SCIENTIFIC AMERICAN

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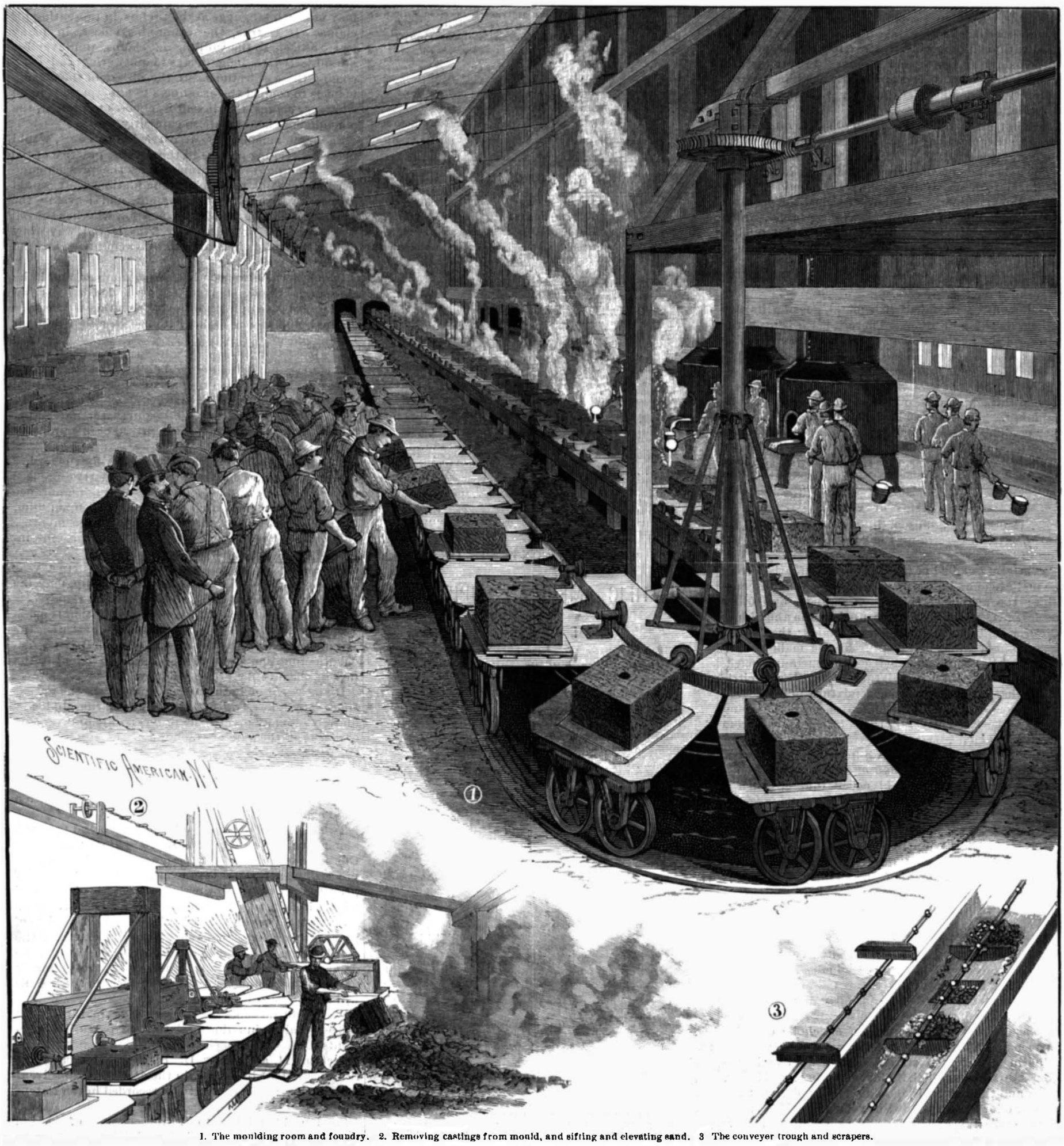
THE WESTINGHOUSE FOUNDRY, NEAR PITTSBURG, PA.

The illustrations show a recently erected plant for carrying out foundry work. It has been installed for the making of small castings for the Westinghouse companies. The air brakes for trains and the complicated interlocking switch and signal mechanisms that these companies are concerned with require a multiplicity of small parts. The foundry plant to which we refer is peculiarly adapted for the production of such pieces.

Its distinctive feature is a series of tables carried on wheels and linked together so as to constitute an endless chain. These move upon an endless track up and down the main foundry and through a smaller room adjoining the casting and moulding room, and carry the flasks or moulds from moulder to founder, and to the room where the moulds are broken up. In this compartment the castings are removed from the moulds. The arrangement of wheels and tracks is peculiar. The front ends of the tables are supported on two wheels, each wheel being journaled in a pedestal, the whole being underneath the table, so as to sustain it at a convenient height from the floor. A single wheel supports the inner end of the table. This wheel is also journaled in a pedestal, but is placed on the top surface of the table, so as to rise well above it. An elevated rail is provided for these wheels, which rail, on both the straight sides of the run, rests on short columns. On these rails the inner wheels run, so that the tables are kept horizontal. The elevated rail bends in the arc of a semicircle at both extremities of the straight portion, and thus completes the circuit. At the end nearest the observer, as shown in our cut of the foundry, a shaft extends from the floor up toward the ceiling, connected above with countershaft and friction clutch. Below the level of the tables the shaft is provided with



1. The moulding room and foundry. 2. Removing castings from mould, and sifting and elevating sand. 3 The conveyer trough and scrapers.

RAPID METHOD OF MOULDING NOW IN USE AT THE WESTINGHOUSE FOUNDRY, PITTSBURG, PA.

a sprocket wheel. This shaft occupies the center of the circle described by the bent rail. The sprocket wheel gears into the endless chain of tables beneath their working surfaces. If rotated, it causes them to travel around the circuit.

It is clear that, if columns were used to carry the semicircular elevated rail, the sprocket wheel would be interfered with. Accordingly this portion of the elevated track, as well as sections of straight track adjoining it, are suspended very ingeniously in the manner shown. A collar is fixed to the vertical shaft. A loose collar sets upon it, and to the loose collar a number of suspension rods are attached which extend diagonally downward and sustain the portions of the railway unsupported by columns. This leaves a free space for the sprocket wheel, and the suspension of the rail from the central shaft avoids the necessity of a more cumbrous system of suspension from the roof trusses or other upper works of the building. The suspension rods are re-enforced by radial pieces extending from a second loose collar at the level of the rail and by a species of U-shaped table that comes inside the rail. As the suspension and radial pieces could not be carried out to the line of the rail, the table is directly carried by them, and in its turn carries the rail.

On one side of the foundry is the moulding table, to be provided with mechanical moulding machinery. A conveyer trough runs from the room in the rear toward this table. A chain propelling scrapers through the trough is kept in motion. As fast as the trough is supplied with moulding sand it is carried to the vicinity of the moulding bench and discharged ready for use. A chain and bucket elevator is arranged in the rear room, which supplies the conveyer with the sand in question.

Adjoining the revolving chain of tables on the side opposite the moulding bench are the cupolas, where the metal is melted.

The operation of the apparatus is as follows: The moulders turn out quite rapidly the moulds by the aid of the machinery. As soon as finished the operator places the mould on one of the traveling tables, which are constantly moving behind him toward the cupolas. The mould is carried around the curve until it reaches the founders. They pour the metal into the mould as it passes. If necessary, the whole series of tables can be stopped for this process.

The mould, now filled with metal, goes on its way and enters the rear room. There it is thrown off the table and the casting is extricated from the sand. The sand is sifted in a revolving sifter, and is elevated to the conveyer, which returns it to the moulders.

It is obvious that snap flasks may be used to advantage on this apparatus, or that regular flasks may be employed. The machine lends itself to any of the ordinary modifications of foundry practice.

The chain includes 158 tables, and there is a single hold on each table for the tooth of the sprocket wheel.

The Acids of Fruits.

Mr. George W. Johnson, in his *Chemistry of the World*, says, in describing the "vegetable food of the world:"

"The grateful acid of the rhubarb leaf arises from the malic acid and bin-oxalate of potash which it contains; the acidity of the lemon, orange, and other species of the genus *Citrus* is caused by the abundance of citric acid which their juice contains; that of the cherry, plum, apple, and pear from the malic acid in their pulp; that of gooseberries and currants, black, red, and white, from a mixture of malic and citric acids; that of the grape from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic, and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow; and that of the cucumber from a peculiar poisonous ingredient called fungin, which is found in all fungi, and is the cause of the cucumber being offensive to some stomachs. It will be observed that rhubarb is the only fruit which contains bin-oxalate of potash in conjunction with an acid. It is this ingredient which renders this fruit so wholesome at the early commencement of the summer, and this is one of the wise provisions of Nature for supplying a blood-purifier at a time when it is likely to be most needed.

"Beet root owes its nutritious quality to about 9 per cent of sugar which it contains, and its flavor to a peculiar substance containing nitrogen mixed with pectic acid. The carrot owes its fattening powers also to the sugar, and its flavor to a peculiar fatty oil; the horseradish derives its flavor and blistering power from a volatile acrid oil. The Jerusalem artichoke contains fourteen and a half per cent of sugar and three per cent of inulin (a variety of starch), besides gum and a peculiar substance to which its flavor is owing; and lastly, garlic, and the rest of the onion family, derive their peculiar odor from a yellowish, volatile, acrid oil; but they are nutritious from containing nearly half their weight of gummy and glutinous substances not yet clearly defined."

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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 754.

For the Week Ending June 14, 1890.

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PROPOSED AMENDMENTS TO THE PATENT LAWS.

Quite a number of bills have been introduced in Congress for the amendment of the patent laws, one of which (H. R. 9953) we will now briefly review.

The first section is to the effect that patents may be issued and will be valid, provided the invention is new and has not been patented or described in any printed publication before the invention or discovery thereof by the applicant.

The second section provides that no patent shall be issued for an invention already patented in a foreign country, unless the patent shall be applied for within two years from the date of the earliest foreign patent.

As the law now stands, an American patent may be granted at any time during the term of the foreign patent, provided the invention has not been in use for more than two years.

The second section also provides that the American patent issued as above shall run for 17 years from the date of the earliest foreign patent.

Under the present law the American patent expires when the earliest foreign patent expires. This is a good amendment and should be adopted. The third section provides that an inventor, after describing his invention in the specification, may use such language in stating his claims as he prefers.

We do not exactly perceive the object or value of this amendment. As the law now stands, the inventor may use such language as he prefers in presenting his claims. It is true, the examining officer, in many cases, objects to the wording of claims, and inventors are subjected to long delays in answering and overcoming these objections. If the object of the amendment is to compel the examiners to allow patents upon whatever claims the inventor chooses to present, the amendment should state so explicitly.

Such an amendment, if carried into effect, would make a sweeping change in the present practice of the office. It would render unnecessary the present cumbersome system of official examinations. It would give to every applicant a patent, and leave to the courts the settlement of the question whether the patent was valid or worthless. This is the way they deal with patents in nearly all other countries, and the plan works well.

It makes the inventor his own examiner, and if he chooses to take a patent for an old device, it is his own affair. It is the opinion of many that this is the best method, and sooner or later it must be adopted in our Patent Office.

Section 5 provides that all assignments, licenses, and conveyances of patents shall be void against any subsequent mortgagee or purchaser, unless recorded within three months from date.

By this provision a *bona fide* purchaser and actual possessor of a patent may be deprived of his property without compensation.

To accomplish this it is only necessary for the former owner to give a second deed to another party and place it on record, the first deed, perhaps through ignorance of the holder, oversight, or trick played upon him, having been kept away from record for three months.

This section needs amendment so as to prevent injustice to the first *bona fide* purchaser.

Section 6 provides that aliens, resident here a year and having declared intentions of citizenship, may file caveats. At present two years' residence is required.

Section 7 provides that when an application is made for a patent for an invention already patented, the Patent Office may, by the assent of both parties, decide the question of priority and grant a patent to the new applicant if he proves priority.

If the assent of both parties is not given, the Patent Office may take *ex parte* testimony from the applicant and give him a patent if he proves a date of invention earlier than the date of the filing of the application of the first patentee. A similar provision applies to rejected cases and competing applications. Whoever proves by *ex parte* testimony that his invention was made before the date of the filing of the application cited against him, is to receive a patent.

This section if adopted would put an end to a vast amount of litigation now carried on before the Patent Office, under the general designation of interference proceedings; it would turn over nearly all questions of priority to the courts, where they properly belong, and where, in fact, they now go for final settlement.

Section 8 provides for issuing certified copies of patents at a charge of twenty-five cents extra for the certification. Section 9 provides that in suits no damages or profits shall be recovered except for six years last preceding the bringing of such suit. This will be a help to infringers.

Section 10 provides for the recording in the Patent Office of all injunctions relating to patent infringements.

Section 11 authorizes U. S. courts to pass the title to a patent by decree, in the case of an insolvent or bankrupt; such decree to be recorded in the Patent Office.

Section 12 relates to infringements of design patents, and makes a verdict of infringement to be conclusive evidence that the profits made by the de-

fendant were due to the infringement. This seems unnecessarily severe and needs revision.

Section 13 provides for taxing patents ten dollars at the end of five years, and twenty-five dollars at the end of ten years. If for any reason the tax is not paid, the patent ceases.

One of the important differences between our patent law and those of other countries is that when a patent is given it holds good for the entire time without taxes or conditions of any kind. There is no need of any such taxation as that here proposed, and it is to be hoped Congress will not adopt it. Its only effect would be to deprive inventors or their families of their patents, who by oversight, inability, absence, or death, should neglect to pay the taxes. The inventor should be treated, every time, as a benefactor to his country, not as a criminal or wrong doer, requiring to be governed by special pains and penalties. This is the European method. Let us not introduce it here.

If the object of this section is to cut off and extinguish patents that certain persons consider to be good for nothing, if such extinguishment is desirable, then the proper and better way to effect it would be to provide by law that any holder of a patent who desires to surrender and cancel the same may do so, and shall, on making such surrender, receive back the sum of twenty dollars, being part of the government fees originally paid in. It would be better to repay something to the patentee, in order to cancel his patent, rather than oppress him with taxes after having given him the patent.

A COMMUNITY OF READERS.

The report of the City Library of Springfield, Mass., which has recently been issued, is extremely interesting, as it conveys a good idea of the reading habits of a representative New England community.

The population of Springfield is about 42,000, and the number of books in its free library is 72,485, which are classified as follows: History, 5,612; biography, 4,278; travels, 5,883; science and education, 5,585; theology and philosophy, 2,986; foreign literature, 2,781; fiction, 66,082; juveniles, 41,435; poetry, 2,380; law and politics, 914; fine arts, 524; language and general literature, 5,188.

The whole number of persons drawing books on May 1, 1890, was 11,317, which is an increase during the year of 1,203. As the number of persons drawing books is over one-quarter of the whole population, and as the books drawn are probably read by several members of the same family, this showing would seem to entitle the city of Springfield to be named as a community of readers.

The report shows that there has been a decided improvement in the kind of books read during the past year. The percentage of books of fiction called for was 49·1, which is less than any previous year in the history of the library. The total number of books given out was 143,648, which is a decrease from the showing of last year; but the statement is made that a larger proportion of the books drawn have been of a higher intellectual grade, and that such books are not exchanged as often, which accounts for the decrease. The causes which have led to these changes are given by the Rev. Dr. Rice, secretary of the library, as follows:

"Among them might be mentioned the development of the taste for the higher department of literature, which has resulted from the formation of classes for special study and the organization of clubs devoted to literary culture. The reading pursued by the pupils in our public schools, in connection with their school work, has been an influence in this direction, and has also led to the reading of a higher class of juvenile literature. But aside from these special causes, the result is in a large measure owing to the elevating influence upon readers by the opportunities which a valuable public library affords. The habit of reading is a great educator of the taste of those who read, and the best fiction is not only valuable in itself, but also develops a taste for other departments of literature."

The building occupied by the City Library was planned to accommodate from 75,000 to 80,000 volumes. It was opened in 1871, and then contained 25,000 volumes. Additions were made last year to the extent of 3,709 volumes, bringing the total wealth of the library up to 72,485 volumes, so that a larger building will be needed in the near future.

These are interesting facts, especially at the present time, when Mr. Andrew Carnegie's generous gifts of free libraries to Pittsburg and Allegheny are fresh in mind, and gifts of a similar nature are to be noted in several localities. These facts give additional force to the following statements, with which Mr. Rice closes his report:

"Certainly nothing can contribute more to the well-being of the city, even in regard to its material interests, than the continued development of its citizens in intelligence, in taste, in practical knowledge, in cultivated skill, and in power to apply to industrial pursuits the constantly increasing discoveries in science and art. No money brings so rich a return as that which is devoted to secure this development, and no instrumentality can be more effective to this end than a public library established on a broad and generous basis, supplemented by an art collection illustrating to some extent the industrial as well as the fine arts.

"John Jacob Astor was one of the merchant princes of New York, distinguished among his contemporaries for his sagacity and enterprise and for his large accumulations. Scarcely a generation has passed away since his death, and yet he is now best known as the founder of the library that bears his name. It is for this that in all time he will be remembered and honored. Who among our citizens will leave behind him such a memorial?"

Interesting Exhibits of Mineralogical and Geological Specimens at the Brooklyn Institute.

The annual reception of the departments of mineralogy and geology of the Brooklyn Institute occurred on June 5. There were several thousand exhibits of great merit, and the hall of the Institute was thronged with interested visitors until a late hour. Much credit was due the reception committee and the exhibitors for the arrangement of the tables and specimens, which enabled a large number of persons to examine the exhibits without confusion. It is obviously impossible for us to give the specimens more than a passing notice. We will mention them in the order in which they occur upon the programme, without attempting to arrange them in the order of their merit.

A general selection of minerals neatly mounted formed the exhibit of Mr. G. O. Simmons. The next in order was the exhibit of Mr. F. B. Jones, which consisted for the greater part in gems and cut stones. Messrs. H. W. Dresser, F. H. Johnson, F. Livingston, and J. Vogt had creditable exhibits of miscellaneous minerals. Minerals from Baltimore County, Md., were exhibited by Mr. A. H. Ehrman. Among these was a fine microscopic specimen of beaumonite on haydenite. Prof. H. Hensoldt displayed a large variety of meteorites, most of them etched to show their characteristic structure. Mr. J. Walker exhibited microscopic sections of Brooklyn minerals. Mr. T. B. Briggs showed graphic granite microscopically with polarized light; also a section of coal fossil, Sigillaria. Mr. L. Reiderer's exhibit consisted of microscopic specimens of aurichalcite. Mr. J. D. Mallonee's exhibit consisted of microscope, spherulitic chert shown by polarized light. Prof. D. S. Martin had an interesting exhibit of copper-bearing rocks of the Keeweenaw series, Lake Superior, carbon minerals, illustrating the stages of alteration from vegetable fiber through coals, etc., to graphite. Mr. E. A. Hutchins displayed emeralds, hiddenites, and rutiles from Alexander County, N. C. Several interesting specimens of corundum from North and South Carolina, Georgia, and from Siam and Ceylon; he also showed some fine opals.

