Apparatus. By J.
On Hammocks. By J. M. C.
On Steam Cars. By F. G. W.
On Vegetable Sponges. By W. H. C.
On Collegiate Ranges. By C.
On Mining Cables. By C. T. S.
On the Science of Geometry. By F. G. C.
On Modern Science. By H. B. C.
On Death by Strychnine. By S. J. P.
On the Grasshopper Plague. By G. P. Z.

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

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 aneroid barometers? Who sells steel, hard enough to cut glass? Who manufactures the so-called fish guano? Who publishes books on aeronautics?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is especially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were
Granted in the Week ending
July 20, 1875.

AND EACH BEARING THAT DATE.

(Those marked (r) are reissued patents.)

Air ship, steerable, F. W. Schroeder..... 165,891
Alarm, burglar, S. Bearight..... 165,892
Alarm, burglar, Silva, Merriam, & Sedgwick..... 165,891
Anvil, E. Hodgson..... 165,792
Auger, earth, G. Taylor..... 165,890
Baking stand, J. A. Watson..... 165,899
Barrel head, H. M. Smith..... 165,796
Bed lounge, W. H. L. Gable..... 165,815
Bell, door, H. A. Dierkes (r)..... 6,548
Blower, rotary, T. S. Dison..... 165,805
Bobbin winder, J. Dorman..... 165,846
Bottle alarm and register, electric, W. C. Baker..... 165,790
Bottle for portable engines, J. Enright..... 165,810
Bottle for ranges, J. A. Gibson..... 165,794
Bottle food heater, etc., J. A. T. Overend..... 165,860
Belt work for doors, Naylor & Brooks..... 165,792
Box form, E. Leetch..... 165,842
Box dressing machine, J. W. Bowers..... 165,794
Brake shoe, W. Robinson, Jr..... 165,872
Bridle bit, Lockard & Agnew..... 165,878
Bridle bit, W. A. Pierson..... 165,803
Brush, J. Earnshaw..... 165,719
Buckle, W. H. Williamson..... 165,805
Butter pull, J. F. Crawford..... 165,796
Butter worker, M. Hutchinson..... 165,804
Calendar, T. J. Thorp..... 165,799
Can, milk, J. W. Smith..... 165,798
Candy spinner, S. B. Hymer..... 165,806
Car coupling, Hiten & Koch..... 165,806
Car coupling, L. E. Musick..... 165,807
Car coupling, F. W. Nash..... 165,791
Car lamp, F. Rhind..... 165,795
Car stock, J. B. McPherson..... 165,840, 165,890
Car blind and screen, W. H. Fletcher..... 165,812
Carbureter, J. A. Pierce..... 165,802
Carding machine, J. J. & J. Dobson..... 165,716
Carpet sweeper, J. J. Hallinger..... 165,790
Carriage, child's, W. Stewart, (r)..... 6,503

