SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLVIII.—No. 10. [NEW SERIES.] NEW YORK, MARCH 10, 1883. [$3.20 per Annum [POSTAGE PREPAID.]

Paint for Floors.

A paint for floors, which economizes the use of oil colors and varnish, is described in the German technical press as having been composed by Herr Mareck. It is remarked that this paint can also be used on wood, stone, etc. For flooring, the following mixture has been found applicable: 2½ ounces of good, clear joiner's glue is soaked over night in cold water. It is dissolved, and then is added (being constantly stirred) to thickish milk of lime heated to boiling point, and prepared from one pound quick lime. Into boiling lime is poured (the stirring being continued) as much linseed oil as becomes united by means of saponification with the lime, and when the oil no longer mixes here is no more poured in.

If there happens to be too much oil added, it must be combined by the addition of some fresh lime paste. For the quantity of lime previously indicated, about half a pound of oil is required. After this white, thickish foundation paint has cooled, a color is added which is not affected by lime, and in case of need the paint is diluted with water, or by the addition of a mixture of lime water with some linseed oil. For yellowish-brown or brownish-red shades about a fourth part of the entire bulk is added of a brown solution obtained by boiling shellac and borax with water. This mixture is specially adapted for painting floors. The paint should be applied uniformly, and is described as covering the floor most effectually, and uniting with it in a durable manner. But it is remarked that it is not suitable for being used in cases where a room is in constant use, as under such circumstances it would probably have to be renewed in some places every three months. The most durable floor paint is said to be that composed of linseed oil varnish, which only requires to be renewed every six or twelve months. It penetrates into the wood and makes it water resisting; its properties being thus of a nature to compensate for its higher cost in proportion to other compositions used for a similar purpose. Its use is particularly recommended in schools and workrooms, as it lessens dust and facilitates the cleaning of the boards.—*The Builder.*

FRANCIS LANA, in 1670, proposed a boat raised by four hollow copper balls, exhausted of air, for navigating the air.

A Good Old Miller.

A New Jersey miller, who had become old and rheumatic, one day called his sons about him, and said: "Boys, I am growing stiff in the knees and faint at heart. My liver is out of order, and I can no longer distinguish between a peck and a half bushel when taking toll. This mill is worth ten thousand dollars. In order to form a stock company, and render my own burdens the lighter, I shall give Reuben two-tenths, Samuel the same, and Henry, who is my first-born, three-tenths. Bless you, my children, bless you. You may now go fishing for half a day." The three sons took the papers which the old man had made out, and instead of going fishing, they went down to a lawyer's office, called a meeting of stockholders, and proceeded to business. The first-born was elected president, Reuben treasurer, and Samuel secretary, and the following resolution was passed: "*Resolved,* That we bounce the old man, and run the mill after our own ideas!"

The above, from the *Millers' Review* (Philadelphia), illustrates substantially the experience of a good many indulgent, confiding fathers. Some that read this will be reminded of like cases that have come under their own notice.—ED.

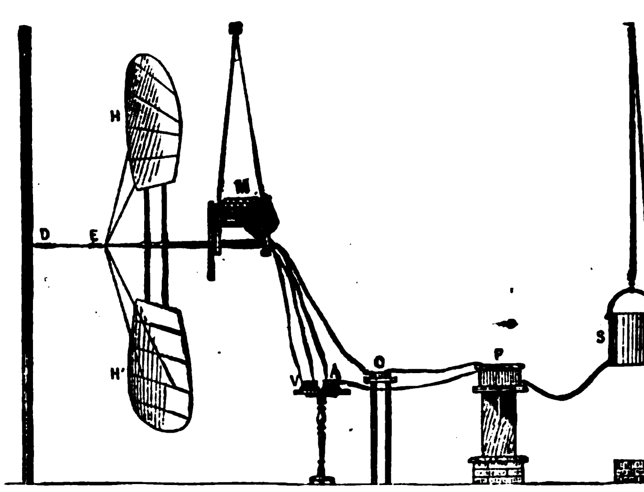


Fig. 1.—APPARATUS FOR EXPERIMENTS OF M. TISSANDIER.

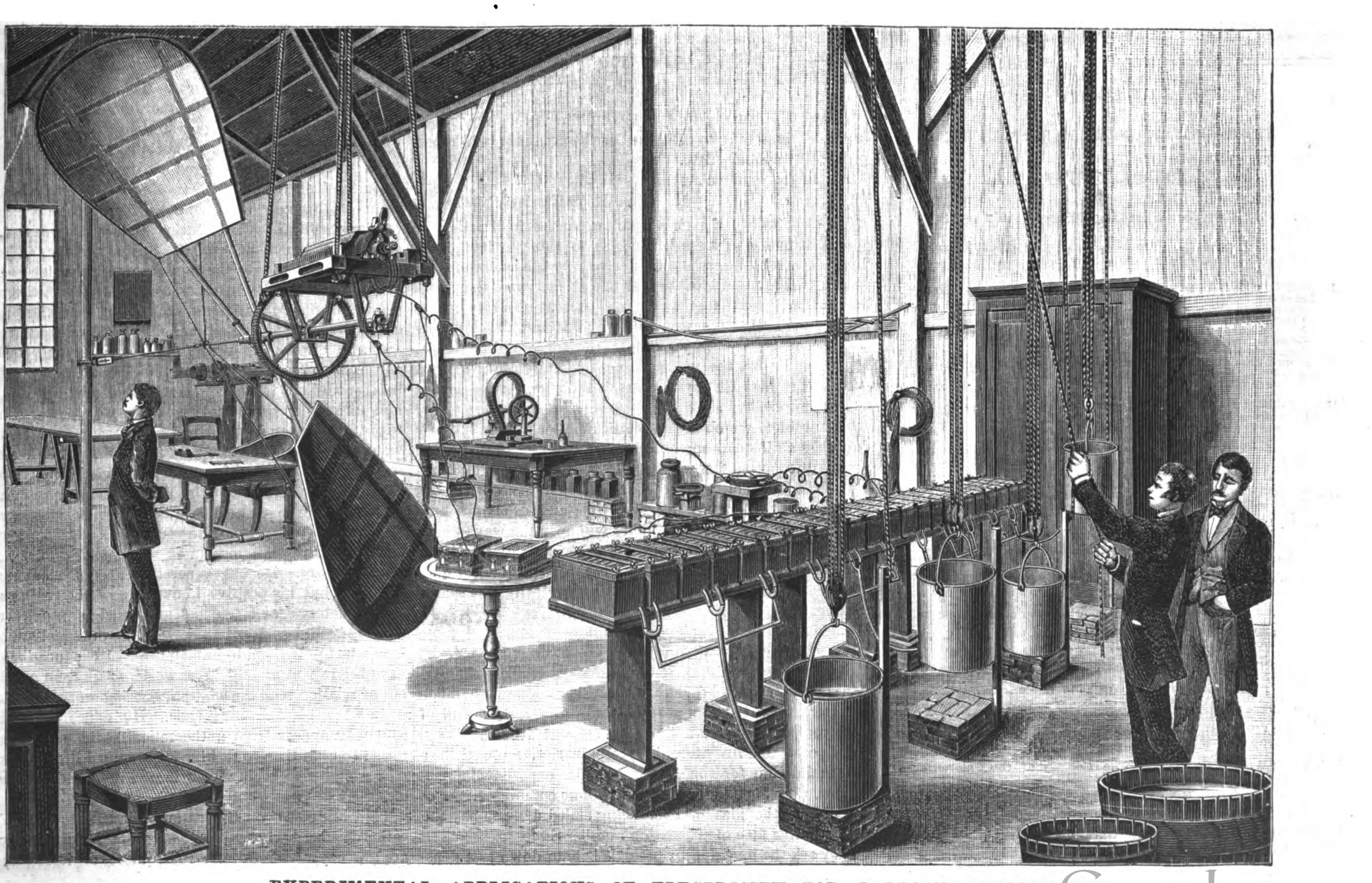
PROPULSION OF BALLOONS BY ELECTRICITY.

Attracted by the difficulties of the problem, M. Gaston Tissandier, of Paris, has undertaken to solve it, taking advantage of the recent progress of science. The interest and the novelty of these experiments consist chiefly in the choice of the motive power destined to actuate the propeller. These electrical motors have the following advantages for aerial navigation: Absence of fire, constancy of weight, and incomparable facility for putting in motion and arresting the mechanism. The lightness of the motor was obtained by the aid of a Siemens machine of special construction, and that of the source of electricity by the aid of bichromate of potash batteries.

The Motor (Fig. 2).—The motor is a Siemens continuous current dynamo, of a new design, constructed from the plans of M. George Boistel, Engineer of the Maison Siemens of Paris. It is characterized by the lightness of its component parts and the very elongated form of the armature, which has the effect of diminishing the relative value of the resistance of the wires which pass over each end of the drum. The position of the brushes is variable, and the inductors are included in the general circuit. The armature transmits its motion to the screw by means of a pinion and wheel; the relation of the velocities is as 1 to 10; therefore, when the motor makes 1,200 revolutions the screw makes 120. Experiments made upon this machine at different velocities and with various current intensities showed that the machine can furnish as much as 100 kilogrammeters per second (1⅓ horse power), measured at the brake, with a current of 45 amperes and a difference of potential of 40 volts at the terminals. Under these conditions a very simple calculation shows that the machine only transforms into work about 55 per cent of the electrical energy which is actually supplied to it. The lowness of this return is due to several causes, and a remedy has been devised, so that the return may easily attain 70 to 75 per cent, which is very satisfactory when we have to deal with an effective return resulting from *direct measurements*, and not theoretical considerations, whose accuracy is often more than disputable.

The mode of measurement adopted consisted of measuring

(*Continued on page* 147.)



EXPERIMENTAL APPLICATIONS OF ELECTRICITY FOR BALLOON PROPULSION.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

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

NEW YORK, SATURDAY, MARCH 10, 1883.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions	154	Lime juice in diphtheria	147
Air extractor, Thomson's*	146	Mechanical inventions	154
Air pump, new	153	Mexican tin	152
Artificial aurora	151	Miss Lurline in her aquarium*	151
Assist. Commissioner of Patents	153	Mortality of New York	152
Balloon propulsion, apparatus*	143	Nettles, cloth from	153
Biting horses	153	New air pump	153
Burglar trap	153	New comet, discovery of	149
Business and personal	154	New tar explosive	150
Carbonic oxide, preparation of	143	Novelties in shoe polishes	150
Caution to plumbers	148	Paint for floors	143
Changes in the Patent Office	153	"Peerless" engine, the*	150
Cloth from nettles	153	Polyphemus, the	148
Coinage, government profit on	152	Railway census of the U. S.	149
Coke and gas as heating agents	146	Remarkable cir. saw accident	145
Compressed bran—$1,000 reward	144	Remedy for erysipelas	146
Cow tree, the	153	Reticulated struc. living matters	153
Deepest sounding in the Atlantic	152	Ribbon holder, new*	153
Discovery of a new comet	149	Schooled but not educated	144
Dismal Swamp, the	150	Side show science	151
Does snow protect soil from frost?	152	Siemens dynamo-electro mach.*	147
Drawbridge safety switches	153	Silk and how dyed	145
Electricity in gold mining	149	Solid and liquid illum. agents	148
Erysipelas, remedy for	146	Statue of Memnon, vocal	152
Foundry cupola, improved*	146	Steel an alloy	153
Good old miller, a	143	The inventor	147
Government profit on coinage	152	Thomson's air extractor*	146
Hearing in insects	150	Tinned sheet copper, manuf. of	151
Hotchkiss' money safe*	150	Tissandier's balloon exper.*	143
Index to new inventions	155	Toy money safe*	150
Inventions to prevent fires	148	Trap for burglars	153
Inventors—work to do	151	White bronze	149
Isometric governor, the*	147	Willard's vertical engine*	150
Kriegar's foundry cupola*	146	Work for inventors to do	151

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 375,

For the Week ending March 10, 1883.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Safety and Feed Apparatus for Steam Boilers.—12 figures 5975
Prevention of Scale in Steam Boilers 5976
Crucible Cast Steel Frames and Rudders.—Several figures 5977
Swing Bridge at Hamburg.—1 figure 5978
Thuillier's Screw Cutting Gap Lathe.—1 figure 5978
Sinclair's Mechanical Stoker.—1 figure 5979
Continuous Press for Sugar Works and Distilleries.—10 figures 5979
Nedden's "Kosmos" Ventilator.—4 figures 5980
Antwerp Water Works 5980

II. CHEMISTRY AND METALLURGY.—On the Molecular Rigidity of Tempered Steel.—By Prof. D. E. HUGHES 5976
Some of the Dangerous Properties of Dusts. By Prof. F. A. ABEL.—The power of coal dust to carry on the flame produced by a blown out shot.—Coal dust the chief agent of destruction in explosions in mines.—Diminution of coal dust in mines.—Methods of detaching coal without raising dust 5984

III. TECHNOLOGY.—How to Season Lumber.—1 figure 5981
M. Loiseau's Magnesium Lamp.—1 figure 5982
Starch Sugar.—A new method for refining and crystallizing starch sugar. By DR. FRANK SOXHLET 5985

IV. ELECTRICITY, LIGHT, AND HEAT.—Step Wound Armature.—7 figures 5982
The Radiation of Cold 5982
A Review of the Doctrine of Ether Waves and of the Material Nature of Light.—By ELLEN R. PRESCOTT.—I. World fires in the nebular theory of creation.—"Seeming wastes of nature."—Ether the legitimate result of the fundamental law of combination and expulsion.—Molecular constitution of ether.—Atomic induction.—Polarization of light 5982
A New Organic Substance Sensitive to Light 5985

V. MEDICINE AND HYGIENE.—Lime Juice; its Properties and Uses.—By MICHAEL CONROY 5986
The Civilized and Uncivilized Woman in Labor 5986
Bacteria in the Soil and the Air 5986
The Trade in Quinine 5986

VI. BIOGRAPHY.—Henry Draper 5987
Gustave Dore.—With portrait 5988

VII. MINING AND GEOLOGY.—The Geology of the Quicksilver Mines of California. By LUTHER WAGNER 5988

VIII. ARCHÆOLOGY.—The Roman Forum at Arles, France.—7 figures. 5989
The Victims of Pompeii 5989

IX. ARCHITECTURE.—Safety Appliances for Buildings 5990
X. MISCELLANEOUS.—The World as Related to the Post Office 5990
The Decapitated Pacha.—2 figures 5990

COMPRESSED BRAN.—ONE THOUSAND DOLLARS REWARD FOR A NEW INVENTION.

In the manufacture of flour the outer cuticle of the grain is separated by sieves in the form of bran, the particles of which are exceedingly light, but strong and elastic; probably they become electrified, for they have the peculiar quality of standing apart and holding air between them, thereby occupying much space. Thus a barrel that carries 196 pounds of flour will only contain about 70 pounds of bran.

The quantity of bran annually produced in this country is enormous. Of flour we are supposed to manufacture about fifty millions of barrels yearly; for every barrel of flour made, probably about 40 pounds of bran is produced.

Bran forms a superior article of feed for animals. As a mixer with other foods it is of unquestionable value; but owing to its great bulk, and the lack of proper devices for its condensation or compression, it is difficult and costly to transport; hence it is almost a drug to the maker. It only brings about five dollars a ton in this country; but in England it sells for almost twenty dollars a ton. In the earlier practice of our Western milling it was common to turn the bran into the river and let it float off as waste. Even now it barely pays for handling.

With a view to the calling out of some new method, process, or invention, by which bran can be more profitably marketed, the Millers' National Association have recently made public an offer of a premium of one thousand dollars in cash, which is to be paid to whoever is able to meet the following requirements and suggestions:

MILLERS' NATIONAL ASSOCIATION.
Secretary's Office,
Milwaukee, Wis., February 19, 1883.

By virtue of a resolution adopted at the Delegate Convention Millers' National Association, in Cleveland, January 31 ult., the Sub-Executive Committee are instructed to offer a cash premium of $1,000 for the invention and production of the best practical machine that will enable mills of ordinary capacity to compress bran economically into a suitable, cheap, and safe package for export, at a saving of at least *five cents per hundred pounds* in the process, package, and freight, over the methods now in general use.

Requirements.

First. A machine that will compress one hundred pounds of ordinary bran into a package not to exceed fifteen (15) inches square, or two hundred pounds in the same ratio.

Second. That will, with the aid of an attendant and a reasonable amount of power, prepare for shipment one ton or more per hour.

Third. The inventor or owner of the successful machine must stipulate to sell it at a reasonable price (to be agreed upon between the Executive Committee and himself) *to all members of the Association.*

Fourth. The offer to remain open one year, the committee to be at liberty to reject all devices, competing for this premium, that do not come up to the requirements of the trade.

Suggestions.

First. Other results being equal, the machine producing a package with the best form for close "stowage," will have the preference.

Second. The package should be compressed in such a manner that when the covering is removed the bran will assume its ordinary condition without manipulation.

Third. No machine, or process, requiring the addition to bran of moisture, or any foreign substance, will be entertained.

Fourth. It is desired that parties building, or with machines in model, intending to compete for the premium, will report progress at an early date.

For further particulars address,

S. H. SEAMANS, *Secretary.*

The chief utility of such a premium consists in directing the special attention of ingenious minds to this particular subject. The real reward to be derived by the successful inventor will come to him through the protection of the patent laws. These beneficent regulations present to every person a perpetual encouragement to study out and develop new improvements; and they grant to the successful inventor, in the name of the nation, the opportunity of securing a generous reward for any new art or industry that he brings before the public.

The problem which the association presents for solution is doubtless a difficult one; but we think that some reader of the SCIENTIFIC AMERICAN will be able to solve it. Whether accomplished or not, we are confident that many ingenious minds will devote study to the subject; and, as always happens in such cases, these researches will open the way to hundreds of collateral suggestions for other novelties. Under pressure of thought the inventor's brain is apt to yield multitudes of new ideas, which fly out involuntarily, like sparks from grinding steel.

The offer of the association would have appeared more just and liberal had the third requirement been omitted. It conveys the impression that the committee regards the payment of the thousand dollars as a consideration of so much importance that they ought to have the practical control of the invention. Such a notion seems almost absurd. Why, it will cost the inventor, in preliminaries, more than a thousand dollars for time, labor, models, experimental machinery, drawings, patent fees, etc. The committee may as well dismiss the idea of ever being called upon to pay the money, in the face of stipulation number three.

They ask the inventor to press their bran down to a density more solid than hickory wood, and retain the compression in the form of a merchantable package, still keeping the quality of the chaff intact.

If this can be done, the commercial effect of the invention will be to increase the selling price of bran probably five or ten times above its present rate; and the 1,000,000 tons of bran, or thereabouts, now annually produced and sold say for five millions of dollars, will bring to the twenty-five thousand mills of this country perhaps not less than fifty millions of dollars a year.

The invention called for, if actually realized, will be of immense value and utility. The man who produces it will be master of the situation; and to him will belong the exclusive privilege of dictating the terms upon which the members of the association may enjoy the use of the invention.

Referring to suggestion number four, we would caution the inventor to give out no description of the nature of his improvements until they are protected by patent.

SCHOOLED BUT NOT EDUCATED.

The great lack of our country to-day, said a shrewd observer recently, is properly educated men. The speaker was a rarely capable business man, whose connection with large financial and commercial affairs brings him into daily intercourse with many of the leading business men of the country.

Our material progress has been so rapid, he went on to say, that men have failed to keep up: consequently the country is full of possibilities which cannot be developed, and of enterprises which are suffering grievously for lack of competent men to manage them. And the difficulty in finding the right men for the waiting work is not felt simply in connection with operations of great magnitude. It is felt wherever there is need of full, specific, and exact knowledge, coupled with self-reliance, practical judgment, and skill to deal promptly and wisely with novel problems.

The men who are now doing the larger work of the world as best they may, have for the most part grown up with their affairs, under conditions comparatively favorable for gaining and retaining the mastery of them. But these men are waxing old, are rapidly dying off, and their mantles fall upon younger men, whose entry upon the stage of action was too late for them to benefit by the earlier formative experience enjoyed by their fathers.

The world's business calls for a wider and wider range of real knowledge, a broader grasp of principles, and a larger executive ability than were necessary a few years ago. At the same time the specializing tendency of the age—the development of specialties within specialties, an inevitable consequence of the increasing magnitude of commercial and industrial affairs—leads to narrower experience, narrower training, and, too often, to a serious limitation of men's grasp of affairs in general, their relations, and interactions. The demands of future years are likely to be for men of larger and still larger capacity; yet the conditions for their development are becoming less and less favorable in active business life as the years roll by, and the subdivisions of service become more minute.

The day has passed, or soon will pass, when a man could begin as a common laborer and rise in succession through all the stages of service, practically mastering each department up to the direction of, say, a great transportation system or other enterprise of national magnitude. The steps are too many and the ascent too great. To a larger extent also, the real workers must remain subordinate while the heirs of capital command the higher stations. How are they being educated for their great responsibility?

The speaker above referred to dwelt with much feeling upon the inadequacy of the traditional systems of education to meet this new requirement. With a few exceptions our great educational institutions, and still more the smaller ones, are in grasp and spirit far behind the age, and entirely out of sympathy with the modern world which the rising generation is soon to take possession of. From the moment the boy begins to prepare for college he faces the past; educationally he lives in the past; and the more conscientiously he does the work laid out for him the vaster will be the final gap between college life and real life. The intellectual habits acquired in school and college may possibly enable him ultimately to grapple with greater power and skill with the later problems of real life, greater, that is, than he would have shown had he been left entirely unschooled; yet in the administration of affairs he is likely to be distanced for the best part of his life by the unschooled practical man who knows from early and real experience precisely what to do in any emergency. The young man fresh from school is apt to know with thoroughness much that the busy world has no use for. He has general notions of many arts and sciences, but his positive knowledge of the realities upon which such arts and sciences are based is usually next to nothing; still less does he know of the practical methods of men who apply them to human uses. His educational years have been spent mainly in a world apart from and largely out of relation with the modern working world he is to enter upon when his schooling ends. His education, admirable as it may appear from a theoretical point of view, serves rather to unfit than to fit him for practical life: and his real education has to begin afresh in the rude and costly school of experience.

This, of course, on the assumption that the youth's education has been wholly by school work. Fortunately there are few boys who do not rebel more or less against the routine of schooling, and so gain under protest, often by stealth, a partial preparation for real life. If the schools did not usually get the credit for good results obtained in this way by the independent and unencouraged efforts of their pupils, it is probable that it would be much easier than it is to do away with the traditional obstructions to real education which linger in most schools and courses of study.

One of the great problems of to-day is to infuse a larger share of modern spirit into school life and school work; to lessen largely the amount of book learning and increase the proportion of individual effort in dealing directly with realities; in short, to make the student more of a doer and less of a passive recipient of vague generalities.

The progress of the schools in this direction during recent years has not been small; yet it has been slight and limited compared with the rapid and general advance in public needs and individual requirements. In every department of active life the call is for men untrammeled by tradition, men trained to challenge every alleged fact and natural law until its truth is proved; bold men, used to the solution of real problems and undaunted by novel difficulties; alert men, ready to grasp every opportunity for improvement in materials and processes, and skilled in the use of everything that ministers to economical success. The schools should help to develop such men. Now they oftener hinder such development.

SILK AND HOW IT IS DYED.

Otto N. Witt and E. Noelting have recently contributed an interesting essay on silk and silk dyeing to the *Chemiker Zeitung*, from which we abstract such points as are likely to interest the readers of the SCIENTIFIC AMERICAN.

Silk holds the same place among fabrics that gold and the diamond do among metals and gems respectively. It is the noble, the royal fiber. Silk has that peculiar luster, that agreeable feeling, which charms our senses. The fiber itself, as it is unwound from the cocoon, consists of two parallel, thick, glossy threads stuck together lengthwise. These threads are so highly polished that the best objectives are unable to disclose any irregular or uneven spots, which fact is expressed in a general way by saying that silk is structureless It is evident that such must be the case, for it is nothing but a solidified liquid thread, resembling in every respect a glass rod. Cotton, on the contrary, is a tube, not a round but a flattened tube, irregularly pressed together, which almost always contains minute granules of dried plasma that once filled the tube. A glass rod is more brilliant than a dusty tube irregularly formed or flattened. Glass wool spun from glass rods has more luster than that spun from glass tubes.

To obtain a similar simile for wool one must compare it to rods of unglazed porcelain, or better still porcelain rods covered with "craquelé," or crackled glass. This represents the bleached wool before it is dyed. When dyed, the conditions are still more favorable on the side of the silk.

The dyer utilizes the great affinity that the silk fiber has for certain chemical compounds, or rather its power of precipitating substances from their solutions and combining with them. The coloring matter is not, however, deposited on the surface of the silk in granular or crystalline form, but is dissolved in the silk and distributed through it just as it was previously dissolved in the dye-bath. The fibroine, or silk substance, is not a base that combines with an acid dye, nor yet an acid which unites with basic coloring matters to form insoluble salts; silk makes no distinctions between acids and bases; it absorbs both just as a sponge sucks up water. It does not even confine itself to dyes, but has the same attraction for many uncolored substances, such as sugar and many metallic salts. Of course the exterior portion of the fiber takes the most, and only gives up to the interior portion the excess that it is unable to retain for itself. Under the microscope the cross-section of dyed silk is seen to be shaded from the center outward, the circumference being darkest, and the center usually white with intermediate shades between.