Mr. A. A. Hopkins exhibited various copper ores, a set of models of the principal diamonds, objects cut from white and smoky quartz, and a variety of miscellaneous specimens of interest. Cut topaz from Spain and Saxony and agates from South America formed the excellent exhibit of Mr. G. W. Street. Mr. F. Braun exhibited a large number of specimens of minerals, rocks, and fossils found in Brooklyn. Mr. W. G. Rothe made a general exhibit of minerals. The exhibit of Mr. G. W. Mather consisted of a large variety of very interesting specimens, among which were stibnite from Japan; fossil ivory, which might readily be mistaken for coal; black cassiterites; pyrite crystals in the matrix; picrolite from Bergen Hill, N. J.; bayrite; natural bismuth from New South Wales; rhodochrosite; niccolite and arragonite from Saxony.

Mr. C. M. Skinner had a beautiful exhibit of gems and cut stones. A fine collection of miscellaneous minerals was exhibited by Mr. A. Chamberlain. Zeolites, etc., from Bergen Hill, N. J., formed the exhibit of Mr. F. Cato. Mr. G. F. Kunz's exhibit consisted mostly in meteorites; two large specimens were shown, one of meteoric iron, the other siderolite; he also exhibited fragments of meteorite that fell May 2, at 5:30 P. M., at Leland, Iowa. The great novelty in this exhibit was the cut meteoric stones.

Prof. W. G. Levison had a general selection of minerals, among which were a large specimen of star mica, crystallized native copper, and a specimen showing stratified sandstone and iron ore. A number of interesting specimens of minerals and fossils from the cabinet of the Institute were displayed on the platform. Dr. J. H. Hunt, president of the department of mineralogy, had a large and well selected series of exhibits consisting of silica, quartz, opal, chalcedony, jasper, silicified wood, and a large number of pseudomorphs.

Dr. A. J. Watts had a very interesting exhibit consisting of sylvanite. Graphic tellurium. A telluride of gold and silver. Smugglers' mine, Cali. Amalgam; a natural crystal of silver, mercury and gold from Moschell, Landsberg, Palatinate, Germany. Lace gold, California. Gold (crystallized). Plumas Co., Cal. Wire gold (Rave), Plumas Co., Cal. Lace gold from Australia. Native gold, Vorospatak, Transylvania; an artificial preparation of gold crystals, and many others.

Mr. G. E. Ashby's exhibit consisted of flos ferri on limonite from Colorado, limonite and siderite from Colorado, chaleotrichute exhibited microscopically. Mr. J. W. Freckelton showed a superb specimen of limonite from Salisbury, Conn., phrenite from Paterson N. J., and section of stalactites from Luray, Va. Proustite, ruby silver ore and limestone with polished surface presenting arborescent forms constituted the exhibit of Dr. R. C. Moffat. Prof. L. B. Hannaford showed a good general selection of minerals. Mr. W. G. Bowdoin displayed some interesting fossils from the coal measures of Pennsylvania, bird track from Massachusetts. A quite extensive and very interesting set of fossils, shells, univalve and bivalve, crinoids, corals, trilobites, etc., ranging from the oldest fossiliferous period, the Silurian, and following through the Devonian, Carboniferous, Cretaceous, and Pliocene periods, and typical of these several geological ages, was exhibited by Professor J. Mickleborough. Professor F. W. Hooper's share of the exhibit consisted of a general collection in lithology. Dr. S. E. Stiles showed microscopic specimens consisting of conochalcite and vanadinite. Dr. L. E. Meeker exhibited a number of fossils, among which were a tree stump from Nova Scotia, bark and ferns from coal measures, fish from Wyoming, palm from Colorado, and fossils from Vancouver's Island.

Fossils, consisting of paradoxides from Newfoundland; phacops-rana, Hamilton group, Moravia, N. Y.; calymene niagerensi, Niagara group, Grafton, Ill., formed the exhibit of Dr. R. P. Stevens. Mr. R. D. Dodge had a general selection of minerals. Miss Alice Dinsmore exhibited fossils from Illinois coal fields and miscellaneous minerals. Miss A. A. Douglass displayed fossil plants from the coal measures. Mr. G. D. Hiscox, besides showing various interesting specimens of minerals and fossils, exhibited a fine specimen of a new brecciated marble from Manchester, N. H.

The officers of the department of mineralogy are as follows: president, Dr. Joseph H. Hunt; vice-president, G. M. Mather; secretary, J. W. Freckelton; treasurer, W. G. Rothe.

The officers of the department of geology are: president, Professor D. G. Eaton; vice-president, Dr. R. W. Raymond; secretary, William G. Bowdoin; treasurer, W. F. Sebert; curator, Frederick Braun.

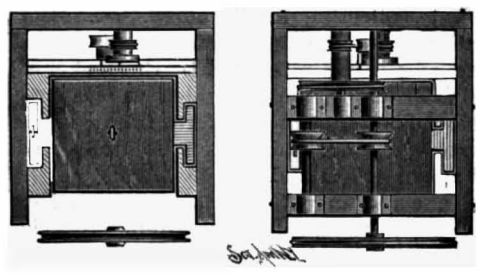
Utilizing Waste Material.

We often speak about the triumphs of invention, and mean thereby the conquest which science and mechanism are constantly making over the forces of nature. And it is indeed wonderful how many of nature's raw materials enter into the manufacture of articles used to satisfy man's daily needs and comforts. But the wonders of production are not confined alone to minerals dug from the earth's bosom, or to the organic life which flourishes upon its surface. On the contrary, man's inventive skill has perfected the art of utilizing waste materials, so that the residue of former arts furnishes the substance upon which new workers expend their labor. Illustrations of this do not have to be sought alone in stores for second hand clothes and furniture, but rather where new and costly commodities are bought and sold. It is necessary to specify only a few representative manufactures where the raw materials are waste products to see the extent to which they are carried on. For instance, millions of bushels of cotton seed have been thrown away in the various States of the South. But now it is utilized in the manufacture of oleaginous products, and promises to be the chief source of many kinds of oils. The slag of furnaces for many years was dumped into ravines and piled upon vacant fields until it had accumulated in vast quantities, but now it is being mined again, resmelted in some instances, made into asbestos or used in ballasting roads. Paper is made mostly from waste materials, and it enters into the composition of a thousand things, from a cigarette wrapper to a car wheel. Blood is manufactured into door knobs, shutters and doors are made from wood pulp, sawdust is a most useful article, dust and dirt are transformed into multitudinous building materials, while the waste products of the gas house are more valuable, if possible, than the original substance. It was formerly supposed that clay was useful only for embankments, for making bricks or pottery. But now a most useful and beautiful metal is extracted therefrom, and clay banks, rich in aluminum, will soon be as valuable as iron mines. And so the catalogue might be extended indefinitely, but this is sufficient to show the variety of uses to which waste products are put. It also shows, adds the *Baltimore Herald*, a tendency to economy in manufacture, which is one of the hopeful signs of the times.

GUM ghatti, being the subject of a paper by C. F. Henry, is said by him to produce a mucilage of bland and not unpleasant flavor. Only 75 per cent of the gum is soluble in water, even with a boiling temperature The residue increases considerably in bulk, however. A 1:3 mucilage is of greater density than a B. P. mucilage of gum arabic, and possesses much greater adhesive properties. As regards cost, an ounce of ghatti gum produces about twice as much mucilage as a similar amount of acacia and at one-twelfth its cost.

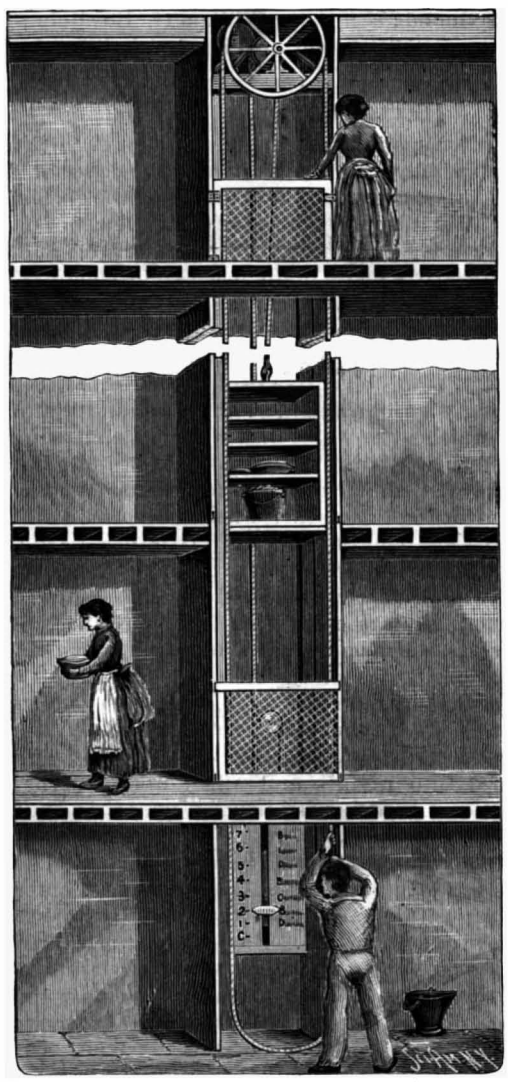
AN IMPROVED DUMB-WAITER INDICATOR.

In the accompanying illustrations is shown an automatically operating and effective device, whereby an operator on the ground floor will be always able to see at a glance the location of the dumb-waiter, no matter at what height in the shaft it may be. It is a patented invention of Mr. Louis Friess, of No. 155 West Eighty-third Street, New York City. The dumb-waiter is suspended in the shaft in the usual way, the rope therefrom extending over two small grooved pulleys at the top and thence downwardly to its connection with the counterbalance weight. To vertically move the car, a large grooved wheel on the front end of the shaft, from which the car is suspended, is operated by means of an endless hand rope, such rope extending over the wheel and down on either side to the bottom of the shaft. On



DUMB-WAITER INDICATOR.
Plan and Sectional Views.

an intermediate cross bar at the top and on the rear wall of the elevator shaft is journaled a short drum-shaft, with a large pulley, as shown in one of the small views, to which motion is communicated from a small pulley on the main shaft by a taut band, the difference in the size of the pulley determining the travel of the pointer of the indicator. A rope or cord from this drum shaft extends downward around a grooved pulley pivoted on a weighted sliding block, and thence upward to an attachment on the rear wall of the shaft. This



FRIESS' INDICATOR FOR DUMB-WAITERS, ETC.

attachment is made upon a short shaft, which has a small hand wheel, convenient for regulation from one of the floors of the building, and by which any slackening of the cord may be taken up. The indicator face plate, to be seen at the rear of the shaft on the ground floor, has spaces for the reception of the names of the occupants of the different floors, with the number of the floors in regular order, and a stud from the weighted sliding block of the indicator device projects through a vertical slot in the face plate, this stud bearing a pointer to indicate the position of the dumb-waiter or elevator car above it.

A NEW COMPOUND OF PHOSPHORUS.—Professor T. E. Thorpe, the well known chemist, has discovered a new compound of phosphorus (P_4O_6), which takes the form of acicular crystals, melts with the warmth of the hand, and glows under the same conditions as phosphorus. It burns readily in oxygen and chlorine, and forms a new compound with ethyl alcohol.

Colored Fires.

For the benefit of those who may wish to celebrate the "birthday of our country," we copy from the *Western Druggist*:

Red Fire.

Strontium nitrate	3 parts.
Potassium chlorate	1 "
Shellac, in coarse powder	1 "

Mix.

Green Fire.

Barium nitrate	3 parts.
Potassium chlorate	1 "
Shellac	1 "

Mix.

Violet Fire.

Calcium carbonate	2 parts.
Malachite	2 "
Sulphur	2 "
Potassium chlorate	6 "

Mix.

Purple Fire.

Copper sulphide	1 parts.
Strontium nitrate	14 "
Calomel	14 "
Potassium chlorate	15 "
Shellac	5 "

Mix.

On account of the calomel, this must not be burnt indoors.

Yellow Fire.

Sodium nitrate	3 parts.
Potassium chlorate	1 "
Shellac	1 "

Mix.

Blue Fire.

Copper ammonia sulphate	3 parts.
Potassium chlorate	1 "
Shellac	1 "

Mix.

A TAIL GUARD AND LINE REST FOR HARNESS.

The attachment shown herewith, which is applicable to any harness, is designed to prevent the tail of the horse from becoming entangled with the lines, and also provides a rest whereby the lines will be held above and kept from entanglement with the harness. It has been patented by Mr. David Hand, of Netherwood, N. J. The body of the device consists of a metal strip bent in V shape, with the ends of its members bent upward and outward, where they are attached to and support a horizontal rest bar having upturned ends or rings for the reception of the reins. The body of the device is curved longitudinally and in cross section, as shown in the small view, to conform to the back and crupper of the animal, to which it is attached by means of an integral loop and billet, there being a pad on the under face of the body bar, so that it will not chafe or injure the back of the animal. At the forward end of the device is a short neck to which is secured a strap and buckle for attachment to the back strap of the harness.

Trust Not Trusts.

The *Shipping List* prints the following list of trusts which are now in existence in the United States:

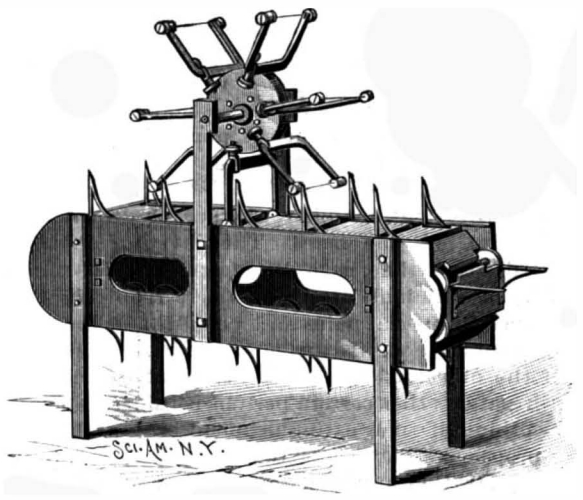
Match Trust.	Gutta Percha Trust.
Steel Rail Trust.	Copper Trust.
Jute Bag Trust.	Zinc Trust.
Cordage Trust.	Slate Pencil Trust.
Kerosene (Standard) Oil Trust.	Iron Nut and Washer Trust.
Borax Trust.	Oil Cloth Trust.
Cotton Seed Oil Trust.	Ultramarine Trust.
Linseed Oil Trust.	Whisky Trust.
Paper Envelope Trust.	Gas Trust.
Nail Trust.	Dressed Beef Trust.
Barbed Fence Trust.	Distillers' and Cattle Feeders' Trust.
Lead Trust.	
Nickel Trust.	Starch Trust.
Sugar Trust.	Cigarette Trust.
School Book Trust.	Straw Braid Trust.

AN IMPROVED FENCE POST.

A metal fence post designed to be easily planted, to sustain a wire fence, or to which a supplementary wooden post may be attached, for rails or boards, is shown in the illustration, and has been patented by Mr. Jacob Copenhaver, of Glen Hope, Pa. The blade is broad enough to give it a firm hold upon the soil, and has ribbed edges and a spear-shaped point. At the top it has a shank, with holes, as shown in Fig. 2, for the attachment of a supplementary wooden or metal post, there being near the upper end of the blade a projecting strap or bracket, through which a wooden post may be driven, as shown in Fig. 1. When a wire fence is to be supported, a short stake is driven through the bracket into the ground, as in Fig. 3, the supplementary metal post, consisting of two vertically-separable strips of metal, being attached to the shank by bolts passed through the holes provided therefor, the two parts of the post being thus clamped together. The supplementary metal posts have recesses or grooves to receive the wires, and the top parts of these posts, above the shank, are held together by clasps or clamping pieces, which fit closely upon the post.

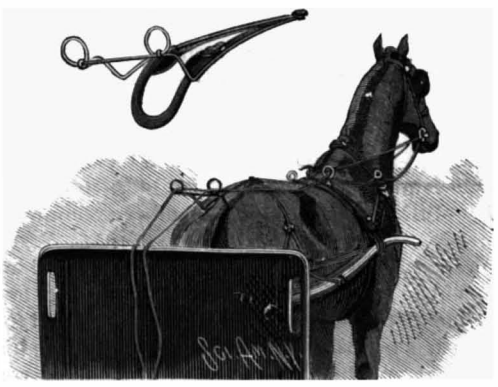
AN IMPROVED TILE OR BRICK CUTTING TABLE.

An easy-running labor-saving device, designed to cut a strip of clay as it issues from the dies into bricks or tiles, the strip of clay furnishing all the operative force required, is represented in the accompanying illustra-



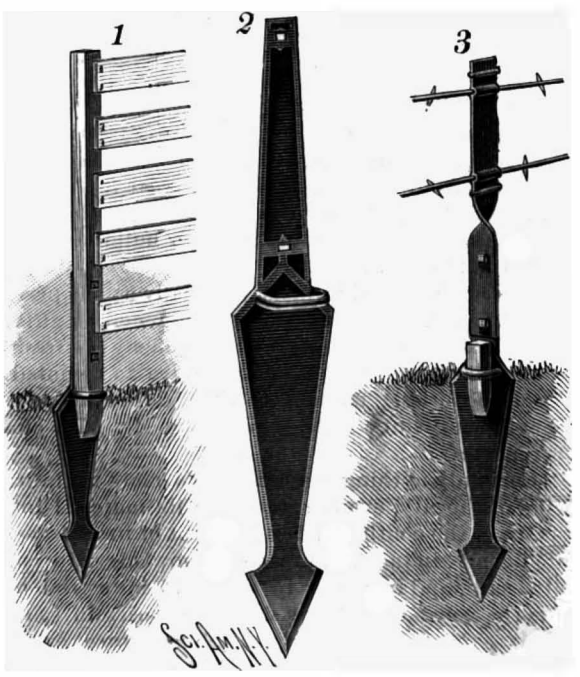
BENSING'S TILE OR BRICK CUTTING TABLE.

tion, and has been patented by Mr. Jacob Bensing, of Malinta, Ohio. On the inner sides of the supporting frame are horizontal metal side plates, having flanges on their inner sides forming guides for an endless carrier, made up of transverse outer and inner blocks connected together and running upon anti-friction rollers, there being a vertical standard upon each end of all the outer blocks of the carrier. In vertical side standards of the frame a transverse shaft is journaled above the carrier, and upon this shaft is keyed a disk, on which sockets may be radially located. A cutter frame is designed to be attached to each socket, each such frame consisting of two sections having on each right-angled outer portion an anti-friction roller, a tongue on its inner end allowing of its adjustment in the socket to regulate the position of the cutter frame relative to the disk. A cutter wire connects the outer ends of the cut-



HAND'S TAIL GUARD AND LINE REST.