Carriage poles, bending, A. G. Snyder..... 165,887
Cart saddle, P. McFadden..... 165,848
Chair and step ladder, C. B. Rawson..... 165,688
Chair base, W. T. Doremus..... 165,717, 165,718
Chair, folding rocking, G. McAleer..... 165,745
Chair spring attachment, R. H. Ober..... 165,684
Cheese cutter, J. W. Row..... 165,760
Chisel for stone cutting, C. C. Simpson..... 165,692
Chlorine, manufacture of, H. Deacon..... 165,801, 165,802
Churn rotary, T. Landt..... 165,799
Cigar box, W. Ellis..... 165,664
Clock calendar, L. L. Kellogg..... 165,840
Cloth freezing machine, G. G. Bishop..... 165,657
Clothes dryer, J. P. Hill..... 165,674
Clothes line reel, A. Thompson..... 165,696
Coal hod, U. D. Alexander..... 165,698
Cock, stop, T. Holland..... 165,837
Commode or stand, F. Mahler..... 165,743
Corn drill, J. Campbell..... 165,788
Corn sheller, E. C. Morgan..... 165,790
Cracker machine, J. W. & A. Ruger..... 165,875
Crackers, device for glazing, D. Forster..... 165,813
Cribs, etc., screen supporter for, H. B. Fairbanks..... 165,665
Crucible, J. Felix..... 165,811
Curtain roller, P. W. Phillips..... 165,881
Cutter head, S. P. Randolph..... 165,868
Cyclophore, R. C. Gwathmey..... 165,818
Dental forceps, N. A. Durham..... 165,808
Dental plugger, C. Hilbarz..... 165,701
Dial, sun, W. H. McCoy..... 165,746
Door, W. C. Hurd (r)..... 6,549
Door check, J. H. McClymonds..... 165,847
Dredging box, Goodwin & Ives..... 165,670
Drill, expansion, M. C. Bullock..... 165,737
Drilling machine, rock, J. W. Moyer..... 165,671
Dryer for paint, O. Russell..... 165,761
Egg tester, Henckler & Troeger..... 165,824
Engine, governor, H. S. Maxim..... 165,744
Engine lubricator, steam, M. L. Waring..... 165,770
Engine lubricator, steam, J. Wheelock..... 165,901
Engine, rotary, W. Weyhe..... 165,772
Engine, steam, W. Read..... 165,869
Engines, carriage for portable, C. M. Miller..... 165,854
Engines, valve and gearing for steam, J. A. Prince..... 165,687
Envelope, document, J. Pritchard..... 165,835
Fare register, W. H. Hornum..... 165,829, 165,832
Felly plate, T. Beatty..... 165,656
Fences, making tabs for wire, Doolittle & Ellis..... 165,661
Fences, tightening wire, P. S. Crawford (r)..... 6,546
Fertilizer distributor, W. F. Wheeler..... 165,778
Fire arm, breech-loading, A. F. W. Tinner..... 165,892
Fire escape, A. J. Culbertson..... 165,714
Fishing and similar floats, W. T. Quinn..... 165,867
Floor, lint room, J. N. Stitt..... 165,889
Fountains, ornamental jet for, T. Galvin..... 165,664
Furnace, hot air, J. La Roe..... 165,740
Furnace, grate, S. B. Chace..... 165,712
Furnace, steam boiler, C. D. Smith..... 165,650
Gage, taper, C. B. Hunt..... 165,734
Gas and water regulator, A. L. Smith..... 165,767
Gas, apparatus for purifying, O. Braun..... 165,783
Gas machines, pressure blower for, J. H. Bean..... 165,782
Gas retorts, supplying oil to, F. H. Elehbaum..... 165,809
Gases, apparatus for hydrating, B. H. Jenks..... 165,837
Gate, L. S. Cohn..... 165,792
Gate, automatic, L. N. Allendorf..... 165,853
Gate, farm, A. Callahan..... 165,709
Gate, farm, miller & Hillson..... 165,745
Gems, setting, T. W. Fry..... 165,722
Governor, steam, W. Meln..... 165,851
Grain tally, W. Schnebly..... 165,763
Graining roller, W. H. Burns..... 165,798
Hand rest, accountant's, W. D. Sloan..... 165,825
Harrow, Chamberlains & Seiple..... 165,790
Harrow, S. G. Jones..... 165,796
Harrow, W. H. Parlin..... 165,733
Hatters, sizing plank for, M. F. Johnson..... 165,783
Hay knife, R. Kellogg..... 165,841
Hay loader, E. R. Whitney..... 165,902
Heater, etc., for boilers, J. A. T. Overend..... 165,860
Heater for rollers, etc., T. S. Wiles..... 165,775
Hemp and flax machine, Herschaft & Lawrence..... 165,825
Hose spanner, J. Burke..... 165,707
Ice hook, D. C. Wood..... 165,778
Icepick and can opener, combined, T. Hagerty..... 165,729
Inhaler, pocket, T. E. Daniels..... 165,799
Injector, G. H. Little..... 165,843
Iron, compound for coating, Brownlow & Francis..... 165,695
Jack, lifting, D. Cilley..... 165,713
Journal bearings, heat indicator for, S. Alley..... 165,780
Key holder, F. W. Coleman..... 165,794
Kiln, brick, J. G. Eberhart..... 165,663
Knife, hay, B. Kellogg..... 165,841
Lamp, J. B. Godwin..... 165,736
Lamp car, F. Rhind..... 165,795
Lamps, etc., extension fixture for, G. R. Lyon..... 165,846
Leather dressing, J. Miller..... 165,680
Leather, manufacturing, G. Herrick..... 165,781
Leather, tanning, G. W. Hatch..... 165,822
Lever, safety piston, G. Bement..... 165,783
Lime kiln, A. B. Weeks..... 165,900
Lime fastener, Brown & Peck..... 165,708
Liquid mixer, J. B. Meyers..... 165,855
Lock, time, J. Sargent..... 165,878
Loom shuttle, N. J. Willis..... 165,771
Looms, wire baffle for, D. C. Brown (r)..... 6,547
Lubricator, Davis and Du Bois..... 165,800
Lubricator, Richter and Merkel..... 165,794
Lubricator, steam engine, M. L. Waring..... 165,770
Lubricator, steam engine, J. Wheelock..... 165,901
Mantel, iron, T. F. Baker..... 165,781
Metal bending machine, E. Devine..... 165,801
Milk strainer, F. L. Oliver..... 165,808
Mill, flour, A. Lenz..... 165,677
Mill, rolling, I. Haba..... 165,819
Mirror, window, D. J. Kennedy..... 165,738
Molding machine, Frank and Spire..... 165,720