With wool the case is quite different. Its scales are horny and have but little affinity for dyes. On warming or boiling the dye-bath, the dye penetrates into the interior of the fiber, which then becomes saturated with the pigment as in the case of silk. Consequently, wool is a dark colored substance surrounded by a covering that has little or no color.

Cotton has no affinity for dyes, but it is hollow, and the cellulose of which it is composed is osmotic, and on this the dyer bases his processes. He first treats it with mordants, which are solutions of different substances that pass through the walls of the cell into the interior of the fiber. He then washes off the excess of the mordant that has not been absorbed. It is next put into a solution of some dye likewise capable of osmosis, when this also penetrates the cell walls, where it comes into contact with a mordant already stored up there, when a mutual decomposition takes place and an insoluble colored compound is precipitated within the cell, and cannot subsequently be removed by any amount of washing. In a cross-section of dyed cotton examined under the microscope, the cell walls are seen as a long colorless ring in which are deeply colored granules. Hence, in this case too we have a dark colored substance seen through a colorless, or nearly colorless, envelope.

The optical effect of dyed silk is just the opposite of cotton and wool. To make use of our comparison again, silk resembles a white substance viewed through colored glass, while the two other fibers may be likened to colored substances seen through *very thin* colorless glass.

We emphasize the fact that the colorless layer is very thin, for we must recollect that very thin plates of colorless substances produce a play of colors, as can be seen at any time on soap bubbles or very thin glass balls. These interference colors are very prominent in the thin colorless layers that overlie the colored portions of cotton and wool. We are unconscious of this play of colors here because the number of transmitted rays greatly exceeds that of the reflected ones. Nevertheless this play of colors is sufficient to dim the luster of the color beneath. It is easy to prove that this lack of luster is due to a phenomenon of this sort by wetting the fiber, which will increase its luster, for the interference produced in these thin layers is much less in water than in air. If it were possible to find a liquid having exactly the same index of refraction as these colorless layers, the colored core within would appear in all its true beauty.

Silk is free from this disadvantage; the center being colorless, and the surface colored, heightens the effect. Here again we have a good example in glass making; it has long been known that "flashed" glass (white glass covered with a thin layer of colored glass) is more brilliant than where the entire mass is colored.

We have already said that the fiber from the cocoon consists of two cylindrical threads glued together; we must now recall the fact that in reeling off the cocoons, several of these double fibers are always united into one thread for spinning. Different qualities of silk differ in the number of fibers thus united and in the manner of combining them. What is called "Tram" consists of a small number slightly twisted, while "Organine" has a greater number, and is hard twisted. A third quality of silk called "Chappe," or floss, is made by combing and spinning the waste of the cocoons which is left after making the other two qualities. This last is generally used for velvet or for mixing with cotton.

Silk is almost invariably dyed before it is woven, so that silk dyers are generally "skein dyers." Piece dyeing is the exception and is generally limited to poor qualities, or to half silk goods.

The preparation of the silk for dyeing is rather complicated, the object being to impart to it that beautiful whiteness and to develop that luster which distinguish it from other fibers. This is called "ungumming, or *décreusage*. Before this is done the finest organzine has a dirty yellow, or yellowish, gray cream color, sometimes greenish, according to its origin, and is hard and lusterless.

In order to understand the action of the reagents employed in degumming silk, we must first briefly consider the chemical composition of silk.

The raw undressed silk consists of the real silk "fibroine," which forms the center, or core, and the so-called silk-gum, a glue-like substance consisting of albumen, fat, resin, and coloring matter, which forms a crust around it. The object to be aimed at is the complete removal of this crust with the least possible injury to the fibroine. According as this is more or less perfectly accomplished different qualities of silk are obtained, which are known as:

(1.) *Cuits*, or boiled silk, in which the gum is entirely removed, the loss of weight reaching a maximum of 25 to 30 per cent (2;) *souples*, where the loss is not over 8 or 12 per cent; and (3) *crûs*, or raw silk, when the silk is merely washed and only loses 3 or 4 per cent of its weight.

The removal of the gum is done before weaving, of course, and a great variety of chemical regents have been employed for the purpose, for example, caustic and carbonated alkalies, alkaline earths, baryta and lime, hydrochloric acid, alcohol, and many others were tried, but they are too energetic. Although they remove all the gum, they attack the fibroine, which thereby loses not only its strength but also its most valued property—its luster. A complete removal of gum without any injurious effect upon fibroine can only be obtained with boiling soap-suds, in which the fiber gains in softness and luster.

The ungumming, as now performed in Lyons, Zurich, Bâle, and Crefeld, consists of two operations, known there as *dégommage* and *la cuite*, but differing only in the manner of dipping the silk and the time. The first is performed in a rectangular wooden box (15 feet long and about 3 feet wide and deep) lined with copper and provided with a coil of steam pipe in the bottom for heating the soap-suds. The skeins are drawn back and forth in the liquid, which is heated to 194° to 203° Fahr. From 30 to 35 parts of soap are used for 100 of silk, according to the hardness of the water, but if it is very hard it is advisable to soften it just to save soap.

The whole operation is not usually finished in one tub, the silk being removed in half an hour to a second, which has the same temperature but contains less soap, and finally to a third. The three operations last from an hour to an hour and a half. As fast as one lot of silk is taken out of the first tub a second lot is put in, until the ends get saturated with gum, which is the case after three or four lots have been passed through it. The suds is then set aside for use in color dyeing. If, however, it is not to be used again, the fatty acids are recovered by precipitation with lime, the lime salt being subsequently decomposed by acid.

The silk is next washed with water containing a little soap and soda, then packed in bags (*poches*), and boiled half an hour in a large copper kettle with one-tenth their weight of soap. The French call this *cuite en poches*. The kettles are hemispherical, from six to eight, or even ten feet in diameter. Formerly they were heated over the open fire, now they are almost exclusively heated with steam. In Lyons this extra boiling is very much in use for white and light shades, in Switzerland it is frequently omitted. After this boiling the skeins are stretched out, and then, if they are intended for light colors, they are exposed while still moist to the action of sulphurous acid gas in closed chambers, to bleach them. This gas is generated by burning sulphur in stone crocks on the floor of the chamber.

The sulphur is left to act on it for six hours, and is repeated two, four, six, or even eight times, according to the nature of the silk. The total quantity of sulphur consumed is only five per cent of the weight of the silk. It has frequently been proposed to substitute for this gas its aqueous solution or acidified bisulphite solutions, but this has never been introduced into practice. After sulphuring, the silk is well washed to remove every trace of sulphurous acid and is then ready to be dyed.

SOFTENING—ASSOUPLISSAGE.

This consists of four distinct operations: 1. Removing the grease (degraissage); 2. bleaching; 3. sulphuring; 4. the actual softening. For darker colors the second can be omitted.

The silk is first put in a tepid bath containing 10 per cent of soap, at a temperature of 77° to 95° Fahr. It is left here one or two hours; pressed and moved around so as to wet it all. The principal object of this is to swell the fibers, open the pores, and prepare them to take up the dye, etc.

The bleaching is accomplished by the use of aqua regia, 1 part of nitric acid to 5 of muriatic, diluted to 2½ or 3° B., or about 15 parts of water to 1 of mixed acids, by volume. The operation should not continue more than fifteen minutes, as the nitric acid will impart a yellow color to the silk that can never be removed. Sometimes sulphuric acid saturated with nitrous fumes is substituted for aqua regia.

The bleaching with sulphur is the same as that for boiled silk (see above). When it comes from the sulphur chambers the silk feels hard and rough, and is brittle, hence the necessity of softening (*assouplissage*).

This consists in treating it for a long time with boiling water, to which is added a certain quantity of tartar. After sulphuring, the silk of course retains a certain quantity of sulphurous acid. About three-eighths of a pound of cream of tartar is dissolved in 100 pounds of water, and the silk drawn through it for 1½ hours. The silk gradually grows softer, swells up, and absorbs water easier, and is easily dyed. After this it is washed in tepid water.

The theory of softening is not yet established on a scientific basis. Many dyers are of the opinion that tartar can be replaced by other acid salts such as hydrosulphate of soda ($NaHSO_4$), or sulphate of magnesia ($MgSO_4$), with the addition of sulphuric acid.

Perhaps it is not even necessary to use acid salts, and that dilute acids will do as well. The question can only be answered by practical experiments on a large scale. At all events tartar is still used, in spite of its high price, in Lyons and elsewhere, whenever beauty is considered in preference to cheapness.

TREATMENT OF THE "ECRUS."

The raw silk is rarely used, even when naturally white, as, for example, in the back of velvets. If yellow, it must be bleached. Its treatment is as follows: 1. Moistening in hot water; 2. washing; 3. sulphuring twice; 4. bleaching; 5. washing; 6. sulphuring three or four times. If the silk is to be white, the treatment is as follows: 1. Cold soap bath without soda, 1 pound of soap to 10 pounds of silk; 2. washing; 3. sulphuring twice; 4. bleaching with aqua regia or nitrosulphuric acid; 5. washing; 6. soap bath like No. 1; 7. sulphuring twice; 8. washing; 9. weak soda bath (16 to 1,000 of silk); 10. weak soap bath, cold (30 to 1,000 of silk); 11. washing; 12. sulphuring twice; 13. washing in pure, or slightly acidified water.

The details of dyeing the silk are promised us in a second paper by the same authors.

A Remarkable Circular Saw Accident.

The premises at Nos. 9, 11, and 13 York Street, New York, are used for an extensive packing box factory, conducted by George Blair. About forty men are employed there. In the rear of No. 13 is a long, low shed, which covers a portion of the machinery. Directly under a skylight in the center of the shed is a table used for "ripping" planks. A circular saw projects above the center of the table about six inches. On the afternoon of February 26th, Caroline Bernheimer, a washerwoman, had been hanging out clothes to dry on a line that was stretched on the shed roof. Shortly after 5 P. M., a workman, who was engaged at the "ripping" table, heard a sound of crashing glass, and the body of the unfortunate washerwoman was precipitated through the skylight. She fell squarely across the jagged teeth of the saw, which was whirling at its full speed. The poor woman had evidently stumbled and lost her balance, and she did not utter a sound when she fell. Death came instantaneously. The horrified workman stopped the machinery, and then lifted the bleeding corpse from the saw. Some of the workmen ran for a physician, and Dr. Gulick, who lives a few doors away in Beech Street, hastily responded. The saw had buried itself into the victim's back, severing the spinal cord and cutting her heart in twain. Mrs. Bernheimer was thirty-five years old. She was a widow, with one daughter, and lived at No. 388 Hudson Street.

THOMSON'S AIR EXTRACTOR.

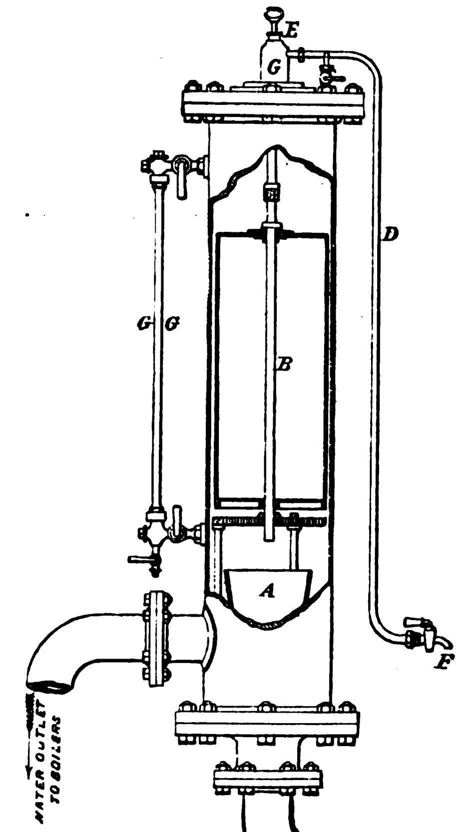
We subjoin an engraving of an arrangement of air extractor for getting rid of the air which is discharged with the water by the feed pumps of marine engines, this arrangement being one designed and patented by Mr. Archibald Thomson, the superintendent engineer of the Union Steamship Company, at Southampton.

The practical experience of the last few years has led most marine engineers to the conclusion that the presence of air in the water contained in a marine boiler is decidedly harmful, the air materially assisting, if not actually originating, the corrosive action on the plates, while it subsequently, after passing through the engines with the steam, tends to impair the vacuum in the condenser.

In marine engines, as ordinarily constructed, the feed pumps have a far larger capacity than is absolutely required, supposing all to be in good order, and under the usual conditions of working they discharge into the boiler with the feed a certain—or rather, we should say, uncertain—quantity of air, which is drawn in through the pet cocks, etc. In the apparatus now under notice the water is discharged from the feed pumps through a bell-mouthed pipe, A, into a cylindrical vessel provided near its bottom with a branch pipe leading to the boilers, and having at its top a piston air discharge valve, G, which is connected by a rod to the float, B.

The air separating from the feed water on its discharge from the pipe, A, collects in the upper part of the cylindrical vessel, a d so long as the air valve is not closed by the rising of the float, escapes through the air valve, G. If, however, this escape takes place more rapidly than the air enters, the water level rises in the vessel and the float, B, is lifted, thus closing the air valve, until a further quantity of air has collected. A glass gauge, G G, at the side of the vessel shows how the apparatus is working, while the air valve, G, discharges into a pipe, D, which is furnished with a stopcock, F, by means of which the engineer can control the working of the arrangement in the event of anything going wrong with the float or air valve.

The whole apparatus is very simple, and in practice it has been found to answer its purpose well. Now that the desirability of separating air from feed water is well understood, we expect, says *Engineering*, to see Mr. Thomson's separator largely applied.

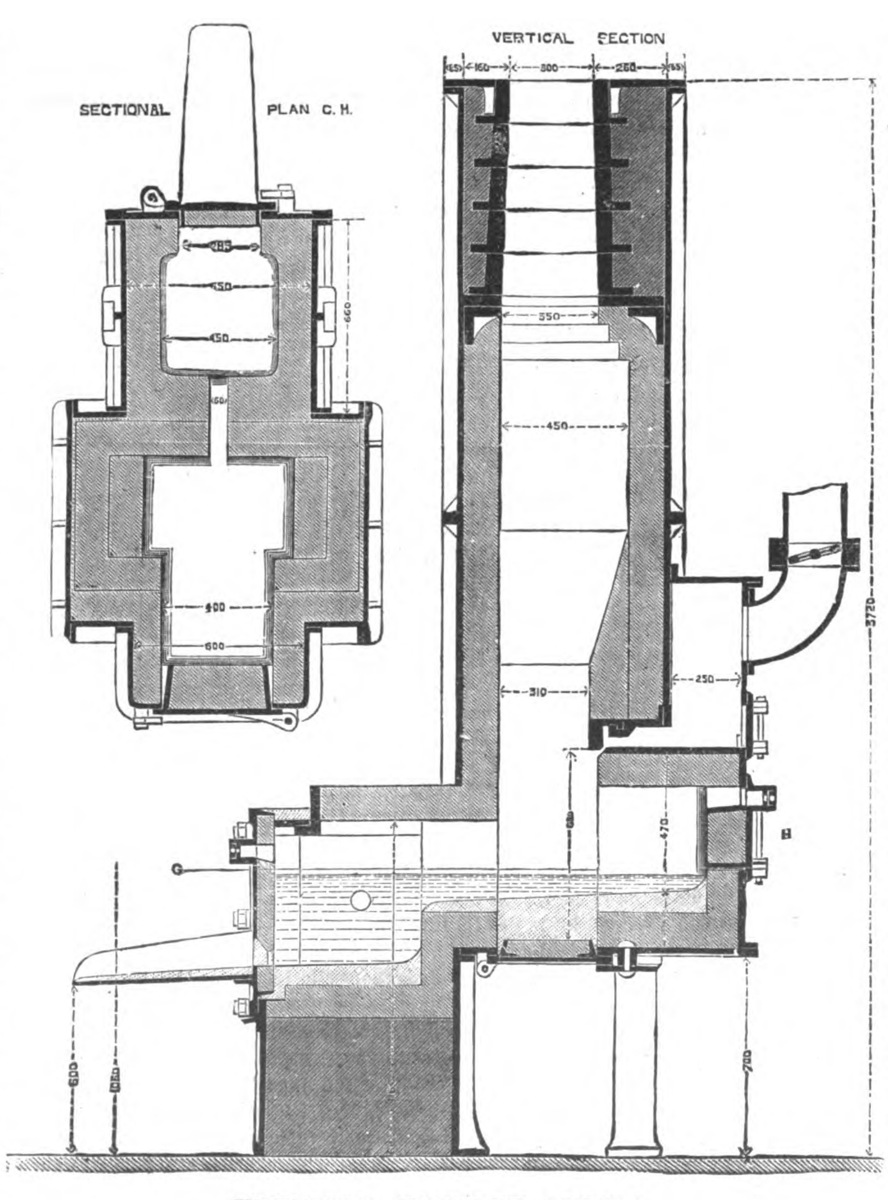


AIR EXTRACTOR FOR FEED PUMPS.

IMPROVED FOUNDRY CUPOLA.

This furnace has now been at work about two years and a half in Mr. Pintsch's works, with the results which we now give. The furnace is square in section, having a cast iron case and built up inside with fire-bricks the lower part being covered with refractory sand. The blast enters at the curved pipe shown fitted with a throttle valve. In the door at H, which gives great facility for manipulation of the reduced materials, are eye pieces, through which the working of the furnace may be observed.

After two and a half years' work, Mr. Pintsch says he doubts whether for his purpose, namely, the production of very clean light castings, he could have a better cupola than Kriegar's. After it has been filled with coke to commence blowing, he is able to melt 100 pounds iron with 4½ pounds Westphalian coke or with 5 pounds of Lower Silesian coke. The blower employed with the furnace is also Kriegar's, and works with 18 inches water column pressure. The process of melting begins after about twenty-five minutes, the furnace rendering a good hot iron, and an addition of 30 per cent of wrought iron may be added. For a daily casting of from one to two hours he believes it is the best furnace in use, but for periods of more than two hours it has been known to give trouble by slagging up.—*The Engineer.*



KRIEGAR'S FOUNDRY CUPOLA.

Coke, Coal, and Gas as Heating Agents.

At a recent meeting of the Manchester Section of the Society of Chemical Industry a paper on "The Use of Gas as a Heating Agent Compared with Solid and Liquid Fuel" was read by Mr G. E. Davis, Government Inspector of Alkali Works. The author recommended the use of coke for house fires. If cooking could not be done well with this fuel, gas should be used sparingly. Manufacturers might also fire with coke, or if coal was still considered desirable, a mechanical stoker should be employed. A ton of dry coke had the same heating nature as a ton of ordinary dry Lancashire coal when properly burned, and in many instances, owing to its freedom from volatile matters, it could be used in such a manner as to do far more work, weight for weight. Coke recommended itself to the householder as well as to the manufacturer, and if means were only found for its continual production in a suitable form for use in domestic grates, a new era of fairly smokeless cities would quickly commence. It would be well for us to remember that when we burned coal at 10s. per ton we got 65 unit tons of heat for one penny; while when coke was burned the number of unit tons of heat for the same money was 84, reckoning coke at 7s. 6d. per ton.

Heating in any ordinary way by gas, dwelling rooms for instance, was entirely out of the question until gas was reduced far below its present price. Even at half that now charged gas heating would be considerably dearer than coal; and from his own experiments, burning gas in the best manner and coal in the usual reckless mode we were all so fond of, the heating values would only be equal with gas at 10d. per 1,000 cubic feet. To look the matter fairly in the face, the lowest price at which gas was put into the mains was in London, where it was said to cost 13d. per 1,000 feet; at one of the works of the Manchester Corporation it cost 14d. per 1,000, so that coal gas for purposes of the continuous warming of rooms, heating of steam boilers, etc., could not be expected to compete successfully with coal for a long time to come. Though gas cooking had its advantages, the high price now charged for gas showed practically no pecuniary benefit, and it was certain that the price of gas must be much reduced in order to tempt people to consume it. There was no reason why its price should not be reduced at once to 1s. 6d. per 1,000 cubic feet, and if the manufacture was not a monopoly, it would have been below this price long since.

All gas stoves should be provided with means for carrying the products of combustion into the outside air. We should no more allow the products of combustion to pass out into the atmosphere of our rooms than we would allow a coal fire to burn in our dwellings without a chimney. It was very well to hear of stoves which consumed their own smoke or condensed all their products, but in any ordinary method of combustion such things were next to impossible. Wherever there was gas burned there must be good ventilation to carry away the products, and when he had seen small bath-rooms and kitchens heated by gas, with gas for cooking, and also water heaters in use in confined places without chimneys, he had never marveled at the complaints of headaches from the occupants, but he had wondered that the so-called "accidents" had not been more frequent. Every gas stove, whether used for heating or cooking, should be connected with a chimney, or with the outside air, in order to carry away the sulphurous and carbonic acids. No stove should be allowed in any dwelling house except under these conditions. It should be universally known that the chief product of the combustion of gas is carbonic acid, a non-supporter of combustion or life; and when present in very small quantities in the air we breathe, had a decided effect upon the living organism. It was essential, then, that this gas be eliminated from our rooms as fast as it is formed. The other impurity arose from the presence of sulphur compounds in the gas, which could easily be removed at a moderate cost. These sulphur compounds burned into sulphuric acid, commonly called oil of vitriol, and as such found their way into the articles of furniture, binding of books, brasswork, etc.

Will Posts Set "Top End Down" Outlast those Set Top End Up?

It is firmly believed by many persons that posts set in the ground in a position the "reverse" of which they stood while growing in the tree, will last much longer than when set "top end up." In the spring of 1879 I selected seasoned sticks, three feet long. These were split in two, and then cut in two crosswise, making four pieces of each. One set was placed in well drained sand, the other in clay soil. In every case two pieces were set side by side, with earth between, one as it stood in the tree, the other reversed. I tried thirteen kinds of timber. Some of these were young wood with the bark on. All contained some heart wood. Those set in sand were examined in autumn of 1881. In case of the beach, sugar maple, ironwood, black ash, and black cherry, the piece reversed or placed "top end down," was somewhat most decayed. In case of red maple, American elm, butternut, and red elm, the piece set "bottom end down" was a trifle the most decayed. In case of basswood, white ash, white oak, and blue ash, there was no perceptible difference. In autumn of 1882, the posts set in clay soil were examined. In case of the red maple, sugar maple, American elm, basswood, butternut, red elm, the piece set "top end down" was most decayed. In case of beech, white ash, black ash, black cherry, the piece set "bottom end down" was most decayed. In case of ironwood, white oak, blue ash, there was no perceptible difference.

I infer that where one piece decayed more than the other it was caused by some trifling difference in the sticks. The freshly sawed ends in each case were placed uppermost, and came an inch or two above the ground.

In some cases one half of a stick (one piece certainly the reverse of the other) lasted considerably better than its other half. As will be seen, it was sometimes the "top end down" which lasted better, sometimes the "bottom end down," and in some cases there was no difference in durability.—*W. J. Beal.*

Remedy for Erysipelas.

At the recent congress of German surgeons, Dr. Fisher, of Strasburg, drew attention to the value of naphthaline as an antiseptic. For some skin diseases, and especially in the treatment of erysipelas, it is almost specific. The application is made in the most simple manner possible, by rubbing gauze in the powdered material, or dipping any suitable fabric in an ethereal solution diluted with alcohol. Naphthaline being very cheap, this preparation will be less expensive than anything of the kind now in the market. It is extensively used in Strasburg, where it is regarded as a perfect preventive of erysipelas; and it is hoped that if this valuable property can be substantiated, it will be used for the same purpose in this country. Dr. Fisher does not state whether its use in the manner stated is attended with any inconvenience or pain to the patient; but persons employed in gas works and elsewhere who have suffered from scales of naphthaline entering the eyes, etc., would be disposed to regard the remedy with very considerable suspicion.

PROPULSION OF BALLOONS BY ELECTRICITY.

(Continued from first page.)

the electrical energy supplied to the machine by the formula—

$$W = \frac{E\ I}{9{\cdot}81}$$

(W representing the work in kilogrammeters; E, the difference of potential at the terminals of the machine in volts; I, the intensity of the current in amperes) and in the determination of the mechanical work produced by the motor by making it absorb this work by the dynamometrical balance of M. Raffard. The electrical energy was measured by the aid of an ampere meter and a volt meter of M. Marcel Deprez.

Comparative measurements made by means of the volt and ampere meters of Messrs. Ayrton and Perry, constructed and graduated in England, gave results which agree perfectly with those given by the apparatus of M. Deprez, constructed in France by the Maison Breguet.

The experiments showed that, when the machine works with a current of 45 amperes and 40 volts at the terminals, *thirty per cent* of the total energy supplied was absorbed for the maintenance of the magnetic field in the inductors. By exciting the inductors separately it was found that 32 amperes sufficed to saturate them. There was therefore a real *waste* of energy for the production of the magnetic field, which was diminished by omitting one layer of wire on the inductors. This modification allowed of working under the same conditions of work and velocity with fewer elements, and consequently with a better return.