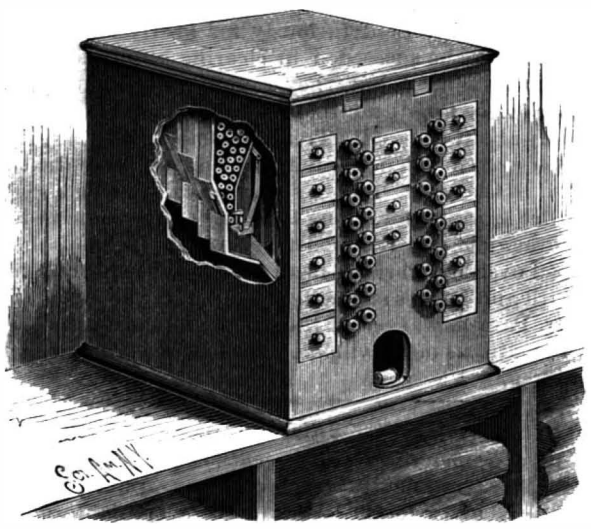
ter frame sections, the wire being passed through a hook extension of a thumb nut seated in a screw-threaded bearing in one of the sections, whereby the wire may always be held rigid. In operation, as one cutter frame is beginning to ascend from the carrier the wire of one of the following frames is about entering the strip, the cutting being regularly and evenly spaced, and the movement of the standards automatically revolving the cutter. The cutter wire necessarily follows the perpendicular face of the standard in its movement into and out of the strip, and the carriers are so hinged that the standards cannot tilt or get out of a vertical position. All dirt caused by the cutting falls between the blocks, so as not to form any obstruction, and all parts of the device are designed to operate with the slightest possible friction.



COPENHAVER'S FENCE POST.

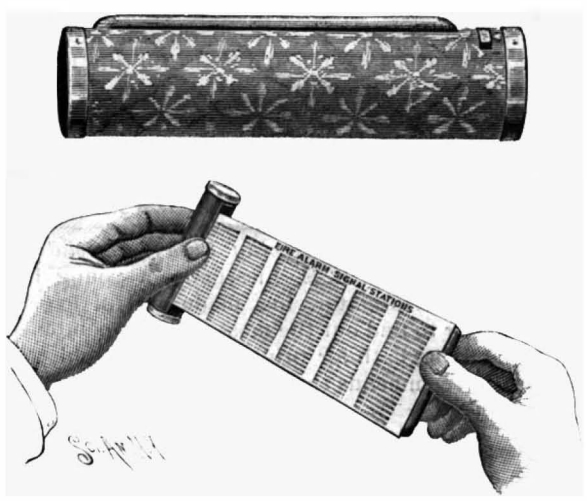
AN IMPROVED CABINET FOR HOLDING SPOOL THREAD.

The accompanying illustration represents a cabinet designed to hold a full stock of thread, delivering a spool of any number on the pulling of a correspondingly numbered button, without the possibility of the

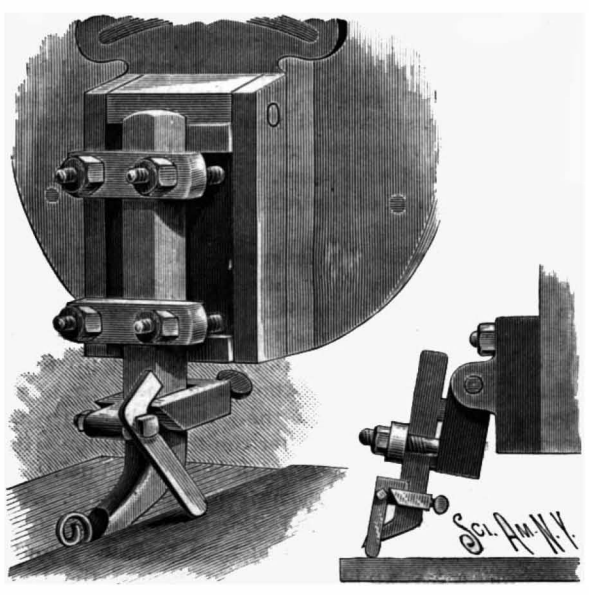


HAYDEN'S SPOOL THREAD CABINET.

jamming of any of the spools, while provision is made for the stowage of surplus spools, and readily returning spools that have been withdrawn. It forms the subject of a patent issued to Mr. James W. Hayden, of Lewisport, Ky. The cabinet has three main series of central and side compartments, from which lead two inclined troughs or ways, one on each side of the series of central compartments, to a receiving tray reached through an opening formed centrally in the front wall of the cabinet near its base. The compartments for the larger spools are nearest the front of the cabinet, and those for the smaller spools behind them, each compartment being proportioned to receive about the same number of spools, thus leaving behind the inclined chutes a space for the stowage of spools, which space is reached through a door hinged to the base at the rear of the cabinet. The spool-receiving compartments are of such width that a number of spools may be placed side by side therein, and, that the spools may be properly upheld until wanted for delivery, a slide is arranged in connection with each compartment, the slides being adapted for withdrawal by being connected through links with bell-crank levers, the latter being also connected to pull rods terminating in buttons on the front side of the cabinet, such buttons preferably being each numbered to correspond with the compartment holding spools of a certain number. To prevent the passage of more than one spool at a time to the receiving tray, a lever is arranged to operate automatically in connection with the slide, one arm of the lever passing between the two lower spools in the compartment before the slide is withdrawn, provision being also made to prevent the arching or jamming of the spools within their respective compartments. For conveniently returning the spools to a place of safety when they have been withdrawn from the cabinet and not used, two receiving trays are provided in the upper part of the case, with swinging flap doors opening inward. In the space between the main interior compartments and the front wall of the cabinet, on each side and in the middle, are also arranged narrow storage drawers. The preferred dimensions of this cabinet are: Length, 24 inches; width, 20 inches; height, 27 inches.



WILLIAMSON'S TAPE ADVERTISING DEVICE.



WILKINSON'S TOOL ATTACHMENT FOR PLANERS.

Insuring Employes.

The Detroit Electric Light and Power Company has adopted a plan of insuring its employes, every one of whom carries a $5,000 policy, the premiums upon which are paid by the company so long as he is in its employ. The arrangement insures the employe's family in case of accidents, and protects the company from damage suits. Why may not other manufacturing establishments adopt the same plan, to the advantage of themselves and their most prized helpers, the annual premium to be paid only as long as the party remains in the employ of the concern?

Special arrangements could undoubtedly be made with insurance companies to refund a large portion of the premiums paid, on the surrender of the policies when the insured is leaving his employer.

A NOVEL ADVERTISING DEVICE.

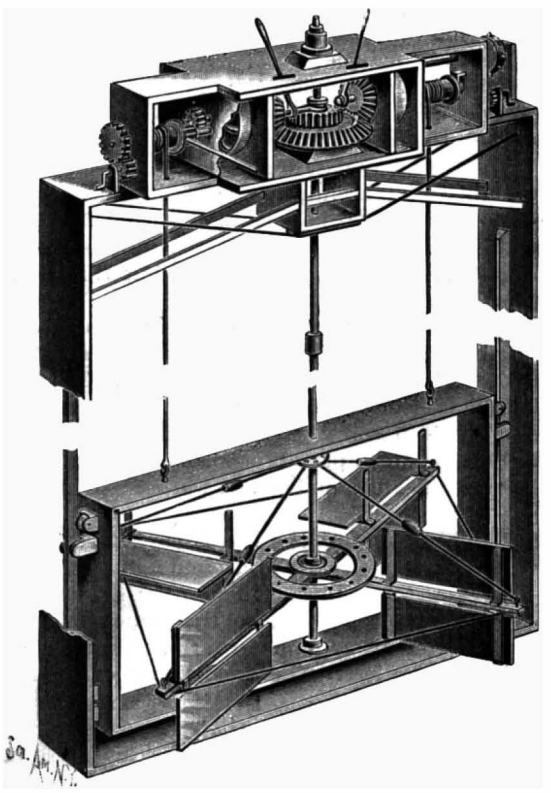
The device represented in the accompanying illustration, designed to be conveniently carried in the pocket, suggests at once a ready means for efficient advertising, by incorporating with the advertisement information which it may be desirable for many people to keep for ready reference. It is a patented invention of Mr. John B. Williamson, of Louisville, Ky., the cut showing as its principal feature the representation of a conveniently unwinding and rewinding tape bearing the record of the fire alarm signal station numbers, to be made according to the requirements of any given locality. The device embraces but few parts, and can be manufactured in quantities at a small cost, any desired information or advertising matter being printed on the scroll or tape.

A CUTTING TOOL ATTACHMENT FOR PLANERS.

The illustration represents the application of an attachment which serves to hold the cutting tool off the bed of the work on the return stroke of the traveling bed on which the work is held, such return stroke being shown in the small figure, while the larger view represents the cutting stroke. It is a patented invention of Mr. James Wilkinson, of No. 2544 Leithgow Street, Philadelphia, Pa. A bracket or frame, having an opening for the passage of the cutting tool, is attached thereto by means of a set screw, the cutting tool being held in the usual holder, pivoted to the head of the planing machine. On the front end of the bracket is a projection, in which is held a transverse bolt on which is loosely fulcrumed a lever, hanging downward, and adapted to swing rearward on the forward stroke of the planer, such motion being limited by a beveled edge on the side of the bracket. On the upper end of the hanging lever is a right-angled extension adapted to engage and rest upon the top of one side of the bracket on the return stroke of the tool, as shown in the small view, thus raising the cutting edge of the tool entirely off the work. The hanging lever may be placed on the transverse bolt at either side of the lug or projection from the forward end of the bracket, to always engage the lower end of the lever with that part of the work not yet planed.

AN IMPROVED WATER WHEEL.

A water wheel designed to be operated for driving any kind of machinery by means of belts or through a chain wheel, or for directly operating a pump or air compressor, is shown in the accompanying illustration, and has been patented by Mr. Lee Middleton, of Clarksville, Mo. On the upper part of the main vertical shaft is a collar riding upon an anti-friction bearing carried by the main frame, the lower end of the shaft being stepped in the base of a wheel frame, and there being on the sides of the latter frame grooved wheels and guides riding upon vertical ways of the main frame, whereby the wheel frame and wheel may be raised out of the current when desired. The upper portion of the main shaft has a feather which rides in a groove in the hub of a gear, this gear engaging gears carried by horizontal shafts, the latter gears being splined to position to be shifted into or out of engagement with the gear carried by the vertical shaft. The horizontal shafts carry pulleys and pinions, and the shifting of the gears is effected by means of levers fulcrumed in standards carried by the flooring. Just beyond the horizontal shafts are drum shafts, chains or ropes from which are connected to the wheel frame, the drum shafts being movable into engagement, by means of pinions on their ends, with the horizontal shaft, to facilitate raising the wheel frame out of the current, other means being provided for completing or entirely effecting such task by hand cranks. Above the gear with which the horizontal shafts are connected is a gear adapted to be thrown into engagement with a crank gear connected with a pitman, whereby either a pump or an air compressor may be operated. The wheel proper consists of a number of radially extending arms carrying vertical braces serving as stops for

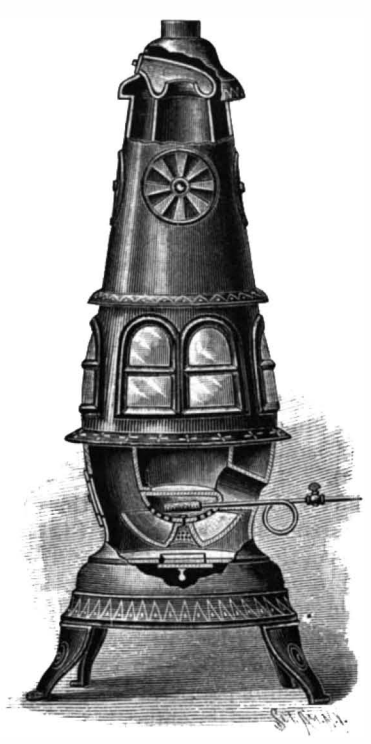


MIDDLETON'S WATER WHEEL.

hinged leaves, other bracing rods, connecting the ends of the radial arms, being in such position that the leaves when folded down rest upon them. As the wheel revolves, the leaves are adapted to automatically open out against the current as they come into position for the current to strike them, resting then against the vertical stops; but when the radial arms to which the leaves are hinged, in the further portion of their revolution, move against the current, the leaves then assume a horizontal position, resting upon the horizontal bracing rods.

AN IMPROVED OIL OR GAS STOVE.

The illustration shows a simple form of stove designed to burn oil or gas, and to give out a large amount of heat in proportion to the quantity of fuel consumed. It has been patented by Mr. John A. Field, of No. 822 College Avenue, Racine, Wis. Within the body of the stove, and cast with or attached to the upper section, is a hollow air cylinder, nearly filling the interior, there being an annular flue between the cylinder and the walls of the stove, through which the smoke and noxious gases pass up the chimney. There is an opening from the outer air to the lower end of the interior cylinder, and a similar opening from its upper end, controlled by a damper, and on the top of the cylinder is an evaporating pan. Attached to the under side of the cylinder is a D-shaped generator, the lower oval side of which is perforated, and into this generator projects a pipe from an oil tank, there being at the inner end of the pipe a roll of asbestos or similiar material, on which the oil flows and is burned. In the oil supply pipe is a coil to act as a trap to prevent gas from the stove passing back through the pipe. Gas may also be readily burned instead of oil, by the use of a screen burner in the generator, below which is a dish-shaped receptacle having its central portion formed into a hollow cone, through which air passes to feed the flame. A damper at the bottom admits the necessary supply of air.



FIELD'S OIL OR GAS STOVE.

The Economic Uses of Leaves.

Of the three divisions of nature's products, man is most chiefly indebted to the vegetable kingdom, whether for his food, medicine, or domestic comforts. Every part of plants and trees is more or less utilized by savage and civilized men, and a common category might be furnished by the various uses of the separate parts—the roots, stems, sap, bark, fruit and seeds, and leaves.

If we take the last-named, the foliage, apparently the most insignificant part of the plant, how dependent are we on these for food, clothing, medicine, dyes, stains, and various comforts.

The miscellaneous application of leaves for different purposes as domestic appliances, and for manufacturing uses, of themselves would furnish a long list; some few of these we may pass under notice, because their adaptability and usefulness are mainly confined to tropical countries. It is true that some leaves have been utilized by the paper maker, as in those of the dwarf palm, maize leaves, and others, but this is only on a small scale.

The leaves of many palms are largely employed for making hats. Those best known are Panama hats, so named from being shipped from that port. These are made from the finely plaited fiber of the leaves of a South American screw pine (Carludovica palmata). These hats are much prized for wear in the tropics, being light and flexible, and can be washed and bleached repeatedly.

The tree has no stems, the leaves have long slender petioles, springing from the ground; they are some two feet long, fan-shaped, and four-parted, each segment being again ten-cleft, so that when folded in venation, each segment on its own rib, there are eighty layers in a young leaf. The tree occurs only on the slopes of the Andes.

About 200,000 dozens of these hats are made in Ecuador and different States of South America. These hats are distinguished from all others by consisting only of a single piece, and by their lightness and flexibility; they may be rolled up and put in the pocket without injury.

In the rainy season they are apt to get black, but by washing with soap and water, besmearing them with lime juice, or any other acid, and exposing them to the sun, their whiteness is easily restored. The plaiting of the hats is very tedious and troublesome; the coarse ones may be finished in two or three days, but the fine ones take as many months to plait. It commences at the crown and finishes at the brim. The hats are made on a block, which is placed upon the knees, and requires to be constantly pressed with the breast. The hats vary in price, according to fineness and quality, from 20s. to as many pounds.

The unexpanded fronds of Livistonia australis, prepared by being immersed in boiling water, are dried, and the fiber thus obtained is much valued for the manufacture of hats in Australia, which much resemble the celebrated Panama hats.

The rough leaves of the Chumico (Curatella americana) and of Davilla lucida are used for cleaning iron, and polishing and scouring wood. Curatella alata is used in the West Indies for polishing bows, sabers, etc.; and C. sambaiba in Brazil—indeed, they serve all the purposes of sandpaper to the Indians for polishing their blow-pipes and war clubs. The leaves of Celtis orientalis are used for polishing horns in the East Indies.

The foliage of Guiacum officinale is very detersive, and is frequently used in the West Indies to scour and whiten floors, which it is said to do better than soap.

Leaves sewn together are much used in India as substitutes for the plates and dishes of more civilized life. It is not always poverty that leads natives to use them in preference to metal or porcelain articles, as caste or custom has often some influence in the matter. The leaves principally used are those of the Egyptian lotus (Nelumbium speciosum), Bauhinia species, Semecarpus anacardium, Butea frondosa, those of the banyan (Ficus bengalensis), by Brahmins, and the plantain leaf (Musa paradisaiaca).

The leaves of Bauhinia Vahlii are used in the construction of the curious, rude leaf bellows in Sikkim, with which the natives of the hills smelt iron. These leaves, when sewn together, are used as plates, cups, rough table cloths, rain hats and caps. The leaves are heart-shaped, and above a foot in breadth, and the same in length. Sewn together with twigs, they also serve for baskets for holding pepper, turmeric, and ginger, and are likewise used for thatching.

Under the name of "Chattahs," a kind of umbrella hat or sunshade is made in the East of the leaves of the Licuala peltata and the Talipot palm, or a Plantain leaf. These Chattah hats are much worn by the plowmen, cowkeepers and coolies of Bengal and Assam.

The large fan-shaped leaves of the Talipot palm (Corypha flabelliformis) are, like those of the Palmyra palm, carried over the heads of people of rank as an umbrella, and also used for making books, and for various domestic purposes. The leaves are also cut up into neat bracelets, worn by Santal girls in India. Those of Vanda Roxburghii, split, are also worn by them as anklets. Those of another species, Borassus æthiopicus, occur as much as 12 feet across; they serve also for the manufacture of baskets, mats, ropes, and sieves. The leaves of Nipa fruticans attain a height of 15 to 20 feet, presenting a very handsome appearance, resembling the fronds of huge ferns. This graceful Eastern palm is utilized in various ways, the principal being in the manufacture of thatching for house roofs, in the East called "Ataps." This manufacture is quite an industry of itself, and affords employment to many natives, chiefly women, the men simply bringing cargoes of the fronds to the women, to be stitched with split rattans, and made up. Atap roofs are the best adapted for these climates, for while the winds are never strong enough to blow them away, they afford the coolest protection against the sun of any kind of roofing known.

The leaves of the Palmyra palm (Borassus flabelliformis) were formerly used like paper, to write books on, and to this day they are applied to this purpose in Orissa, Southern India, and Ceylon, where an iron style is employed to write upon them; in certain parts of Bengal, young children use them to write the alphabet lessons on. They are largely employed for making pans, bags, winnows, hats, umbrellas, and for thatching, etc. The leaf takes a dye well, and is worked up in Madras into pretty colored patterns in baskets and mats.

The slips of Talipot and other Palm leaves are coming into European commerce for the manufacture of ornamental braids, and in the construction of straw or Leghorn hats. The fiber obtained from the base of the leaves of the Chusan Palm (Chamærops fortunei) is used by the Chinese for making hats and coarse clothing. The sale of Palm leaves for decorative purposes in the towns of Elche and Alicante in Spain produces a considerable income to the towns.