Molding machine, A. S. Gear..... 165,669
Motor, hydraulic, A. Schmid..... 165,879
Nail plate feeder, L. Soule..... 165,693
Newspaper forms, etc., imposing, W. D. Hughes..... 165,833
Nut lock, J. M. Whitmore..... 165,697
Ore stamp feeder, J. Tullock (r)..... 6,564
Oven for firing pottery, T. M. Minton..... 165,855
Padlock, H. S. Lockwood..... 165,741
Paper bag machine, J. Hatfield..... 165,823
Paper barrel and box, B. Rhodes (r)..... 6,551
Paper collar machine, C. H. Denton..... 165,803
Paper stock, grinding, J. M. Barghardt..... 165,706
Pavement, wood, J. J. Schroyer..... 165,882
Pavement, wood, H. M. Stow..... 165,695
Paving block, Von Versen and Bickel..... 165,896
Peg cutting machine, J. F. Smith..... 165,896
Pen and pencil case, J. U. Gerow..... 165,728
Photometer, O. Schuetz..... 165,784
Pianoforte case, H. J. Baker..... 165,699
Piano, joiner's, J. Look..... 165,742
Picture frame, A. D. Judd..... 165,797
Picture holder, stereoscopic, J. D. Rice..... 165,879
Pipe stem, H. C. Fritz..... 165,814
Pipes, forming sockets on, H. B. Camp..... 165,710
Plane, bench, C. Bridges..... 165,704
Plane, bench, H. Shogren..... 165,884
Planter, corn, G. W. Shepherd..... 165,765
Plow, W. K. Allen..... 165,652
Plow, J. H. Sample..... 165,876
Plow, O. P. Sanford..... 165,877
Plow, G. and T. Ward..... 165,903
Plow, gang, E. P. Pulliam..... 165,708
Plow point, reversible, M. M. Bowers..... 165,654
Pocket book, C. Arms..... 165,864
Pocket book safety attachment, T. Potter..... 165,891
Press, hydraulic, J. F. Taylor..... 165,859
Printers' leads, cutting, J. A. T. Overend..... 165,871
Printing plates, numbering, T. Richards..... 165,838
Printing press, rotary, C. Kahler..... 165,852
Pulley for shafting, loose, C. H. Mellor..... 165,737
Pump, double acting, C. Gordon..... 165,683
Punch, conductor's, Nye and Zapf..... 165,906
Railway, elevated, J. G. Wilson..... 165,845
Railway rail chair, R. C. Ludlow..... 165,795
Railway switch signal, W. W. Colley..... 165,690
Range, portable, Cox and Hopkin..... 165,734
Ranges, boiler for, J. A. Gibson..... 165,651
Refrigerator, ice cream, G. D. Adams..... 165,738
Refrigerator, show case, J. H. Hoffman..... 165,797
Register and ventilator, H. N. Creamer..... 165,721
Register, ventilating, H. Fritz..... 165,667
Retorts, apparatus for charging, W. Foulis..... 165,806
Rifles, sharpening, S. P. Doane..... 165,839
Roller, land, J. A. Keeler..... 165,771
Roof, metallic, E. Watson..... 165,659
Rule, registering board, W. M. Bullock..... 165,821
Sad iron, Harris and O'Neil..... 165,702
Sandpapering machine, O. Sawyer..... 165,856
Sash holder, P. Mullane..... 165,739
Sash holder, O. Rock..... 165,749
Saw, drag, H. H. Miller..... 165,910
Sawing machine, hoop, E. Young..... 165,737
Sawing machine, scroll, J. H. Roberts..... 6,555
Scraper, rotary road, J. W. Wilson (r)..... 165,685
Screw driver, W. F. Patterson..... 165,711
Sewing machine, J. Carter..... 165,798
Sewing machine, C. S. Cushman..... 6,550
Sewing machine, A. F. Johnson (r)..... 165,832
Shafting, loose pulley for, C. H. Mellor..... 165,909
Sheet iron barrel, C. M. Wyvell..... 165,880
Shingling gage, C. Schneider..... 165,686
Sketching and photographic case, T. J. Phillips..... 165,747
Slate, school, C. H. Meigs, Jr..... 165,662
Spark arrester, J. Dubois..... 165,907
Spark arrester, Wiser and Schmieders..... 165,895
Spoke-tensioning machine, W. H. Von Behren..... 165,692
Stone-cutting, chisel for, C. C. Simpson..... 165,694
Stove, coal, L. B. Sprout..... 165,895
Stove pipe joint, G. D. Umland..... 165,898
Stove polish, J. M. Watson..... 165,854
Strainer, milk, F. L. Oliver..... 165,672
Table, ironing, E. S. Heath..... 165,908
Table, ironing, J. N. Wunderlich..... 165,728
Telegraph, transmitter for music, E. Gray..... 165,816
Thermometer, G. Gano..... 165,702
Ticket stamp, L. J. Blades..... 165,835
Tile, illuminating, T. Hyatt..... 165,817
Time clock, H. Greene..... 165,671
Tool, T. Hagerty..... 165,825
Transit, S. Holton..... 165,756
Tree protector, R. F. Williams..... 165,820
Trunks, etc., fastening, J. Hall..... 165,888
T-squares to boards, attaching, W. B. Stevenson..... 165,682
Valve gear, reversible, N. E. Nash..... 165,791
Valve relief, G. H. Clemens..... 165,804
Vessel for removing foul water, H. H. Vogeding..... 6,652
Vessels, making of irregular, B. Rhodes (r)..... 165,897
Vessels, shoal indicator for, Wagner & Rumpus..... 165,689
Wagon jack, J. Sawyer..... 165,789
Wagon rack, J. F. Cass..... 165,675
Washing machine, T. A. Irick..... 165,844
Washing machine, M. Loughran..... 165,679
Washing machine, P. Markley..... 165,874
Watch, M. G. Cole..... 165,800
Watch escapement, J. R. Hopkins..... 165,798
Watches, barrel arbor for, J. D. Brez..... 165,831
Watchmaker's box, P. H. Wheeler..... 165,804
Watchmaker's eyeglass, M. W. Ward..... 165,678
Water meter, W. Helme..... 165,715
Wells, removing drills from, B. Keet..... 165,873
Windmill, E. Dewald..... 165,758
Windmill, R. N. Rockwell..... 165,758
Wood, preserving, L. S. Robbins..... 165,655
Wrench, R. S. Battles..... 165,725
Wrench, pipe, L. Glynn..... 165,734
Wringer, M. A. Richardson..... 165,666
Yarn beam, J. A. Gould..... 165,779
Yarn to set the twist, treating, D. Wright..... 165,779