The Source of Electricity.—M. Tissandier thought, in his first experiments, of using electrical accumulators, but this source presents, at least for this particular application, the inconvenience of not discharging itself rapidly enough—that is to say, of only furnishing a weak delivery. It is necessary, in fact, that in a period varying between two and three hours, the source of electricity should furnish all of which it is capable, and from this point of view accumulators are found inferior to bichromate batteries. After a minute investigation, and a long series of experiments upon the nature of the liquid, the form and nature of the cells, the size and thickness of the plates of zinc and carbon, their number, etc., M. Tissandier devised a type of bichromate batteries with concentrated liquid, which, with a weight of seven kilograms per element, can furnish a current of 50 amperes for two hours, the electromotive force being about two volts, and the internal resistance not exceeding 0·01 of an ohm. The elements established in the aerostatic laboratory of M. Tissandier at Point du Jour are 24 in number, and arranged in four series of six elements each (Fig. 3). We are indebted to *La Nature* for our engravings. The liquid required to fill each series is placed in a copper tank coated with lead communicating, by means of a ramified tube, with the ebonite boxes which serve for receptacles. By raising one of the tanks by the aid of small pulleys, we can fill the corresponding series, and put it in action immediately; on lowering it the liquid runs off, and the series is emptied.

A commutator varies the number of series which actuate the motor, and a volt and ampere meter show at every moment the electrical energy supplied. The machine is suspended to a longitudinal beam by cords; the screw is fixed upon the lower axis; the static effort exerted by the rotation of the screw is measured by the aid of a spring balance attached at one end to a fixed point, and at the other, by a thin metallic wire and a swivel, to the extremity of the revolving arbor of the screw. Precautions are taken that the center of gravity of the machine may remain always in the vertical plane passing through the points of suspension, in order that the horizontal component due to the inclination which it might take without these precautions may not influence the indications of the balance. In Fig. 1. S is a tank containing solution of bichromate of potash; P, batteries; C, commutator; A, ampere meter; V, volt meter; M, dynamo: H H', screw; E, swivel; D, balance.

The screw constructed from the plans of M. Tatin is 2·85 meters (9½ feet) in diameter, and has a pitch equal to its external diameter; it is formed of two blades made of silk varnished with gum lac, stretched upon a frame furnished with two spokes of pine, with laths of the same wood, and an axle box fixed upon these laths. With 12 elements in series the screw turns at the rate of 80 revolutions per minute and exerts upon the balance a pull of five kilograms; with 18 elements the speed is 120 revolutions and the pull seven kilograms; with 24 elements in series the speed of rotation reaches 150 revolutions and the pull nine kilograms.

It results from the experiments that the motor, without exceeding, with the generator, a total weight of three men, is capable of furnishing regularly during a period of three consecutive hours the work of 12 to 15 men, that is to say, 75 to 100 kilogrammeters. This motor only requires, for raising it in the air with two or three travelers, a balloon of the small capacity of about 900 cubic meters. An elongated balloon of about nine meters diameter in the center, and 27 meters length, constructed of silk, inflated with pure hydrogen, is amply sufficient. Under the action of the propeller such a balloon would have in calm air a velocity of about four meters per second, or 15 kilometers per hour in round numbers. Very often the speed of the wind in calm weather is below this figure; in this particular condition of the atmosphere, this balloon could deviate sensibly from the line of the wind, go backward or forward, and perhaps return to the place of its departure.

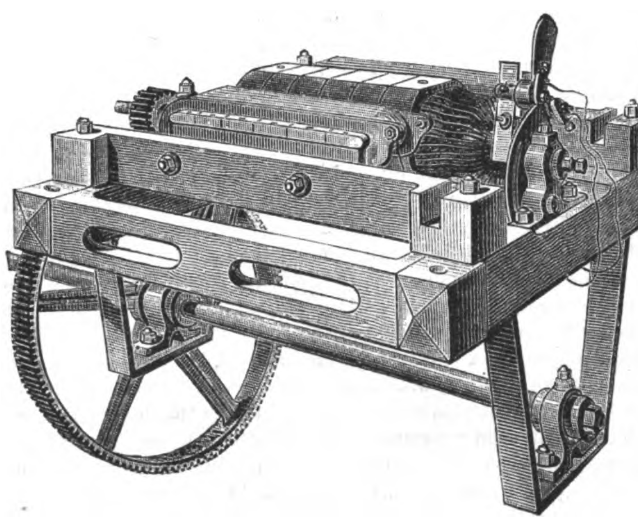
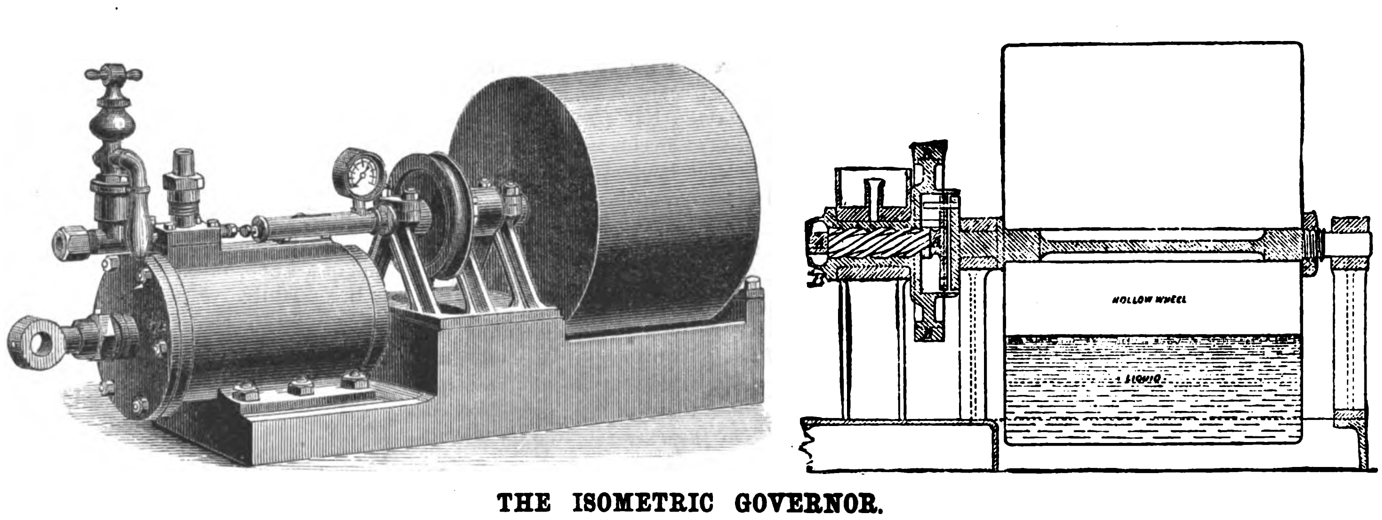


Fig. 2.—SIEMENS DYNAMO-ELECTRIC MACHINE.

M. Tissandier, satisfied with the results furnished by the batteries and motor, which present all the desired lightness (of course the system disposed under the balloon would be arranged quite differently to the battery in the experiments which we have just described), is busy with the construction of a pure hydrogen gas apparatus capable of furnishing 1,000 cubic meters in a few hours; he will then construct an elongated balloon to receive the screw and its electromotor.

THE ISOMETRIC GOVERNOR.

We annex engravings of a governor devised by Mr. Girdwood, and to which the name of isochronometer has been given. Its action, like that of some previous governors, is based upon the use of an appliance that offers a resistance to rotation that is a function of the speed, and increases with the velocity. This appliance consists in this case of a hollow drum or cylinder partly filled with fluid and rotating on a horizontal axis. When the cylinder is put in motion, the liquid is carried up one side to a height that is determined by the speed, and, if the motion be uniform, it will remain at that point, and will offer a resistance to the rotation which increases in proportion to the lateral displacement of its center of gravity. Should the speed increase, the liquid will be raised still higher, its center of gravity will be carried further to one side, and it will offer an increased resistance.



THE ISOMETRIC GOVERNOR.

These varying resistances are balanced by a spring which responds to them by contracting and expanding, and in so doing gives the motion for operating the governing mechanism. As will be seen from the illustrations, which we find in *Engineering*, the cylinder spindle ends in a crank disk provided with a driving pin, which engages with a similar disk at the end of a screwed or rifle spindle, A. This spindle fits in a corresponding nut formed in the boss of a driving pulley or wheel, B, and abuts at its other end against a spring arranged in a case, and provided with an index and scale. When the wheel, B, is turned, its first tendency is to force the screw, A, endwise to the left, compressing the spring, but the moment that the latter opposes a sensible resistance to its motion, the screw begins to rotate with the wheel and to carry the hollow cylinder round with it. As the speed increases, the resistance of the wheel likewise increases, and the spring is more strongly compressed, there being a certain definite pressure upon it for every velocity. A rod connected to the spring is attached to the slide valve of a small steam cylinder, the piston of which works the throttle valve of the engine that is to be regulated. The valve is designed so that an extremely small motion opens the cylinder either to the steam or the exhaust, and thus comparatively minute changes of engine speed are sufficient to cut off the steam.

The Inventor.

Now we do not for a moment expect to revolutionize the world, or to be successful in eliminating selfishness from the catalogue of shortcomings which afflict the human race, says the *Manufacturers' Gazette*, but we do desire to put in a plea for the inventor, the man of genius, the man to whom we are so largely indebted for the great progress made in nearly every department of human affairs, and to urge a more liberal and generous recognition of his merits. It is no new or uncommon thing for some men to ride to fortune on the brains and genius of others, and, where the arrangement is mutual, we do not object; but when, in good faith, the man who has given ceaseless study and thought to perfect and make practical an idea which will simplify some process, increase the quantity and improve the quality of some article of manufacture, unites his fortunes with the man or men of means in order to bring such improvement before the public, and is mercilessly "swallowed up," "bought off" with a pittance, or "cleaned out" by false representations, it is time at least to enter a protest and to ask men to apply the golden rule in these cases.

We are not quite sure but that most of the blame belongs to the inventor himself, for if a man possesses the genius and brains to do something that no other man has done, solving problems which start the world ahead a point, and thus becomes a benefactor, he has no excuse for being swindled with his eyes open, save the excuse of poverty, and even then, if his invention bears unmistakable evidence of merit, poverty need not be a stumbling block, for good goods always sell at a fair market price, and there are always purchasers. There are tempting allurements certainly, and it is not infrequently the case that to a poor inventor a dollar (and much more so a hundred or a thousand) looks as "big as a cart wheel," and throws him unsuspectingly off his guard, and before he knows it he is "gone." Don't be too quick or anxious to give up a good thing for a song, and thus have cause to repent at leisure. We earnestly hope, adds the *Gazette*, for a reform in this matter, that this class of benefactors may have their just deserts.

Lime Juice in the Treatment of Diphtheria.

M. Czartoryski, M.D., of Stockton, California, writes as follows to the London *Lancet*:

During a prolonged residence in the interior of China, I became acquainted with the fact that the Chinese place great reliance during epidemics of diphtheria on the internal use of the fresh juice of limes, and of the fruit itself, which they consume in enormous quantities, in every conceivable form—as lemonade, with native spirits, cut in slices, etc.—during attacks of this dreadful disease, with apparently most successful results, it hardly ever failing to effect a cure. The Chinese consider it a specific, and will, in case of need, do anything to obtain a supply.

Since I have come back to California, as also in Louisiana, I have used limes and their juices in my practice as a physician with most successful results in cases of diphtheria, even in the most desperate cases. As soon as I take charge of a case of diphtheria, I order limes to be administered as freely as possible, in any manner the patient can be prevailed upon to take them, especially in the form of hot lemonade, sweetened with white sugar or honey, or cut in slices with powdered white sugar. Besides lime juice (which I suppose acts by imparting an excess of oxygen to the circulation, and thereby prevents formation of vibriones, etc., and so has almost a specific effect on disease), I prescribe whatever drug may be indicated to relieve symptoms as they develop, and impart strength by appropriate stimulants and nourishment.

RECENT tests of yarn made from different hemps gives the following relative strengths: Manila, 245; Italian, 221; New Zealand, 143; Russian, 128. Manila is evidently the yarn to be hanged with.

Solid and Liquid Illuminating Agents.

Mr. Leopold Field, F.C.S., lately lectured before the Society of Arts, Adelphi, on "Solid and Liquid Illuminating Agents." There was a large display of exhibits and illustrative diagrams. The lecturer began by saying that the electric and gas lights, brilliant though they were, left something to be desired. The one was unsteady, the other injurious to pictures and books. The candle and oil lamp to a great measure supplied the deficiencies of the larger lights, and these would form the subject of the lectures. Mr. Field then proceeded to give a slight outline, illustrated by elaborate tabular views, of the scheme of the hydrocarbons, and their derivative alcohols and acids—marsh gas represented the paraffines; ethylene the oleofines; and acetilene might be called the taproot of the whole, as it might be formed by the direct union of carbon and hydrogen, and again reunite directly with hydrogen to form olefiant gas, from which again the paraffines and alcohols could be got by simple action. All the above were shown and descanted upon. The fatty acids were the most important series at present, as nearly every animal and vegetable combustible contained one or more of them, free or combined as an ethereal salt or glyceride. The lecturer then proceeded to give a rapid sketch of the history of lighting. The fire had always been associated with divinity, and the custom of celebrating great festivals with lights was handed down from the remotest ages, as in the old Roman Lupercalia, changed by Pope Gelasius into Candlemas. The earliest light was probably the torch, which led to the candle. Various torches were exhibited, one nearly eighty years old, disinterred from the cellars at Lambeth. These would, by degrees, grow smaller, and at last assume a suitable size for domestic purposes, in which state they were used by many nations, who surrounded a simple strip of tow, cotton, rush, or wood with bitumen, ozokerite, pela, wax, or tallow, as the case might be; some even drew a wick through the body of the gannet. But, though from a passage in "Apuleius" it is evident that candles both in wax and tallow formed part of the domestic light of the Romans, these were confined entirely to the lower classes. Strips of pine formed the street lights, and lamps illuminated the house. These gave scope for every variety of ornamental design, and were sometimes marvelously beautiful, as in the great golden lamp of the Erecthium, which burnt for a whole year, and that of Cortona, which had sixteen nozzles most exquisitely carved. Mr. Field quoted several authorities to show that candles were regarded as out of date and vulgar by the Romans, and gave it as his opinion that wherever candlesticks and candles are mentioned in Holy Writ and elsewhere oil lamps are to be understood. The substance burnt and the wick varied. The former was generally olive oil, the latter a kind of cotton, though in many countries doubtless other vegetable and animal oils, and in some, as Egypt, naphtha and bitumen fed the flames. There was, however, no appliance, even among the wealthy and refined Romans, for checking the smoke, not even a chimney; nor was the wick supplied constantly, having to trust entirely to its capillary attraction. In fact, with the exception of a few slow improvements in candle making—such as that of mould candles by the Sieur de Brog, drawn tapers by Pierre Blaisenier, and a few modifications in the process of dipping, the art of lighting might be said to have stood still till the inventions of Argand in lamps and Chevreul in candles gave it an impulse which had steadily increased.

Inventions to Prevent Fires.

Until some new and cheaper material than timber for building purposes is discovered, or until all the trees in the land are cut down, it seems probable that inflammable materials will continue to be used for building purposes. The demand for improved means for the prevention of fires becomes every day more urgent, and there should be increased study on the part of inventors to find out and make known new and better ways to prevent the ravages of flames. Among recent inventions in this direction we give the following from *Engineering:*

The latest fireproof paint is the invention of Mr. C. J. Mountford, of Birmingham. This consists of asbestos ground and reground in water, aluminate of potash or soda, and silicite of potash and soda. When it is to be exposed to the weather, it is combined with oil, driers, and gummy matters, and in some cases with zinc oxide or barytes. The buildings of the Fisheries Exhibition in the Horticultural Gardens are to be painted with this material. On two sides of the ground are valuable collections of works of art and scientific objects, while on the third side is the Albert Hall. Over the way, too, is the South Kensington Museum, containing the vastest assemblage of objects of decorative art ever amassed, and it requires little acquaintance with government officials to know that their consent could never have been obtained to the erection of light timber buildings covering 280,000 square feet if they had not been convinced that there was a method by which they could be rendered fireproof.

A public trial was lately made in the gardens before fifty gentlemen to demonstrate the security of the buildings. Two wooden huts, one of plain timber and one painted with three coats of asbestos paint, were filled with shavings and simultaneously ignited. The first caught fire at once, driving the spectators backward by its heat and the extent of its flame, while in the second the shavings, after a hearty blaze that scorched and blistered the paint, fell into a heap of red embers. Half a bucketful of petroleum flung into the hut filled the inside with a fierce flame that belched forth in a solid body and curved on to the roof, and for a few minutes it was the opinion of the on-lookers that the confidence of the inventor had overleapt itself. But gradually the petroleum vapor became exhausted and little flame remained beyond that of the gas driven out of the cracks of the wood by the intense heat. The structure was intact, and it needed no special skill to see that a slight building filled with combustible material would, if painted with asbestos paint, be able to retain the fire within itself for sufficient time to allow of the arrival of the firemen. But the reputation of the paint does not rest upon an isolated experiment; not only in London, but also in Birmingham, Manchester, and Liverpool has it been severely tested, and every time successfully. Asbestos has now established its character as a fire-resisting material, and we think that a grave responsibility will attach to all that have the management of buildings in which special risks are run, such as theaters, music halls, carpenters', and packing-case makers' shops, and the like, if they fail to avail themselves of it in some form or other.

But although it may be possible to localize a fire for a time, our experience of the way in which the flame will destroy a building almost entirely of iron and stone forbids the anticipation that the use of fireproof materials will be of sufficient avail by themselves. Once a structure is fairly alight, stone and cement crack and fly, and iron girders twist, and it is not paint alone that will preserve them. The respite that it gives must be turned to good use in extinguishing the flames. Unfortunately, this interval is often lost for want of apparatus, particularly in the country, where it is a long way to the fire engine station. To supply the necessary means for quickly quenching a fire, Mr. Foster, of Bolton, has brought out a portable fire engine, which emits a stream of carbonic acid and water. By this arrangement he is able to keep his apparatus within small limits, as the pressure of the carbonic acid is available for propelling the jet, and, as is well known, it is extremely efficacious in stopping combustion. The same idea has long been before the public in the form of the extincteur, which is universally known and appreciated. Mr. Foster's engine differs from this in being a pump that can be kept going during the whole progress of the fire, and can be supplied with fresh chemicals from time to time as they become exhausted. In addition to his pumps he has a portable chemicalizing chamber, through which water from a high pressure main can be passed and be impregnated with carbonic acid.

A public trial of Mr. Foster's apparatus was recently made on a piece of waste land near the City of London Schools. A wooden house had been built, the upper story of which represented a bedroom. This was saturated with tar and petroleum, and when filled with flame was extinguished by a jet from a one-eighth inch nozzle in one minute. The lower story represented a warehouse filled with boxes saturated with petroleum, and when fairly alight was extinguished in little more than a minute. Other experiments followed, all of which were successful in demonstrating that a small quantity of water impregnated with carbonic acid will put out a fierce fire, especially in confined situations and in cases where the combustion has not penetrated below the surface of the burning surface.

The Polyphemus.

This novel production of the British navy is, according to the London *Engineer*, a failure so far as anything effective as a war vessel is concerned. But the experience gained by her construction may be worth her cost. Our contemporary says:

She carries no guns, save a couple for saluting and signaling purposes, and relies altogether for her power of offense and defense on her speed, her ram, and her torpedoes. She is fitted with special appliances for discharging torpedoes under water from her bows and her sides; and up to the present moment nothing but disappointment has attended every effort made to use these last. The torpedoes fired from the bow ports have at all events been got away from the ship; but as much cannot be said of those discharged from her broadside. They are expelled from tubes 9 feet below the water line. A fish torpedo is about 18 feet long. The Polyphemus has attained a speed of seventeen knots an hour, and the moment the torpedo shows its nose outside of the hull it is deflected by the apparent current running alongside the ship, and is thereupon jammed in the tube. If it can be got clear of this, it is only with its screw blades broken and its stern or tail twisted that the luckless torpedo gets off; and it is not curious that the short course which it then describes is erratic in the extreme. To prevent this action, a steel plate 16 inches wide and 25 feet long has been pushed out from the ship's side, and under the lee of this the torpedo is discharged; but hitherto the resistance of the water has proved too much, and the steel bar, standing like an ore blade in the water, has been bent, and the torpedo has stuck half in and half out of the ship. The Polyphemus is coming round from Portsmouth to Chatham to have new boilers put in, and renewed attempts will then be made to fit her with some apparatus which will allow of the discharge of broadside torpedoes when she is running at full speed; but we confess we see little reason for expecting that success will be attained. Even though the torpedo is discharged, the course which it will take must be, to say the least, doubtful. Up to the present the targets aimed at, even at distances of 200 and 300 yards only, the ship steaming at 8 knots or less, appeared to be specially avoided by the torpedoes, which sometimes turned round on the ship, and now and then hastily sought a bed in the mud.

The velocity actually attained by the ship was 17½ knots, but this was only maintained for very short periods by bottling up steam; and her best regular performance may be taken as 15 knots, which was obtained when the boilers were in good humor, and did not prime very heavily. The ship is 240 feet long, 40 feet beam, and 18 feet 9 inches deep. Her displacement is about 2,620 tons, and it is calculated that with 5,000 horse power she can be propelled at 17 knots. She has twin screws, and two pairs of compound horizontal direct acting engines, with cylinders 38 inches and 64 inches diameter, and 39 inches stroke. Her boilers are, as we have said, of the locomotive type, ten in number, arranged athwartships on each side of a longitudinal bulkhead, in two groups of three boilers and two boilers. The uptakes all lead into one fixed chimney. We do not know what power has been developed by her engines, nor is it likely any one will until questions are asked in the House of Commons by and by; but it is easy to see that to augment her speed from 15 knots to 18 knots, which speed it is hoped she will reach, the power of the engines must be nearly doubled. Let us suppose, for example, that she steams at 15 knots with 3,375 horse power, which, probably, is not far from the truth. Then to go at 18 knots, she will require at least 5,832 horse power, and probably considerably over 6,000. Such an increase will entail a very great augmentation in the weight of the generators, and how this is to be provided for no one seems disposed to explain. A locomotive boiler with water, capable of working up to 500 horse power, need not weigh more than 10 tons at the outside. About half this will suffice in torpedo boat boilers, but an ordinary tubular boiler and water to develop as much will weigh at least 20 tons. If we suppose that the locomotive boilers worked up to only half their anticipated power, they were still doing as much as an equal weight of ordinary boilers; and to obtain the full power required the weight of the new boilers must be nearly, if not quite, doubled. This appears to us to be a very serious consideration in the case of a comparatively little ship like the Polyphemus, in which there is already hardly room to turn round.

Preparation of Carbonic Oxide.

In a recent number of the Berlin *Berichte*, E. Noack describes a convenient method for the preparation of pure carbon monoxide (CO) in a continuous current for laboratory use. Two methods have hitherto been employed for the manufacture of this gas on a small scale. One consisted in the decomposition of oxalic acid by means of strong sulphuric acid, but the resulting gas was a mixture of equal volumes of carbon monoxide and dioxide, and a large amount of alkali was required for the absorption and removal of the latter gas. The other and better method, that of Townes, consists in decomposing crystallized ferrocyanide of potassium (yellow prussiate of potash) with an excess of strong sulphuric acid. The mixture foams, the evolution of gas is rapid but not continuous, and more or less prussic acid is formed.

Noack's consists in the reduction of carbon dioxide (CO_2) by means of zinc dust. A piece of hard glass tubing, such as is used for combustions in organic elementary analysis, is filled with zinc powder, which is held in place by a tuft of asbestos at each end. A narrow channel is left free above the zinc, as in combustions, and the tube placed in a combustion furnace, which is slightly inclined, or one end of the tube may be bent downward, so that any water formed may run off. A current of carbon dioxide generated from marble and hydrochloric acid is passed through a solution of sodium carbonate to retain any of the hydrochloric acid that might be carried along, then conducted through the hot tube filled with zinc, and afterward passed through a wash bottle containing caustic soda or potash to absorb any undecomposed carbon dioxide.

With the use of 200 grammes of zinc dust Noack says that he obtained in a short time over 20 liters of carbonic oxide gas. The best results were obtained when the heat employed was just enough to make the clay channel under the combustion tube red hot, and the current of carbon dioxide was rapid enough to form 400 bubbles per minute from the end of a 4 mm. tube.

In a quantitative experiment made by passing a measured quantity of the gas over the zinc and measuring the resulting gas, he obtained 11 liters of carbon monoxide from 13 liters of carbon dioxide used. An analysis of the gases obtained when the carbon dioxide was not absorbed, gave only 0·73 per cent of the latter with a slow current, and 3·21 per cent with a rapid current.

A Caution to Plumbers.

A decision was rendered in an English court recently, which is, to say the least, highly suggestive. A plumber sued a civil engineer for the cost of erecting a lavatory, something near $150. The defendant made a counter claim of $600, on the ground that the plumber's work was improperly done, thereby allowing sewer gas to enter the house, causing the illness of six members of the defendant's household and the death of his son.

The plaintiffs claim was denied by the court, and judgment was given for the defendant.

This decision might or might not have any direct effect upon the action of an American court in a case of that nature; yet the awarding of consequential damages for bad work by an English court furnishes a warning which careless or tricky plumbers may do well to bear in mind.

Correspondence.

Discovery of a New Comet.

To the Editor of the Scientific American:

It was my good fortune to discover this evening, at 6 h. 45 m., February 23, 1883, a new bright telescopic comet in the constellation Pegasus. Its right ascension was approximately 23 h. 50 m.; north declination, 28°. It has a large bright head, very condensed, and a delicate straight narrow tail. Its motion is eastward, and is probably approaching the earth. It was discovered with my 9-inch reflecting telescope, but may be well observed with telescopes of moderate aperture. Telegraphic announcement was at once made of the discovery. WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Feb. 23, 1883.