Kadjan mats, manufactured out of Nipa leaves, are indispensable for traveling purposes. Packed up in the smallest compass when not required, each mat is capable of affording sufficient cover at night for two or three persons, either in boat or forest journeys. They also form, almost exclusively, the material for side walls and divisions within houses. The young leaf unfolded and dried, under the name of Roko, forms the favorite covering for cigarettes in the Malayan Peninsula in preference to paper.

The large leaves of the Teak tree (Tectona grandis) are used for plates, for packing, and for thatching. The leaves of Cordia myxa are employed as plates in Pegu and to cover Burmese cheroots. In Bangalore the leaves of Canna indica are used by the natives in lieu of plates, to serve their Ragi or Millet puddings and other dishes on. The leaves of the Papaw tree (Carica papaya) are employed by the negroes in washing linen, as a substitute for soap. They have also the property of rendering meat wrapped in them tender, owing to the alkaloid papain which they contain, and which acts as a solvent.

For cordage and other textile purposes, numberless leaves are used, and they serve very generally for packing and wrapping up small parcels in India. In Guiana, Tibisiri fiber is obtained from the inner surface of the spiral leaves of the Ita Palm (Mauritia flexuosa). It is used by the Indians for making hammocks, etc. The leaves are cut before they are open, and the midrib separated by drawing each division of the leaf through the finger and thumb. After drying, the fiber is ready for use without further preparation. About a quarter of a pound may be procured from each leaf, and if the central leaf is left uninjured, no evil effect is produced on the tree. Bags or matting could be cheaply and easily made from this fiber, as well as hats similar to those known as Panama.

The foregoing is only a brief enumeration of some of the many uses to which leaves are industrially applied.—*P. L. Simmonds, Gardeners' Chronicle.*

The Perils of Quicksands.

A remarkable example of the dangers of working in quicksands occurred recently at Woodside, N. Y. An intelligent man, Mr. James H. Parsells, undertook to build a well near his house. The well was 15 feet deep in the center of a quicksand. Mr. Parsells went into the well to repair a pipe when the sides caved in, partly burying him. When he was discovered, his head and part of his body were still above the sand, which was slowly pressing around him. He did not seem to be much injured, for he was cool and self-possessed, and with a calm voice himself directed the excited villagers, who were eager to rescue him.

Steven and John Parsells, aged fourteen and nineteen, worked desperately to save their father's life. Dozens of men with shovels worked around the well, while others fastened ropes under Mr. Parsells' arms. Ten men pulled on the rope from the second story of the new house, until deep ridges were made by the rope in the window sill, but all the efforts to pull out the man failed, and the sand packed itself more solidly around his form. It continued to rise, stealing up over his shoulders and about his head. Stimulants were given to the doomed man, and a rubber tube was placed in his mouth to supply him with air.

Meanwhile the rescuing party fought the deadly sands desperately. They could not dislodge the body from the tenacious grip of the sands. Then the sands rose quickly, bubbling up like the waters of a spring. They surrounded the man's head and covered him entirely. John Parsells stood at his father's head, and with a shovel worked furiously for nearly two hours. Three times he succeeded in clearing the sands from his father's head, but they rapidly covered it again, being forced up, no doubt, by the crowds which pressed closely about the well. Trenches were dug at the sides of the well, in the hope that the man might be extricated in that way, but they were quickly refilled.

After working for a long time the rescuers succeeded in dragging out the body, but when the sands had closed over Mr. Parsells' head the air-tube fell from his mouth and he was suffocated.

Mr. Parsells was one of the oldest and most respected of the citizens of his village. He leaves a wife and six children.

PHOTOGRAPHIC NOTES.

Salted Paper for Enlargements. — The *Bulletin* of the Photographic Society of Italy, published at Florence, gives in its last number a special formula for salted paper for enlargements, communicated to it by Signor G. Moretti, a member of the society and director of the studio for the Dilettanti Photographers in Florence. The formula is this:

Water	1,000 grammes.
Gelatine	2 "
Chloride of sodium	4 to 6 "
Citrate of soda	21 "
Ammonia chlorhydrate	13 to 16 "

The gelatine, cut up into very small slices, is first dissolved in the tepid water; afterward the other substances are added; when all are dissolved, the solution is filtered, and placed in bottles for use. To prepare the paper, the mixture is poured into a basin, and the sheets are allowed to float for three minutes, using the same precautions as in the preparation of albumenized paper. After the moisture has been removed from the sheets prepared with this solution, they are sensitized on an ordinary 12 per cent silver bath, and when dry they may at once be used, and a beautiful tint, imitating perfectly that of hematite, will be obtained. When the bath above described is employed, especially if it be fresh and uncontaminated by any noxious vapors, the sensitized paper may be kept in excellent condition for three days during the summer, and for a week in the winter season.

Combined Toning and Fixing Bath for Gelatino-Chloride Paper.—Mr. R. E. Liesegang, a young but very serious investigator, has made careful experiments in order to find out the most efficient combined toning and fixing bath for prints on gelatino-chloride paper. He recommends the following one:

Solution No. 1.

Hyposulphite of soda	200 grammes.
Alum	80 "
Nitrate of lead (pulverized)	2 "
Boiling water	400 c.c.

The solution is allowed to stand for two days; then once more 400 c.c. of boiling water are added, and the solution is filtered. Meantime, the following solution is prepared in a bottle:

Solution No. 2.

Sulphocyanide of ammonia	160 grammes.
Water	1,200 c.c.

Solution No. 1 is mixed with solution No. 2, and then added:

Solution of gold chloride (1 per cent)	10 to 20 c.c.

With this bath the prints take any desired tone within three to five minutes.—*H. E. Gunther in Photo. News.*

A Great Volcanic Eruption in Alaska.

A recent dispatch from San Francisco brings word that Bogoslov, the Alaskan volcano that rose from the ocean depths about seven years ago and blazed and smoked for a time, is again in eruption.

This recent eruption began February 10, and has continued at intervals. April 17 and 22 there were signs of great activity, smoke and flame pouring from the lofty crater, and rising to a great height. The sky for weeks was clouded with ashes, and these fell in liberal showers in the town of Illuliuk, forty-four miles to the eastward.

To the people who saw the eruption it seemed a pillar of fire and smoke fully fifteen miles high, rising from the horizon and losing itself in the low clouds.

Professor Davidson, of the Coast Survey, estimates that the volcanic pillar must have been sent up to a height of at least four miles above the sea.

Captain Everett Smith, of the steam whaler Orca, passed near the scene soon after the first eruption. He noted that four new islets, each detached, but near the volcano island, had arisen from the depths. As the ocean bottom here, off Bogoslov, sounds 844 fathoms, and there is a depth of 1,200 fathoms about twelve miles away, an idea may be gained of the tremendous energy required to raise an islet from the ocean bottom above the surface.

The First American Tin Mill.

An interesting account of the mill of the Glendale Tin Mining Co., the first tin mill established in the United States, and from which is now being put out the first fruits of the Dakota tin mines, is given in the Rapid City *Republican*. That paper states that the mill is located on Iron Creek, about 22 miles southwest of Rapid City, at the foot of the mountain in which the mines are situated. The mill proper measures 50 feet in width by 100 feet in depth, and is divided into three stories. It is unique in plan, compact and convenient, well built in all particulars, and protected from all danger of fire, both by a system of water pipes and by having roofs, etc., covered by a thick asbestos coating.

Either steam or water power may be used for running the machinery. The steam equipment consists of two 100 horse power boilers and a 100 horse power high speed engine. The water power equipment consists of a flume 20 by 24 inches in section, bringing the water from a dam on Iron Creek, 1¼ miles distant from the mill, giving a head 100 feet pressure at the wheel. About 500 miner's inches of water are supplied to the turbine wheel, which was manufactured by Craig, Ridgeway & Co., of Coatsville, Pa. The water power will be used except during short cold snaps in the winter, the engine being placed in the mill as reserve power in case of accidents.

The ore is hoisted from the main shaft, and dumped first into an ore bin of 200 tons capacity, located high up the mountain over the mill. From this bin it is conveyed to the mill by a wire rope bucket tramway, the loads going down hill to the mill, hauling the empty buckets back to the mine. The ore buckets mechanically deliver their contents into a 175 ton ore bin, above and back of the mill. The large lumps of ore are crushed, first by a Gates crusher, then passed through a drier to a set of Gates improved Cornish rolls; thence elevated to a set of rotary sizing sieves. From the sieves the finer sizes are conveyed to a set of Paradox concentrating tables, and the coarser sizes to common Hartz jigs. The screens, jigs, and concentrators separate completely all of the mica, quartz, and feldspar, leaving clean concentrates of cassiterite or oxide of tin, ready to be smelted into bar tin. The concentrates are, for the present, being shipped to Chicago to be smelted, but it is the intention of the company to erect at once a smelting plant in the hills. The first shipment of concentrates to Chicago yielded 65 per cent of metallic tin, and the second shipment 68 per cent; and it is expected that with more practice they will yield over 70 per cent.

The main vein measures from 28 to 32 feet in width at the outcrop, and over 40 feet in the lower working. There is no doubt as to the true fissure character of the vein, as it cuts the slates at nearly right angles, and has well defined polished walls with a thick clay gangue or cleavage. The vein stuff is principally albite (white feldspar), with here and there white, glassy quartz. The black crystals of tin oxide are disseminated all through the vein material, varying in size from crystals weighing an ounce or more to those as fine as grains of pepper. Assays and tests from the different workings give an average of over 3 per cent metallic tin, while picked or specimen rock is often blasted out that will yield over 30 per cent of the white metal. With these large bodies of ore, and the excellent facilities for mining cheaply, there is no question but that the present mill, with a capacity of crushing and concentrating 100 tons of ore per day of 24 hours, will soon be supplemented by a still larger mill.

Electricity Taking the Place of Steam.

Prof. Elihu Thomson, in speaking on "The Problems of the Future," says: "In the near future railways will be run by electricity; not the small roads, I mean, but really the large ones connecting cities, and there is no reason why we should not expect higher speeds than we can attain at present with our steam locomotives. There we have reciprocating parts that must be put in motion, stopped, and reversed continually, while in the electric locomotive we have the simple rotary motion, which is all we need, which makes it possible accordingly to run at a much higher rate of speed. Although the steam locomotive has been very much improved, yet it can hardly compare with the economy of stationary engines, placed where they can have an abundant water supply for condensing purposes. We can, therefore, by employing stationary engines and electric roads, do away with a great deal of unnecessary weight, and the moving parts being symmetrical, we can attain a much higher speed, say a hundred miles an hour. This would be a grand step forward, which would save us a great deal of time. It might even be possible to reach a speed of 150 miles an hour. It simply depends upon finding the method of applying sufficient power, and building the locomotives to suit, arrangements being adopted to keep the cars on the track."

A DERRICK used by a shipping company at Hamburg can pick up a ten-wheeled locomotive with perfect ease.

Edible Birds' Nests.

Travelers going from Hong Kong to Bangkok or Singapore by steamer pass along the coast off Annam and near a group of islands that are at once picturesque and curious. Behind them is Tourane, an ancient French settlement, the stopping place of steamers bound for Hue and Haiphong, and destined to be an important commercial port in a not very distant future.

Several of these islands produce an important article of commerce—that is, the edible birds' nests, which have caused considerable learned discussion among scientists. They are as dear to the Chinese palate as to the Chinese purse. It is a singular fact that Annam is the only country that produces them. Why the swallows select this locality as a habitation, and no other, when there are islands apparently as eligible scattered all along the Asiatic coast from Sumatra to Korea, is a mystery that the scientists who have given the subject so much attention have never attempted to elucidate. Had Banquo lived in these times, he might have given an explanation as poetic and reasonable as that which he gave to Duncan for the preference manifested by the Scotch martins for the pure and delicate air that bathed Macbeth's castle. The swallows' nests are a source of riches to the region. Their value is said to have been discovered some hundreds of years ago, during the reign of Gia Long, who promised a liberal reward to any one who would discover a new and profitable article of export within his realm. The nests discovered on the island of Nam Ngai were presented to the sovereign, who, faithful to his promise, offered a patent of nobility to the finder. This was respectfully declined, and instead a monopoly of the harvest was accepted by the discoverer for himself and his descendants. This privileged family was to pay yearly eighty pounds of the nests to the emperor as royalty. On the other hand, they were to be exempt from personal taxes, from military service, and from contributions of personal labor, such as are common in Oriental countries. They formed a family league of forty or fifty men, elected two of their number as leaders, under the title of *gnan* and *doi*, and founded a village convenient for their commerce, which still exists under the name of Yen Xa—"Village of the Swallow's Nest." The nests are the product of a salivary secretion of the birds. As to their mercantile value, they are divided into three distinct categories. The most valuable are those into which there enters a certain proportion of the blood. These are called *yen huyet*. Singularly enough, they can only be produced by the birds affected with a malady which resembles consumption, and which is attended by copious hemorrhage. Nests of this kind are in great demand. They are rare, and are gathered only in the spring. Local tradition says that these birds died of exhaustion, or of consumption in its advanced stages, before the end of the second winter. Scientists being scarce among the Annamese, and the French colonists not having yet had sufficient time for observation, it is not known whether this disease is peculiar only to a part of the birds or whether the salivary secretion that causes the malady causes the death of all of them after a year or two of existence. The smallness of the quantity of these nests annually gathered—which is only three or four pounds—would seem to indicate that the disease is only partial and peculiar to those possessed of the weakest lungs. All other nests (*yan soo*) are classed as second quality. Nothing but the saliva of the bird enters into their construction. They are gathered in the spring, summer, and autumn. The spring harvest is the most valuable because it includes the two qualities. Two nests of the first quality weigh one ounce, and are worth at the place of production five Mexican dollars at current value in Annam. Those of the second quality are worth little more than half as much. The summer gathering is entirely of nests of the second quality. They are smaller and less compact. It requires four of these to make an ounce, which is worth two Mexican dollars. The autumn harvest is still less valuable. The nests are scarce and not highly esteemed. It requires seven to make an ounce, which is not worth more than $1.20 to $1.40. Experts express the opinion that this third gathering should be dispensed with, since it is worth so little and there is danger of destroying the eggs. Nearly all the nests are sold to the Chinese living in the cities of Annam and Tonquin or sent to Chinese ports. Only the Chinese and some high mandarins of the Court of Hue, who prefer the Chinese *cuisine*, can afford the luxury. They are eaten by the Chinese cooked with flesh or with sugar, having first been cleaned of all extraneous substances by a liberal application of hot water. When cooked with fowl or game, fruit of the water lily is added. Chinese physicians prescribe them as a sovereign remedy for diseases of the lungs, asthma, disordered digestion, and most other maladies. If they have curative qualities of the kind mentioned, they probably share them with other alimentary substances containing more or less gelatine. The good qualities of the nests are estimated no doubt in proportion to the price. It is certain that, as an article of diet, they have made little impression on Western nations.

The harvest is made in a manner simple and picturesque. Sections of bamboo are thrust into the holes in the side all the way up the precipice, forming an immense ladder by whose rounds the coolies ascend, detaching with a knife as they go the nests glued to the walls. One of the family which monopolizes the industry watches meanwhile anxiously below to see that the laborer does not in gathering detach some portion of the precious nest and secrete it about his person. The operation is full of danger, and annually costs several lives. The monopoly is at this moment in danger of passing into other hands. A rich Chinese company of Hong Kong, which is building a handsome European hotel at Tourane, and which has branch houses in the principal cities of Annam and Tonquin, if offering the Hue government a handsome bonus for the privilege of gathering the nests. The monopolists are greatly excited at the prospect of losing it, and in support of their claim are offering in evidence the very document given to their ancestors by the Emperor Gia Long. Money is needed at the court of Hue, and the ancient manuscript will be critically scrutinized by Annamese officials to discover if it is indeed a grant in perpetuity or whether there is not a chance to make a good round sum by the transfer. In the meantime the swallows, instead of seeking haunts free from invasion, come back punctually with every recurring season, regardless of their health and this increasing spoliation. Other swallows in other countries can return peacefully to their last year's nests in the ensuing spring. These swallows of Annam must keep on pandering to an aristocratic desire, building and rebuilding their homes and giving their life's blood forever to satisfy a diseased appetite.—*Shanghai Courier.*

A European Census.

Americans who are loudest in their groanings about several census questions should look at the inquisition to which the Germans are subjected.

The German year book gives the figures of even the income tax. An income of $250 or less is not taxed, and up to $750 the tax is nominal. For incomes over $750 the owner must swear as to the truth of the figures he gives. The exact rental of each dwelling is obtained, and the average rentals for different conditions are published. The showing for the year 1885 makes the average rental for a single room without a stove—or an "unheatable" room, as the expression used is—a sum that corresponds in our money to $30 per year. It makes the rental for a single room with a stove in it—or a single "heatable" room—$50; for living apartments consisting of two "heatable" rooms, $85 per annum; for apartments consisting of three such rooms, $150; for four "heatable" rooms, $200, etc.

No personal liberty in Berlin. The police methods in Berlin greatly aid in the preparation of an accurate census. No room can be rented at a hotel or boarding house, and no apartment or house can be legally leased, until the landlord has sent to the police the name and purpose of the newcomer and the length of time for which he will probably make the city his home. The same method is in vogue in other German cities. The experience of one of the professors of the University of Pennsylvania last summer is significant as to the effectiveness of these methods. Wishing to communicate with an American lady who was abroad and, as he thought, in Leipsic, he wrote to the police of that city. The answer declared that no person of the name was in the city. A similar letter was sent to the police headquarters of Dresden, and a similar answer was received. When, later, however, the professor wrote to the police of Berlin, the reply announced that Mrs. ——— was living at No. — ——— street, on the ——— floor.

Golden Magnesium.

M. N. Varren finds that when the metal magnesium is heated in a current of ammonia thoroughly dry, and keeping the temperature below a red heat, it combines with the gas without changing much in appearance, though its chemical properties are much modified; for instance, it will not melt below a bright red heat, and burns, when red hot, with violent decrepitations or small explosions. If the current of ammonia is continued, and the metal in this form heated to bright redness, it is gradually converted into an orange yellow substance which is permanent. This new product dissolves in acids, and the solution contains ammonia. When fragments of magnesium which have been kept at a dull red heat for some time come in contact with gaseous ammonia, it often happens that their surface becomes dark yellow and shines like gold. The exact nature of this golden magnesium has not yet been made out.