DESIGNS PATENTED.

8,488.—DRINKING FOUNTAIN.—J. W. Fiske, N. Y. city.
8,489.—LAMP SHADE.—C. F. A. Hinrichs, Brooklyn, N. Y.
8,490.—GAS BURNER.—M. Stewart, Philadelphia, Pa.
8,491.—KNOW SHAKES.—A. E. Young, Boston, Mass.
8,492.—CENTER PIERCE.—H. Berger, New York city.
8,493.—PIPE STEM.—L. G. Hussmann, Gattenberg, N. J.
8,494.—ALBUM LEAVES.—W. Mayer, Brooklyn, N. Y.

SCHEDULE OF PATENT FEES.

On each caveat.....\$10
On each Trade mark.....\$25
On filing each application for a Patent (37 years).....\$15
On issuing each original Patent.....\$20
On appeal to Examiners-in-Chief.....\$10
On appeal to Commissioner of Patents.....\$20
On application for Reissue.....\$30
On filing a Disclaimer.....\$10
On an application for Design (34 years).....\$10
On application for Design (7 years).....\$15
On application for Design (14 years).....\$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,
July 14 to 24, 1875.

4,982.—E. S. Winchester, Boston, Mass., U. S. Rock drill. July 14, 1875.
4,983.—W. Moore, Pelham, Ont. Plow cleaner. July 14, 1875.
4,984.—C. W. Mills, Montclair, N. J., U. S. Self-discharge for grain vessels. July 14, 1875.
4,985.—W. Mathewson, Brooklyn, Ont. Oscillating washing and wringing machine. July 15, 1875.
4,986.—R. Dick, Buffalo, N. Y., U. S. Labeling machine. July 15, 1875.
4,987.—C. M. Murch, Cincinnati, Ohio, U. S. Lamp reflector. July 15, 1875.
4,988.—H. Carter, Aymer, Ont. Carpet stretcher. July 15, 1875.
4,989.—M. C. C. Church, Parkersburg, Va., U. S. Heating stove. July 15, 1875.