NOTE.—Observations on this comet made at Harvard observatory show that it is moving away from the sun and earth, and is growing fainter every day.

Electricity in Gold Mining.

Among other uses to which electrical currents are applied, the purification of mercury seems to be likely to take a very important place; a place so important, indeed, that the subject deserves considerable attention. The results obtained are not only singular and striking, but they are to a certain extent still unexplained. That is to say, particular effects are produced, but precisely why and how has not yet been settled. In order to make what follows intelligible, it will be necessary, in the first place, to say something concerning the modern commercial system of gold mining as distinguished from the finding of nuggets and the washing of river sands. Gold is found in almost all countries in greater or less quantity. The principal supply is obtained, however, from quartz "reefs." Through some of these reefs the gold is disseminated in veins, visible to the eye. In other cases it appears as nodules or nuggets; but for the most part it exists in a state of extreme subdivision in the quartz rock. To obtain it the rock is broken to a fine powder in stamp mills; this powder is then sprinkled on inclined wooden tables, some 15 feet long and 3 feet wide, down which a stream of water flows continuously. At intervals, across the table, depressions or troughs are provided, in which mercury is put to a depth of half an inch or so. As the water and gold bearing quartz powder run down the table or "riffle," they pass over the surface of the mercury in the troughs. The mercury seizes the gold *in transitu*. After a time the mercury becomes saturated with gold, about 3 ounces of gold being in practice sufficient to saturate 75 pounds of mercury. The mercury is then drawn off and "retorted;" that is to say, it is heated in special stills, and evaporated like so much water; the mercury vapor or fumes being condensed and used over again in the form of mercury, much as the feed water in a surface condensing engine is used and reused. At the bottom of the retort when the mercury has evaporated is found a button of gold, or rather of gold and a very little mercury. This button is then treated with nitric acid, and a number having been collected, they are melted in a crucible and cast into ingots. There is a certain loss by waste of mercury at every retorting, which is made up by fresh supplies.

Now if the miner had nothing but clean quartz and gold to deal with, he would have no trouble in carrying out this process, but he seldom meets with conditions so favorable. Indeed, the quartz is constantly found impregnated with sulphides of arsenic and other metals, and these are found to "sicken" the mercury in the troughs in the riffle. The surface of the mercury must be absolutely bright and clean, or it will not take up the gold. To illustrate our meaning, let us suppose that the riffle troughs were filled with melted tin. Copper and tin have a considerable affinity for each other, and if bright copper filings were permitted to pass over the surface of the tin, they would sink and alloy with that metal. If, however, the tin were coated with oxide, it will be clear to any of our readers who has used a soldering bit, or tinned a piece of brass or copper, that the filings would pass away down the riffle untouched by the tin. The arsenic and other impurities found with the quartz have an analogous effect. They adhere to and foul the surface of the mercury, and amalgamation becomes impossible The moment fouling or "sickening" takes place the riffle becomes useless, and the mercury must be all drawn off and retorted. Nor is this sickening a tedious process. It can be effected in half a minute. Thus two or three drops of oil from a bearing will instantly sicken twenty or thirty pounds of mercury. The practical effect of all this is that there are very rich quartz reefs which cannot be worked, because there is no known method of getting the gold out of the ore. We may cite one case in which there are no less than 42 ounces of gold to the ton, but the quartz is so "foul" that it cannot be worked. Thus, then, we have an ore worth £126 per ton, which, as it happens, could be mined and treated for about £4 per ton, and which is entirely valueless, all attempts to work it having hitherto failed. A great many cases might be cited in which promising mines have entirely collapsed for this reason. A laboratory analysis of the ore has shown that it is rich in gold, carrying perhaps 5 ounces or 6 ounces to the ton, but owing to the sickening of the mercury the most that can be got out will be a couple of pennyweights perhaps—hardly enough to pay for the working.

We need hardly say that chemists and others have for years attempted to hit on some expedient for cleaning "sick" mercury without retorting, and the result can be attained in two ways. Thus, a small quantity of sodium added to the metal restores its power of amalgamating with gold, owing, no doubt, to the remarkable power which sodium possesses of making metals alloy. Thus, if a little sodium amalgam be rubbed on a bit of hoop iron, the iron may be dissolved in a pot of melted zinc. The mercury can also be cleaned by blowing chlorine gas through it. Neither plan has, however, met with much practical success. Sodium is not easily obtained in sufficient quantities, and it is not a very nice thing to carry up country to wild and out of the way districts. There are obvious troubles, again, connected with the use of chlorine, and so neither have, as we have said, met with much, if any, favor from practical gold miners.

Some months ago Mr. Richard Barker, of Norfolk Street, a member of the Geological Society, discovered—for we cannot say invented—a very curious phenomenon, namely, that if mercury be used as a cathode, while a copper or other metallic electrode is immersed in water covering the mercury, the mercury will immediately begin to expel any impurities which it contains, except metals. This principle he has applied to the purification of mercury in gold riffles, and with remarkable success. The invention—for the discovery referred to above had to be reduced to a practical form, in the shape of suitable apparatus—has been taken up by the Electro Amalgamator Company, and a riffle has now been at work in Southwark for some little time. This riffle consists of a wooden trough, about 3 feet wide, and 12 feet or 14 feet long, with the usual mercury troughs across it. Along one side of the trough run two iron bars, one of which forms one side of an electric circuit, while the other forms the other. Rods of iron dip into all the mercury troughs, and put the mercury on the negative or return side of the circuit; similar rods are connected with bars, one of which lies across the riffle over each mercury trough, and from this bar strips of copper about 1 inch wide and 8 inches long extend and lie horizontally over the mercury, which is thus under, so to speak, a huge comb, the teeth of which are about 8 inches apart. The distance between the mercury and comb teeth is about one-fourth of an inch, and so long as the riffle is dry no current can pass. Close to the riffle is a very simple and inexpensive dynamo, wound for quantity only, with very coarse wire. Over each comb is fixed a small roller or axis of wood in which are stuck pegs, which pegs dip into the mercury between the comb teeth. The dynamo is driven by a small gas engine, and the pegged rollers are caused to revolve at the same time, the pegs agitating the surface of the mercury. The ground quartz and a full stream of water descend the riffle from the top, as already explained, and the water flowing over the mercury and touching the comb teeth, contact is at once made and a current flows from the whole lower surface of each comb tooth through the water to the mercury. The effect produced is magical. No matter how "sick" or foul the mercury is, the moment the current is turned on the impurities fly from the space below the comb tooth, and collect in narrow ridges in the intervening spaces, from which they are washed away by the current of water, and the surface of the mercury at once becomes as bright as silver. We have seen quartz used, heavily charged with sulphur and arsenic from sulphur pyrites. One shovelful of this stuff sufficed to sicken all the mercury in the riffle, and the mercury was brought back to condition in less than one minute after the current was turned on. With the current flowing, the mercury could not be made sick. One experiment which we witnessed showed in a startling way the effect produced by the passage of the current. Four or five pounds of clean mercury being put into a china bowl, some oil was added, and the whole beaten up with a stick to a species of ointment, a process which occupied five or six minutes. A sovereign dropped into this mixture of oil and mercury came out untouched by the mercury. For all purposes of amalgamation the mercury was useless, and must remain so until retorted. The bowl was now nearly filled with water, and the end of a negative wire from a battery was plunged into the metal and oil, while the positive wire was just dipped into the water, which stood two or three inches deep. The moment contact was made with the water the oil began to rise in streams from the mercury, which could be seen collecting itself into little drops, two or three of which would coalesce. In about three minutes the whole of the oil had come to the surface of the water, and the mercury lay pure and bright at the bottom of the bowl.

We are unable to explain to what this action is due, nor are we aware that any chemist or electrician is in a better position to supply information. There are two or three theories at the service of our readers, all more or less—principally less—satisfactory. According to one of these, the impurities on the surface of the mercury, or mixed with it, become electrified, and are repelled by the mercury, because they are not metallic. According to another, the molecules of mercury are polarized, and, changing their relations to each other, expel all foreign bodies. Another theory attributes the action to the formation of nascent hydrogen, which acts chemically on the impurities; and this theory finds confirmation in the fact that pure water acts more effectively than any other liquid, the addition of any other liquid to the water, or of any substance soluble in it, apparently weakening the action of the current. It is a noteworthy fact that if the poles be changed, the cathode or negative end of the wire being in the water, while the anode or positive wire is in the mercury, the action is very trifling. If both ends are plunged in the mercury, there is no action whatever. If a quantity of sickened, "floured" mercury be put into a large iron pan, and covered with water, experiments may be carried out which demonstrate the action of the current very clearly. Taking the positive insulated wire in the hand, an inch or so of the wire being left bare, while the other wire is plunged in the mercury, we can cause the impurities on the surface of the mercury to go in any direction we choose. They always fly away when the positive wire is pointed at them, just as dust will go before a blast from the nozzle of a pair of bellows. Indeed, it requires small exertion of the imagination to believe that a current of air proceeds from the end of the wire, and brushes the dirt before it. It has, we may add, long been known that the passing of a current of electricity through mercury tended to clean it, but the action was too feeble to be of any importance, and so far as can be seen, the whole virtue of the Barker system resides in the use of water on the top of the mercury. As to the importance of the invention our readers can judge for themselves. It is to be hoped that a really satisfactory explanation of the action of the current will be forthcoming ere long.—*The Engineer.*

The Last Railway Census of the United States.

The census report of 1880 relating to railways shows that for the fiscal year ending 1880, there were operated in the United States 86,781½ miles of railway, the cost and liabilities for which were a little over five thousand six hundred millions of dollars ($5,658,914,158).

The average cost of the railways, counting capital paid in and borrowed, has been approximately $62,552 per mile.

The aggregate transportation earnings for 1880 were $580,450,594, and the expenses were $352,800,120. Net earnings $227,650,474. After paying interest and other fixed charges the amount available for dividends was $110,344,597.

The total railway stock subject to dividend was over two thousand six hundred and thirteen millions of dollars $(2.613.606.204), on which a trifle over 4½ per cent average dividends were earned, and an average of 2·70 declared, the balance of 1·80 being held.

The earnings per mile were $6,688. Expenses per mile, $4,065. Freight trains earned $1.65 per mile, and cost to run 98 cents per mile. Passenger trains earned $1.19 per mile, and cost to run them 76 cents per mile. In round numbers 291,000,000 tons of freight were carried; average distance each ton, 112 miles. Passengers to the number of 270,000,000 were carried; average distance each, 23 miles.

Number of passengers killed	148	Injured	544
" employes "	923	"	3,617
" other persons "	1,475	"	1,518
	2,541		5,674

Total killed and wounded for 1880, 8,215.

The equipment is as follows:

No. of locomotives	17,412
No. of passenger cars	12,330
No. of mail, express, and baggage cars	4,475
No. of freight cars	375,312
No. of all other cars	80,138
Cost of equipment	$418,045,459

The number of railway employes is as follows:

General officers		3,375
General office clerks		8,655
Stationmen		63,380
Trainmen—Engineers	18,977	
Conductors	12,419	
All others	48,254	
		79,650
Shopmen—Machinists	22.766	
Carpenters	23,202	
All others	43,746	
		89.714
Trackmen		122,489
All other employes		51,694
Aggregate		418,957
Amount of pay rolls for the year		$195,350,013

White Bronze.

Experiments are being made, according to the *Polytechnische Notizblatt*, in Paris with a new alloy having a white color yet containing no nickel. It is said to be very strong and malleable. It is made of copper and ferro-manganese, the proportions being varied according to the purpose to which the alloy is to be employed.

An alloy of forty parts of copper and sixty parts of ferromanganese, with a suitable quantity of some appropriate flux, produces a metal of such tenacity that it surpasses the best steel armor plates. The melted mixture is cast in blocks and is perfectly malleable. To obtain a white metal that can be rolled out in sheets, the above alloy is melted again, and 20 or 25 per cent of zinc or white metal added, which imparts to it the desired quality.

A plate of the first named alloy two inches thick was found by experiment to offer more resistance to a cannon ball than a steel armor plate of the same thickness.

This new kind of "white bronze" is not to be confounded with the alloy used in this country under the same name for gravestones and monuments, and which consists principally of zinc.

A Throat Electric Lamp.

At the last meeting of the Leeds and West Riding Medico-Chirurgical Society, Mr. Margetson, of Dewsbury, exhibited an incandescent lamp, designed by himself, and used by him since October last in examining the mouth and throat. The globe was about half the size of a walnut. It can be held in the mouth for two minutes without discomfort from the heat.

Novelties in Varnishes and Shoe Polishes.

Reinhardt has devised a method of destroying the stickiness of varnish, which consists in placing the article in a closed vessel or chamber where it can be exposed to the action of ozonized air in motion.

A leather varnish or polish is prepared by Gunther, of Berlin, by mixing a filtered solution of 80 parts of shellac in 15 parts of alcohol, with 8 parts of wax, 2 parts of castor oil, and a sufficient quantity of pigment. The mixture is evaporated in a vacuum to a sirup. The varnish is applied to the leather with a brush moistened with alcohol or with a colorless alcoholic varnish.

Nicolet, of Lyons, prepares boot blacking by dissolving 150 parts of wax and 15 parts of tallow in a mixture of 200 parts of linseed oil, 20 parts of litharge, and 100 parts of molasses, at a temperature of 230° or 250° Fahr. After this 108 parts of lampblack are added, and when cold it is diluted with 230 parts of spirits of turpentine, and finally is mixed with a solution of 5 parts of gum lac and 2 parts of aniline violet in 35 parts of alcohol.

Hein, in Kaufering, makes another kind of shoe blacking by melting 90 parts of beeswax, or ceresine, 30 parts of spermaceti, and 350 parts of spirits of turpentine, with 20 parts of asphalt varnish, and adds 10 parts of borax, 20 parts of lampblack, 10 parts of Prussian blue, and 5 parts of nitro-benzol.

Brunner uses 10 parts of bone black, 10 parts of glucose sirup, 5 parts of sulphuric acid, 20 parts of train oil, 4 parts of water, and 2 parts of (carbonate of) soda. The bone black and glucose are stirred with the acid in a porcelain vessel until the whole mass is homogeneous and has a shining black surface when at rest. The soda is dissolved in a little water, and boiled with the oil under constant stirring until it forms a thick liquid, and then the other mixture is stirred into it. By varying the proportions of these two mixtures, the blacking is made thinner and softer, or harder and firmer. The substances sold as French polish are mostly composed of these ingredients. In this and all other kinds of shoe blacking made with bone black and sulphuric acid, the precaution must be observed of stirring rapidly and evenly after the acid is added, otherwise lumps will be formed that are difficult to crush, and the blacking will have a granular condition that does not belong to it. Good shoe blacking must always remain soft, and show a smooth uniform surface when applied to the leather.—*Neueste Erfahrungen.*

THE "PEERLESS" ENGINE.

The engine represented in the engraving is one of the simplest, most compact, and strongest in the market. The piston rod, valve stem, and pins are made of steel. The crank shaft and connecting rod are made of Chester steel. The main frame of the engine and the slides, as well as the bearings for the crank shaft, are cast in one piece, so that it is impossible for the working parts of the engine to get out of line or change their relation to each other.

The construction of the engine is such that the action of the piston rod is exactly central, and all lateral strains are avoided.

The "Peerless" engines do not require any masonry foundation, or extra care in setting up, thus saving expense to the buyer. They will stand upon any ordinary floor and do perfect work, even when out of plumb. Every engine is adjusted, and run for several hours, before leaving the shop, and is in complete order when sent out.

A detached engine has many features which recommend it to those wanting power. When small engines are mounted on boilers, the journals often become so heated that it is difficult to keep them lubricated, and the working parts of the engine are liable to be thrown out of line by unequal expansion of the different parts of the boiler to which they are attached, and the durability and efficiency of the engine greatly lessened.

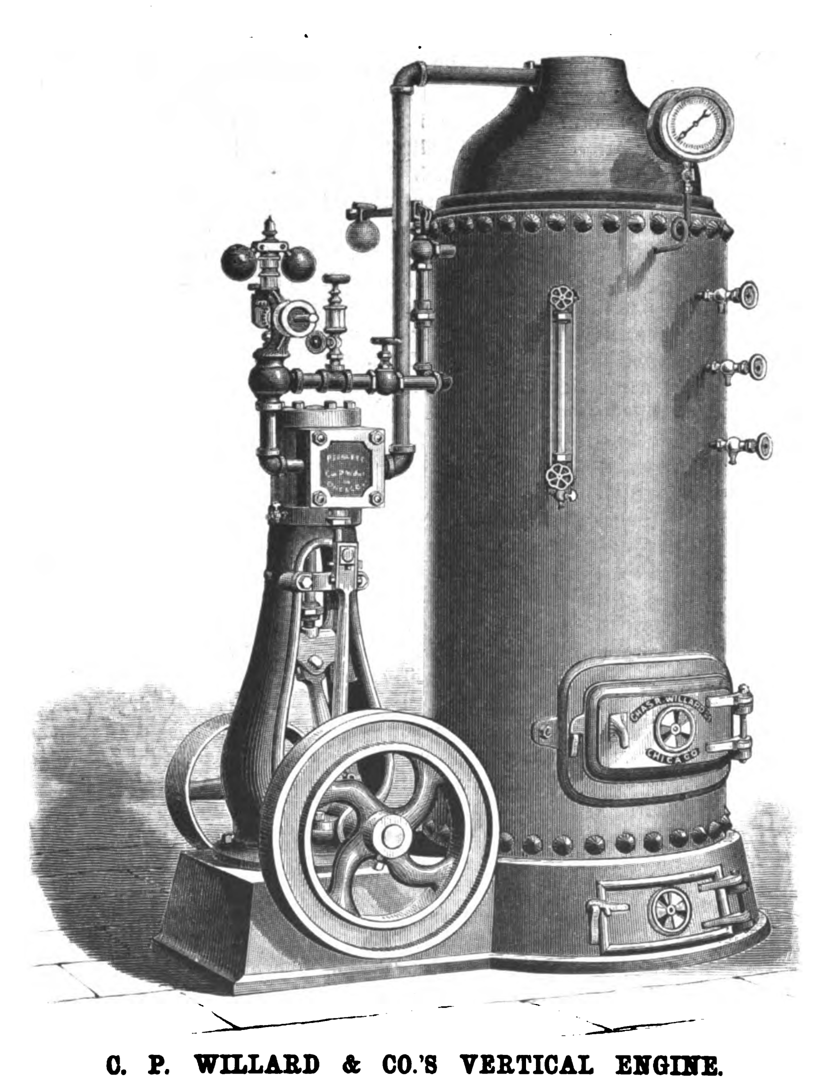
This engine occupies but little space, is convenient to work around, and makes a solid, substantial thing. Should it be necessary to move it at any time, the boiler can be taken off the base by simply unscrewing the steam and exhaust pipes.

A valuable feature of this form of portable boiler and engine is, that it can be taken apart and carried up or down stairs, or into localities where it would be difficult and expensive to carry the same power engines and boilers if all fastened together.

All persons familiar with the mechanical principles involved will understand why this form of engine, detached from boiler and standing on a solid iron foundation, is superior to the lightly constructed engines which are bolted to the boiler shell. Aside from every other consideration, the greater power obtainable from an engine of this pattern, of same sized cylinder, owing to the higher rate of speed at which it can be run without serious vibration, should give it the preference among all careful buyers.

In a vertical engine no counter weight is required, because the recoil produced in a horizontal engine in overcoming the inertia of the reciprocating parts is here prevented by the perfect resistance of the earth, as the travel of the piston is in the direction of the line of gravitation and not across it, as with horizontal engines, and greater steadiness and freedom from vibration is obtained. In a vertical engine the wear is equal on all sides, which is not the case with a horizontal engine, in which there is always the heaviest wear on the under side of the cylinder.

Five sizes are manufactured, two, four, five, six, and nine horse power. Chas. P. Willard & Company, 20 La Salle Street, Chicago.

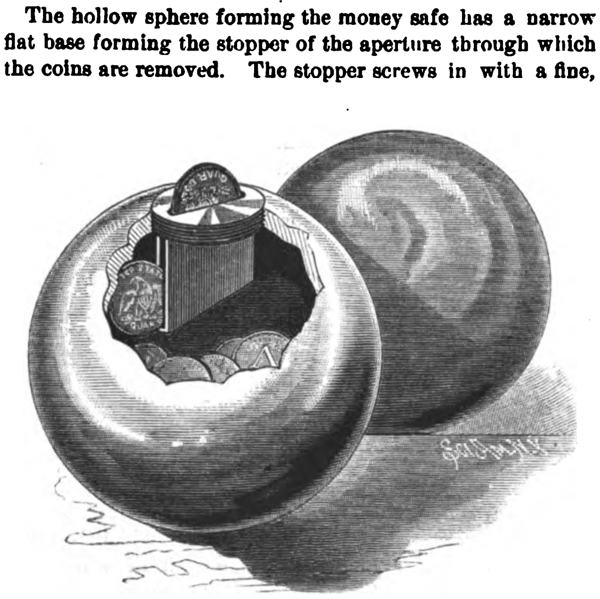


C. P. WILLARD & CO.'S VERTICAL ENGINE.

TOY MONEY SAFE.

The child's bank or toy money safe shown in the engraving serves as a secure and convenient receptacle for coins, and at the same time is a truly ornamental object, being of polished metal, nickeled, silvered, or gilded, bronzed or japanned. It may be made of rubber or any other suitable material. It can also be made of brass spun in spherical form.

The hollow sphere forming the money safe has a narrow flat base forming the stopper of the aperture through which the coins are removed. The stopper screws in with a fine, close-fitting thread, and with so much friction as to render it impossible for the child to remove it. In the stopper is a slot connecting with a short flat tube having an inclined bottom, which deflects the coins as they are introduced, and absolutely prevents their being shaken out.



HOTCHKISS' TOY MONEY SAFE.

This simple device can be made to sell for a very low price and yield a good profit; at the same time it admits of a fine finish, and may be made in various sizes to suit users.

This invention has recently been patented by Mr. J. F. Hotchkiss, of 84 John Street, New York city, who may be addressed for further information.

Laver Bread.

Laver bread is made of a seaweed (*Porphyra laciniata*) found growing on the low rocks. The women gather it in large baskets and carefully pick it over, wash it, and take out any other sort of seaweed that gets in with it. It is then thoroughly washed again to remove all the sand, after which it is boiled for about two hours, then chopped up with a knife, rolled into lumps, and sprinkled with oatmeal to keep it together and make it look clean. It is only made along the Glower and Devonshire coasts, where a great many women earn their living by making it. After it is cooked it will keep for about three or four days in summer, and for about a week in winter. Most of it is taken to the Swansea market, for which a great deal is sent from Devonshire, where the seaweed grows more abundantly than about Gower. It is sold at 3d., 4d., and 5d. per pound. The poor people are very fond of it, and eat it either fried with bacon grease, or else cooked like a vegetable with meat.—*Kew Report.*

A New Tar Explosive.

Among the derivatives of coal tar, several kinds of explosives have long been known; but a new compound of this character has lately been made by Dr. Himly and Herr Von Frutzschler-Falkenstein, which is said to be suitable either for mining purposes or for firearms. It is described in the *Journal of Gas Lighting* (London) as a mixture of saltpeter, chlorate of potash, and a solid hydrocarbon, for which latter constituent paraffin, asphaltum, or pitch may be chosen. The solid ingredients are powdered and intimately mixed; and the mixture is then treated with a liquid volatile hydrocarbon, such as benzine or gasoline, which dissolves the solid hydrocarbon and forms the whole into a plastic mass. The cake is then rolled into sheets, and hardened by allowing the liquid solvent to evaporate; the product being afterward broken up into grains of any desired size, like ordinary gunpowder. By this mode of dissolving the hydrocarbon before or after admixture with the salts, the grains become coated, after drying, with a waterproof coating of varnish. The process of manufacture is simple and free from danger, because in the event of the paste catching fire the volatile hydrocarbon will first burn away entirely, after which the powder will burn slowly and quietly. The new compound is therefore only an explosive when confined in a close space. It possesses the same density as gunpowder, and is very hard. It can be made twice as strong as the latter; but the intensity of the explosion can be regulated at will by varying the proportions of the ingredients and the size of the granules.

Hearing in Insects.

The sense of hearing in insects has been recently studied by Herr Gruber. He found the cockroach (*Blatta germanica*) very sensitive. On sounding a violin note when a cockroach was running across the floor, the creature always suddenly stopped. Again, a number of these cockroaches were inclosed in a glass vessel, and on making a strong sound there was evident agitation and excitement; some would fall down from the glass as if paralyzed. A cockroach was hung by a thread from its hind leg; when it was quiet a bow was drawn sharply over the violin strings at the distance of about four feet, whereupon the insect was greatly excited, and struggled round, getting its head uppermost.

Beetles also were readily affected by sounds, but grubs and ants gave no certain indications. Of aquatic insects various kinds of corixa were tried. These would often remain quite quiet for several minutes, but on tapping the glass with a glass tube they rushed about with much agitation. A disk at the end of a long rod drawn to and fro in the water near a quiet corixa produced no effect, but on conducting the sound of a struck bell into the liquid by the rod, there was lively reaction; similarly when a glass bell stroked with a bow was brought to touch the water. These creatures were also sensitive to high violin notes in air, to the sound of a metal plate struck with a hammer, etc.

Still more sensitive to sound were various aquatic beetles (laccophilus, laccobius, *Nepa cinerea*, etc). On the other hand various larvæ, especially of ephemerides, were unaffected; but these were sensitive to mechanical agitation of the water. Herr Gruber considers the response the insects make to sound an indication of true hearing, and not mere reflex action.—*English Mechanic.*

The Dismal Swamp.