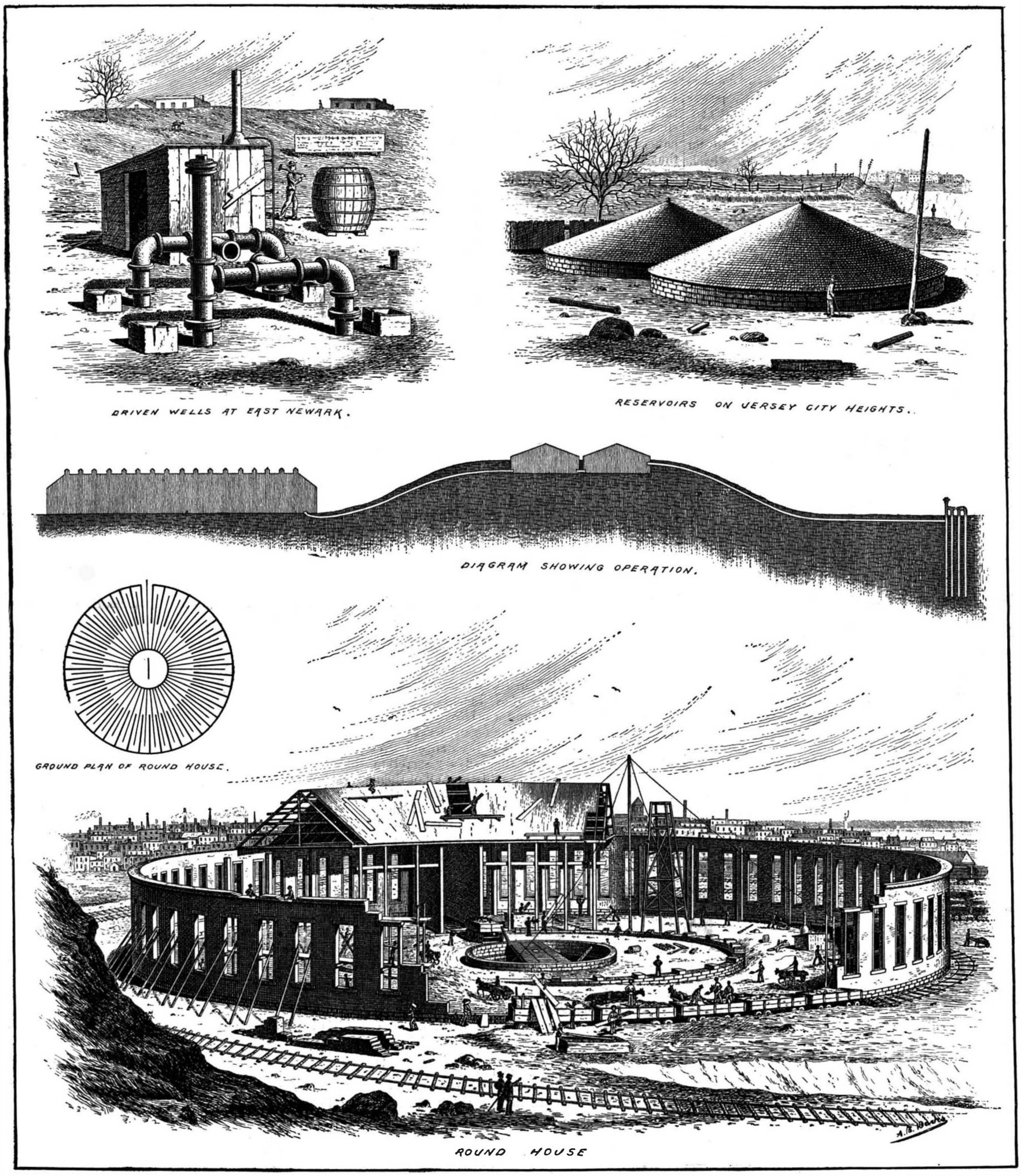
A LOCOMOTIVE working under a pressure of 140 to 160 pounds to the square inch may move a railway train at a velocity of 60 miles per hour, which we are apt to think of as a wonderful speed. But it is slow compared with the rate of motion of the projectile from a modern great gun. Such projectile flies at the rate of 1,365 miles per hour, impelled by a pressure of 35,000 to 40,000 pounds per square inch.

THE MOUNT PLEASANT YARD OF THE PENNSYLVANIA RAILROAD, AT JERSEY CITY, N. J.

The Pennsylvania Railroad proposes to elevate its tracks through Jersey City. In connection with this work the establishment of a track yard for storage of passenger cars and locomotives and for the drilling and making up of trains became necessary. Operations are in progress near Jersey City Heights upon such an establishment, which when completed will include store rooms, track yard, watering facilities, and the largest round house upon the Pennsylvania road, if not in the world. We here illustrate some features of this work. The first thing to be seen to was the supply of water. Four six-inch driven wells were established at East Newark or Harrison, close to the banks of the Passaic River. These were driven 80 feet, bringing them about 50 feet below the bottom of the Passaic River. The water was analyzed in the laboratory of the Altoona shops, and found to be an excellent water for boiler purposes as well as for drinking. In the wells the water rises to within 18 feet of the surface, and during two weeks' consecutive pumping, day and night, with an eight inch Niagara pump, could not be lowered any. A line of ten-inch cast iron pipe is carried from these wells across the marshes, supported in many places by piling, and crossing the Hackensack River 100 feet south of the regular railroad bridge. Knuckle joints were used for this crossing.

It next rises up the hill and discharges into two reservoirs, south of the main line of the road, near Marion. Each of these is 80 feet in diameter and 9 feet deep, roofed over with wood. The sides are of stone with a lining of brick placed on edge and parged with cement. Their united capacity is 700,000 gallons. The pump at East Newark, which is placed between the four wells, is a ten-inch Worthington pump, and has a capacity of 400 gallons per minute. Ultimately a second pump will probably be connected. The water is thus drawn from the wells by suction, and forced through about 6 miles of pipe to the reservoirs. To provide for accidents, the Jersey City water supply is connected also to the reservoirs, but of course will only be used in emergencies. From the reservoirs the line of pipe is taken down the hill to the track yard, and the supply is there distributed by branch lines among the tracks. It is to be used for washing cars, for supplying boilers, and to furnish the passenger cars with drinking water.

Near the center of the yard the round house is placed, which is now about completed. Its external diameter is 320 feet. Its outer wall is of brick. Its interior wall or that facing upon the turn table is of iron, as is also the roof. The turn table in the center is turned by power. Accommodations for 44 locomotives are provided. On the line of track passing through its entrance and exit are two stand pipes connected with the general water system for engine supply. The head of water maintained throughout the yard by the reservoirs is 60 feet, enough to throw water over the highest building that will be erected there. The yard, which is to be known as the Mount Pleasant Passenger Track Yard, will have a capacity for 600 cars. A train entering Jersey City will run on one side of the round house down to the ferry and discharge its passengers. The drilling engine will take the empty cars in charge, drawing them back over the elevated road to the yard, where they will be stored upon the tracks on the other side of the round house. The engine returning on a special track will run beyond the round house and will enter it on the further side, receiving water if necessary before going in. It will then run upon the turn table and be driven into its own stall. On leaving the round house the engines go out at the



NEW LOCOMOTIVE ROUND HOUSE AND SUPPLY WELLS FOR THE PENNSYLVANIA RAILROAD.

other end, and there also pass a stand pipe in order to be watered if necessary. Interlocking switches will be provided at one or both ends of the yard.

While the work is incomplete, such parts of it as are available are being used; thus the well water is already in use for constructional purposes, and the round house itself will very soon be occupied by engines. When completed, the buildings will all be lighted by electricity, the Pullman car service and the ordinary car service will each have large store rooms, a special electrical plant will be installed, and eventually a very complete system for passenger car service will be in operation.

Fire Hydrants.

The need of having plenty of street hydrants was illustrated by Chief Scannell, of the San Francisco fire department. With the aid of his most powerful engine he recently gave the grand jury and the mayor and supervisors of that city an ocular demonstration of the crying need for proper protection against fire of additional fire hydrants. Of course the gentlemen knew perfectly well that in many parts of the city the distance between the hydrants was from 1,500 to 2,000 feet, but it is probable that they never before realized so thoroughly how great was the loss in power of a stream caused by the friction in the long line of hose thus made necessary. It is safe to say that they were somewhat surprised when, after seeing water thrown 206 feet through 100 feet of hose, the pressure at the nozzle standing at 90 pounds, 900 feet more of hose were coupled on and the enfeebled stream fell to the ground just fifty-four feet from the nozzle, where the pressure mark was but six pounds.

THE "AMERICAN SYSTEM" OF ELECTRIC ARC LIGHTING.

It is almost needless to say at the present day, when dynamos are used in nearly every city and village and in many isolated places for the purposes of illumination, that the dynamos and machinery employed for such use should be of the simplest character, as it cannot be expected that an accomplished electrician or engineer will accompany every electric lighting plant, large and small.

The dynamo shown in the annexed engraving is based upon the principle of the well known Gramme machine, the pioneer of efficient dynamos. The machine, as developed by the New American Electrical Arc Light Co., is a great improvement over the original Gramme. It has been simplified, its parts have been rendered accessible, the armature is provided with means for free ventilation, the commutator is so constructed as to avoid short-circuiting, and the commutator bars are made removable, so that one or more may be taken out of the commutator without disturbing the rest.

The lamps used in connection with this dynamo are practical and efficient. It is claimed that 2,000 candle power lamps are run in connection with this machine with an expenditure of seven-tenths of a horse power each. The machines range in capacity from 1 to 50 arc lights, each of 2,000 candle power, and they will supply a proportionately increased number of lamps of 1,200 candle power.

It may be of interest to state that this company has lighted the statue of Liberty in New York Harbor since its completion. Owing to the haste with which this plant was installed, the apparatus was not arranged in duplicate; however, its operation has been continuous, and the machinery is said to have performed satisfactorily in all respects without any interruption.

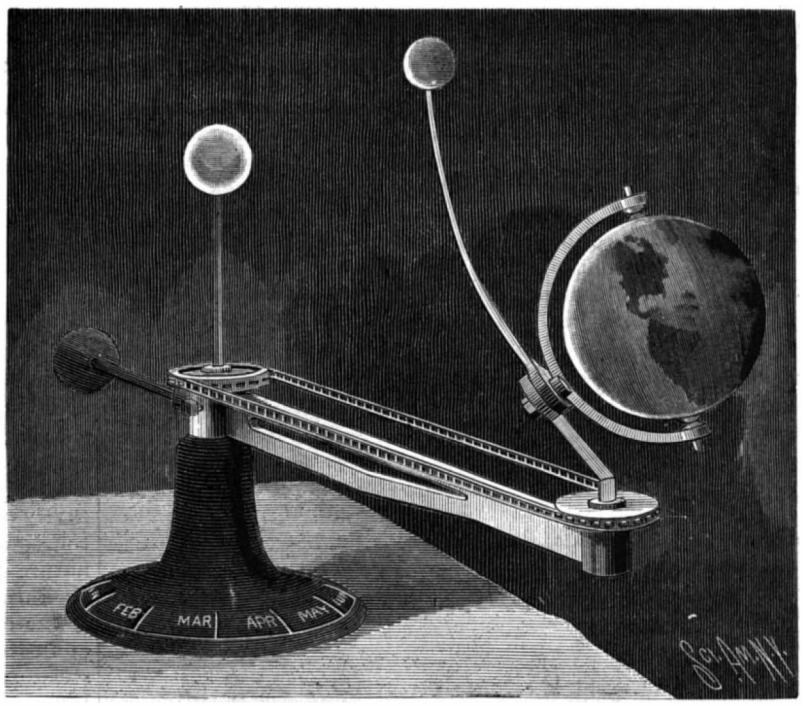
The American system of electric lighting is in extensive use in all parts of the United States and Canada as well as in England, France, Germany, Sweden, Australia and China.

The offices of The New American Electrical Arc Light Company are at 173 Broadway and 2 Cortlandt St. Factory at 165 West 18th St., New York.

CAUSTIC soda or kerosene oil may be used to clean the hands from printer's ink. The former must be dilute or it will affect the skin unpleasantly. Other inks yield to oxalic acid, javelle water, etc.

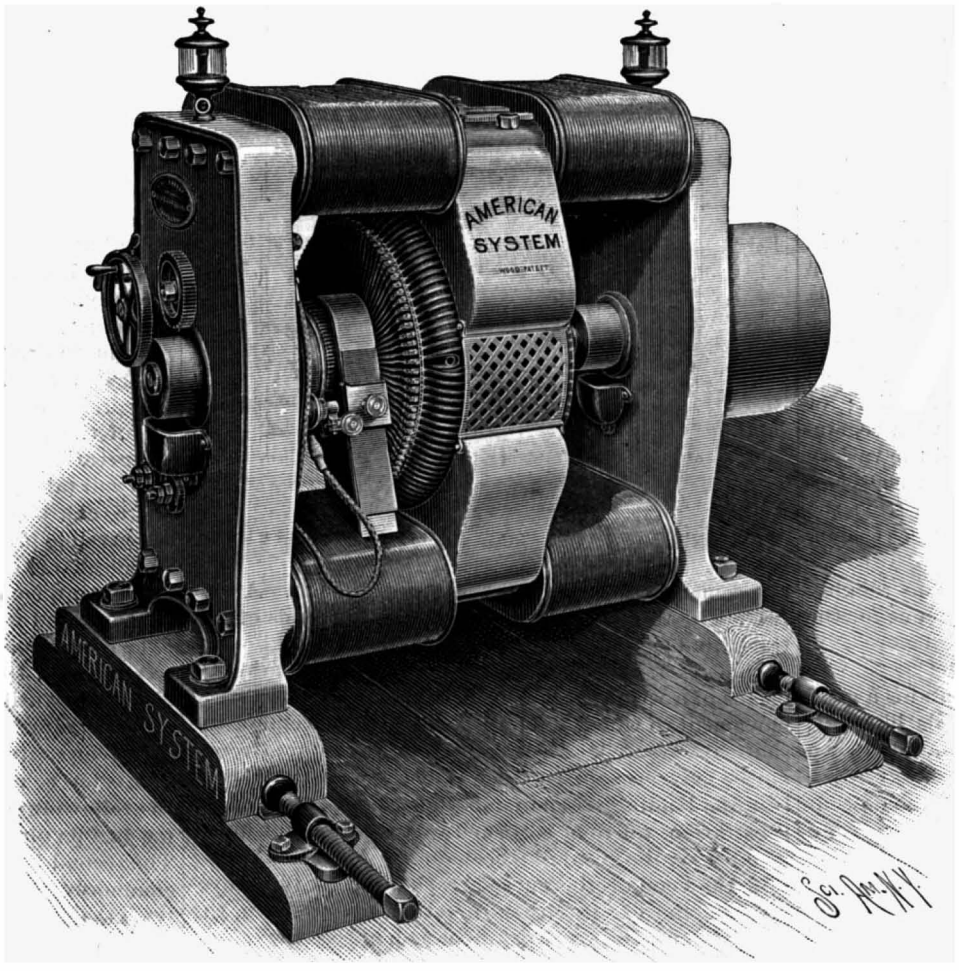
Soapstone and Its Uses.

A writer in a London journal calls attention to the unappreciated uses and preservative qualities of soapstone, a material, he says, which possesses what may be regarded as extraordinary qualities in withstanding atmospheric influences, those, especially, which have so much to do with the corrosion of iron and steel; and from experiments made, it is said that no other material is capable of taking hold of the fiber of iron and steel so readily and firmly as this. In China, soapstone is largely used in preserving structures built of sandstone and other stones liable to crumble from the effect of the atmosphere; and the covering with powdered soapstone in the form of paint, on some of the obelisks in that country, composed of stone liable to atmospheric deterioration, has been the means of preserving them intact for hundreds of years.



HOSKING'S INSTRUMENT FOR ILLUSTRATING THE CHANGES OF THE SEASONS.

AN arrangement for the prevention of accidents by the electric current has been adopted at the works of the Morgan Engineering Company, of Alliance, Ohio. A board is fixed on the wall facing the dynamo in the engine room. On this board are six hooks on the checks of the six men who are employed in looking after the circuits. When a man is called on duty he removes his check from the hook and takes it with him. The engineer sees by a glance at the board that one hook is absent, and that, therefore, one man is engaged about the lines around the shop, and the dynamo is not started until the check is replaced on the hook. The engineer then understands that the coast is clear, and turns on his current without fear of accident to any of the linemen.



THE "AMERICAN" DYNAMO.

AN IMPROVED TELLURIAN.

The illustration represents an instrument designed to show, in a simple and effective manner, the motion of the earth around the sun and that of the moon around the earth. It has been patented by Mr. Alfred Hosking, of the Mount Eden School, Auckland, New Zealand, the instrument being the result of the inventor's efforts to perfect a "seasons demonstrator" for use in his own school—one which would not readily get out of order, and which would enable the teacher, instantly and without noise, to change the relative positions of the sun, earth, and moon. On a circular base, provided with a graduation indicating the different seasons of the year, is a post on which is mounted to turn a counterbalanced horizontally extending arm, on the outer end of which turns a vertical shaft integral with which is an inclined arm. At the outer end of this arm is a stud provided with a segmental arm, in which is mounted to turn a globe representing the earth, the axis of this globe being inclined to the vertical post extending upward from the base, on the upper end of which is a fixed globe representing the sun. On the stud carrying the segmental arm in which is held the globe representing the earth is also held to turn a curved arm carrying at its outer end a globe representing the moon. On the main post, above the horizontal arm, is a sprocket wheel, over which passes a sprocket chain, which also passes over a sprocket wheel on the vertical shaft of the horizontal arm. The sprocket wheels are both of the same diameter, so that when the operator turns the horizontal arm once around the post, the globe representing the earth makes a movement similar to that of our earth around the sun, and the moon globe, when its arm is turned, travels around the earth in a similar manner to the natural movement of the moon around the earth. The horizontal arm and the arm carrying the moon can be turned at pleasure, and the four seasons of the year can be easily demonstrated on the globe representing the earth.

Warping of Wood.

As lumber is now sawn, every board but one will warp and curl up in the process of seasoning. The reason for this is plain. If the board be sawn from the side of a log, the grain rings of the wood lie in circles, which have a greater length on one than upon the other side of the board. A board cut from the very center of the log has grain circles of equal length upon each side, and will lie perfectly flat when seasoned.

When selecting the lumber for a tool chest or some other fine job, pick out boards which show that they came, as near as possible, from the center of the log. A method is in use which compensates for this tendency to curl in seasoning. This is known as quarter sawing, and quartered oak, of which so much is said at present, is sawn by this process.

It consists in cutting out boards radially from the center to the outside of the log. Suppose a log to be split into four pieces, each of these pieces is sawn diagonally so that the grain rings run through, instead of the circles running into, part way through and out upon the same side of the board.

Quarter sawn lumber will not warp in drying, neither will it yield so readily to changes of weather. It has the disadvantage of being more expensive, as in sawing each quarter a narrow board is first taken off, then one a little wider. The boards increase in width until the middle of the quarter is reached, making the widest board equal to half the diameter of the tree. The narrow boards may be glued up into wide strips, but that shows considerable sap, and they cannot be used in some kinds of work.

To prove that the circles or sap rings cause curling during the seasoning process, it is only necessary to take such curled boards and wet the concave side, or apply heat to the convex side. If each or both be done, the boards will straighten out forthwith. This method is often taken advantage of by carpenters, in working twisted or warped boards. The seasoning process is also controlled by frequently turning boards over so that each side may receive just enough heat and air to keep the boards flat.—*Woodworker.*

Chocolate and Cocoa.

BY A. N. BELL, A.M., M.D.

The introduction and common use of the terms "coca" and "cocoa," applicable to medicinal substances, have had the effect of confusing people's minds with regard to the source and preparation, and, in some cases, creating a prejudice against the use, of the wholly different substances—chocolate and cocoa.