4,990.—W. H. McMillan, Philadelphia, Pa., U. S. Fire plug. July 15, 1875.
4,991.—C. R. Patterson, Pittston, Pa., U. S. Planting machine. July 15, 1875.
4,992.—E. Dallaire, St. Sebastien, P. Q. Auger boring machine. July 15, 1875.
4,993.—J. Matthews, Lyden, Ont. Pump plunger. July 15, 1875.
4,994.—G. Collins, Kingfield, Me., U. S. Saw buck. July 15, 1875.
4,995.—R. Cahuc, Toulouse, Haute Garonne France. Mining powder. July 15, 1875.
4,996.—A. Higley, Cleveland, Ohio, U. S. Car axle box. July 15, 1875.
4,997.—G. P. Farmer, Brooklyn, N. Y., U. S. Yarn bundle. July 15, 1875.
4,998.—J. James, Township Bosanquet, Ont. Bag holder. July 15, 1875.
4,999.—F. Doucet, Yarmouth, N. S. Knife cleaner. July 17, 1875.
5,000.—A. E. Mitchell, Sweetinburgh, P. Q. Churn. July 17, 1875.
5,001.—A. E. Peters, Moncton, N. B. Combination lock. July 17, 1875.
5,002.—R. W. Drew, Albany, N. Y., U. S., et al. Automatic lubricator. July 17, 1875.
5,003.—C. L. Holland et al., Ipswich, Mass., U. S. Laundry drying. July 20, 1875.
5,004.—E. Farnsworth, Paxatawney, Pa., U. S. Stump and stone elevator. July 20, 1875.
5,005.—W. H. Seaman, New York city, U. S. Testing the purity of dye in silk. July 20, 1875.
5,006.—H. A. Stearns, Lincoln, R. I., U. S. Churn dasher. July 22, 1875.
5,007.—F. S. Berry et al., New Sharon, Me., U. S. Thill loop. July 22, 1875.
5,008.—G. S. McConkey, Toronto, Ont. Cigar-stamping machine. July 22, 1875.
5,009.—L. Dague, Sherwood, Mich., U. S. Seeder, plaster sower, and harrow. July 22, 1875.
5,010.—P. H. Cowper et al., Montreal, P. Q. Belt-making machine. July 22, 1875.
5,011.—F. L. Pope, Elizabeth, N. J., U. S. Electric signals. July 22, 1875.
5,012.—W. G. Swartz, Fairview, Ill., U. S. Insect-gathering machine. July 24, 1875.
5,013.—W. H. Martin, Mobile, Ala., U. S. Toy gun. July 24, 1875.
5,014.—A. S. Chamberlin et al., Franklin, N. Y., U. S. Stove pipe sheet. July 24, 1875.
5,015.—J. V. Taylor, La Cigne, Kan., U. S. Bed bottom. July 24, 1875.
5,016.—J. Greenebaum, San Francisco, Cal., U. S. Pocket-fastened pants. July 24, 1875.

Advertisements.

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

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



THE TRADE ENGINE.

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

PIANO STOOL SCREWS—With perfect cut thread, in both screw and nut. Prices very low. Address T. SHRIVER & CO., 333 E. 56th St., New York.

FOR SALE—In Danbury, Conn., a Lumber Yard, Planing and Moulding Mill, with Steam Power and Machinery, now manufacturing Sash, Doors, Blinds, Mouldings, Wood Turning, Band and Circular Sawing. Business is of 20 years' successful operation. Location unsurpassed. Is a rare chance for a good business. Terms easy, and inducements good. For other particulars, address D. STEVENS, Box 45, Danbury, Conn.

MECHANICAL ENGINEER AND SUPERINTENDENT, experienced in Compound and Low Pressure Engines, &c., for Marine, Corporation pumping, and other purposes, will soon be disengaged. References. MECHANICAL ENGINEER, 121 E. 128th St., N. Y.

\$1.00 PER BBL. for Cement direct from Manufacturer, on board cars or boat, 100 miles from N. Y. City. PHINCE'S CEMENT WORKS, Lehigh Gap, Pa.

Ladies Can make \$5 a day in their own City or Town. Address ELLIS M'FG. CO., Waltham, Mass.

STRANGE'S CYLINDER SAW AND MACHINE COMPANY, TAUNTON, MASS., Manufacturers of Cast and Circular Cylinder Saws, Hoghead, Barrel, and Nail Keg Stave Machines, and the Champion Combination Foot Lathe. Send for Price List.

JUST PUBLISHED. PYROLOGY, OR FIRE CHEMISTRY; a Science interesting to the general philosopher, and an Art of infinite importance to the Chemist, Mineralogist, Metallurgist, Geologist, Agriculturist, Engineer (Mining, Civil, and Military), &c., &c. By WM. ALEXANDER ROSS. Crown 8vo, cloth, 348 pp., 4 colored plates and numerous engravings. Price \$15.00.

PROCEEDINGS OF THE ASSOCIATION OF Municipal and Sanitary Engineers and Surveyors. Volume 1. 1873-4. Edited by LEWIS ANGELL. 8vo, cloth. Price \$4.25.

E. & F. N. SPON, 446 Broome Street, N. Y.

Model Steam Engines, FROM 50 CTS. UPWARDS, FROM GEORGE FARR'S UNEQUALLED MODELS OF Steam Cranes, Vertical Engines, Paddle Engines, Steam Lathes, Steam Hammers, Locomotive Engines, Steam Boilers, Marine Screw Engines, Powerful Engines, Water Motor Engines, Fire Engines, Miniature Machine Shop, Conical Figures and Saw Mills run by above appliances. Also, Celebrated Amateur's Lathes. Tools and Fittings of every description. Limitable Castings, for \$1.00 per set and upwards, by means of which all members of the above Steam Engines, Lathes, &c., have been successfully made by Amateurs. Thousands prove the unparalleled success of the above models and castings. For full description and prices of the above, together with the requisite tools, see "Farr's Technical Guide," containing over 40 illustrations, with all necessary information, how to buy, how to use, and how to make model engines. Post free, 35 cents. Address GEORGE FARR, Buffalo, N. Y.