The Dismal Swamp in Virginia is much reduced in extent compared to what it was twenty years ago. It now contains, says a recent visitor there, some of the best farming land in the State. A railroad runs across it, and it is on its way to final extinction. The drainage of Lake Drummond, a central body of water lying higher than the average level of the swamp, would make the whole area fertile. This is a project of Gov. Benjamin F. Butler, who once had surveys made, but at length abandoned it. The one great industry of the swamp is lumbering. It is penetrated by small ditches in connection with larger canals, and by rude tramroads, over which the logs are hauled to be sawed up into shingles, railroad ties and fencing. The lake, however, with its fringe of cypress and its projecting roots and stumps, is just as dismal as ever.

PASTE for labels is made by soaking glue in strong vinegar, then heating it to boiling and adding flour.

SIDE SHOW SCIENCE.

There has recently been exhibited in the Circus of the Champs Elysees, in Paris (we learn from *La Nature*), a curious example of the ability to remain a considerable time under water without asphyxia. This is "Miss Lurline, the Queen of the Water," as she is called. The aquarium in which she performs consists of a large rectangular vessel with glass sides (the larger about 10 feet long by 7 feet high), and filled with water which is slightly tinted green, and is strongly illuminated by means of five or six oxyhydrogen lights.

Miss Lurline dives, swims, lies down and eats at the bottom of the water, passes between bars of a chair, etc.

At a certain moment, the music ceases, the girl draws a few long breaths, then lets herself sink to the bottom, where she kneels on one knee, crossing her arms on her breast. A man outside stands with watch in one hand and hammer in the other, with which latter he counts the half minutes by striking. One half minute—one minute—a minute and a half—two minutes—two minutes and a half! During the silence, interrupted only by the sound of the hammer, the minutes seem very long, the spectators are painfully intent, and experience a relief when the diver returns to the surface.

To appreciate what is implied in passing two minutes and a half without taking breath, let any one (says M. Kerlus in the journal named) make a small experiment, holding his breath as long as possible, while watching a seconds watch. Few persons reach one minute; the majority are obliged to take breath before forty-five seconds have elapsed, and it is only exceptionally and with much difficulty that some attain one minute fifteen seconds.

The fishers of sponges, mother-of-pearl, and of pearl oysters in the Mediterranean and elsewhere, do not ordinarily remain under water longer than two minutes. It has never been authentically observed, *watch in hand*, that they effected a voluntary immersion of more than three minutes. The mean time is one minute to a minute and a half. Even under these conditions, the work of a diver in deep water is excessively painful. On coming out of the water, they usually remain some time motionless, the face congested, the eyes bloodshot, and often blood given out by the mouth from rupture of blood vessels in the lungs. These divers do not live long; they sometimes die of apoplexy after coming out of the water; they also frequently lose sight by reason of congestion of vessels of the eyes.

The public divers in aquaria run much less risk. They have not to bear any great pressure resulting from thickness of the layer of water above, and, besides, they remain still in the water, whereas the fishing divers have to perform active work during immersion, and so exhaust more quickly the supply of oxygen retained in their lungs.

During the last twelve years, four or five divers (male and female) have exhibited in Paris, under various aquatic names, such as "l'Homme-poisson," "l'Homme-amphibie," "La Femme-Sirene," "La Reine des Eaux." Their exercises have been much the same. One of them, however, the fish man, made a very curious experiment. He smoked a cigarette almost entirely, but without emitting the smoke. Then he lay down at the bottom of the water, and let a succession of gray bubbles of smoke rise to the surface. The quantity of smoke thus returned seemed enormous. At intervals the series stopped, to commence again a few seconds later, greatly to the surprise of the spectators. Some of these estimated that the experiment lasted quite five minutes. In reality, it did not exceed one minute.

While a diver is immersed, if one do not look at a watch, one finds it difficult to calculate the time of immersion correctly, and generally exaggerates. Hence, in all probability, the accounts of many wonderful divers. It is said, *e. g.*, that Ionian and Sicilian divers employed after the naval battle of Navarino, in 1827, remained five to ten minutes under water, and one of them even a quarter of an hour. Exaggeration here is evident.

Whence comes this power, possessed by some persons, of remaining longer than others without breathing? The old physiologists attributed it to the aperture of Botal not being closed in the heart (as in the child before birth). This is easily proved to be an error.

It has also been supposed that divers feed only on vegetables, their food yielding blood less rich in corpuscles, and so requiring less oxygen. Another idea is that divers exhibiting in public take either morphine with the view of retarding the circulation, or digitalis with the view of retarding the heart beats.

These supposed means (says M. Kerlus) are not practicable, or they would tend to the opposite of the end aimed at. The power of remaining a long time without respiration seems due simply to a great development of pulmonary capacity, to lungs of large volume and perfectly sound. This great capacity may be natural; it may be the result of heredity, as is probably the case with the sons and grandsons of fishing divers; it may be acquired, or at least developed, by exercise. The profession of diver is similar in this respect to those of the runner, the gymnast, and also the singer.

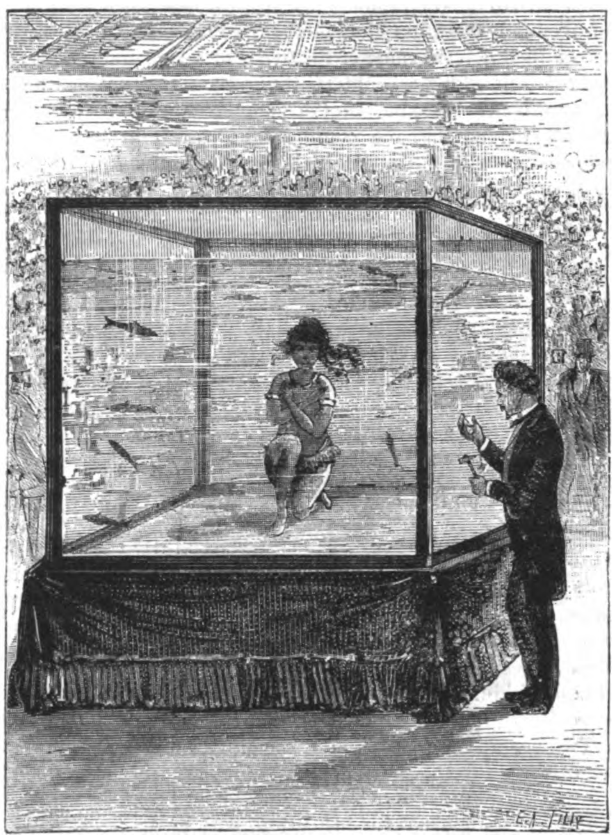
THE London *Medical Record* concludes from Prof. Koch's experiments that the only certain disinfectants are chlorine, bromine, and corrosive sublimate. Solutions of one part of the latter to 1,000 parts of water will kill spores in ten minutes, while a solution of 1 in 15,000 is strong enough to arrest the power of development in micro-organisms.

Manufacture of Tinned Sheet Copper.

An interesting patent case has been decided by Judge Shipman in the United States Circuit Court of Connecticut, in which the following particulars of the above art were brought out:

Tinned sheet copper for the manufacture of culinary utensils was formerly furnished to the coppersmith in the form of a soft sheet of copper tinned on one side, and the copper side discolored by the action of the heat and acids employed in the tinning process. This soft, porous, flexible sheet was then made dense and hard by tedious and expensive hand hammering, or "planishing," as it was called, which consisted of hammering the sheet upon an anvil with hammers of a curved surface to make the sheet dense, and then with hammers of a plane surface to smooth and brighten it. Tinned copper had been also sometimes cold-rolled or passed through polished rolls, whereby the sheet was made more dense; but the form in which the coppersmith generally received the sheet for manufacture into utensils was the one which has been described. Sometimes the discoloration was attempted to be removed by the use of acid. Mr. Andrew O'Neil, in 1867, received letters patent for a tinned copper sheet prepared in this way. A varnish, made after a prescribed formula, was applied with a brush to the copper side of the tinned sheets in the rough state "without subjecting them to any acid bath, scouring, planishing, or any other chemical or mechanical preparation." The varnished sheets, when dry, "were passed through highly polished rolls of steel or case-hardened or chilled iron." In 1869 another patent was granted to Mr. O'Neil.

This invention, which consisted in subjecting the sheet to cold-rolling, whereby the surface was made dense and glossy, and to polishing, whereby the discoloration was removed,



MISS LURLINE IN HER AQUARIUM.

and, if need be, to an additional enameling process, was received with great favor, went into extensive use, entirely superseded hand planishing, and was very useful. In 1877 a reissue of this patent was obtained, on which reissued patent this suit was brought. In the specification the patentee says that "in some instances the sheet had been passed through rollers before my invention;" but in consequence of the acids employed in preparing the sheet for tinning and the heat in the tinning operation the copper surface became dark and mottled.

The reissued claims are as follows:

"1. As a new article of manufacture, the tinned sheet copper herein described, the same having a bright or polished copper surface, and the whole being cold-rolled, as and for the purpose described.

"2. The improvement in the manufacture of tinned sheet copper, consisting in tinning one surface, cleaning or brightening the other surface, and subjecting the sheet while cold to pressure between rollers, substantially as set forth.

"3. The sheet of tinned copper prepared by cleaning and rolling, and protected by a varnish upon the copper surface, as and for the purpose set forth."

The first claim is identical with the first claim of the original. It is not for a tinned sheet, cold-rolled, and having a bright copper surface, made such by the use of acids, but having a surface made bright or polished by the wheel, or by any approved mode of polishing. The second claim is for the process of manufacturing described in both original and reissue, not including the varnishing; but it is not to be construed as including any mere "cleaning" of the surface, although the word "cleaning" is introduced both into the description and the claim. To include in the patented process cleaning by acid, or by scouring with acid and sand, would be an undue expansion of the original patent.

In 1876 Thomas James obtained a patent for an improvement in the manufacture of tinned sheet copper, under which the defendants now make the article which is said to be an infringement. After the sheet is tinned the discoloration is removed by the use of diluted acid, or by scrubbing with acid and sand. The sheet is then washed in pure water, and after it is dry is cold-rolled between bright chilled rolls, two sheets having been placed together with their tinned surfaces in contact. By this process the discoloration is removed by the application of acid, and then the surface is polished by the chilled rolls. By the O'Neil process the surface is polished and made glossy by the rolls, and the discoloration is removed by the buffer or other approved polishing method.

The defendants' process is not the patented process. It omits a patented step, and in its stead includes one which the patentee intended to avoid.

There is no infringement, and the bill is dismissed.

Work for Inventors To Do.

We have machines for doing almost all kinds of work in field, shop, and factory. But most of the machines we find in them now will not be used twenty years hence. They will give place to something vastly better. All the machines now styled "perfection," will be found to be very imperfect.

The machines now employed for making paper, weaving cloth, printing, sewing, shaping brick, and working up lumber will soon be displaced. A very valuable invention is seldom very valuable, in itself, beyond the term for which it is patented. It is improved to such an extent that only a single principle remains to be kept in operation.

It is likely that much will be done in the future in restoring old processes, and in combining them for doing certain kinds of work. In many departments of industry little has been done to lighten the burdens of human labor. Kitchen work is performed in about the same way as it was when the first kitchen was constructed. Clothes, dishes, and floors are washed after the most primitive fashion.

Our methods of doing all kinds of housework are twenty centuries behind our methods of doing farm and factory work. Knives and forks are made by machinery, but are scoured by hand. A new tin dish is made in a factory quicker and with less trouble than an old one is cleaned in the kitchen. When drudgery was driven out of the field and workshop it took refuge in the kitchen, seemingly with the determination of making it its permanent place of abode. It clings to it with desperation. New dishes for the table and new garments for the person all make work, but the persons who bring them out produce no labor saving machine for cleaning the first or keeping in order the last.

It is likely that most of the valuable inventions in the future will be made by persons who will devote themselves to inventing as a business. More knowledge, skill, time, money, and higher talent are now required to make inventions than were formerly needed. A person must now study to find out what is wanted in any department of industry, and then learn what has been accomplished. He must read many books and consult with many persons. If a proposed invention pertains to the application of any science to the arts, he must become familiar with both the science and the art for improving which it is designed.

Messrs. Bessemer, Ransome, and Edison, three of the most illustrious inventors of our time, afford good illustrations of what men of genius, judgment, and perseverance can accomplish by devoting themselves to specialties. A technical education and a library are as necessary to an inventor as to any professional man. For a mechanical inventor a workshop is as necessary as it is to a mechanic. Some capital of course is necessary to enable a person to devote all his time to this business. Ability to concentrate one's thoughts on a particular subject is of prime importance to a successful inventor. A "happy idea" may occur to him, but patience is required to make it of any practical value. Many scientific men and mechanics can devote considerable time to inventing and go on with their regular pursuits, as they have unusual facilities. Much always depends on little things in the perfection of great inventions. Goodyear and Morse found their greatest difficulties with matters that at first appeared trifling.—*Chicago Times.*

An Artificial Aurora.

A telegram has been received by the Finnish Academy of Sciences from Professor S. Lemström, chief of the Finnish Meteorological Observatory, at Sodankylä. He states that, having placed a galvanic battery with conductors covering an area of 900 square meters on the hill of Oratunturi, he found the cone to be generally surrounded by a halo, yellow-white in color, which faintly but perfectly yields the spectrum of the aurora borealis. This, he states, furnishes a direct proof of the electrical nature of the aurora, and opens a new field in the study of the physical condition of the earth. A further telegram has been received, in which Professor Lemström states that experiment, with the aurora borealis made December 29, in Enare, near Kultala, on the hill of Pietarintunturi, confirm the results of those at Oratunturi. On that date a straight beam of aurora was seen over the galvanic apparatus. It also appears from the magnetic observations that the terrestrial current ceases below the aurora arc, while the atmospheric current rapidly increases, but depends on the area of the galvanic apparatus, to which it seems to be proportional. The Professor regrets that with the means at his disposal further experiments cannot be made, and that he intended almost immediately to withdraw the apparatus.

The Vocal Statue of Memnon.

On the low marshy plains near Thebes, on the banks of the Nile, are situated the wonderful colossal statues of Memnon, which for so many centuries have attracted the attention and excited the wonder and admiration of travelers and students. These two colossal monoliths, which are supposed to represent the royal personage of Amenophis III., and to have been erected by him some 1,700 years before the Christian era, are of the same dimensions, and are hewn from the same sort of granite.

The height of the figures from the soles of the feet to the crown of the head is about fifty feet, making a total height with the pedestal of over sixty-five feet. One of these monoliths being mounted upon an unsufficient foundation, began to assume an inclined position many centuries ago, and a little crack forming in the stone was increased year by year, until, about the year 27 B.C., an earthquake taking place in Egypt, the upper part of the statue was broken off and overturned, and there it has been lying ever since.

Soon after this occurrence, certain curious rumbling noises were heard to proceed from the standing portion of the statue. These sounds were observed to occur at break of day, immediately after the rising of the sun. That this phenomenon was noticed by a number of travelers and savants is pretty well proved by the inscriptions chiseled on the pedestal of the statue by different persons at different times, and all bearing witness to the same fact.

Strabo, who visited the statue some dozen years after its fall, thus speaks of it: "There are two colossal monoliths, one of which is still standing, while the upper portion of the other has been overthrown, I am told, by an earthquake. It is believed, also, that once each day a sound like a slight blow proceeds from that portion which remains standing on the base. As for myself, when I visited this locality with Alius Gallus, I most assuredly heard a noise at the first hour. Did it proceed from the base, from the colossal, or from some of those who were standing about the base? Was it done designedly? This is what I cannot assert positively, for without knowledge of the true cause it is better to imagine almost anything than to admit that stones so placed can emit sounds." Later observers were more decided in their opinion, however, and assert positively that they distinctly heard the sounds proceeding from the interior of the stone. In the time of Septimius Severus, the statue was restored, and the upper portion, consisting now of five pieces, was replaced to its original position, and since then there is no record of any sound having proceeded from the austere figure.

It has been noticed that the sounds were heard at the time when the first rays of the sun fell upon the statue, and further that these noises did not begin to be noticed until after the upper portion of the statue had been overturned, and that as soon as the monolith was restored to its original condition they were heard no longer. Taking all these facts into consideration, M. De Roziere, who has made a considerable study of this matter, considers the phenomenon to be due to the fact that the rays of the sun, striking on the broken portion of the monument, dry up the moisture which has been absorbed during the night. The dew deposited in the fissures of the rock and thus caused rapidly to evaporate tends to open the crack still further.

If the matter were homogeneous throughout or composed of fine particles, no noise or vibrations would be discernible; but as the stone consists of an agglutinous mass of hard grains, the larger grains will resist more than the others the tendency in the rock to crack and separate into fissures, and will be left alone to support the strain. This tension being continually renewed, these grains finally give way. This rupture causes in the stone a concussion or rapid vibration, and it is this which produces the groaning sound in the stone at the rising of the sun.

Humboldt speaks of having discovered musical stones, called by the inhabitants *lojas de musica* on the banks of the Orinoco. These were granitic in character and were full of cracks and fissures, and emitted sounds, as he says, immediately after the rising of the sun, like the tones of an organ.

The seventy inscriptions which make mention of this prodigy leave almost no doubt as to the facts in the case, and the great matter for regret is that the religious or perhaps superstitious ardor of Septimius Severus should have led him to set about those restorations which have for ever closed the mouth of the royal Memnon.

Government Profit on Coinage.

Some curious facts relating to unredeemed obligations of the Government have been collated by the New York *Sun*, which show a considerable source of profit to the United States Government. The amount of paper money and coin which is never presented for redemption comprises a large sum. Much of this is destroyed by fire. Some of it is buried or hid in places known to no person alive. A large quantity of the coin is melted to make sterling silverware. Considerable amounts of both paper money and coin are exported never to return. Not long ago a United States bond, issued about 1819, was presented at the Sub-Treasury in this city. The interest on it had ceased over fifty years. It had come back from Europe through Baring Brothers. The outstanding principal of the public debt of the United States last year was nearly two billions of dollars, chiefly represented by bonds and treasury notes.

It would be, of course, impossible to say how much of this will never be presented for redemption, but some idea may be formed from the fact that $57,665 of it was issued so long ago that the date is not recorded. It appears in the report as "old debt" that may safely be put down as profit. There is an item of $82,525 of treasury notes issued prior to 1846. Some of them were issued nearly fifty years ago, and will not, in all probability, ever be presented for redemption. One thousand one hundred and four dollars of the Mexican indemnity of 1846 has never been claimed. The last of the fractional currency was issued under the act of June 6, 1864, yet, although nearly twenty years have elapsed, $7,077,247 has not been presented for redemption. Some of this is held as a curiosity. Some of it is still used by banks and merchants for transmitting small sums by mail. Several New York banks have considerable sums of new fractional currency, which they distribute for the accommodation of their customers.

As to the coin, the Government derives a considerable profit from it. The silver in one thousand silver dollars costs, on an average, about $803.75. The coinage of a silver dollar costs about 1¼ cents. The total cost of one thousand silver dollars to the Government is therefore $816.25. Since the organization of the mint, in 1793, 127,190,618 silver dollars have been coined, on which the Government has received a profit of over twenty-three millions of dollars.

In the same period $122,758,510 was coined into half dollars. At the same rate of cost for coinage the Government profited $19,395,769 on these. The total silver coinage of the Government since 1793 is $347,766,792. Estimating the profit on the halves, quarters, and subsidiary coins at the same rate as on the dollars, the total profit received by the Government on its silver coinage has been about sixty-four millions of dollars.

In the coinage of the five cent nickels the Government reserved to itself the liberal profit of nearly 50 per cent. This gave to the Government last year the handsome revenue of over $100,000 from nickels alone. The wide margin between the intrinsic value of the five cent nickel and its face value led to extreme counterfeiting. Several years ago an assay was made of some of the counterfeit nickels, and it was discovered that the counterfeiters had put into their coins more valuable metal than the Government uses in making the genuine coins.

Does Snow Protect the Soil from Frost?

Prof. Alexander Edmond Becquerel, of the Conservatoire des Arts et Metiers in Paris, the celebrated investigator of electro-chemical decomposition, has recently been investigating a question of considerable scientific interest as well as of great practical importance especially, to agriculturists, namely; whether a blanket of snow prevents frost from entering the ground or hinders it to any great extent.

The numerous experiments which it was necessary to make to obtain a precise answer to this question were carried on last winter in the Jardin des Plantes. The aim of these was to ascertain, first, to what extent the temperature of the ground was influenced by the temperature of the air, both under bare ground and in sodded soil, with and without snow. Also to ascertain what depth the temperature of the air was able to make its influence felt. In these very complicated investigations the electric thermometer invented by Becquerel himself was employed, an instrument which needs some description to make the following details intelligible.

Two covered wires of unlike metals—copper and iron—are soldered together at both ends, which are left uncovered for this purpose; otherwise they are covered their whole length, for the purpose of insulation, with gutta-percha and silk. If the soldered ends of these double wires are exposed to different temperatures, an electric current is generated in them, and the greater the difference in temperatures the stronger the current, but the current ceases when both are exposed to the same temperature. This electric current acts on a magnetic needle suspended so as to move freely over a graduated circle, a kind of compass. The copper wire forms a vertical frame around the needle parallel to the normal direction of the needle. As long as both ends of the double wire are at the same temperature the needle continues to point to the north, being subject only to the earth's magnetism, but as soon as there is any variation in temperature the needle is sure to move instantly and take another position, which it will keep until some other change of temperature takes place.

The application of this ingenious instrument for the measuring of soil temperatures was made as follows:

One of the soldered joints was buried in the earth to a depth at which it was desired to take the temperature, and the other end was put in a water bath at any desired distance from the first. The temperature of the latter could be increased or diminished at pleasure, and was measured by a very sensitive thermometer. To ascertain the temperature in the soil where the other end is buried, it is only necessary to raise or lower the temperature of the water bath until the magnetic needle stands at zero, and then read the thermometer. The thermometer will stand the same as if it were buried at that point. The results obtained were absolutely accurate, and the method itself very simple and easy.

Prof. Becquerel began his observations at the end of November. Simultaneous observations were made of the temperature of the air at the height of 33⅓ feet and 66⅔ feet, and of the soil at the depths of 2, 4, 8, 12, and 24 inches. They were made under sod and bare ground. On November 26, a dry frost began which lasted without interruption until December 3. At this date the air had a temperature of 7° Fahr., and a heavy fall of snow began that covered the ground to the depth of 10 inches. From the 6th to the 19th of December, the cold steadily moderated until on the morning of the 19th and 20th it was above 32°. A variable cold weather followed, and the snow sank to less than 8 inches.

Observations of temperature showed that both before and after the snow fell the temperature of the soil, where it was covered with sod, remained above the freezing point even on the coldest day. On November 26, at a depth of 2 inches the temperature was 40° Fahr. From this time it sank continuously until December 14, when it reached 32½° Fahr., but it never fell below this minimum.

The results were quite different in soil not covered with grass sod. On November 26, the day when the dry frost began, the temperature at a depth of 2 inches fell below 32° Fahr.; on November 29 it stood at 26¼° Fahr., and on December 2, before the snowfall, it was 25° Fahr. During the whole time when its surface was covered with snow from 10 to 8 inches deep, the temperature never rose above 32°, but only varied, at a depth of 2 inches, between 28° to 30° Fahr.

From these observations, which were repeated a great many times, although we have given but few of the results, we may deduce a whole series of very interesting results of great importance to agriculturists.

In the first place it was proved that changes in the temperature of the air make themselves felt to a certain distance in the earth even when the surface is thickly covered with snow. Hence the generally received opinion that a mantle of snow keeps the earth warm is in general erroneous. Snow does not protect the soil and seed at all from freezing, but only hinders to a certain degree the too extensive radiation of heat from the soil, and is converted into water at 32°, which sinks into the earth and somewhat raises its temperature.

Becquerel's experiments also prove that the best protection for the soil is a heavy sod, which does more to raise its temperature than ever so thick a layer of snow.

The matted roots of the sod form a sort of felted covering which not only excludes the cold in a high degree, but also draws up the moisture from the lower strata toward the surface. Our winter grain does not have the thickness of a bed of sod and cannot act the same, having much more the character of bare ground, and hence we are not entitled to consider our grain fields sufficiently protected from the strongest frosts when only covered with an ordinary layer of snow.—*F. Von Thumen, in Weiner Landwirthschaftliche Zeitung*, January 6, 1883.

The Deepest Sounding in the Atlantic.

The Coast and Geodetic Survey steamer Blake returned to this port February 14, from a winter cruise for deep sea exploration between the Bermudas and the Bahamas. On the 19th of January, in latitude 19° 41′ N., longitude 66° 24′ W., about 105 miles northwest of St. Thomas, there was found the greatest depth ever measured in the Atlantic, or 4,561 fathoms.

The place was about eighty miles southwest of the place where the Challenger made her deepest sounding, of 3,862 fathoms. It was inside a basin—that is, many hundred fathoms down it was inclosed by a ridge. The temperature of the water at this great depth was 36 degrees. It is a curious fact in connection with such basins as this that the water of the bottom of them is of exactly the same temperature as that which runs over the top of the ridge several hundred fathoms above. The specimen of the bottom secured at this sounding showed a soft, brown ooze, with evidences of fauna.

Mortality of Our Great City.