The medicinal wine of coca and the powerful alkaloids and nerve stimulants cocaine and hygrine are prepared from the leaves of *Erythroxylon coca*, a shrub indigenous to Peru and Bolivia, wholly different to *Theobroma cacao*, a small but beautiful tree, which grows luxuriantly both wild and cultivated in the northern parts of South America, Central America, Mexico, and the West Indies, from the *seeds* of which chocolate and cocoa, and (from the oil) cocoa ointment or "butter," are prepared.

When the Spaniards first visited Mexico, four centuries ago, they found the natives using *chocolatl*.

It was introduced into Europe as early as 1520, and has since been more or less extensively used in every civilized country. Linnæus was so fond of it that he gave to the tree from which it was obtained the name of *Theobroma*—food for the gods.

Chocolate and cocoa are only two forms of the same substance. The tree twice in the year yields a crop of reddish spongy fruit, shaped somewhat like a cucumber; the ripe fruit being collected at the decline of the moon, the tree continues its yield for twenty or thirty years. Each fruit or pod contains from six to fifty beans—usually about twenty—and there are from ten to twenty pounds of such beans from each tree at each crop. The beans are usually about the size of large almonds; they are frequently (from a confusion of language) called indifferently "beans," "seeds," "nuts," "berries," and "fruits," but their character will be better understood by regarding them as beans contained within a pod. They are generally picked out and dried for exportation.

Besides the beans, the pulp contains a creamy and cordial juice; and, by steaming and pressing, the beans will yield one-third of their weight of a kind of butter, to which the richness of cocoa is due.

For preparing the beverage material, the beans are exported in their original state, to be converted into cocoa or chocolate by a manufacturing process. They are first roasted in slowly rotating ovens, then broken by machine into such a state that the husks may be separated from the kernels by a blast of air, and they are afterward treated and beaten and converted into a pulp by means of their own oil. The pulp, when ground between millstones till it assumes a consistency something like that of treacle, is in a state to receive any of the modifications that will fit it for the market.

It may be "plain cocoa," or "homeopathic cocoa," or "vanilla chocolate;" it may have arrowroot, or sago, or sugar mixed with it; or, if the manufacturers be tinctured with roguery, there may, perchance, be bean meal or other adulterants mixed with the pulp. The pulp, when fully prepared in any of these diverse ways, is cast into large moulds; the cakes thus produced are cut into minute shreds by machine, and the shreds are rubbed, sifted, and packed for sale.

The preparations of cocoa and chocolate made in France are more numerous than those usually made in England or the United States: they comprise vanilla chocolate, milk chocolate, chocolate bonbons, chocolate papillotes, chocolate crackers, chocolate pastilles, chocolate with taraxacum or with sarsaparilla, chocolate with tar—in short, there is no end to the list; for once admit the principle of mixing cocoa with vegetable infusions, or decoctions, or essences, and the variety becomes interminable. The French limit themselves to the use of the word "chocolate," derived from the Mexican name of the plant (*chocolatl*); they seldom speak of "cocoa."

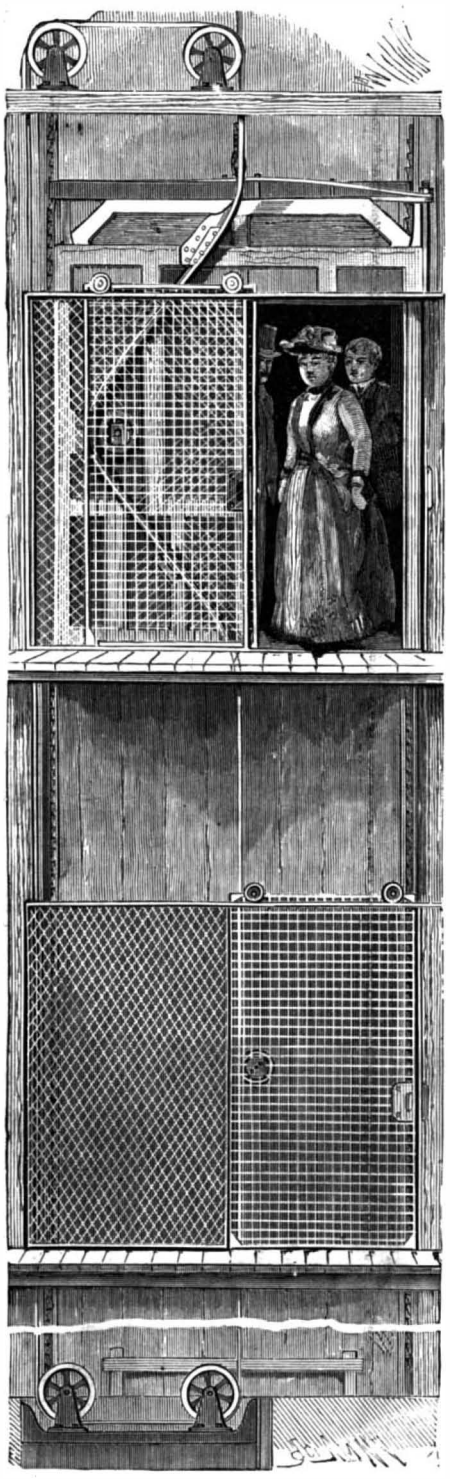
What are called "cocoa nibs" are the beans roughly crushed. "Flake cocoa," also, is another name for the beans when crushed between rollers, but before anything else has been added to them.

The husk of the seed, after roasting, contains a good deal of nutriment; indeed, so do the pods likewise; and all three are more or less used in making cheap cocoa. The plant is certainly used in more ways than coffee: drunk as a thick decoction (made to somewhat resemble gruel), made into various confections and pastries, eaten as bonbons, etc., while a poor decoction is drunk in some places by boiling the husks separated from the beans.

While chocolate and cocoa contain an essential principle, *theobromine*, comparable to *caffein* and *theine*—the alkaloids of coffee and tea—it is much less potent as a disturber of the nervous system; and chocolate and cocoa are proportionally more wholesome as a beverage, besides possessing specially nutritive qualities which render them much more sustaining; and there can be little question but that its general substitution for tea, especially of that cheap, oversteeped, second edition kind which is the too common beverage of overworked women in various avocations of life, would be promotive of health.—*The Sanitarian.*

AN IMPROVED METHOD OF AUTOMATICALLY CLOSING ELEVATOR DOORS.

The accompanying illustration represents a simple and inexpensive construction for automatically operating the sliding doors guarding the exposed landings of passenger elevators, and by means of which all the doors in the elevator shaft will be held positively closed, except the door at the particular landing where the car is stopped. This has been patented by Mr. C. H. Stilson, and Messrs. Otis Bros., of New York, have contracted to use the guard. On each landing door, near the latch side and opposite the latch, is a grooved wheel about eight inches in diameter, and on the elevator car there is a parabola-shaped track adapted to engage the groove of the wheel, this track running down and inward on the side of the car, from just above its top to a point about midway of the door, and back from the side of the car a distance equal to the width of the door. From there the track bends back to a point below the door, and in line with the commencement of the track at the top of the car. A wire cable is attached to the upper and lower ends of this track, and extends over pulleys at the top and bottom of the shaft, this cable being kept under tension by means of a weighted platform having a slight vertical movement to which the pulleys at the lower end of the shaft are secured, or for which an adjustable screw device may be substituted. When the elevator is at rest at a landing, as shown in the upper portion of the illustration, the door is opened by the attendant in the usual way, the grooved wheel on the door then fitting into the bend of the curved track; but on the movement of the car in either direction, up or down, the wheel follows the lower or upper arm of the track, forcing the door forward and firmly closing it. As the cable attached to each end of the track forms virtually a continuation of the track to the top and bottom of the shaft, all the doors in the shaft are thus held closed whether latched or not, as the car passes away from them, and cannot be opened except when the car is present. The car can thus be moved from a remote landing and brought to any other, above or below, closing the door of the landing it leaves, without requiring the services of an attendant on the car. The apparatus may be readily applied to all elevators, old or new, where the doors slide on rollers, and can be easily manufactured and put in place by any good mechanic. For further information address the inventor, Mr. C. H. Stilson, architect, 736 Chapel Street, New Haven, Conn.



STILSON'S ELEVATOR DOOR-CLOSING ATTACHMENT.

Fusible Plugs.

Fusible plugs are very important adjuncts to a boiler, yet, like everything else about a boiler, they need a great deal of attention, and often more than they get. These plugs usually consist of a piece of tin, lead, and bismuth inserted in various manners in the crown sheet or heads of the boiler, and as will be readily understood, the design being that when the water gets too low the fusible metal will be melted by the heat, allowing the water to escape into the fire, or the pressure to be relieved from the boiler. So long as the alloy is kept at a comparatively low temperature by the water on one side, it is of course prevented from melting by the fire on the other.

Notwithstanding the great favor in which they are held, Wilson claims there is no doubt that their efficiency has been much overrated, as in his experience as a boiler inspector numerous cases of failure to work are recorded every year. This is partly due to an accumulation of soot and dirt that usually takes place in the cavity over which the plug is inserted, and partially in consequence of the alteration which takes place in the nature of the alloy during long exposure to the heat of the furnace.

There are numerous instances given by Wilson, also, of fusible metal melting out without liberating the steam pressure. This is chiefly caused by the accumulation of incrustation on the metal being sufficiently strong to withstand the pressure upon it, and prevent the liberation of the steam, and it does not take much to do this. The simple plan of screwing or riveting a piece of lead or fusible metal into a hole should never be adopted, on account of the leakage that often takes place when the plug is slack, which leads to the corrosion, patching, and destruction of the plate. Moreover, the plug will probably not melt until the crown sheet shall have actually become bare. For this reason alone there should be a provision on the furnace plate for the insertion of the plug to keep the sheet still covered with two or three inches of water after the plug itself has been left bare. This is usually done by riveting or screwing a seating of the wrought iron into the sheet into which the fusible plug is fitted, sometimes one within another, so that in the event of one failing to work, the other may be ready. Where the area is small, greater care is necessary in keeping the metal free from incrustation, a coating of hard scale less than one-sixteenth inch thick over a one-half inch hole being sufficient to hold a pressure of 70 to 80 pounds. The mouth of the seating, when that method is used, is made two or three inches in diameter, to allow the easy removal of the soot and greater exposure to the heat.

In making a selection of the description of plug, the nature of the feed water should be considered. With feed water containing much carbonate of lime or magnesia, especially where grease is present, many of the fusible plugs in use are found to be too sensitive, and cause much trouble by melting, even where there is still abundance of water over the sheet, from the same cause as brought about the bulged plates referred to recently.

It must not be supposed that the steam in an ordinary large sized boiler can always be liberated with sufficient rapidity through a small hole to prevent overpressure. Many engineers state that, on the melting of the plug, the discharge of dry steam over the fire greatly increases the heat of combustion. That this will take place under certain favorable conditions there can be no doubt, and is probably one reason why fusible plugs are sometimes ineffective; but when the discharge of water or wet steam over the fire is to any extent, combustion will be retarded, the pressure relieved, and warning of danger given.

To guard against the risk arising from the tendency to change in the nature of the alloy, it is advisable to renew the fusible metal every three or four months, and only plugs that will admit of this should be chosen. Low temperatures can be determined by the melting points of compositions of lead, tin, and bismuth, and the following alloys are given by Weisbach as suitable for fusible plugs, together with their melting points. The second is what is known as Rose's metal, and very commonly used.

1	part	lead,	1	part	tin,	4	parts	bismuth,	201° Fah.
5	"	"	3	"	"	8	"	"	202° Fah.
2	"	"	3	"	"	5	"	"	202° Fah.
1	"	"	4	"	"	5	"	"	246° Fah.
1	"	"	—	"	"	1	"	"	257° Fah.
1	"	"	1	"	"	—	"	"	466° Fah.
—	"	"	2	"	"	1	"	"	334° Fah.
1	"	"	3	"	"	—	"	"	334° Fah.
—	"	"	3	"	"	1	"	"	392° Fah.

—*Boston Jour. of Com.*

To coat tin dishes to withstand the action of chemicals used in developing and toning photos, use a quick-drying asphalt varnish, as that for bicycles.

Thioketone, the Worst Smelling Substance Known.

An amusing instance of the inconveniences of carrying on chemical research in populated districts (*Brit. and Col. Drug.*) appears incidentally in a paper on Thioderivatives of Ketone, by E. Baumann and Fromm. By the reaction of sulphureted hydrogen on acetone in the presence of condensation agents they obtained principally trithio-aceton $C_9H_{18}S_3$, and small quantities of a non-volatile, definitely crystalline compound $C_{15}H_{28}S_4$, tetrathiopeuton. At the same time, however, an exceedingly volatile body was formed which possessed a smell so horrible that, in comparison therewith, ethylmercaptan, ethylenmercaptan, and other volatile sulphides must be considered as faint-smelling substances! The authors could not obtain the compound pure (for a reason which they mention further on), but there could be no doubt that it was the monosulphureted acetone C_3H_6S or thioketone. As they were once distilling the reaction product of 100 gr. aceton, concentrated hydrochloric acid, and sulphureted hydrogen, with the most perfect arrangements for condensation, so that no perceptible loss of the product occurred, the atmosphere of the surrounding district of the town was infected over an area more than 800 yards wide! Every attempt to obtain the substance pure brought down such a storm of protest and complaint against the laboratory that the authors were compelled to relinquish the research.

Armor Plate Tests.

An armor plate 4 feet square by 4 feet thick, manufactured by Messrs. Wm. Jessop & Son (Limited), Brightside Works, Sheffield, was recently subjected to a severe trial on board the Nettle, off Portsmouth. Three shots were fired at the plate from a 5 inch breech loader only 30 feet distant, with special charges of gunpowder and chilled projectiles. The first shot directed at the plate was fired toward the bottom, 12 inches below the center. It made a slight penetration, but was hurled back broken into fragments, leaving only a very small and almost imperceptible crack from the point of impact to the bottom edge. The second shot, fired at a spot equidistant between the center and the top left-hand corner, gave even better results. It hardly penetrated the plate at all, and was thrown back in several pieces. No crack appeared at all near the point of impact, but a slight start of an appearance of a crack was formed on the outside edge nearest where the shot struck. The results of these two shots were considered so remarkable that it was decided to fire a third, which was launched against the plate before it had recovered from the vibration of the second impact. This shot, which took effect 12 inches from the side and 12 inches above the center, caused two cracks, one extending down to the impact of the first shot, and the other going upward to the top outer edge. Nevertheless, the shot did not penetrate half way through the plate, but was returned into the arena almost pulverized to dust. The general opinion of those who witnessed the trial, we are informed, was that the plate was the best of its kind yet tested. The plate was manufactured of special steel recently patented by Mr. J. F. Hall, the works manager of Messrs. Jessop's works.—*Colliery Guardian.*

Hemp Silk.

Mr. Nayemura Sakusaburo, a druggist of Hikone, in Omi, Japan, has succeeded in converting wild hemp (yachyo) into a substance possessing all the essential qualities of silk. Nothing is said about the process, but it is asserted that trial of the thread has been made at the first silk-weaving establishment in Kioto and at other factories, with excellent results in every case. The plant in question grows on moors and hillsides. Its fiber is said to be strong and glossy, in no wise inferior to silk when properly prepared. Cultivation on an extended scale would present no difficulties.

ORNAMENTAL IRON WORK FOR AMATEURS.

Although artistic wrought iron work dates from very early times, it was never more popular than it is at present. This remark applies especially to movable articles such as tables, stands, racks of various kinds, fuel baskets, lamp supports, etc. Many of these articles of recent manufacture are copies of antique objects, while others are of modern design. As works of art they are fully equal, if not superior, to the specimens of earlier work.

Now, while no imitation can ever equal the original article, it must be admitted that imitations often

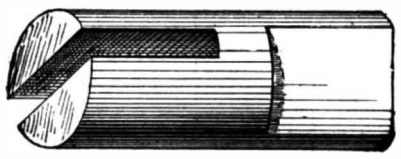


Fig. 3.—JAW FOR BENDING.

prove very satisfactory to those who can neither make nor purchase the real article.

The examples of iron work here illustrated are styled imitations, as they are made without forging, *i. e.*, the iron is bent either cold or hot, without the use of a hammer, while the iron bars or rods maintain their original cross section. Any one used to the hammer and anvil can, in addition to the curves, apply forged portions, or twist and forge the bars used in the scrolls.

The only special tool used in making articles of this class is the steel jaw shown in Fig. 3. Its slot receives the bar to be bent, and its flattened shank is designed to be held in an iron vise. A scroll is formed by placing the end of a bar in the jaw, and winding the bar around the jaw and upon itself, afterward unwinding the bar to open the spiral as much as may be required. After the scroll is complete, the inner straight end of the bar is cut off by means of a hack saw. The sharp angles may also be bent by the use of the jaw. It will facilitate the operation if the bar is heated red hot at the point of bending. A hammer may prove useful in this part of the operation.

The standard of the lamp support consists of a piece of gas pipe. The feet are attached by means of screws, and the different parts of the iron work are fastened together by means of small screws or bolts.

A rod is fitted to the gas pipe and has at its upper end a frame or cup for receiving the lamp. A clamping screw passing through the gas pipe holds the rod at the desired height.

An easy and satisfactory way of blacking the work after it is finished is to coat it with a thin varnish of stick or seed lac cut in alcohol, with refined lampblack stirred in to give it the required color. The varnish should be made quite thin to avoid any gloss.

It is obvious that grilles, gates, screens, doors, and other objects may be made from iron in this way with little trouble or expense.

Figs. 1 and 2.—IRON LAMP SUPPORTS.

A New Era of Prosperity.

It is the opinion of many close observers of the times that this country has entered upon a new era of prosperity. One of the chief reasons for this belief that they cite is that wheat values, which, with the exception of two or three instances of temporary abnormal inflation, have for a number of years past been unusually low, must in the future inevitably maintain a higher range, owing to the simple fact that our home consumption is increasing much more rapidly than the production of wheat—that there will be less new land to subdue, less bonanza wheat farming, and a greater diversification of crops in the future than in the past. As the prosperity of the country depends upon that of the farming community, it is easy to see that a steady, legitimate advance in the price of breadstuffs under the conditions cited would inevitably bring better times to the people. Increase of home consumption is the factor upon which the farmers and millers must mainly rely to enhance their prosperity. The foreign market will cut much less of a figure in the future than heretofore, and the sooner those who are banking so heavily upon it now arrive at an understanding of this fact, the more contented in mind will they be.—*The Modern Miller.*

Make an Agreement.

It is a difficult matter to deal with that class of men who will neither give nor receive a definite proposition looking toward compensation. If, on the one hand, you meet a man who says, "That will be all right; I guess we won't have any trouble about that part of it," set it down that there will be trouble on just "that part of it." If, on the other hand, you find a man who is always declaring, "You'll not lose anything by this; I'll see that it's all right," you may be sure it will be all wrong in the end. When two men of this sort get together, and the services are of such nature that to determine their exact value at the time of their inception is impossible, the end will be a misunderstanding, mutual dissatisfaction, possibly an estrangement. Yet there is no case in which a probable value cannot be got at. If you consider matters as a complete affair, and estimate the value of results as you plan them to happen, you can never be far wrong. If one cannot do that, he has no business to undertake to make contracts at all. It may be that there are times when a man may go into a business engagement without a definite idea of what his pay is to be, and there may be men who will always settle satisfactorily. But one is never safe to make engagements in such a lax way. False modesty always stands in the way of sensible business arrangements. But it has no place in business. As an old merchant said once to a writer: "We are friends, and I trust will always remain so. Perhaps it is against my interest to tell you so, but when you are making an agreement for the purchase and delivery of goods, don't think of your feelings toward each other at all. Buy of me as you would of a stranger; consider your own needs and profits, and don't hesitate to buy when you can do best." It should be exactly this way in making arrangements for employment. Treat the matter simply as business, pure and simple. You can't afford to do business without making proper arrangements for all points. These sensible suggestions from the *National Grocer* have more than a money value. "Business is business" seems sometimes like a heartless proverb, but it is a fact that no business is likely to prove so satisfactory as that which is done strictly on business principles. Here is where the great value of business education comes in. It impresses upon the mind at every stage of its course that "business is business."