The Fire on the Hearth

The Fire on the Hearth
Improved in appearance, convenience, and efficiency.
Combines all the advantages of The Open Fire with those
of the best Warm Air Furnaces. Adapted to the use of
Coal, Coke, Wood, or Peat. Send for Circular to
THE OPEN STOVE VENTILATING CO.,
107 Fulton Street, New York.

TO ELECTRO-PLATERS.
BATTERIES, CHEMICALS, AND MATERIALS,
 In sets or single, with Books of Instruction for
 GOLD, SILVER, OR NICKEL PLATING. THOMAS HALL,
 Manufacturing Electrician, 19 Bromfield Street, Boston,
 Mass. Illustrated Catalogue sent free.

EAGLE FOOT LATHES,

With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artisan. Send for it.

WM. L. CHASE & CO.,
95 & 97 Liberty St., New York.

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

8,000 in Use!



Blake's
STEAM PUMPS
for every possible duty. Send
for Illustrated Catalogue.
GEO. F. BLAKE & F.G. CO.
86 & 88 Liberty Street.

Cor. Causeway and Friend
Sts., Boston, Mass. | 50 and 52 South Canal
St., Chicago, Ill.

Machinery of Improved Styles for making
SHINGLES HEADING, AND STAVES
Sole makers of the well known IMPROVED LAW'S PATENT
SHINGLE AND HEADING SAWING MACHINE. For circulars
address
TREVOR & CO., Lockport, N. Y.

Excelsior Do Your Own Printing
"Lowest Priced and BEST."

Portable \$3 Press for cards, labels, envelopes, etc.
Larger sizes for larger work.
Business Men do their printing and advertising, save money and increase trade. **Amateur Printers**, delight

 **Printing Presses** full pastime for spare hours. **BOYS** have great fun and make money fast at printing. Send two stamps for full catalogue presses type etc to the Mfrs **KELLEY & CO.** Malden, Conn.

G LASS **M** OULDS, for Fruit Jars, Lamp
Bottles, Ink Stands, etc., made by H. BROOKS
15 years COR. WHITE and CENTRE STS., N. Y. For ad

Every description of moulds for glass, rubber, zinc etc. Send model or drawing, inclose stamp.

PATENT COLD ROLLED

SHAFTING.

other in use, renders it undoubtedly the most economic.
We are also the sole manufacturers of the CELEBRATED
COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed
upon application to JONES & LAUGHLINS.

Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa.
190 S. Canal st., Chicago, Ill.
Stocks of this Shafting in store and for sale by
FULLER, DANA, & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers street, N. Y.

BLAKE'S PATENT
Stone and Ore Breaker

Crushes all hard and brittle substances
any required size. Also, any kind
STONE for ROADS and for CONCRETE, &
Address: BLAKE CRUSHER CO.

STENCIL DIES For cutting business Stencils, all sizes. A complete outfit for Clothing Stenciling.

The HOADLEY

PORTABLE STEAM ENGINE.
WITH
AUTOMATICAL CUT OFF REGULATOR

A detailed technical drawing of a balanced valve mechanism, showing a cross-section of the valve assembly with various components labeled with letters and numbers.

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

MACHINERY

IRON & WOOD WORKING MACHINERY
OF EVERY DESCRIPTION.

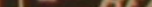
Cold Rolled Shafting

GEORGE PLACE,
121 Chambers & 109 Reade Sts. N. Y. C.

MAN'G CONCERNS.—Buerk's Watchman Time Detector, capable of accurately controlling motion of a watchman or patrolman at the different stations of his beat. Send for circular.

J. E. BIERK, P. O. Box 979, Boston, Ma.
N. d.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 19, 1874. Proceedings have been commenced against Imhaeuser & Co. for selling, contrary to the order of the Court, and especially

clock with a series of springs in the cover, and make
Pat'd Oct. 30, '14. Persons using these, or any of
clocks infringing on my Patent, will be dealt with ac-
cording to law.



**WROUGHT
IRON
BEAMS & GIRDERS**

THE Union Iron Mills, Pittsburgh, Pa.

mode of manufacturing, are entirely avoided. We are
pared to furnish all sizes at terms as favorable as can
be obtained elsewhere. For descriptive lithograph and
Circulars, write to Carnegie Brothers & Co., Union Iron Mills, Pittsburgh.

THE SCIENTIFIC AMERICAN

Circulation larger than that of all the weekly and monthly publications devoted to Science, Manufactures, Mechanics, Inventions, and Engineering combined, published on this Continent; therefore its value as an advertising medium cannot be over-estimated.