Thirty-seven thousand nine hundred and fifty-one persons died in New York city in 1882, the ratio being a little over twenty-nine per thousand of population. These figures show that New York has no equal among Northern cities for funerals and that the business of undertakers is remarkably active.

The number of cases and deaths from the principal contagious diseases for 1882 was as follows:

Diseases.	Cases.	Deaths.
Smallpox	708	269
Measles	4,733	912
Scarlet fever	6,594	2,070
Diphtheria	3,842	1,521
Croup	..	730
Whooping cough	....	655
Erysipelas	...	151
Typhus fever	207	66
Typhoid fever	684	363
Malarial fever	...	533

The average death rate for the United States, as indicated by the census returns for 1880, is between 17 and 19 per thousand. Of suicides there were 199; of these, 165 were men, and 34 were women; 71 were Germans, 50 Americans, and 20 Irish.

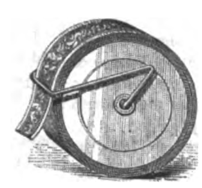
Mexican Tin.

The first ton of Mexican tin ever sent to thi country was recently received. The metal is said to be bright, clear and apparently of good texture. It came from Durango. The ores of placer origin are said to average 73 per cent of smelted tin. Mr. Henry Freeman, an Australian tin mining engineer, has been for a year or more exploring the region between Chihuahua and southwestern Durango in search of evidences of the tin lodes and placers spoken of by the old Spanish settlers, and has secured for St. Louis merchants and capitalists a considerable tract in the southwest quarter of Durango believed to contain tin ore in large quantities. The famous iron mountain of Durango is in the northern part of the district.

RECENT INVENTION.

New Ribbon Holder.

The annexed engraving shows a very simple and convenient ribbon holder recently patented by Mr. John Mellette, of Winamac, Ind. It consists of a wire bent V-shaped, with the ends bent toward each other and with a bend at or near the middle, so that the wire acts as a spring to hold the ribbon from unrolling accidentally, while it admits of unwinding any desired amount by simply drawing it from the roll in the usual way. When the roll is of wood, the ends of the wire are inserted in the center of the block from opposite sides. When the roll is of pasteboard or other thin material, the central holes are eyeleted to prevent wear.



Cloth from Nettles.

Though not in these days generally cultivated, at least in Europe, the despised nettle was at one time, and that for several centuries, held in high honour and esteem throughout the world. In an old medical book of the fifteenth century, many pages are devoted to a description of its healing virtues. During the Irish famine, it is said that hundreds of poor people subsisted entirely upon it; while in Russia, Sweden, and Holland it is still mown several times a year as fodder for the cows, whose milk it is found greatly to improve both in quality and quantity, though they will not touch it in its green state. In Kamschatka the fibers have long been used for fishing lines; in France they have been made into paper; in Hindostan and China, woven into so-called "grass cloth;" and in Scotland and some parts of England the stalks have been dressed, spun, and woven into linen as good as that made from flax; while the old German name for muslin, "nettle cloth," shows that it must have been at one time extensively used for weaving purposes on the Continent. The change in the estimation in which the nettle was held began when cotton was introduced from America, now a century or more ago; and in a few years the home grown plant was entirely superseded by the foreigner, and sank into the state of utter neglect and oblivion in which it has remained till within the last few years, when efforts have been made in Germany to draw attention once more to its capabilities and good qualities. After the exhibition in Philadelphia, when it became evident to the German manufacturers that they must bestir themselves in real earnest if they hoped to compete successfully with their neighbors in the future, Professor Reuleaux, their representative in America, seriously advised them to turn their attention to their own native industrial products, with a view to becoming less dependent on foreign countries. He reminded them among other things of the stinging nettle, and then people suddenly remembered that it had once been as highly esteemed as flax and hemp, and scientific men began to talk and write about the proper methods of cultivating it. For the most part, however, it was the foreign species which found favor in their eyes, and above all the snow white, stingless, Chinese nettle, which yields a glossy fiber, like the finest silk or spun glass. An enterprising lady, however, Madame Roeszler-Lade, had already determined to try what could be done with the common stinging nettle, the *Urtica dioica*, and made her first experiment on her own estates in 1878. It failed, simply and solely, as it would appear, because the peasants could not be induced to do as they were told, and were absolutely contemptuous when directed to treat the nettle stalks as they did their hemp. But now, when Professor Reuleaux came forward as the champion of the native nettle, Madame Roeszler-Lade applied to him for advice, and then planted her nettles on a piece of poor, rocky ground, having but a thin layer of soil; and this time she succeeded so well that, at an agricultural exhibition held in the autumn of 1877, she was able to exhibit specimens of nettle fiber in all stages of preparation, ending with the spun yarn. This was a triumph, and the unbelievers who had turned up their noses in derision were now convinced, and hundreds determined to begin growing nettles without delay, and this not only in Germany, but in Switzerland, Belgium, Hungary, Poland, Sweden, Austria, and North America. Two years later the first German "China grass" manufactory was established by Herr F. C. Seidel in Dresden, and after many failures and much expense he has succeeded in spinning the nettle fiber in a manner which is perfectly satisfactory. He uses the common nettle, but prefers the Chinese nettle as yielding, at present, a better looking and much stronger fiber.—*Cassell's Family Magazine.*

Reticulated Structure of Living Matters.

At a recent meeting of the New York Academy of Sciences, Mr. Romeyn Hitchcock read a paper on the above subject on the "Bioplasm Doctrine."

The speaker devoted most of his paper to objections to Heintzmann and Elsberg's claim of having discovered a reticulum or network in red and white corpuscles and in the amœba. He said that if these microscopists had seen it, others ought to be able to see it also. Few people, it is true, know how to *use* a microscope, but most people can see the most minute objects under a high power glass when it has been properly adjusted and focused, hence he denied Heintzmann's assertion that because a tyro can't see a thing is no proof that it don't exist.

The speaker had several elegant microscopes on the table fitted with the best high power objectives, and under one of these he placed an amœba, under another a pus corpuscle, and under two others red blood corpuscles, to demonstrate the fact that no *reticulum* or network exists, because none can be seen. It has been claimed that this reticulum contracts and expands, thus causing motion, and that some such reticulation is necessary to account for the motions of protoplasm, but it may be asked how this can of itself contract and expand. It is an explanation which fails to explain. The speaker next referred to the three sources of error in microscopic work first, error in illumination; second, error in the correction of objectives; third, errors in focusing. To demonstrate the reticulum on red blood corpuscles, it is necessary to touch them with a dilute solution of bichromate of potassium, but this causes them to become granular, and as this action continues, it breaks up the corpuscles. Such an effect was visible in one of the slides exhibited under the microscope. It is claimed that reticulum can be seen in the white corpuscles without this treatment, but such was not the case here. Minute granules can be seen in amœba, but no reticulum. In microscopy errors of interpretation are easily made; dots may merge into each other and be taken for lines, and such may have been the case in the amœba.

Dr. Schene made some interesting remarks on bioplasm, and thought that microscopists should make allowance for "personal errors," just as astronomers do in a different way.

Mr. George F. Kuntz then exhibited a specimen of cretaceous amber from the marl of Gloucester County, N. J. When found, the mass was 20 inches long, 6 inches wide, and about an inch thick, weighing 64 ounces, the largest ever found in New Jersey. Its specific gravity is 1·061. It was found at a depth of 28 feet, in the middle bed of the upper cretaceous, and was covered with greensand.

Several specimens of amber from other localities were also exhibited, including some very rare specimens from Sicily. Drs. Martin and Newberry and Messrs. Julian, Brittain, and Hadden took part in the discussion that followed. Prof. Hidden also exhibited some nuggets of gold from Burke County, N. C.

Drawbridge Safety Switches.

The New York, New Haven, and Hartford Railroad Company has adopted a set of drawbridge signals which, it is claimed, will render it absolutely impossible for an accident to occur. These signals are worked by a series of levers, five in number, the first two working semaphore signals at a distance of 1,900 feet and 800 feet, respectively, from a bridge. The other three work the switches of the siding and the lock of the bolt which holds the draw in place. Before the bridge can be unlocked, that a vessel may pass through the draw, these levers must be worked in their order. It is impossible to work them in any other way, the interlocking preventing the draw-tender or signalman from moving the higher numbered lever until he has first moved the lower number. He cannot, when the draw is closed, replace the levers except in the regular reverse order. It follows that a danger signal must first be shown at a distance of 1,900 feet from the draw, and if that warning to bring his train under control for a stop is neglected by the engineer, the signal is again given at 800 feet distant. Should this warning be neglected, the engineer will find his train shunted to a side track, and thus prevented from plunging into the open draw; for the draw cannot be opened unless it has been previously unlocked; it cannot be unlocked until the safety switch has first been unbolted and set for the siding; the switch cannot be set until the home signal has been set for danger, and the home signal cannot be set for danger until the distance signal has been so set. These operations are repeated on the other side of the draw, which is fitted with a bolt at each end. Supplemental apparatus is provided, so that the signalman may know at a distance of 1¼ miles that a train is approaching, so that the draw may not be opened and trains delayed unnecessarily. It is further claimed that when the draw, even if closed, should be unlocked, the safety switch cannot be thrown on the main line either by accident or design, and therefore no train can possibly run into the draw. By this apparatus the impossibility of a drawbridge accident is secured independently of the engineers, and the risk substituted is only that of running over a misplaced switch, and in this case the risk is reduced to a minimum by two outlying and interlocked signals which must show that danger if it exists.—*New York World.*

Biting Horses.

Horses have been successfully cured of this vice by putting a piece of hard wood an inch and a half square in the animal's mouth, about the same length as an ordinary snaffle bit. It may be fastened by a thong of leather passed through two holes in the ends of the wood, and secured to the bridle. It must be used in addition to the bit, but in no way to impede the working of the bit. Rarey adopted this plan with the zebra in the Zoo, which was a terrible brute at biting. Mr. Rarey succeeded, however, in taming and training him to harness, and drove him through the streets of London. Animals with this vice should be treated kindly in the stable, and not abused with pitchfork handles, whips, etc. An apple, crust of bread, a piece of beet, etc., and a kind pat, but firm, watchful hand and eye, with the use of the above wooden bit, will cure the most inveterate biter. The fact that he cannot shut his mouth or grip anything soon dawns upon him, and then he is conquered.—*Toronto Globe.*

A Burglar Trap.

A country store keeper in Connecticut having been annoyed by robberies of the contents of his cash drawer, lately contrived the following trap: He arranged in the floor a trap door which perfectly matched the boards of the floor. In the day time the door was securely fastened, but at night on leaving the store a catch was so fixed that the moment the unsuspecting burglar stepped on the door to operate on the money drawer, the trap door opened and dropped him into a pit in the cellar below. The sides of the pit were smooth and higher than a man's head, so that once dropped the burglar could not escape. The trap closed automatically by a spring, ready for a second burglar. A practical trial of the trap proved successful, for one morning the store keeper found evidence of an entrance to his store in the night and on looking into the pit discovered the imprisoned burglar. He coolly went about his business, and in due course had the burglar arrested.

A New Air Pump.

A double action mercury air pump, invented by Signor Serravalle, who was awarded a gold medal for it at a recent exhibition in Messina, is described in the *Rivista Scientifico-Industriale.* By a simple mechanical method two similar vessels are raised and lowered alternately with each other on opposite sides of a vertical support. A long caoutchouc tube connecting their bottoms lets mercury pass from one to the other. Each has at top a three way cock; one port of which in a certain position leads into a small open vessel to receive any excess of mercury, and another is connected by means of a caoutchouc tube with a spherical piece fixed laterally about the middle of the vertical support. This piece has three passages, communicating together; two of them are opposite each other, and lead into the tubes from the mercury vessels; the other is connected by tubing to the vessel to be exhausted of air. The three way cocks at the tops of the vessels are mechanically shifted at the top and bottom of their course by means of a toothed sector and rack in the one case, and a pin and projecting piece in the other.

The Cow Tree.

Sir Joseph Hooker, in his report on Kew Gardens, gives a sketch of a most interesting botanical curiosity, the *Palo de vaca*, or cow tree. This tree grows in forests at the foot of certain mountain ranges in Venezuela, and attains a height of 100 feet, and frequently the trunk reaches to 70 feet without a branch. The remarkable characteristic of the tree is the milk which exudes from the trunk when an incision is made. The flavor is of sweet cream with a slightly balsamic taste, but it is very wholesome and nourishing, the composition being said to approach very near the milk of the cow. From the fact that the milk is somewhat glutinous it would seem that the tree is of the caoutchouc order. Seeds which have been sent to Bombay and the colonies are said to be thriving well. It is noteworthy, as an example of the law of compensation traceable in nature generally, that this cow tree seems originally to have been a native of a country where milk giving animals were formerly totally unknown.

Simple Method of Measuring Refraction.

M. Piltschikoff describes an arrangement for measuring the refractive index of liquids of which one has but small quantities. A hollow lens is filled with the liquid, and with the aid of a graduated scale and a microscope one measures exactly the focal distance of a monochromatic flame placed at a given distance from the lens. The author gives a simple formula for calculating the index of the liquid, when the constants of the apparatus have been determined once for all. In one set of experiments, the index of glycerine was found=1·47298, with a probable error estimated at ±0·00001.

The Assistant Commissionership of Patents.

Mr. R. G. Dryenforth, late an Examiner in Chief in the Patent Office, has been nominated by the President and confirmed by the Senate for the office of Assistant Commissioner of Patents. Mr. Dryenforth is a man of ability, and well capable to fill the office. His confirmation was opposed before the Senate Committee. The principal objection came from a notoriously untrustworthy man. This fellow alleged crooked proceedings on the part of the Examiner in connection with the issue of certain patents; but it was a good deal like Satan rebuking sin.

Steel an Alloy.

Professor D. E. Hughes, F.R.S., recently read an important paper on the molecular rigidity of tempered steel before the Institution of Mechanical Engineers. From the experiments he has made, he strongly favors the view that steel, when tempered, is an alloy containing fixed carbon in a far greater quantity than when soft.

NEW subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of the year. Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1882, may be had at this office, or obtained through news agents.

R. J. FISHER, Jr., a Principal Examiner in the Patent Office, has been appointed Examiner in Chief, in place of Mr. Dryenforth, promoted to be Assistant Commissioner of Patents.

MECHANICAL INVENTIONS.

An improvement in spinning machines consisting of a revolving thread guide, has been patented by Mr. Thomas D. Wilmarth, of Providence, R. I. The great advantage of this invention is to relieve the thread or yarn of tension, so as to prevent stretching and breaking, and to produce a more even and a stronger yarn.

An improved adjustable window cornice has been patented by Mr. William C. Hamnett, of Toledo, O. The cornice is constructed so as to be drawn out the desired length, and then locked. Provision is also made for bay windows and niches of irregular forms. For persons who change their residence often, this invention is especially adapted.

A clothes rack constructed in such a manner as to afford a large amount of clothes receiving surface, which can be folded compactly for storage and transportation, and which when not required as a clothes rack can be readily arranged for use as a table, has been patented by Mr. William Klinschmedt, of Haddonfield, N. J. Thus one piece of furniture is made to accomplish two objects.

An improved feed winding regulator for spinning mules has been patented by Messrs. Edward H. Gilbert, of Ware, and Thomas H. Greenwood, of Hardwick, Mass. The object of the invention is to keep an even tension upon the thread, and thus make the thread of a uniform quality, and prevent "breakdowns" of the thread and the consequent waste of material.

An improved feather renovator has been patented by Mr. Augustus C. Dudley, of Nashville, Tenn. The invention consists of a jacketed cylinder mounted in supports by trunnions which supply steam to the cylinder and the jacket, respectively, in the renovating process. The cylinder is provided with an extension for the connection of the tick to receive the feathers, and a discharger for delivering the feathers into the tick after their treatment.

An improvement in means for attaching loose or removable handles to crosscut, pit, or other saws has been patented by Mr. Benjamin Goulton, of Kaco, Wangaroa, New Zealand. The invention consists in a blade which is furnished with a slot to which the handle of the sawbar is fastened by means of a cross rivet or pin, and of a secondary slot into which passes a pin which is fixed on a slide operated by a spring, which spring holds the pin firmly in the slot, but which can be readily pushed back by hand when the handle is to be removed.

An equalizing apparatus for pumping and other machinery has been patented by Mr. Charles Bridges, of San Fernando, Cal. This improvement is designed to be applied to powers where walking beams or levers for working pumps, etc., are employed. In a walking beam, one end of which is connected with the pump, and the other is attached to a large pinion wheel operated by a crank shaft, the invention consists in applying a balance weight and a secondary balance weight in such a way that not as much power is required to operate the pump as would otherwise be needed.

Messrs. Isaac Burnett and Joseph E. Clifton, of Geneseo, Ill., have recently patented an improved coal chute. The improvements relate to the construction and arrangement of coal chutes used for coaling locomotive tenders and other carriages, and to save time in the coaling operation, by the combination, with the coal box or chute, of a balanced apron, which, when turned down, forms a chute or slide for the coal to pass over. The gate of the coal box is automatically released when the apron is brought in place for discharge of the coal, and is ingeniously arranged for the purpose.

Mr. James M. Collier, of Atlanta, Ga., has patented an improved grinding mill. The invention is an improvement on a mill patented by Mr. Collier in 1882, and the object is to effect a more accurate adjustment of the parts, and thus render its facilities for grinding more perfect. By the use of a swiveled screw and hinged arm, combined with a lever attached to a shaft connected with the upper and lower stone carrying racks, the stones can be adjusted with accuracy. To the lower rack is fulcrumed a lever, which is connected with the upper rack by a rod and nut, so that the upper stone can be raised at will without changing its adjustment or set.

Matthew Van Tassel, of Brooklyn, N. Y., has recently patented an improved brake rod for cars, which he claims is more durable and less liable to break than the old style straight rods usually employed. The invention consists in a brake rod made with a U-bend at its rear end. The brake beam is placed upon the short arm of the brake rod, and the two arms are connected at the forward side of the brake beam by a link, so that the bending of the rod from the turning of the brake beam will be made to occur in the body of the rod. The rod thus constructed is less likely to crystallize, rendering it less likely to break when brought suddenly into action.

A novel fishing float has been patented by Mr. Ralph W. E. Aldrich, of Northampton, Mass. This invention consists of a float carrying a mast, sail, and fishing reel, the latter so arranged as to hold the line and to automatically signal the hooking of a fish, and at the same time give play line to the hooked fish. The mast is spring supported on the float and is adapted to be locked down flat upon the deck. The mechanism for locking the mast flat on the deck is at the same time adapted to lock the reel with as much line paid out as desired, according to the depth of the water and the kind of fish sought. The reel and locking mechanism are so arranged that the jerking of a fish at the hook will release locking mechanism, the reel, and also the mast, which will then be raised by its springs to a vertical position, unfurling the sail and giving the signal.

Mr. Silas Van Patten, of Duanesburg, N. Y., has patented an apparatus for loading and unloading wagons, an improvement upon a patent granted to same inventor Dec. 27, 1881. The invention consists in the combination, with the tongue, a slotted block attached to the rod sliding in the tongue, and the brake rod, of an elbow lever, and a bend formed upon the shaft of the brake lever, whereby the said sliding rod can be readily locked and unlocked. The band attached to the U-shaped end of the extension rod is made with a flange upon its upper side and a pin at its lower side to adapt it to serve as a stop for the neck yoke ring. The derrick is made curved and tubular, and is provided with a pulley at its upper end to receive the hoisting rope. The socket rings in which the derrick turns are provided with bushings to adapt them to receive different sized derricks. With the rear axle of the wagon is a clamp operated by a rod to grasp the hoisting rope and hold the load when partly raised and allow the apparatus to be readjusted.

AGRICULTURAL INVENTIONS.

An improvement which relates to means for attaching cultivator plows or teeth to the beam has been patented by Messrs. Amenzo W. Diefendorf and Peter H. Merrill, of Wyocena, Wis. The invention consists in a stock pivoted to the beam of the plow and provided with a groove for connecting the plow or tooth to the beam by bolting the shank of the plow in this groove. A strong leaf spring is attached to the back of the beam to hold the plow forward to its work, but capable of yielding to let the plow swing back to avoid any obstruction that may be too deeply embedded to be displaced by the plows.

An improved sulky plow has been patented by Mr Enoch C. Eaton, of Pinckneyville, Ill. The invention consists in a plow constructed in such a manner that it will be held steady and prevented from tipping toward either side, and can be raised from and lowered to the ground by operating a lever. Also the driver will be able to raise and lower the plow while at work by operating this lever with his foot, and will also be able to use the lever to assist in raising the plow from the ground. Also, should the plow incline to run out of the ground, it can be held down by pulling the foot lever slightly upward.

An improved check row corn planter has been patented by Mr. John J. Fraikin, of Ottawa, Ill. In using the machine the marker next the planted rows is kept raised. At the ends of the rows the other marker is raised. The machine is then turned, and as the cross ribs of the wheels come into a vertical position the pin which holds the push rod is inserted, and the lever locks the wheels from turning, and when the marker is over the mark made by the cross rib of the drive wheel at the last crossing, the push rod is again connected, the lever releases the wheels, and the machine is driven forward, planting the hills in accurate check row.

A combined seed planter and fertilizer distributer has been patented by Mr. Richard S. Wright, of Monticello, Ark. The machine consists of a distributing wheel attached to the axle of the vehicle and revolving with it, which is furnished with equidistant cups or cavities for receiving the grain from the hopper above. These cups may be closed, so that only one hill may be planted to every revolution of the wheel, or if left open as many as five or even six hills may be planted to every revolution. Within the hopper is arranged an agitator, which is rotated by a cog wheel attached to the wheels of the machine. To the draught shaft of the machine is attached a plow which opens the furrows, and in the rear are pivoted two other plows and a covering block, so arranged that the rows planted may be instantly covered. The covering block may be so adjusted as to make the hills of any required height.

An improved wheat grader and cockle separator has been patented by Mr. Judson N. Merchant, of Bloomingdale, Mich. The machine consists in two screen shoes arranged one above the other, the upper one being longer than the other and of such a size of mesh that the large grain will be carried down to the end of the shaft to fall into a reservoir prepared for it, while the small grain and chaff will fall through the screen into the slide below. The upper screen is agitated by the revolution of the drive shaft, which at the same time revolves certain rollers between which the grain is made to pass. In operation the grain passes from the screen shoes into the corrugated cylinders, whence it falls partly separated upon the revolving rollers and from thence on to other rollers, when the process of separation will be thoroughly accomplished. The wheat treated in this machine will be divided into two grades and all the small seeds will be removed from the wheat.

MISCELLANEOUS INVENTIONS.

A die for making clip king bolts has been patented by Mr. Nicholas Eccles, of Auburn, N. Y. The object of this invention is to manufacture clip king bolts by means of dies which produce a complete forging instead of blanks, as in the ordinary mode of making king bolts.

An improved nail extractor has been patented by Mr. George W Lewis, of Portsmouth, Va. The invention belongs to that class of nail extractors which are provided with a long handle for leverage, and a grasping claw for seizing the head of the nail or bolt to be withdrawn. It seems to be a very useful implement as now improved.

A novel window reflector has been patented by Mr. William H. Shipman, of Newark, N. J This invention is an improvement in the class of folding and adjustable mirrors which are adapted for use exteriorly to a window for the purpose of reflecting objects in the street or sidewalk, and the invention consists in placing mirrors in pairs in such angles and in such a manner that every portion of the street is brought within range.

An improved coffee pot, designed to extract the full strength of the coffee and free the liquid coffee from the grounds, has been patented by Mr. Edward H. Odend'hal, of Norfolk, Va. The invention consists in the employment of a chamber or base having tubes or pipes passing through it from a point on a plane a little above its lower end to a suitable height above it, and connected with a cylinder, on which is fitted a perforated vessel or strainer.

A new mechanical telephone, the object of which is to increase upon the line the vibrations given to the diaphragm by the voice, so as to insure greater loudness and clearness of tone, has been patented by Mr. Charles Egan, of Zanesville, O. The invention consists in employing two diaphragms, which are connected by wires that diverge from the center of the outer diaphragm, and are attached to the inner one at points between its center and edge.

A temporary binder of novel device has been patented by Mr. Joseph B. McNally, of Clearfield, Pa. The invention consists of a binder with a flexible back, one cover being furnished with two flexible prongs or fasteners which are to be forced through the sheets to be bound, and then inserted in holes in a metal strip and bent over. This metal band is also provided with a slot through which is passed and fastened a loop attached to the other cover, by means of which contrivance the two covers are closely bound to the sheets they are designed to hold together.

An improved fence, the object of which is to provide a fence which is portable, can be erected and taken down very easily and rapidly, and can be folded compactly for storage or transportation, has been patented by Mr. William McG Butler, of Dyersburg, Tenn. The invention consists in U-shaped clips attached to the ends of the slats, and provided with screw pintles which are passed through apertures in the posts, and in a polygonal base block provided with dovetailed recesses in the sides, which in combination with certain other elements form the details of the invention.

A very simple and effective permutation pad lock has been patented by Messrs. Frederick Michael and John W. Fowble, of Eaton, O. The invention consists of a long case with a hollow space extending longitudinally through it, into which perforations are made through which the attachment to the heads of tumblers project. These heads protrude through the case to enable the operator of the lock to manipulate the combination. On the plate of the lock and around the heads of tumblers an index and pointer is placed which act as a guide to the operator in setting the combination.