RECENTLY PATENTED INVENTIONS.

Engineering.

VARIABLE CUT-OFF.—Walter de Sanno, Corry, Pa. This is a slide valve connected by a connecting rod with an operating lever, a lever to which the rod is attached being pivoted to the side of a rocker lever and a sliding block being attached to the operating lever and provided with suitable rods by which it may be moved, thus effecting a quick valve motion and variable cut-off, with means for quickly changing the stroke.

SLIDE VALVE.—Edward Leslie, Orangeville, Ontario, Canada. This valve consists of an outer valve section formed to rest upon the valve seat, this section controlling the inlet of the motive agent, and an inner valve section having an open top, which also rests upon the valve seat and is formed with a flange that fits closely against the under side of the top of the outer valve section, this inner valve section controlling the exhaust, and the construction providing for an exceedingly rapid reciprocation of the valve.

BOILER LEVELER. — William H. and Joseph L. Freeman, Shell, Ohio. Combined with the boiler, the front axle, and a straight rack bar loosely attached thereto, is a worm gear secured to the boiler and a shaft arranged alongside of it, with other novel features, for conveniently and rapidly leveling the boilers of traction engines.

IGNITOR FOR GAS ENGINES.—John J. Pearson, New York City, and Julius Kunze, Yonkers, N. Y. Combined with the power cylinder is a water jacket valve chamber in which is seated a spring-pressed valve having an apertured stem and valve seat, another valve being fitted to the valve seat and carrying a plate and burner to heat the plate, in connection with a movable cam arranged to push forward both valves, an operating lever and governor balls.

Railway Appliances.

CAR COUPLING.—Charles G. Wheeland, Brush Creek, Iowa. This invention provides a means whereby the link may be vertically adjusted from the side of the car to couple with a drawhead of greater or less height, the coupling being made automatic when desired, and the device being capable of being reversed or turned end for end.

ELEVATED RAILROAD. — John N. Valley, Jersey City, N.J. This is a structure more especially adapted for use in timber lands for getting out logs, or in mines for transporting coal, etc., and is made with a single rail or track supported by hangers from overhead longitudinal stringers sustained by struts set on or into the ground.

Mechanical.

SAW FILER. — Chandler W. Dudley, Whiting, Iowa. This device has a supporting rod on which slides a bed plate, there being pivoted on the latter a turn table having guide standards in which slide guide rods, with other novel features, by which, when the device is set to the proper pitch or bevel, it is impossible to file at any other angle, and the labor is easily performed.

WINDMILL. — Lincoln E. Martin, Emery, South Dakota. This mill is more especially adapted for the discharge of water taken by it from a well into an adjacent float tank to maintain a water supply to buildings or farms, the mill being automatically operated for such purpose, and the entire construction being designed to be simple, strong, and efficient.

BELT SHIFTING AND BRAKE MECHANISM.—James H. Rohme, Newburg, N. Y. This is a combined mechanism to be connected with the driving wheel and flywheel of a sewing machine, to readily shift or unship the driving belt from the driving wheel while the latter is in motion and apply a regulated pressure to the flywheel to brake it.

Agricultural.

CORN PLANTER. — Byron E. Cagle, Medina, Kansas. This invention relates to corn planters in which the seed-dropping mechanism is located on the traveling wheels, the cut-off slides being automatically operated during the revolution of the wheels to drop the seed at the proper time by engaging a fixed portion of the planter frame, the operation being positive and the machine simple in construction.

REVERSIBLE PLOWSHARE. — William Heithersay, Petersburg, South Australia. In this plowshare the standard has a foot projected laterally at an angle in combination with a reversible approximately triangular share secured at its apex to the foot, the cutting edge of the share making one side of the base of the triangle, forming a double-pointed share which can be reversed when the forward point becomes blunt, when the reversed point will be automatically sharpened by the further use of the share.

HAY STACKER. — John H. Moore, Plessis, N. Y. This is a slide or chute, usually consisting of two parallel end beams, connected by a number of slightly spaced strips or planks, and adapted for attachment within a barn, whereby the hay elevated by the fork or sling may be directed to the sides of the mow or to the center.

HAY LOADER. — Adolph Lasack, Oxford Junction, Iowa. Combined with a bed and crank shafts journaled therein is a series of longitudinal rake bars, provided near their upper ends with tracks, each formed of a piece of wire bent upon itself to constitute parallel arms with prongs, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

Miscellaneous.

WAGON JACK.—A. J. Oliver and R. M. Wren, Oakland, Cal. Combined with a standard having three walls stiffened by web pieces, with two rows of hook-shaped teeth projecting from its front face in opposite pairs, is a bracket frame to which are attached sleeves adapted to slide on the standards, a forked lever, a cross bar, and two pivoted parallel links loosely connected to the ends of the fork lever, with a dog which can be made to mesh with two opposite teeth of the standard, the construction being simple, strong and efficient.

FAMILY BIBLE CABINET. — John Melville, Connellsville, Pa. This is a combined case and book holder movable vertically therein, with latches pivoted to the holder, whereby they may be turned laterally to engage the case when the holder is elevated, with other novel features, whereby such a book may be well preserved and readily adjusted for convenient examination.

FOLDING BED. — Fredrick Bennett, New York City. In this bed the bed bottom is hinged to a vertical stationary frame with rigid arms on its lower edge, in combination with intermediate sections, to which are hinged a head rail with weight levers and links, the head rail being attached to the mattress and supported loosely at its ends, the mattress being drawn taut and held from yielding when the bed bottom is wholly lowered.

WINDOW SHADE FIXTURE.—Abraham B. Dunkle, Steelton, Pa. This is an improved form of roller carrying brackets adapted to fold when not in use, combined with an independent strip to which they may be attached without resorting to the ordinary means of securing them, whereby the brackets are supported without direct attachment to the window frame, and may be readily placed in position for use.

LINIMENT. — Stephen J. Lancaster, Petrolia, Ontario, Canada. This is a new composition of matter for the treatment of sciatica, neuralgia, gout, inflammatory rheumatism, and similar diseases, the composition including a tincture in alcohol of capsicum, Prince's pine, camphor gum, and other ingredients, combined and applied in a manner specified.

TIME LOCK. — Charles F. Myers, McKinstry's Mills, Md. This is a lock for the doors of safes, vaults, etc., and specifically provides for the accidental derangement of the time mechanism by having two sets of mechanism operating in unison or independently of each other, providing for automatic unlocking when it has been accidentally allowed to run down, and in the event of the breaking of the mainspring or other operative part.

COIN-RELEASED TELEPHONE LOCK.—Harry L. Cassard, Baltimore, Md. This is a lock by which the suspension hook for the receiver is held from upward movement to complete the telephone circuit, but will be released by the aid of an inserted coin, the apparatus being especially designed for application in telephone stations where the proprietor desires to collect tolls from outside parties using the telephone.

GALVANIC BATTERIES. — Edward M. Burt, Paris, Ill. This invention provides an inexpensive and effective exciting solution for galvanic batteries, formed by dissolving the salts produced by the burning of cobs of Indian corn, the battery being prepared after a manner specified.

OXIDIZING OR DESULPHURIZING ORE.—Edwin M. Clark, Butte City, Montana. This invention provides for forcing a large supply of air into the furnace containing the ore, for which a novel form of furnace is provided, thus hastening combustion and desulphurization, instead of first roasting the ore for a longer time to consume or destroy the sulphur.

HOLDING CARBON PAPER FOR COPYING.—William H. Pardee, Antigo, Wis. This is a combined surface plate and carbon paper holder, adapted to be used by slipping it in between the leaves of a copying book, writing pad or tablet, to give a smooth writing support, and also serve as a carrier and holder of the carbon paper.

TABLET OR BOOK HOLDER.—This is a novel form of slip holder for tablets or books, patented by the same inventor, adapted to hold the back and one corner of the tablet or book within it, and designed for use as an appendage to a desk or table, or as a flexible book cover for binding purposes.

RIBBON SPOOL FOR TYPE WRITERS.—William L. Salvage, Chattanooga, Tenn. This invention provides for the quick and cleanly substitution of ribbon spools in all machines using ribbons, the spool shaft being held in place by a pivoted spring and a stop limiting its endwise movement, thus largely economizing time and facilitating the changes where a large variety of work is done.

ARTIFICIAL LIMB. — Alexander Gault, Medford, Minn. This invention relates especially to the construction of the foot and ankle, all ankle machinery and heel and toe cords being dispensed with, and means provided whereby felt may be employed in forming the foot, and the toe be held at all times in position to contact naturally with the ground.

COLLAR AND CUFF BOX. — Theodore Springmeyer, New York City. This box has a central tubular cuff receptacle, an annular collar receptacle, and a small pocket or covered well secured centrally to the cover, forming a convenient receptacle for small articles of jewelry, such as buttons, studs, etc.

SHOW AND SALE CASE. — Edwin A. Angell, Boston, Mass. The casing has opposite doors at or near its bottom, with a partition pivoted at one side of its center, whereby it is adapted to be held inclined from front to rear or from rear to front, and having also an extensible leaf, the case being designed for the use of grocers, seedsmen, etc.

FUMIGATOR.—Albert R. Bowker and James D. Millen, Winona, Minn. This is a hollow cylinder provided with a fire box and grate, with a chemical box above the fire box to sprinkle chemicals upon the fire, and a piston to force the smoke through an opening in the cylinder, the device being operated by suitable handles to fumigate a building or an animal burrow.

SAD IRON.—Christian Fox, Christiana, Pa. This is an iron in which the handle is made detachable, the body of the iron being either hollow or solid, and the handle being reversible with respect to the ends of the body, simple catch devices facilitating the expeditious attachment or detachment of the handle.

CANDLESTICK. — George Gavin and Lawrence W. Cromer, Eureka, Nevada. Combined with a base pan are two spring wires secured, and having curved overlapping central parts at a proper distance above the base for holding the candle, forming an extremely simple and inexpensive device.

DOUBLE BAG.—Charles McCaffrey and Charles W. Biglow, New York City. This is a bag in which the outer portion is formed of textile fabric and the inner portion of paper, the inner portion being slightly larger, whereby the strain upon the inner bag will be taken up by the outer bag, the combined device being adapted for carrying ground plaster, phosphates, etc.

GATE.—James H. Slater, Hart, Mich. This is a gate especially designed for simplicity of construction and cheapness of material used, and adapted to be quickly and conveniently adjusted for height to avoid snow and ice, while its hinge connections permit it to fold flat against a fence in opposite directions, the gate being more particularly designed for guarding railroads and farm inclosures.

DRAIN FOR STALLS. — Martin Logan, New York City. Combined with the longitudinal slats of the stall floor, with suitable drains between the slats and a cross drain in the rear, are cleats in the rear of and parallel with the cross drain, with a locking bar fitting between the cleats and the slats of the stall floor, to cover the cross drain and hold the slats in position, making a simple drain that will not easily become clogged and can readily be cleaned.

FOUNTAIN FOR WATERING STOCK.—Alphonse Friedrick, Baldwin, N. Y. This is more especially designed for a poultry yard, the reservoir having a drip pipe which discharges into a main pipe laid underground in an inclined position, while branch pipes extend vertically therefrom to cups held above ground, whereby it is designed to keep the water cool and fresh in summer and prevent it from freezing in winter.

CRATE. — George T. Hall, Monrovia, Cal. This is styled the "California berry crate," and has solid ends, to the inner sides of which transverse strips are secured, and partitions secured to the strips, the partitions consisting of a rigid section and a hinged section, the latter being movable back upon the rigid section, whereby access may be had to the lower portion of the crate, while the sections cannot be removed and displaced.

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References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2259) J. W. asks how to prepare an ink for the automatic shading pen. A. Use solution of gum arabic of proper thickness colored with aniline colors. Add just enough oil of cloves to give a perceptible odor, to prevent moulding.

(2260) C. C. writes: In making bichromate batteries for running small lamps for armatures, would it make any difference if the cells were larger, say about a quart, provided we use a less number of cells? How are batteries compared with one another in strength. Is it by the area of zinc used, supposing the solutions to be both the same? I would like to have directions for making something to attach to an electric bell so that it will not ring more than five seconds when the button is being pushed, and which will release when the button is let go. About how many ohms resistance are common electric bells wound? A. It is necessary to have a number of battery cells to secure the required voltage. The strength of the current increases with the size of the plates, the pressure or voltage with the number of cells. A dash pot arrangement might do for your push button. Bell magnets run from 5 to 20 ohms resistance.

(2261) W. P. S. asks: What will take away the bad smell from the water in a cistern without making it unfit for washing purposes? A. Possibly suspending a bag full of charcoal in it may answer. A little permanganate of potash may do good. In this case, if enough is added to produce a pink color, it will stain the clothes.

(2262) F. L. M. asks: What pressure must be applied to air to raise the temperature from 50° Fah. to 100° Fah.? A. 1·3793 atmospheres. This is on basis of adiabatic compression, there being assumed to be no loss of heat. The rule is that the temperatures referred to the absolute zero are in proportion to the 0·2907 power of the pressures. It must be calculated by logarithms.

(2263) E. W. B. asks how to make a good shoe dressing for ladies' and children's shoes. A. See answer to query 1704, SCIENTIFIC AMERICAN, January 11, 1890.

(2264) A. J. H. asks: Is there any chemical used to make cider vinegar sour? Is it injurious? A. Unfortunately, other acids are used by unscrupulous manufacturers or dealers. We consider any such treatment an adulteration.

(2265) W. F. C. asks: 1. What salts are there which when mixed with gelatin will make it insoluble, and when acted upon by light will make it soluble? A. The reverse action, if any, takes place with most known salts. 2. Cement or glue to fasten hard rubber together, also to fasten hard rubber to wood. A. Use 20 parts shellac and 1 part gutta percha melted together. 3. Best glue for fastening cloth to brass. A. Try gum tragacanth. 4. How can I cover a detective camera with canvas such as that used on telescopic hand satchel? Would fish glue be good for cementing the canvas to the varnished wood? A. Yes.

(2266) F. A. M. asks: 1. How is vulcanite or hard rubber polished by experienced rubber workers? I have a great deal of vulcanite work to do, and would like to know the best possible way to cut and polish it. A. The method of polishing hard rubber depends on the form of the article and also upon the way in which it is moulded and vulcanized. It may be vulcanized in such a way as to require very little finish. If it is to be shaped in any way by means of a lathe, or cutters or files, it will of course require smoothing and polishing. Irregular pieces are shaped by rotary cutters and by filing, smoothed by means of sand paper or emery cloth, semi-polished by means of felt wheels and rather harsh brushes charged with ground pumice stone and water, and finally finished by the use of soft polishing brushes charged with whiting and water. Pieces turned in a lathe are smoothed with fine emery cloth with a little oil, and finished with whiting and water applied with a woolen cloth. 2. How is hard rubber manufactured? A. Hard rubber is made by intimately incorporating sulphur and coloring matter with the pure gum, pressing it into the mould, and then vulcanizing it by placing it in a suitable chamber filled with steam under pressure. For the details of the process we refer you to the literature of the subject.

(2267) M. J. F. asks if white, the same as paper, is a color. A. Subjectively speaking, white is not a color. Theoretically, it is due to a mixture of all light waves of all lengths, and, therefore, may, in that sense, be defined as a mixture of an immense number of colors.

(2268) C. S. asks how the seltzer water bottles are opened, or at least how they are filled. A. They are closed by a self-acting valve, which opens inward. The water is forced in through this valve, which retains it once it is in.

(2269) C. W. D. asks for a receipt for making liquid glue that is adhesive and tasteless to the tongue. I want to use it on labels, so after they are glued, they can be moistened with the tongue without leaving a bad taste. A. The following is said to be used on postage stamps:

Dextrine	2 parts.
Acetic acid	1 "
Water	5 "
Alcohol	1 "

(2270) R. E. W. writes: What material will become electrified by friction? What material could be used to coat an iron or other metal surface so as to electrify it by friction? Friction to be by bristle brush. A. Give it several coats of shellac varnish, made by dissolving shellac in alcohol.