It goes into all the machine and workshop in the country, and is taken at the principal libraries and reading rooms in the United States and Europe.

A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth \$3.75 per line to advertise in one of forty-five thousand.

We invite the attention of those who wish to make their business known, to the annexed rates:

Back Page, - - - \$1.00 a line
Inside Page, - - - .75 a line
Business and Personal, 1.00 a line

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

If you wish anything in the mechanical line, advertise or it in the SCIENTIFIC AMERICAN.

If you have patents or machinery to sell, advertise in the SCIENTIFIC AMERICAN.

Address the publishers.

Munn & Co.,

37 Park Row, New York.

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

FOR SALE, VERY LOW—A well established business, with the tools and machinery for making the Cummins Extension Shoe-knife Blades. Price \$2,000. For information, address S. A. CUMMINGS, Middleton, Mass.

MODELS AND DRAWINGS. PATTERNS, 209
MACHINERY. DMAN'F'G CO. CENTER ST.

TRADE MARK.  GENUINE CONCORD AXLES

The Standard—Best Stock—Finest Finish.

MANUFACTURED ONLY BY

D. ARTHUR BROWN & CO., Fisherville, N. H.

WIRE ROPE

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

THE TANITE COMPANY
Emery Wheels, Emery Grinders
STROUDSBURG MONROE CO. PA.

Munn & Co.'s Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-EIGHT YEARS EXPERIENCE.

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

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

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

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

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

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

A pamphlet of 116 pages, containing the laws and full directions for obtaining United States patents, also a circular pertaining exclusively to Foreign Patents, stating cost for each country, time granted, etc., sent free. Address

MUNN & CO.,

Publishers SCIENTIFIC AMERICAN,

37 Park Row, N. Y.

BRANCH OFFICE—Corner F and 7th Streets Washington D. C.

600,000 FEET OF LUMBER SAWED WITH 500 Patent Saw Bits.

MEASURES, EMBROIDER, FORD & CO.—Gentlemen: Our Planer Toothed Saw, purchased from you, sawed SIX HUNDRED THOUSAND FEET of Oak and Poplar, full of Sand and Grit, with the FIVE HUNDRED BITS that you sent with the saw. We are free to say that we believe your saw to be the best in use.

Yours, very respectfully, G. W. MONEYEGHON & BRO'S.
N. B.—We have recently improved the quality of our Patent Saw Bits. Five hundred given with each Saw. This Saw will cut lumber cheaper than any other saw in the world. No Filing, No Setting, No Gumming. And no loss of time. Saw always the same size. For Circular and Price List, address EMBROIDER, FORD & CO., Beaver Falls, Pa.

ROOTS' FORCE BLAST BLOWER.



FIRST PREMIUM AWARDED

AT

PARIS AND VIENNA.

SPEED ONLY 100 TO 250 REV. PER M. SAVES HALF THE POWER REQUIRED FOR FAN.

P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.

S. S. TOWNSEND, Gen'l Ag't, 31 Liberty St., NEW YORK.

FOR NEW & SECOND HAND ENGINES & BOILERS in perfect order, address J. H. HARRIS, Titusville, Pa.

RE-DUPLICATION.

We need a process by which from ten to fifteen copies of freshly written documents can be made rapidly and distinctly on durable paper and with ink that will not fade. Such an invention can be immediately and successfully introduced in fifty different cities of the Union, and will be made amply remunerative. Apply to E. W., Box 803, New York City.

STRONG TISSUE PAPER.

Wanted—Samples of very strong Tissue or other Paper, which can be used for manfolding with carbon sheets, or otherwise, in order to make ten or fifteen copies. Should be of such quality that it will not readily tear or break by constant use. A large quantity will be required of a suitable article. Address E. W., Box 803, N. Y. City.

NOTES EXTERMINATED!!

Carpet and Clothing, without injury to the most delicate color or Goods, the expense for material and labor to clear them from the largest Parlor Suit will not exceed One Dollar. For ONE DOLLAR we will forward recipe and instructions and GUARANTEE all we claim or refund the money. We refer to any National Bank in our City, and the Commercial Agency of Messrs. Dunn & Co.

NEWTON & DAVIS, BIRMGHAMTON, N. Y.

THE BEST INJECTOR

For Locomotive and Stationary Boilers. FRIEDMANN'S PATENT.