Mr. John Wilson Brown, Jr., of Baltimore, Md., has patented a machine for cutting green corn from the cob. This machine relates to that class in which the ear is forced by a plunger through a circular series of knives that cut the corn from the cob. The knives in this machine slide in radial grooves, and combined with the knives is a tapering feed throat which acts as a gauge, and in expanding to receive large ears of corn, expands the series of knives correspondingly. Between the cutting devices and the trough which receives the ears, a brush is arranged to clean the ear of silk or dross before it passes through.

An improved cotton gin rib has been patented by Mr. Jordan H. Mitchell, of Hatchechubbee, Ala. The invention relates to an improvement in that class of gin ribs that have at the point where the saw passes between them a steel plate for resisting the wear to which this part of the rib is subjected, and which plate, being detachable, may be removed and replaced by another whenever it becomes worn or defective. The invention consists in the peculiar construction of the detachable plate and the manner of fixing it in the face of the rib, which is claimed to be a great improvement over the old system.

A station indicator of improved device has been patented by Mr. John Van Fleet Ryerson, of New Brunswick, N. J. The invention consists in rolls, on which webs having the names of the stations and destination marked on them are wound and unwound, so as to expose to view at the proper time the several stations successively, and the ultimate destination of the conveyance. These rolls are actuated automatically by one or more springs, an automatic stop mechanism is used for holding the roll at measured points in its rotation by means of the actuating spring; for the purpose of exposing each station on the web a gong bell is likewise provided for attracting the attention of the passengers to each change in the indicator.

An improvement upon that class of meat chopping machines in which spring supported knives and a revolving block are used, the knives and block being operated by means of a sprocket shaft, has been patented by Mr. Henry R. Shirk, of Albion, Ind. This invention provides a machine simple in construction, which can be readily adjusted according to the material to be chopped, both in effect and the power required to operate it, and when the block becomes worn and has need of dressing-off, it may be removed, and when the chopping surface has been cleaned and removed, say to a depth of half an inch, the block is replaced; and in order that it may be brought in proper relations with the knives it is elevated by means of a screw placed underneath for that purpose, by which devices the machine is made very durable and lasting.

An automatic car brake, designed to be operated by the momentum of the train, has been patented by Mr Charles Van Dusen, of New Albany, Ind. In this brake two heavy rack bars, with buffers formed at their outer ends, are so supported under the car, one at each end, that they reach past the ends of the car and are capable of longitudinal movement. Arranged above the rack bars are two transverse shafts on which are secured grooved pinions, which mesh with the rack bars, and attached to these shafts are chains that connect with the brake levers. The inner ends of the rack bars are connected by chains that pass over the grooved pinions, and all of the rack bars in the train are upon the same line, except the rack bar of the tender, which is jointed and drops out of line while running; and this rack bar has practically no longitudinal movement. The tender is coupled longer than usual for furnishing the necessary slack in the train for putting on the brakes, and while running this slack is taken up by a hinged bumper, which must be raised for putting on the brakes. In putting on the brakes, at the same time the said bumper is raised, the jointed rack bar of the tender must be brought into line. The speed of the engine now being slackened, the momentum of cars will bring the buffer ends of the rack bars throughout the train together, causing them to have longitudinal movement, which will cause the pinions to lift the transverse shafts and thus wind up the brake chains, and set the brakes. Upon the forward movement of the train, the rack bars are brought to normal position by suitable springs, thus letting off the brakes.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Improvement in Sawmill Carriages.—Applicable to old and new mills; increases capacity and durability; tested in practical use. Entire patent for sale. M. Taplin, Boston, Mass.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description.

The Celebrated Wooton Desk. See adv., page 142.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

An assistant to distinguished electrical inventors for the last 15 years is open for an engagement. Address Electrician, 590 Pacific Street, Brooklyn, N. Y.

"A uniform" or "an uniform." Regardless of which is correct, the Esterbrook Steel Pen Company will still go on making pens of uniformly good quality. The stationers have them.

Again the H. W. Johns Manufacturing Co., of 87 Maiden Lane, N. Y., are in the front rank in the matter of non-conducting coverings for steam pipes, boilers, etc. Their recent contracts comprise, among many others, the boilers and pipes of the Goodyear Rubber Co., at Middletown, Conn.; the New York Car Steam Heating Co.; the new Scranton Steel Works, at Scranton, Pa.; and the five boilers of the Penn. R. R. Co.'s elevator. In the latter case their system of coverings is to replace another style which has proved to be comparatively worthless.

Wanted, by a Patent Solicitor, a good specification writer. Address, stating terms, "Solicitor," box 773, N. Y.

Machinery wanted for cutting paper mats oval and arch top. S. Goforth, 100 N. 10th St., Philadelphia.

Forsaith & Co., 209 Centre St., N. Y. city, have the following new, first-class modern engine lathes ready for instant shipment: 6′ x 16″, $300; 6′ x 18″, $325; 8′ x 18″, $345; 9′ x 18″, $355; 18′ x 18″, $385; 8′ x 20″, $375; 12′ x 20″, $415; 8′ x 22″, $550; 14′ x 26″, $700; 16′ x 26″, $736. Also, of new first-class upright drills, as follows: 18″, $110; 20″, $150; 24″, $185; 28″, $315; 32″, $365. One 48″ radial drill, $750. With a large stock of other machine tools.

James Hamblet, Electrical Clocks. P. O. Box 1414, N. Y.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 140.

Cope & Maxwell M'f'g Co.'s Pump adv., page 142.

Curtis Pressure Regulator and Steam Trap. See p. 140.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

Blake's Belt Studs, Belt Hooks, Belt Couplings Lace Cutters, Belt Punches. Greene, Tweed & Co., N. Y.

Gould & Eberhardt's Machinists' Tools. See adv., p. 141.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 140.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 140.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N. H.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

The Sweetland Chuck. See illus. adv., p. 142.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 124.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 125.

For Mill Mach'y & Mill Furnishing, see illus. adv. p 110.

Drop Forgings. Billings & Spencer Co. See adv., p. 109.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 110.

Mineral Lands Prospected, Artesian Wells Bored by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 108.

Steam Pumps. See adv. Smith, Vaile & Co., p. 110.

Scientific Books. See page 108. 100 page Catalogue free. E. & F. N. Spon, 44 Murray Street, N. Y.

Valuable manufacturing property for sale at Taunton, Mass., by Geo. Place Machinery Co., 121 Chambers St., N. Y.

Magic lanterns, stereopticons, cond. lenses, etc., on hand and made to order. C. Beseler, 218 Centre St., N. Y.

See New American File Co.'s Advertisement, p. 94.

Free.—"Useful Hints on Steam," a book of 96 pages, illustrated. By mail, 15 cents. E. E. Roberts, 107 Liberty Street, New York.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

Improved Skinner Portable Engines. Erie, Pa.

25″ Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Engines, 10 to 50 horse power, complete, with governor. $250 to $550. Satisfaction guaranteed. More than seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton. N. J.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York

Soapstone Packing and all kinds of Steam Packing, in lots to suit. Greene, Tweed & Co., New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

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

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) J. F. asks: 1. What is the best cement to make leather stick to iron pulleys? I have tried several with poor success. A. The following is said to be excellent: Soak equal parts of common glue and isinglass for ten hours in just water enough to cover them. Bring the whole to nearly the boiling point, and add pure tannin until the whole mixture becomes ropy, or appears like the white of eggs. Buff off the surfaces to be joined, apply the cement, and clamp firmly. The belt must not be used before the cement is thoroughly dry. 2. I have lagged the pulley which runs our electric light machine (the Edison), which is 46 inches diameter, driving the pulley on the machine, which is 10 inches diameter, 1,200 turns. What is the reason the lagging will not stay on the pulley? Is it the fault of the cement, or on account of the difference of diameters of the pulleys? A. It might be well to roughen the pulley, for it is probable that the speed at which it is run is too great, producing too much friction. Perhaps an endless rubber belt would be more serviceable.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

February 20, 1883,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Adding machine, W. H. Beatley ... 272,696
Advertising device, W. De Mesa ... 272,583
Air compressing apparatus, J. J. Lawler ... 272,711
Air compressing machinery, G. H. Reynolds ... 272,771
Alarm. See Railway crossing alarm.
Alcohol and other crude spirits, rectifying, Rousseau & De Barbeyrac ... 272,585
Amalgamating machine, ore, E. R. Lucas ... 272,531
Amalgamator, W. E. Harris ... 272,544
Amalgamator, S. G. Lindsey ... 272,564
Amalgamator, W. Moller ... 272,741, 272,742
Ammonia, apparatus for the manufacture of sulphate of, J. Coates ... 272,651
Animal trap, T. B. Zeller ... 272,507
Assay furnace, J. C. Tappeiner ... 272,599
Automatic double gate, Austin & Chamberlain ... 272,619
Awning, J. L. Rieger ... 272,772
Axle box, car, R. Zeppenfeld ... 272,508
Bag. See Filtering bag. Mail bag.
Baking pan, L. H. Graham ... 272,679
Bar. See Chain bar. Grate bar. Railway rail splice bar.
Battery. See Voltaic battery.
Bed bottoms, device for stretching, I. Lorenzen ... 272,721
Bed, folding, C. Williams ... 272,502
Belt fastener, H. C. Hart ... 272,685
Belts on shafting, mechanism for preventing the lapping of, W. Hayes, Jr. ... 272,687
Belting, device for joining the ends of leather, J. J. Brislin ... 272,523
Berth guard for sleeping cars, H. S. Billings ... 272,520
Bessemer plant, W. Hainsworth ... 272,683
Beverages, apparatus for rapidly cooling and straining mixed, W. J. Wright ... 272,506
Binder or holding device, W. B. Clough ... 272,650
Blacking, waterproof preservative, J. A. Van Keuren ... 272,606
Blind fastener, A. C. Dunham ... 272,417
Blind support, window, W. W. S. Orbeton ... 272,751
Block. See Toy block.
Blower, rotary fan, W. D. Smith ... 272,595
Board. See Pressing board.
Boat knee, D. True ... 272,603
Boats, building veneer, E. G. Durant ... 272,663
Boiler. See Heating boiler. Steam boiler.
Boiler furnace, steam, C. H. & S. S. Wilson ... 272,504
Boot and shoe nailing machine, S. Shepherd ... 272,486
Bottle stopper, W. L. Roorbach ... 272,775
Bottle washing machine, F. B. Seiberlich ... 272,484
Bottom support, H. W. Shepard ... 272,590
Bow, cross, G. Eger ... 272,418
Box. See Axle box. Fare box. Packing box. Photographic camera box. Stuffing box.
Bracelet, H. Cockshaw ... 272,829
Bracket seat, O. E. Briggs ... 272,522
Bridge, truss, D. B. Matlock ... 272,568
Buckle, J. A. Park ... 272,754 to 272,756
Buckle attachment, G. B. Northrup ... 272,748
Burner. See Gas burner.
Button, A. H. Savage ... 272,586
Button, J. S. Smith ... 272,491
Button and button fastener, A. McKevit ... 272,736
Button fastener, H. Schmoele ... 272,587
Button fastening, W. M. Hasel ... 272,836
Caisson, floating, P. H. Loud ... 272,722
Can. See Fluid can. Oil can.
Car, coal, D. Holt ... 272,550
Car coupling, J. W. Alexander ... 272,339
Car coupling, B. Cade ... 272,643
Car coupling, E. S. Graver ... 272,680
Car coupling, N. Halsted ... 272,430
Car coupling, W. A. & C. S. Hawkins ... 272,433
Car coupling, H. Kroblen ... 272,840
Car coupling, F. G. Lawrence ... 272,712
Car door, grain, D. D. Miles ... 272,455
Car, sleeping, W. H. Paulding ... 272,580
Car, stock, A. C. Mather ... 272,451
Car window deflector, H. B. Mears ... 272,738
Carboy stand, C. T. Armstrong ... 272,512
Carpet stretcher, Peterman & Smith ... 272,463
Carriage top, L. Schmetser ... 272,779
Carriage top-bow support, J. P. Whitman ... 272,814
Carrier. See Egg carrier.
Cartridge shell, H. G. Piffard ... 272,581
Case. See Draining case. Dressing case. Eyeglass case. Show case. Ticket case.
Casting shaft couplings, apparatus for, W. Tucker 272,800
Castings, facing for foundry, O. E. Weatherhead. 272,808
Ceiling, fireproof, A. W. Cordes ... 272,657, 272,658
Centering shafts, axles, etc., machine for, J. N. Kaufholz ... 272,704
Centrifugal machines, crushing attachment for, E. C. Knight ... 272,710
Chain bar, etc., E. S. Johnson ... 272,444
Chair. See Railway rail chair.
Chair, W. H. Paulding ... 272,579
Chair and cutting table, combined, B. A. Hathaway ... 272,434
Chair fastening device, T. M. Blackstock ... 272,406
Charcoal kiln, H. M. Pierce ... 272,766
Chimney cap or ventilator, W. D. Bartlett ... 272,517
Churn, G. R. Barnes ... 272,516
Cleaner. See Flue cleaner. Steam boiler cleaner.
Cloak, W. B. Dowse ... 272,537
Cloak, D. W. Howard ... 272,440
Clock, W. S. McLewee ... 272,737
Clothes drier, J. S. Gold ... 272,424
Clothes pin, B. B. Perkins ... 272,763
Coffee mill, O. J. Range ... 272,584
Coffee or tea pot, J. Vacheresse ... 272,802
Coffee pot and filter, A. Rutenick ... 272,481
Collar, horse, L. E. Woodard ... 272,824
Comb. See Curry comb.
Compass, recording, R. Pickwell ... 272,765
Conduits of concrete, apparatus for forming continuous, W. M. Campbell ... 272,411
Cool atmosphere in rooms and apartments, producing a, H. D. Cogswell ... 272,653
Cooling and freezing liquids, apparatus for, H. Egells ... 272,667
Cores, forming, S. J. Adams ... 272,612
Corn sheller, feed grinder, and horse power, combined, J. S. Tarr ... 272,495
Cotton gin hopper, E. G. Horne ... 272,694
Cotton opener and lapper, R. Kitson ... 272,709
Coupling. See Car coupling. Telegraph wire coupling. Thill coupling. Trace coupling.
Crane, brake mechanism for a trolley of a, T. A. Weston ... 272,608
Crimp protector, G. C. Humphries ... 272,603
Cultivator, F. H. Johnson ... 272,701
Cultivator, G. F. Skank ... 272,490
Cultivator and plow, combined wheel, E. L. Murray ... 272,460
Curry comb, W. E. Lawrence ... 272,558
Cut-off mechanism, J. Thomas ... 272,797
Cut-off valve, B. Webster ... 272,809
Cutter. See Fodder cutter. Pipe cutter. Sod cutter.
Dash pot bumper, F. G. Coggin ... 272,652
Davit for boats, J. F. Mumm ... 272,745
Desk cabinet, L. P. Ross ... 272,776
Desk, cabinet folding, L. P. Ross ... 272,777
Desk top, E. A. Paul ... 272,759
Diamond drill, J. P. Grissom ... 272,681
Disinfecting apparatus for water closets, Parker & Blackman ... 272,758
Ditches, machine for forming and cleaning, C. W. Case et al. ... 272,412
Door check, R. G. S. Collamore ... 272,531
Draught equalizer, G. M. Kerby ... 272,706
Draining and ventilating stores, etc., apparatus for, E. & W. C. Mentz ... 272,570
Draining case for barrels, Crapon & Pickett ... 272,415
Dress lining, S. W. Wheeler ... 272,513
Dressing case and wash stand, combined, J. Penney ... 272,467
Drier. See Clothes drier.
Drill. See Diamond drill. Grain drill.
Druggist's graduate, L. C. Leake ... 272,713
Dyestuffs for application to fibrous materials, preparing, H. W. Vaughan ... 272,499
Dyestuffs to fibrous materials, applying, H. W. Vaughan ... 272,498
Eccentric, R. R. Angell ... 272,511
Egg carrier, A. L. Hill ... 272,546
Ejector, Wickersham & Huston ... 272,816
Electric arc light, J. A. Wetmore ... 272,811
Electric underground conductor, R. M. Hunter ... 272,441
Electric wires, system of laying subterranean lines of, J. T. Goodfellow ... 272,538
Electrical currents, metallic circuit for, S. D. Strohm ... 272,792
Electro-magnetic regulator, R. H. Tucker ... 272,799
Electrotype or stereotype plate holder, H. G. Waterson ... 272,807
Elevator. See Water elevator.
Elevator safety attachment, N. P. Cleaves ... 272,413
Elevator safety gate, W. H. Ivers ... 272,563
Engine. See Gas engine. Hydropneumatic engine. Traction engine.
Envelope, D. Lubin ... 272,725
Evaporating pan, J. Shoemaker ... 272,784
Eyeglass case, C. H. Manning ... 272,450
Fan attachment, Crawford & Temple ... 272,416
Fan, exhaust or blower, W. W. Green ... 272,542
Fare box, J. B. Slawson ... 272,591
Faucet, M. Dinneen ... 272,536
Feather renovator, G. F. Tallman ... 272,795
Feed water, apparatus for removing impurities from, D. D. Wass ... 272,806
Feed water heater, J. W. Heylmun ... 272,689
Feed water heater for steam boilers, E. J. Hall ... 272,684
Feeder, automatic boiler, T. W. Mather ... 272,730
Fence, metallic, C. H. Salisbury ... 272,482
Fence wire, barbed, O. P. Briggs ... 272,407
Fence wire, barbed, H. A. Devendorf ... 272,534
Fence wire, barbed, E. S. Lenox ... 272,563
Fertilizer distributer, G. R. Lewis ... 272,716
Fertilizer distributer and grain drill, A. C. Hendricks ... 272,546
Filtering agent, J. W. Hyatt ... 272,442
Filtering bag, H. Muench ... 272,576
Fire escape, A. T. Brown ... 272,642
Fire extinguisher, automatic, C. L. Horack ... 272,698
Fire extinguisher, automatic, V. Vankeerberghen 272,803
Flour mill dust collector, F. Prins ... 272,473, 272,474
Flue cleaner, W. J. Bradshaw ... 272,640
Fluid can, W. H. & W. J. Clark ... 272,647
Fodder cutter, L. M. Batty ... 272,403
Form or stand, dress, G. M. Rockwell ... 272,479
Frame, braced, F. H. Beattie ... 272,627
Fruit gatherer, S. S. Hickok ... 272,690
Fruit stoner, L. C. Hill ... 272,549
Fuel, machine for twisting grass for, G. A. Parker ... 272,757
Furnace. See Assay furnace. Boiler furnace.
Gas, apparatus for the purification of coal, C. C. & W. T. Walker ... 272,804
Gas burner and pipe pliers, P. Mihan ... 272,573
Gas engine, L. C. Parker (r) ... 10,290
Gas purifying screen, E. M. Provonchar ... 272,582
Gate. See Automatic double gate. Elevator safety gate.
Gate, A. W. Chilcott ... 272,646
Gate, L. D. Meckley ... 272,739
Gearing and ungearing mills and other machinery, pinion lifter or apparatus for, Underwood & Daniels ... 272,605
Generator. See Steam generator.
Glycerine from fatty matter, extracting, Ams & Litzelmann ... 272,510
Gold washer, J. P. Spencer ... 272,788
Grain and seed cleaning mill, W. Bowen ... 272,637
Grain binder, J. P. Bullock ... 272,828
Grain binder, J. F. Steward ... 272,597, 272,598
Grain cleaning apparatus, W. Shaw ... 272,782
Grain drill, fertilizing, A. C. Hendricks ... 272,547
Grate, L. Bannister ... 272,514, 272,515
Grate bar, J. Ritchie ... 272,773
Grindstones, device for roughening, G. Andrews ... 272,615
Guard. See Berth guard. Pulley guard.
Gun magazine, P. Boch ... 272,636
Halter trimming, O. P. Letchworth ... 272,715
Harness back band hook, O. Pitts ... 272,767
Harness breast strap slide, J. A. Park ... 272,753
Harrow and cultivator, wheel, C. H. Eggleston ... 272,668
Harrow, riding, Mizhell & Hull ... 272,454
Hay and cotton press, W. J. F. Liddell ... 272,719
Hay rack, J. R. Steitz ... 272,791
Hay rake and loader, combined, W. W. New ... 272,747
Heater. See Feed water heater.
Heating boiler, steam, Hopkins & Fockler ... 272,692
Hedge trimming machine, M. Lowrey ... 272,843
Hitching device, horse, J. H. Osgood ... 272,466
Hoisting apparatus, hog, G. B. Flanigan ... 272,422
Hoisting machine, B. Harrington ... 272,431, 272,432
Hoisting machine, H. S. Haskins ... 272,439
Holdback, vehicle, J. H. Stamp ... 272,492
Holder. See Electrotype or stereotype plate holder. Whisk-broom holder.
Hook. See Harness back band hook.
Hoop fastening for buckets, etc., H. B. Phillips ... 272,469
Horseshoe, H. Olson ... 272,750
Horseshoe calk, removable, F. Fawcett ... 272,672
Hydropneumatic engine, L. G. Cook ... 272,656
Ice cream freezer, C. W. Packer ... 272,752
Ice creeper, A. W. Eichelberger ... 272,669
Incubator, A. H. Morgan ... 272,744
Indicator. See Train indicator.
Injector and ejector, combined, G. H. Little ... 272,448
Insulated electric conductor, A. A. Cowles 272,659, 272,660
Irrigating agriculture and other lands, M. A. Martindale ... 272,728
Jack. See Lifting jack.
Jar and bottle stopper, J. H. Wood ... 272,823
Joint. See Screw joint.
Kiln. See Charcoal kiln.
Knife. See Roofing knife.
Knitting machine, W. Carter ... 272,529
Knitting machine, G. A. Leighton ... 272,560, 272,561
Knitting machine, circular, G. A. Leighton ... 272,559
Knockdown table, G. D. Post ... 272,471
Lacing books, machine for making, S. N. Smith ... 272,787
Ladder, top extension step, M. G. Gartrell ... 272,540
Lamp, R. Marsh ... 272,567
Lamp support, tubular, J. Krummenauer ... 272,842
Lamp, tubular, J. Krummenauer ... 272,841
Lathes for turning crank-pins, attachment to, J. W. Wilbraham ... 272,820
Lifter. See Stove cover lifter.
Lifting jack, J. S. Kirkwood ... 272,837
Light. See Electric arc light.
Lock. See Nut lock. Padlock. Seal lock.
Lock, E. P. Teeters ... 272,796
Locomotive, A. A., E. & H. Blackman ... 272,633
Locomotive sanding device, J. B. Collin ... 272,414
Lubricator, A. W. Swift ... 272,793
Mail bag, I. H. Northrup ... 272,577
Match cards, machine for sawing, Flewwelling & Harris ... 272,675
Measuring and cutting out garments, apparatus for, W. Abrahart ... 272,611
Measuring and weighing grain, apparatus for, F. C. Mason ... 272,729
Measuring machine, cloth, F. Sanderson ... 272,483
Mechanical movement, G. R. Peare ... 272,760
Metal, chill for chilling, W. Tuttle ... 272,497
Meter. See Water meter.
Middlings purifier, F. Prins ... 272,475
Milk skimming device, W. Coldits ... 272,655
Mill. See Coffee mill. Grain and seed cleaning mill. Roller mill. Sawmill. Windmill.
Motion, mechanical device for changing reciprocating to rotary, A. Trousdale ... 272,602
Motor. See Rotary motor. Spring motor.
Motor, H. W. Gurney ... 272,429
Mule, self-acting, E. A. Baldwin ... 272,401
Nail or spike, W. Taylor ... 272,600
Neckwear shield, D. E. Mayer ... 272,731
Nut lock, J. M. Mack ... 272,565
Nut, top prop, A. Searls ... 272,589
Nut, top prop, H. Smith ... 272,594
Oil can, E. R. Deverall ... 272,535
Ore concentrating and amalgamating machine, D. H. Anderson ... 272,614
Ore concentrator, Adams & Carter ... 272,509
Ottoman, W. S. Wright ... 272,825
Packing box, reshipping, W. M. Baker ... 272,513
Padlock, C. H. Smith ... 272,593
Pails, pouring spout for milk, H. Leonard ... 272,714
Pan. See Baking pan. Evaporating pan.
Paper cutting machine, W. F. Hill ... 272,438
Paper, damping and cutting, W. Scott ... 272,588
Pencil, lead, G. L. Jaeger ... 272,700
Photographic camera box, E. B. Barker ... 272,623
Photographic cameras, plate holder for, W. H. Lewis ... 272,717
Pick, J. C. Cramer ... 272,661
Pile, iron, Gray & Abbott ... 272,426
Pin. See Clothes pin.
Pipe cutter and tongs, J. W. Calef ... 272,526
Pipe elbow, sheet metal, A. F. Peters ... 272,764
Pipe into sections, apparatus for cutting sewer, R. W. Lyle ... 272,727
Pipes of concrete, apparatus for forming underground, W. M. Campbell ... 272,410
Plane, recess, H. L. Tupper ... 272,801
Planter and cultivator, combined seed, J. J. Birdsong ... 272,632
Planter, automatic check row, W. H. Johnson ... 272,703
Planter check row lines, anchor for corn, A. Barnes ... 272,402
Planter check rower attachment, seed, L. Eberhart ... 272,538
Planter check rower, seed, F. C. Randall ... 272,476
Planter, corn, J. E. Bering ... 272,404
Plow, rotary, G. A. Betancourt ... 272,631
Pool ball rack, W. F. Whitney ... 272,609
Portable press, W. J. F. Liddell ... 272,718
Pot. See Coffee pot. Coffee or tea pot.
Press. See Hay and cotton press. Portable press. Printing press.
Pressing board, tailor's, J. Neerpasch ... 272,746
Printing machine, S. D. Tucker ... 272,604
Printing machine, J. T. Hawkins ... 272,834
Printing press, J. T. Hawkins ... 272,835
Printing press air cushioning device, G. P. Fenner ... 272,673
Printing press gripper motion, G. P. Fenner ... 272,674
Printing presses, automatic feeding device for, C. Ellery ... 272,419
Projectile for carrying and discharging oil, W. D. Baker ... 272,400
Protector. See Crimp protector.
Pulley guard, band, C. E. Frick ... 272,677
Pump condenser, steam, W. A. Miles ... 272,456, 272,457
Pump, force, A. Annibale ... 272,616
Pump piston, J. O. Davis ... 272,663
Pump reel, chain, W. P. Harrison ... 272,433
Pumping engine condenser, W. A. Miles ... 272,458
Purifying, heating, and condensing apparatus, G. B. Field ... 272,831
Rack. See Hay rack. Pool ball rack.
Railway crossing alarm, J. A. B. Lovett ... 272,723
Railway rail chair, Armstrong & Abbott ... 272,617
Railway rail splice bar, I. Nutt ... 272,749
Railway rail, street, T. L. Johnson ... 272,554
Railway rails, hot bed for cooling, W. K. Seaman. 272,781
Railway signal, N. Allen ... 272,613
Railway signal, electric, E. L. Orcutt ... 272,464
Railway signal and switch system, electric interlocking, Knight & Baker ... 272,839
Railway sleeper, metallic, H. Reese ... 272,477
Railway switch, W. Spielman ... 272,789
Ratchet wrench, J. W. Womelsdorff ... 272,822
Reel. See Pump reel.
Refrigerated air and water, system of and apparatus for producing and distributing, H. D. Cogswell ... 272,654
Regulator. See Electro-magnetic regulator.
Resawing machine, Jones & Wetherell ... 272,445
Roller mill, C. B. Campbell ... 272,644
Rolling steel springs, roll for, D. F. Kansley ... 272,556
Roofing knife or tinner's scraper, G. J. Cline ... 272,649
Rotary engine, T. & J. W. Wilbraham ... 272,818
Rotary motor, G. Lenhardt ... 272,562
Rug making machine, O. Huff ... 272,697
Sash fastener, H. J. England ... 272,671
Saw and edge moulder, scroll, A. Showalter ... 272,785
Saw gauge, rip, T. A. McDonald ... 272,734
Sawmill, J. C. Wuerfel ... 272,610
Sawmill, reciprocating, J. H. Berkshire ... 272,630
Sawmill dog, G. F. Knight ... 272,838
Saw setting and jointing device, Beach & Burch ... 272,625
Saw teeth, device for dressing, S. H. Chase ... 272,530
Saw teeth, machine for swaging, J. Orm ... 272,465
Scale for weighing diamonds, balance screws of watches, etc., F. F. Ide ... 272,699
Screen. See Gas purifying screen.
Screw, W. Schilling ... 272,778
Screw grinding apparatus, H. A. Rowland ... 272,480
Screw joint for metal pipe fittings, W. A. Miles ... 272,574
Seal lock, J. C. Rae ... 272,769
Seaming sheet metal cans, double, F. A. Walsh ... 272,500
Seat. See Bracket seat. Vehicle shifting seat.
Sewing machine, T. A. Macaulay ... 272,844
Sewing machine, D. Mills ... 272,740
Sewing machine, boot and shoe, C. Brown ... 272,409
Sewing machine buttonhole attachment, J. W. Cameron ... 272,527
Sewing machine feeding mechanism, G. R. Peare 272,761
Sewing machine guide, N. B. Williams ... 272,503
Sewing machine quilting attachment, A. Heartsill 272,688
Sewing machine ruffling attachment, T. B. Garretson ... 272,423
Sewing machine ruffling attachment, C. Grotz ... 272,427
Sewing machine, sole, McKay & Hoadley ... 272,735
Sewing machine trimming attachment, Wallace & Griffin ... 272,805
Sewing machine trimming mechanism, C. H. Bayley ... 272,519
Shade rollers, swinging bracket for, G. Lockhart 272,449
Shingle machine, J. P. Bowling ... 272,638, 272,639
Ships and the rate of currents, electric log or apparatus for ascertaining the speed of, R. M. Lowne ... 272,724
Shirt, W. E. Hubbard ... 272,696
Shirt, M. O. West ... 272,810
Shoes or gaiters, manufacture of, O. E. Mellenny. 272,453
Shoes, toe piece for rubber, J. L. Thomson ... 272,601