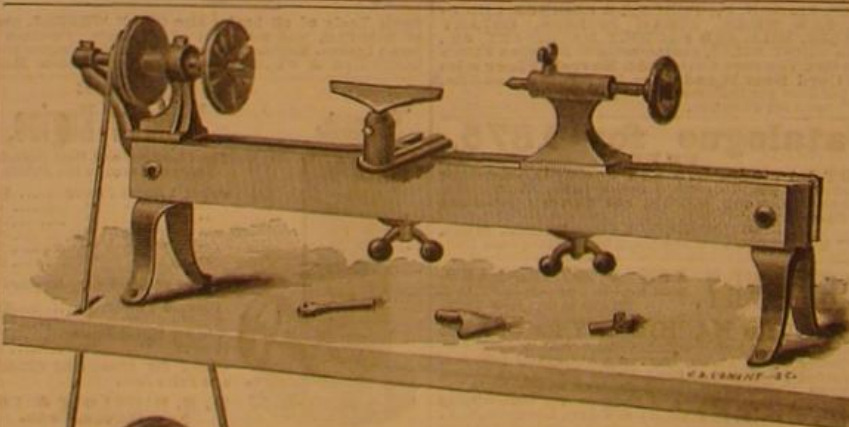
Over 15,000 Now in Use Here and in Europe.

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

NATHAN & DREYFUS, Sole Manufacturers, 108 Liberty St., New York.

Send for Catalogue.

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



EUREKA LATHE, - - \$9;

with Foot Power or Pulleys, \$15.

For Turning, Scroll and Circular Sawing,

Boring, Drilling, Grinding, Polishing,

or any other purpose for which a Lathe is intended. Suitable for MECHANICS, MANUFACTURERS, DENTISTS, JEWELERS, or any one desiring a good serviceable Lathe for little money.

The "EUREKA" is a perfect Lathe turning sixteen inches long, and five inches in diameter; steel spindles and centers. Arranged to work a jig-saw from face plate.

POPE BROS., M'rs,

45 High Street,

Boston, Mass.

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

WHEN YOU DESIRE BOOKS, SEND TO GEO. F. STEVENS & CO., Cincinnati, O. Ask prices or information.

TO INVENTORS AND MANUFACTURERS

The 44th Exhibition of the American Institute will open September 21st; Machinery will be received after August 15th, other goods after August 21st. For particulars address "General Superintendent, American Institute, New York."

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

NEW PATENT CAR FOR INCLINED PLANES, conveniently arranged to carry Passengers and Vehicles at the same time. Descriptive Circular sent on application. Address J. EARNSHAW, Civil Engineer, N. W. Cor. 4th and Race Sts., Cincinnati, Ohio.

LEUCHTWANGER & CO., Chemists, manufacture and import many rare chemical productions, Soluble Glass, Fluoric Acid, Nickel Salts, Marble Putty, Sulphides, all Metallic Oxides; keep Fluor spar, Feldspar, Flint, and finest Silica; Manganese, crystals, granulated, and powder of the highest grade. For sale at 180 Fulton Street, New York.

Steam Super-Heaters.

Set under boilers, or in separate furnace, will supply Dry Steam of any required temperature, and save fuel. HENRY W. BULKLEY, 96 Liberty St., New York

Pyrometers, For showing heat of Boilers, furnaces, Ovens, Hot blast pipes. HENRY W. BULKLEY, Sole Manufacturer, 96 Liberty St., New York

BOLT CUTTERS.

Patented 1868-1874. Dies open and close and Bolt thrown out automatically. One pattern, holds finished bolts on centres and threads them with greater accuracy and uniformity and ten times as fast as a chaser in a Lathe. Highest award of American Institute, 1869 & 1874.

Wood & Light Machine Co., Worcester, Mass. make all kinds of Iron Working Machinery. Also, Shafting, Pulleys, &c.

NOYE'S Mill Furnishing Works

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

Machinists' Tools.

EXTRA HEAVY AND IMPROVED PATTERNS. LUCIUS W. POND, MANUFACTURER, Worcester, Mass.

WAREHOUSES 98 LIBERTY ST., N. Y. Lathes, Planers, Boring Mills, Drills and Gear Cutters a Specialty.

THE NATIONAL Steel Tube Cleaner.

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

NON-COMBUSTIBLE STEAM BOILER & PIPE COVERING

WITH AIR SPACE IMPROVEMENT. Saves ten to twenty per cent. CHALMERS SPENCE CO., foot E. 9th Street, N. Y.; 132 N. 2nd St., St. Louis, Mo.

PROSPECTUS

OF THE SCIENTIFIC AMERICAN, FOR 1875.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THIRTIETH YEAR.

VOLUME XXXIII.—NEW SERIES

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

To the Mechanic and Manufacturer.

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

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

TERMS.

One copy, one year (postage included).....\$3.20

One copy, six months (postage included).... 1.60

One copy, three months (postage included).... 1.00

One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"..... 10.00

One copy of Scientific American for one year, and one copy of "Science Record" for 1875..... 5.20

Remit by postal order, draft, or express.

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

MUNN & CO.

37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. ENCK JOHNSON & CO. 8 INK, Tenth and Lombard Sts. Philadelphia and 59 Gold St. New York