Show case and separator, combined, E. Jones..... 272,708
Signal. See Railway signal.
Sleigh, L. Debolt, Jr.................... 272,532
Sod cutter, A. Test.................... 272,496
Speaking tube attachment, F. Gould.............. 272,541
Spectacles, J. L. Borsch.................... 272,521
Speed changing device, T. J. Perrett.............. 272,763
Spigot, self-closing, F. Mayer.................... 272,732
Spike, H. W. Fowler.................... 272,676
Spinning maching spindle bearing, J. Birkenhead (r).................... 10,288
Spinning spindle bearing, W. T. Carroll.............. 272,528
Spittoon, J. Bassemir.................... 272,518
Spoke socket, C. E. Merrifield.................... 272 571
Spring motor, J. Fearn.................... 272,830
Stamp, steam power, W. S. Sharpneck.............. 272,485
Stand. See Carboy stand. Stove stand.
Steam boiler, Oldham & Payne.................... 272.578
Steam boiler cleaner, C. Reiser.................... 272,770
Steam boiler, straw burning, W. R. Michener..... 272,453
Steam engine reversing gear, W. A. Clarke........ 272,648
Steam generator, H. P. & R. E. Tilton.............. 272,798
Steam shovels, method of and device for the application of cable power to, Starke & Crowley.. 272,790
Steel ingots for rolling, preparing, W. Hainsworth. 272,682
Stocking supporter, A. N. Horner.................... 272,695
Stone or metal, manufacturing artificial, Simon & Petit.................... 272.786
Stopper. See Bottle stopper. Jar and bottle stopper.
Store service apparatus, H. Hayden.................... 272,686
Stove and furnace grate, W. McClave.............. 272.733
Stove cover lifter, N. L. Post.................... 272,472
Stove stand, oil, F. Baier.................... 272.620
Stove, vapor, W. C. North.................... 272,462
Stove ventilator, cooking, J. F. Linscott.......... 272.720
Stoves, steam heating attachment for, W. H. Pratt.................... 272,768
Straw stacker, C. E. Merrifield.................... 272,572
Stuffing box for journals, J. W. Wilbraham........ 272.819
Suction ventilator, E. S. Radcliff.................... 272,583
Surveying instrument, C. W. Stickney.............. 272,494
Table. See Knockdown table.
Tap, W. H. Goodwin.................... 272,425
Tap wrench, M. S. Brooks.................... 272,408
Tap wrench, R. F. Rice.................... 272,478
Telegraph wire cable, N. M. Rittenhouse.......... 272,774
Telegraph coupling, G. Brott.................... 272,524
Telegraphs, signaling apparatus for district and fire alarm, T. A. Casey.................... 272,645
Telephone exchanges, alarm signal apparatus for, E. A. Woelk.................... 272,505
Thill coupling, G. W. Beebe.................... 272,628
Thrasher stacker, D. Sherry.................... 272,487
Thrasher stacker base, Sherry & Robinson........ 272.488
Thread guide and tension device, R. Wharton.... 272,812
Ticket case, J. L. Kirk.................... 272,708
Tile, illuminating, D. G. Beeching.................... 272,629
Tin, etc., machine for cutting, G. B. Wiggin........ 272,501
Tire tightening apparatus, P. & J. Young.......... 272.826
Tongue, wagon, T. B. Sykes.................... 272,794
Top, C. M. Kimball.................... 272,707
Toy block, R. H. Ingersoll.................... 272,443
Toy kitchen, E. Durlach.................... 272,665
Toy stove, E. Durlach.................... 272,664
Toy wagon, J. Murray.................... 272,461
Trace coupling, J. M. Basinger.................... 272,624
Traction engine, J. H. Elward.................... 272,670
Traction engine, Lippy & Hughes.................... 272,447
Traction engine, C. D. Monnot.................... 272,743
Train indicator, O. M. Shepard.................... 272,783
Transferring designs, J. M. Moss.................... 272,575
Trap. See Animal trap.
Truck, car, E. B. Meatyard (r).................... 10,289
Truck, hand, E. Wickersham.................... 272,817
Trunks, desks, etc., supporting device for, A. Montant.................... 272,459
Tube scraper, C. P. Higgins.................... 272,437
Tug, hame, T. Broderick.................... 272,641
Undershoe, H. E. Pond.................... 272,470
Valve, J. H. Blessing.................... 272,634
Valve, M. M. Zellers.................... 272,827
Valve, stopcock, and blow-off valve, combined check, J. H. Blessing.................... 272,635
Valve, three-way, B. Fitts.................... 272,421
Vault cover or grating tile and surfaces made of the same, illuminating, T. Hyatt.............. 272,551
Vehicle shifting seat, R. Fawcett.................... 272,420
Vehicle, two-wheeled, J. G. Gay.................... 272,678
Vehicle, two-wheeled, G. P. Kimball.............. 272.557
Vehicle, two-wheeled, E. Whitmore.............. 272,8'5
Vessel hull, D. Bainbridge.................... 272,621
Ventilator. See Stove ventilator. Suction ventilator.
Voltaic battery, J. M. Stebbens.................... 273,493
Wagon, dumping, C. Kaeppel.................... 272,555
Wagons, detachable step for farm, J. Hallett...... 272.543
Wagons, lock for top boxes of, T. Fleming........ 272,832
Wall paper hanging machine, M. Heffernan........ 272,436
Washer. See Gold washer.
Washing machine, J. R. Martindale.............. 272,666
Washing machine, F. Schwarz.................... 272.780
Watch escapement, G. F. Jacot.................... 272,553
Watch, stop, Henchoz-Arnold & Henchoz-Huguenin.................... 272,545
Water closet, J. Foley.................... 272,539
Water closet, urinal, and cesspool, J. B. Berlier . 272,405
Water elevator, H. W. Norwood.................... 272,463
Water meter, piston, F. Walker.................... 272.607
Water wheel, bucket, C. D. Smith.................... 272,592
Water wheel, turbine, M. D. Grow.................... 272,428
Water wheel, turbine, B. Keiser.................... 272,705
Waterproofing fabrics, W. McNeil.................... 272,569
Well, B. F. Stephens.................... 272,596
Wheel. See Water wheel. Wind wheel.
Wheel runner, H. Holland.................... 272.691
Whisk-broom holder, C. E. Kidder.................... 272,446
Wind wheel, J. C. Butler.................... 272,525
Wind wheel, A. Sherwood.................... 272,489
Winding cops, quills, bobbins, etc., machine for, E. Barton.................... 272,623
Windmill, J. M. Mack.................... 272,566
Windmill, W. E. Williams.................... 272,821
Windmills, etc., attachment to, D. Austin........ 272,618
Wrench. See Ratchet wrench. Tap wrench.

TRADE MARKS.

Cigars, cigarettes, and smoking tobacco, Towle, Carle & Co.................... 10,060
Dentifrice, R. Fingerhut.................... 10,063
Fertilizers, Imperial Guano Company.............. 10,057
Flour, wheat, Lawton Brothers.................... 10,058
Lard packages, Menacho, Puig & Co.............. 10.065
Needles, sewing, J. Smith & Son.................... 10,066
Organs, reed, J. Bellak.................... 10,061, 10,062
Silk piece goods, H. L. Gargan.................... 10.056
Stoves and furnaces, heating and cooking, Peninsular Stove Company.................... 10,059
Stoves, certain preparation for cleaning and polishing, Lustro Company.................... 10,064

DESIGNS.

Carpet, E. Fajon.................... 13,623
Carpet, E. Fisher.................... 13,624
Carpet, H. Horan.................... 13,625 to 13,627
Carpet, W. McCallum.................... 13,629
Carpet, D. McNair.................... 13,630
Carpet, T. E. Meagher.................... 13.628, 13.631
Carpet, T. Onslow.................... 13,633, 13,634
Carpet, E. Poole.................... 13,636, 13,637
Carpet, O. Righter.................... 13,640 to 13,644
Carpet, E. G. Sauer.................... 13,646
Carpet, T. J. Stearns.................... 13,647, 13,648
Carpet, C. W. Swapp.................... 13,649, 13,650
Curtain band, I. Dreyfus.................... 13,622
Fringe, J. L. O'Brien.................... 13,632
Gate, J. Pirkl.................... 13,635
Glassware, W. F. Russell.................... 13,645
Hand wheel, L. Bailey.................... 13,621
Step pad, J. L. Pope.................... 13,638, 13,639
Type, printing, H. H. Thorp.................... 13,651

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to 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 Thursday morning to appear in next issue.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to 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 Thursday morning to appear in next issue.

ONE THOUSAND TONS METALLIC SHINGLES

Are now being used by the W. S. and B. R. R. on depots between New York and Buffalo.
Manufactured by the
ANGLO-AMERICAN ROOFING CO.
22 CLIFF STREET, NEW YORK.
And 221 Dudley Road, Wolverhampton, Eng.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia.
Our stock comprises the literature of every branch of science applied to the arts. Catalogues free to any address in the world.

H. W. JOHNS' ASBESTOS

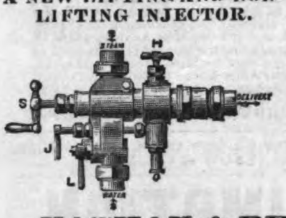
ASBESTOS ROPE PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS SHEATHINGS,
ASBESTOS GASKETS,
ASBESTOS BUILDING FELT.
Made of strictly pure Asbestos.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York,
Sole Manufacturers of H. W. Johns' Genuine
ASBESTOS LIQUID PAINTS, ROOF PAINTS, ROOFING, STEAM PIPE AND BOILER COVERINGS, FIREPROOF COATINGS, CEMENTS, ETC.
Descriptive price lists and samples free.

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 CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2d and 3d Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
☞ Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

The "MONITOR."

A NEW LIFTING AND NON-LIFTING INJECTOR.



Best Boiler Feeder in the world.
Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.
Also Patent
EJECTORS
OR
Water Elevators,
For Conveying Water and Liquid.
Patent Oilers, Lubricators, etc.
NATHAN & DREYFUS,
Send for catalogue. 92 & 94 Liberty St., New York.

NUT TAPPING MACHINE.

DURRELL'S PATENT.
No. 1 Machine, 900 lb., 7 spindles.
" 2 " 1,050 " 7 "
" 2 " 600 " 3 "
Capacity of 7 Spindles, 8,000 per 10 hours.
Acknowledged to be an indispensable tool. Manufactured by
HOWARD BROS.,
Fredonia, N. Y.

THE BEST THE DUEBER WATCH CASE

Establ'd EAGLE ANVILS. 1843.

Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

BARNES' PATENT
Foot and Steam Power Machinery.

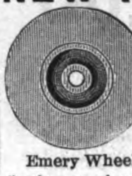
Complete outfits for actual workshop business. Lathes, Saws, Formers, Mortisers, Tenoners, etc. Machines on trial if desired. Descriptive Catalogue and Price List Free.
W. F. & JOHN BARNES,
No. 1,999 Main St., Rockford, Ill.

SHAFTS PULLEYS HANGERS

At Low Prices. Large Assorted Stock.
A. & F. BROWN, 43 Park Place, New York.

NEW YORK BELTING AND PACKING COMP'Y.

The Oldest and Largest Manufacturers of the Original
SOLID VULCANITE EMERY WHEELS.



Emery Wheel.

All other kinds Imitations and Inferior [...] is stamped in full upon all our standard BELTING, PACKING, and HOSE.
Address NEW YORK BELT[...] PACKING CO.,
JOHN H. CHEEVER, Treas. [...] PARK ROW, NEW YORK.
SPECIAL NO[...].
Owing to the recent great fire in the "World" Buildi[...] [...]ice has been removed as above.

BLISS'S AMERICAN WONDER PEA.

Extra Early, Very Dwarf (8 to 10 inches), Requires no Bushing, Exquisite Flavor.

Acknowledged by all to be the best and earliest Pea grown.
CAUTION.—As there is another Pea in the market called "American Wonder," send to us and get the genuine *Bliss's American Wonder.*
PRICES.—Half pint package, 25 cents; pint, 45 cents; quart, 80; by mail, post-paid.

D. K. BLISS & SONS'
HAND BOOK for the FARM & GARDEN.

300 BEAUTIFUL ILLUSTRATIONS
With a richly colored plate of a Group of Carnations, and a descriptive priced list of 2,000 varieties of FLOWER and VEGETABLE seeds—with much useful information upon their culture—150 pages—mailed to all applicants enclosing 6 cents.
Our Illustrated Novelty Sheet, containing a description of all the Novelties of the season, mailed free to all applicants.
Bliss's Illustrated Potato Catalogue, containing a list of 500 varieties Potatoes, with explicit directions for culture—50 pages, 10 cents.
D. K. BLISS & SONS, 34 Barclay Street, New York.

The Sugar Refineries at Demerara Use
VAN DUZEN'S PATENT
STEAM JET PUMP.

All Brass, no valves, no moving parts. The best and cheapest Steam Pump made for raising *Water, Juices, Sirups,* etc. (hot or cold) to heights not exceeding 60 feet vertically. Is also used as force pump for Fire purposes with hose and nozzle. Warranted satisfactory, reliable, and superior to all others. Ten sizes: $7, $8.50, $10.50, etc., and capacities to 20,000 gallons per hour. Send for "Catalogue No. 49."

TO MANUFACTURERS AND USERS OF SPRING KEYS AND COTTERS.—I have a patent on article superior to either, which I will sell. Will also sell patent on the simplest, most

durable, and fastest working device ever made for bending cotters and flat keys. Address
WILLARD H. FOX, New Haven, Ct.

TOOPE'S PATENT
Asbestos Lined Removable Covering,

Made of Felt and Asbestos. For use on STEAM BOILERS and PIPES, Refrigerators, Meat Cars, Ice Houses, and HOT and COLD WATER PIPES. Easily applied by any one. Address CHALMERS-SPENCE CO.,
23 John St., New York.

PATENT
JACKET KETTLES,

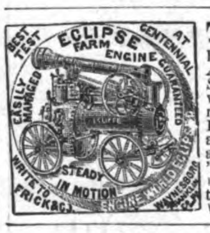
Plain or Porcelain Lined. Tested to 100 lb. pressure. Send for Lists.
JAMES C. HAND & CO.,
614 and 616 Market St., Philadelphia, Pa.

PATENT
Self-Oiling Loose Pulley.

Fully tested by several years' use and found reliable.
SATISFACTORY RESULTS
guaranteed, if directions are followed. Orders filled for Pulleys from 6 in. to 20 in. diameter.
LANE & BODLEY CO.,
CINCINNATI, OHIO,
MANUFACTURERS
Shafting, Steam Engines, Boilers,
SAW MILLS, AND GENERAL MACHINERY.

FEED WATER HEATERS.

THE BEST AND CHEAPEST IN THE MARKET.
Warranted to heat water by exhaust steam from 206° to 212° Fahrenheit.
For description and price, apply to
THE NATIONAL PIPE BENDING CO.,
New Haven, Conn.



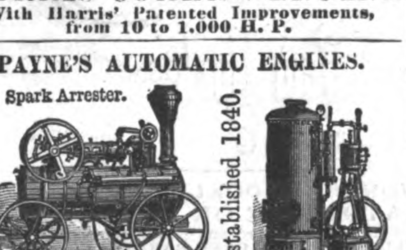
The Eclipse Engine

Furnishes steam power for all *Agricultural* purposes, *Driving Saw Mills,* and for every use where a first-class and economical Engine is required. Eleven first-class premiums awarded, including Centennial, '76. Refer to No. 7, issue of '77, No. 14, issue of '78, of SCIENTIFIC AMERICAN, for Editorial illustrat'ns. FRICK & CO., Waynesboro, Franklin Co., Pa.

WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE

With Harris' Patented Improvements, from 10 to 1,000 H. P.

PAYNE'S AUTOMATIC ENGINES.



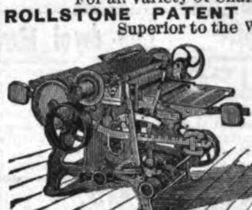
Reliable, durable, and economical, *will furnish a horse power with one-third less fuel and water than any other engine built, not fitted with an automatic cut-off.* Send for Illustrated Catalogue "A 2" for information and prices. Box 1207.
B. W. PAYNE & SONS, Corning, N. Y.

"Moore County Grit" CORN MILLS

AND
Corn Mill Stones,
ALL SIZES.
Best in the world. Samples of meal sent on application.
North Carolina Mill Stone Co.,
WESTMINSTER, MD.

IMPROVED ROTARY BED PLANER

BACKKNIFE GAUGE LATHE,
For all variety of Chair Legs, etc., etc.
ROLLSTONE PATENT VARIETY LATHE,
Superior to the Waymouth.



Pattern Maker's Lathe, Fuzz Planers, Band, Jig, and Swing Saws, Wardwell Pat. Saw Bench, Rod Machines, Boring Machines, etc., etc. Dealers in Second-hand Iron and Wood Working Machinery. Engines and Boilers, etc., etc. Send stamp for catalogue and address Rollstone Machine Co., 48 Water St., Fitchburg, Mass., U. S. A.

THE MEDART PATENT WROUGHT RIM PULLEY,

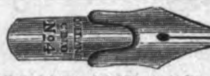
MADE BY
McMURRAY & STOUGHTON,
HARTFORD, CONN.

ROCK DRILLS & AIR COMPRESSORS.

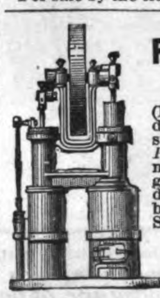
INGERSOLL ROCK DRILL CO.,
1 PARK PLACE NEW YORK.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.



JOHN HOLLAND, 19 W. 4th St., Cincinnati, O.,
Manufacturer of all styles of **Best Quality Gold Pens.** Pen and Pencil Cases, Gold Toothpicks, etc.
Our pens received the highest award at Philadelphia Exposition "for great elasticity and general excellence." See judges' report, published by Lippincott & Co.
For sale by the trade. Illustrated lists mailed free.



THE
RIDER COMPRESSION PUMPING ENGINE

(Hot Air), for city or country residences where it is required to raise a supply of water, is the most *Perfect Pumping Machine* in the market. Its marvelous *Simplicity,* absolute *Safety,* great *Economy* and *Effectiveness,* render it far superior to all others. Can be run by any inexperienced person. Send for catalogue and price list to
CAMMEYER & SAYER,
93 Liberty St., New York,
and 20 W. Lake St., Chicago, Ill.
Please mention this Paper.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,

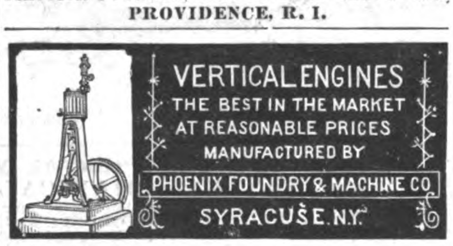
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.
This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.
(Descriptive catalogues forwarded on application.)
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.
All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.
Information furnished upon application.
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

Leffel Water Wheels,

With Important Improvements.
11,000 IN SUCCESSFUL OPERATION.
FINE NEW PAMPHLET FOR 1883
Sent free to those interested.
JAMES LEFFEL & CO.,
Springfield, Ohio.
110 Liberty St., N. Y. City.

VOLNEY W. MASON & CO.,
FRICTION PULLEYS, CLUTCHES, and ELEVATORS,
PROVIDENCE, R. I.



Working Models

And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

COLUMBIA BICYCLE.

This easy running, staunch, and durable roadster is the favorite with riders, and is confidently guaranteed as the best value for the money attained in a Bicycle. Send 3c. stamp for 36-page Catalogue, containing price list and full information.
THE POPE M'F'G CO.,
597 Washington St., Boston, Mass.

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

UPRIGHT DRILLS 16 TO 60 INCH SWING BORING & TURNING MILLS

TO SWING 48, 66 & 84 INCHES H. BICKFORD
CINCINNATI, OHIO.

ERICSSON'S New Caloric Pumping Engine

FOR
DWELLINGS AND COUNTRY SEATS.
Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS

C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

KORTING UNIVERSAL INJECTOR

FOR BOILER FEEDING.
Operated by one handle.
WILL LIFT HOT WATER.
POSITIVE ACTION GUARANTEED UNDER ALL CONDITIONS.
NO ADJUSTMENT FOR VARYING STEAM PRESSURE.
WILL LIFT WATER 25 FEET. SEND FOR DESCRIPTIVE CIRCULAR.
OFFICES AND WAREROOMS:

PHILADA., 12TH & THOMPSON STS.	NEW YORK, 109 LIBERTY ST.
BOSTON, 7 OLIVER ST.	CHICAGO, 84 MARKET ST.
AUGUSTA, GA., 1026 FENWICK ST.	ST. LOUIS, MO., 709 MARKET ST.
DENVER, COL., 438 BLAKE ST.	SAN FRANCISCO, 2 CALIFORNIA ST.
RICHMOND, VA., 1419 MAIN ST.	

HARTFORD STEAM BOILER Inspection & Insurance COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, New York.

SCIENTIFIC AMERICAN

FOR 1883.
The Most Popular Scientific Paper in the World.
Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to
MUNN & CO.,
261 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.