(2271) A. E. P. writes: Will you please advise me if there is any ink or combination of chemicals which will make a stain or color on paper that will disappear on being heated? I want to find if possible something which works directly opposite to the salts of cobalt, which are invisible at ordinary times, but which appear when heated. A. A dilute solution of iodine and starch will lose color on heating. Also paper colored with a solution of cupric sulphate (blue vitriol) will tend to whiten on the application of heat.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 27, 1890.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable chair or stool, J. Briggs 428,664
Advertising device, R. W. Swann 429,070
Air, device for indicating the condition of the, H. Wintherlich 429,078
Alarm. See Burglar alarm. Low water alarm.
Album, musical, I. Von Auw 428,795
Animal trap, C. S. Shaw 428,966
Annunciator, R. P. Garsed 428,810
Anvil clamp, W. Way 428,980
Archery bow, D. M. Holmes 428,912
Axle box lid, car, W. Pennock 428,944
Axles for vehicles, machine for oiling the, C. T. Phillips 428,945
Bag. See Double bag. Paper bag.
Bake pan, L. E. Willey 428,792
Baling press, T. Tebow 428,976
Band cutter and feeder, W. Close 429,014
Bar. See Grate bar.
Barrel, ventilating, J. F. East 429,021
Basins, device for ejecting water or other liquids from containing tanks to, J. Penney 428,943
Basins [stationary wash stands, device for securing, J. Gaghan 429,028
Battery. See Galvanic battery.
Battery solution, galvanic, E. M. Burt 428,888
Battery zinc, preparing, J. H. Mason 428,684
Bed bottom, spring, W. Schmitt 428,637
Beds or lounges, head and shoulder rest for, W. Oxley 428,938
Bell, door, F. Sanderson 428,636
Bit. See Bridle bit.
Bit brace, L. C. Wilcox 428,964
Blackboards, composition for, C. R. Ruttkar 429,063
Block. See Pulley block.
Boiler. See Locomotive boiler.
Boiler furnace, steam, E. O. Holmes 428,609
Boiler leveler, W. H. & J. L. Freeman 428,837
Book cover for educational purposes, E. Eggleston 428,899
Bookbinder's gathering machine, H. Mattill 428,685
Bookbinding machine, A. Bredenberg 428,741
Boring bar puppet, F. W. Taylor 428,703
Bottle, hot water, A. McTernen 428,692
Box. See Letter box. Match box.
Box fastener, J. E. Mergott 428,726
Box fastener, H. S. Wright 428,992
Box staying machine, E. M. Richardson 428,952
Brace. See Bit brace.
Bracelet, A. Kienle 429,039
Brake. See Car or locomotive brake. Vehicle brake. Wagon brake.
Braking and scutching machine, A. & L. L. Bentley 428,663
Brick, building, C. Reynhold 429,061
Brick, cleaning and polishing, B. F. Fay 429,090
Bridge gate, draw, Millidge & Johnson 428,927
Bridle bit, G. Brockington 428,767
Bridle or halter, G. T. Duncan 428,898
Broom catch, M. Lamont 428,680
Broom head, Clyde & Welsh 428,665
Bucket, feed, A. F. Moody 428,622
Burglar alarm, L. B. Battin 429,001
Burglar alarm, Hayward & Sims 428,774
Burglar alarm, W. H. Reiff 428,693
Burner. See Gas and air burner. Oil burner. Hydrocarbon burner.
Button fastening machine, E. Noelle 429,052
Button setting machine, W. M. Gerkey 428,903
Cable grip, E. R. Guerra 428,904
Calendar, perpetual, A. G. Masius 429,043
Calendar, perpetual, T. Stapleton 428,788
Calipers and dividers, W. H. Stuart 429,069
Cameras, roll holder for, T. H. Blair 428,797
Can. See Oil can.
Can cover, E. M. Peacock 428,760
Candlestick, Gavin & Cromer 428,673
Cant hook for loggers, L. Koster 428,724
Car coupling H. C. Buhoup 429,081
Car coupling, F. A. Fox 429,026
Car coupling, W. H. Harris 428,910
Car coupling, L. J. Kemp 428,918
Car coupling, C. McKeraban 428,855
Car coupling H. E. Moomaw 428,928
Car coupling, R. T. Morrison, Jr 428,689
Car coupling, N. Newman 429,051
Car coupling, G. W. Powell 429,096
Car coupling, G. W. Simmons 428,640
Car coupling, W. J. Walker 429,103
Car coupling, C. G. Wheeland 428,872
Car or locomotive brake, M. P. Burgey 428,744
Car propelling mechanism, G. B. Siccardi 428,639
Car, stock, S. P. Tallman 428,973
Car ventilating device, H. L. Morrell 428,624
Car wheel, R. D. Apperson 428,998
Cars, etc., attachment for street, W. S. Livengood 428,923
Cars, life guard for, C. Carr 429,082
Caramel holder, P. C. Wiest 428,765
Carbons, manufacturing, C Heisler 428,604
Card teeth for carding fibers, apparatus for grinding, Middleton & Wilson 429,044
Carding machines, mechanism for adjusting traveling flats of, T. Knowles 428,778
Carpet beater, hand power, J. Clark 428,715
Cart, road, D. W. Corey 429,016
Cart, road, J. H. Lewis 428,921
Case. See Show and sale case.
Cash indicator and register, W. Koch 428,679
Chair. See Adjustable chair. Folding chair. Railway chair.
Chain attachment, R. A. Breul 428,798
Chain, drive, D. J. Sheldrick 428,862, 428,863
Check machine, W. Koch 428,678
Check rein attachment, A. E. Howard 428,614
Chop grader, C. Haggenmacher 428,908
Churn power, M. J. Williamson 428,987
Cigarette machine, R. Hardie 429,031
Clamp. See Anvil clamp.
Climbing apparatus, O. L. W. Johanson 428,812
Clock, electric programme, J. L. McCaskey 428,854
Clock, stop, J. H. Dates 428,717
Clocks, electric circuit closer for, H. C. Karr 428,676
Clothes drier, A. C. Etzel 429,022
Clothes drier, J. W. Fletcher 429,023
Clutch, friction, H. P. Claussen 429,085
Clutch, friction, W. N. Rumely 428,634
Coal cutting machine, P. Richards 428,951
Coffee mill operating mechanism, F. Wiswell 428,709
Coil, reactive, Lemp & Moody 428,620
Coiling metal rods, device for, F. G. Tallman, 428,971, 428,972
Coke oven front, H. B. Riddell 428,953
Collar and cuff box, T. Springmeyer 428,866
Comb. See Curry comb.
Cooking apparatus steam, W. C. Salmon 429,099
Copy holder, Snyder & Grabe 428,700
Copying purposes, device for holding carbon paper for, W. H. Pardee 428,856
Corn popper, A. B. Olson 428,626
Cotton picker, C. R. Stephenson 428,867
Coupling. See Car coupling. Pipe coupling. Thill coupling.
Coupling for shafts or like purposes, J. O. Ellinger 428,808
Crane, hydraulic, I. W. Frank 428,749
Crate, G. T. Hall 428,840
Crate, F. B. Sites 428,642
Cultivator, A. Caldwell 428,591
Cultivator, J. Dullenty 429,020
Cultivator shovel, A. J. Kern 429,037
Cup. See Oil cup.
Current circuits, turn-off for alternating, E. Thomson 428,647
Cultivator, transformer for heavy, H. Lemp 428,618
Curry comb and brush, combined, S. W. Burke 429,010
Curtain rod support, Reubel & Taylor 428,783
Curtains, means for suspending, R. G. Sharp 428,965
Cushion. See Pincushion.
Cut-off for engines, variable, W. De Sanno 428,861
Cutter. See Band cutter.
Cutting circular plates, machine for, S. Trethewey 429,072
Delivery apparatus, automatic, Hanicke & Bermich 428,720
Dial, timepiece, W. W. Barrett 428,588
Dies, making, J. Scott 428,962
Diffusion apparatus, L. Boyer 428,589
Door mat, H. Pattberg 428,627
Double bag, McCaffrey & Biglow 428,553
Double pole switch, G. H. Alton 428,586
Draught chain spreader, S. P. & E. Windsor 428,708
Draught device for vehicles, A. B. Webster 428,981
Draught equalizer, H. Hitchcock 428,608
Draught equalizer, G. J. Kaplan 429,035
Drain for stalls, M. Logan 428,848
Drier. See Clothes drier.
Drier and digester, combined, P. C. Vogellus 428,978
Drill feed, automatic J. Ulrich 429,073
Driving wheel, machinery, G. D. Munsing 428,728
Drum, heating, E. P. Johnston 428,756
Dumping receptacle, B. F. Singer 428,731
Dye, substantive yellow, W. Pfitzinger 428,629
Dyeing apparatus, C. L. Klauder 428,614
Easel, O. Berg 428,796
Eaves trough, T. C. Belding 428,822
Egg beater, A. J. Austin 428,999
Ejector for vacuum brakes, A. P. Massey 428,621
Electric cable, W. L. Candee 428,745
Electric conductors, device for suspending, H. I. Pierce 429,056
Electric light and conductor support, C. H. Simmons 429,067
Electric light hanger, C. L. Jeffers 428,723
Electric machine regulator, dynamo, E. Thomson 428,705
Electric machines, brush holder for dynamo, F. A. Weller 428,735
Electric machines, commutator collector or block for dynamo, C. F. Brush 428,742, 428,743
Electric meter, E. Thomson 428,649
Electric motor, R. M. Hunter 429,094
Electric motor and generator, F. J. Sprague 428,732
Electric motor or dynamo-electric machine, Potter & Morgan 428,782
Electric switch, J. F. McLaughlin 428,934, 428,935
Electric switch, E. Thomson 428,704
Electric wires, underground conduit for, E. L. Witthaus 429,104
Electrical distribution system, E. Thomson 428,651
Electrode, male genital, A. R. Sommerville 429,068
Electrodes, assemblying secondary battery, J. F. McLaughlin 429,049
Elevator. See Skirt elevator.
Elevator, Harrison & Burford 428,841
End gate, W. C. Blee 429,066
End gate, wagon, H. Bussel 429,011
Engine. See Gas engine. Gas motor engine. Rotary engine. Steam engine.
Engine indicator, steam, W. S. McKay 428,933
Engine or motor operated by explosive mixtures, A. E. Tavernier 428,764
Engraving machine, C. H. Field, Jr 428,770
Excavator, J. N. & J. E. Foye 429,027
Expanding tool, J. A. Seaman 428,786
Extractor. See Lemon juice extractor.
Fan, P. Murray, Jr 428,799
Farming machine, J. M. Hering 428,721
Fastener driver, F. W. Starr 428,701
Faucet, R. F. Stahl 428,644
Feed regulator, E. Decollogne 428,768
Feed water purifier, J. S. Roake 428,695
Fence, J. Kerr, Sr 429,038
Fence, Sparks & Brown 428,763
Fence, hedge, W. T. Harris, Jr 428,754
Fences, making metallic, W. Livingstone 429,095
Fence, wire, H. Hollensbe 429,032
Fibrous material, treating, I. W. Marshall 428,925
File cabinet, paper, P. J. Pauly, Sr 428,941
File, letter and bill, G. H. Dietz 428,805
File, paper, L. Ordner 428,937
Firearm, breech-loading, J. Frick 428,597
Firearm, magazine, J. M. & M. S. Browning 428,887
Fire escape, A. Sample 428,635
Fire extinguisher, Otis & Peirce 429,053
Fire extinguisher, portable, W. H. Frear 428,596
Fire service, life saving apparatus for, A. Harley. 428,603
Fishing rod, L. N. Hawes 428,755
Flue scraper, boiler, T. Burke 428,714
Flushing tank, A. Rosewater 428,957
Folding chair, W. Schleicher 428,959
Forging machine, R. W. Bayley 429,080
Frame for placards, etc., M. R. Funke 428,599
Furnace. See Boiler furnace.
Furnace bottom, reducing, C. J. Eames 428,747
Fumigator, Bowker & Millen 428,880
Gauge. See Rule gauge.
Galvanic battery, J. S. Nowotny 428,781
Galvanometer, A. E. Colgate 428,746
Game wheel, alarm, G. Wilkening 428,985
Gas and air burner, mixed, O. M. Shannon 429,066
Gas, apparatus for heating apartments by, O. M. Shannon 428,963
Gas, apparatus for the manufacture of, J. M. Rose 428,955, 428,956
Gas engine ignitor, Pearson & Kunze 428,858
Gas engine, rotary, W. S. Sharpneck 428,762
Gas meter register, L. Ehrlich 428,900
Gas motor engine, H. Campbell 428,801
Gas pressure regulator, C. A. Jamison 428,843
Gate. See Bridge gate. End gate. Overflow gate.
Gate, C. F. Darnell 428,716
Gate, E. R. Guerra 428,905
Gate, F. J. Johnston 428,777
Gate, J. H. Slater 428,864
Generator. See Steam generator.
Glass bottles, apparatus for making, J. Boyer 428,712
Glass vessels, apparatus for making, C. N. Brady. 428,713
Glove fastener, A. J. Shipley 428,967
Grain binder, J. Miller 429,046
Grain binder, B. F. Stewart 428,645
Graphophones, machine for the manufacture of wax-coated tablets for, C. S. Tainter 428,646
Grate bar, S. W. Evans 428,595
Grease lubricator, C. Verniaud 428,657
Gridiron, W. C. Perkins (r) 11,080
Grinding horseshoe calks, machine for, G. W. Barian 428,878
Gun, magazine spring, A. J. Emlaw 429,106
Gun, recoil operated magazine, H. Leineweber 428,813
Gun sight, H. H. Grenfell 429,030
Hammer, tilt or drop, J. Bee 428,766
Hammock canopy, adjustable, W. F. Wright 428,993
Handle. See Tool handle.
Hanger. See Electric light hanger. Pipe hanger. Tobacco hanger.
Harrow, W. R. Davie 428,895
Harness, R. J. Clark 429,084
Harness rosette, G. H. Ford 428,901
Harp and hanger, T. Hipwell 428,607
Harvester platform, T. E. Lewis 428,683
Harvesting and binding machine, J. Miller 429,045
Harvesting machine, potato, J. Zimmermann 428,794
Hay loader, A. Lasack 428,844
Hay stacker, J. H. Moore 428,850
Heater. See Water heater. Watering tank heater.
Hinge, spring, G. R. Taxis 428,974
Hoisting apparatus, J. McMyler 428,691
Holder. See Caramel holder. Copy holder. Horse holder. Lamp holder. Paper holder. Photographic plate holder. Rein holder. Tablet or book holder.
Hook. See Cant hook. Snap hook. Whiffletree hook.
Hopper, overflow slop, E. W. Williams 428,986
Horse holder, J. J. McCann 428,931
Horse power sweep attachment, Lamb & Emmert 428,615
Horseshoe, G. T. Chapman 428,802
Horseshoe, J. E. Elkerton 428,594
Horseshoe nails, die for use in making, D. E. Kempster 429,036
Hose coupling band, W. Yerdon 428,660
Hub band, Rheinecker & Ferkel 428,784
Hydrant, P. White 428,707
Hydraulic motor, H. P. Christiansen 428,829
Hydrocarbon burner, Avery & Smith 428,587
Indicator. See Cash indicator. Engine indicator. Musical key indicator.
Indicator lock, J. C. Barr 428,710, 428,711
Induction coil casing, E. Thomson 428,648
Inkstand, fountain, F. Guinter 428,753
Inspirator, L. Chapman 428,592
Insulator, electric, G. B. Watson 428,979
Invalids, apparatus for lifting and moving, A. Harley 428,602
Iron, See Sad iron.
Iron into steel, composition for converting malleable cast, W. J. Miles, Jr 428,687
Ironing machine, W. A. E. Henrici 428,605
Ironing machine, shirt, C. O. White 429,076
Joint. See Metal plate joint. Railway rail joint.
Keg hooking and heading machine, T. A. Cook 428,831
Keg nail, H. E. Spilman 428,865
Knife, C. & W. Rush 428,817
Knob, W. Livingstone 428,924
Lace fastener, shoe, E. J. Mayfield 428,758
Ladder, extension, R. S. Adley 428,995
Lamp, central draught, R. L. Brewer 428,882
Lamp globe, electric, W. H. Wilson 428,989
Lamp holder, electric arc, J. Pawlowski 428,842
Lamp socket, incandescent, Thomson & Alton 428,652
Lamps, suspension hanger for electric, E. P. Morris 428,929
Lantern, signal, E. S. Piper 428,946
Latch, reversible, J. R. Forster 428,771
Lemon juice extractor, S. Prince 428,947
Letter box, H. V. Snead 428,968
Life-raft, M. Edwards 428,833
Limb, artificial, A. Gault 428,839
Lobster can, A. M. & M. S. Weston 428,983
Lock. See Indicator lock. Nut lock. Permutation lock. Telephone lock. Time lock.
Lock, C. Felton 428,718
Locomotive boiler, A. Beothy 429,003
Locomotive, electric, E. Dummer 428,669
Loom pile warp suppiying mechanism, R. Foster 428,902
Low water alarm, electric, J. Morehead 428,688
Lubricant, S. Hopkins, Jr 428,610
Lubricator. See Grease lubricator.
Magnetic device alternating current, E. Thomson 428,650
Magnetic tool, C. F. Carpenter 429,012
Mat. See Door mat.
Match box, J. B. Morgan 428,623
Mattress, H. Westphal 428,791
Measure, shoemaker's, A. S. Adler 428,875
Measuring electric currents, E. W. Rice, Jr 428,633
Measuring mechanism, coal, C. W. Hunt 428,916
Medicine, tropical remedy, G. G. Wellington 428,982
Metal plate joint, H. W. Dressler 428,807
Metal sawing machine, L. M. Ham 428,778
Metal work, forming hollow ornamental, H. D. Bronson 428,883
Meter. See Electric meter.
Middlings purifier, W. D. Gray 428,674
Mill. See Sawmill.
Mining machine, coal, F. M. Lechner 428,929
Mining machine pick, E. A. Sperry 428,736
Moulding machine, T. E. Caddy 428,590
Mop and wringer combined, E. C. Rolls 428,696
Mop head, W. J. McDonnel 429,018
Mortising machine, M. J. Piper 429,059
Motion and overcoming dead centers, mechanism for reversing, P. B. Landgraf 428,681
Motor. See Electric motor. Hydraulic motor.
Multiple switch board system, single cord, C. E. Scribner 428,698
Musical key indicator, W. F. Donovan 428,806
Nail or tack attachment, J. C. Tilley 429,071
Nest, hen's, F. W. Bridenbecker 429,008
Nitro-cellulose, etc., manufacturing thin sheets of, E. N. Todd 428,654
Nut lock, B. E. Tilden 428,789
Nut wrench, ratchet, E. P. Justice 429,034
Oil burner, G. R. Moore 428,759
Oil can, C. E. Herman 428,775
Oil cup, pitman, R. Conrader 429,086
Oil, etc., means for effecting a uniform supply of, T. Macneill 429,042
Oil or similar liquids, apparatus for forcing, W. R. Addicks 428,874
Ordnance recoil check for, H. Schneider 428,960
Ore oxidizing or desulphurizing apparatus, E. M. Clark 428,830
Ores of copper or other metals, melting the, C. Wessell 428,659
Organ action, pneumatic, J. E. Treat 428,706
Overflow gate and liquid separator, G. A. Hyde, Jr 428,613
Padlock, permutation, C. D. Cowgill 429,017
Pail, strainer, Shobe & Platt 428,699
Pan. See Bake pan.
Paper bag and twine holder, D. D. Nolley 428,936
Paper bag machine, A. Bredenberg 429,007
Paper box machine, P. H. Knight 428,677
Paper holder and cutter, roll, W. T. Geltz 429,029
Paper, mechanism for feeding sheets of, C. H. Heywood 428,605
Paper pulp refining engine, J. H. Horne 428,914
Pea thrasher and separator, E. E. Sanford 428,958
Peanut roaster and warmer, J. B. Bartholomew 428,879
Pelts, machine for removing water hairs from, A. Hedbavny (r) 11,079
Pen, fountain, N. C. Stiles 428,969
Pencil safety attachment, J. C. Gores 428,752
Perambulator, U. McClinchie 428,780
Permutation lock, L. Houck 429,092
Phonogram blanks, resurfacing, O. P. Austin 429,079
Phonographs, coin-actuated attachment for, Glass & Arnold 428,750
Phonographs, coin-actuating attachment for, Glass & Arnold 428,751
Photographic plate holder, W. H. Fuller 428,809

Picker See Cotton picker.
Pigment and paint base, combined red, J. P. Perkins ... 429,054
Pigments, treating slag for the production of red, J. P. Perkins ... 429,055, 429,056
Pincushion and paper weight, combined. R. K. Chandler ... 429,083
Pipe coupling, C. T. Leonard ... 428,846
Pipe hanger, W. J. McKelvey ... 428,690
Pipe hanger, A. H. Peterson ... 429,057
Pipe wrench, E. O. Ely ... 429,088
Pitman connection, J. M. Hutchinson ... 428,612
Planter, corn, B. E. Cagle ... 428,827
Planter, cotton, E. Truss ... 429,102
Platform. See Harvester platform.
Plating on solid wire, S. F. Merritt ... 428,727
Plow, W. H. Prisk ... 429,060
Plow, sulky, A. V. Ryder ... 429,064
Plowshare, reversible, W. Helthersay ... 428,842
Power. See Churn power.
Press. See Baling press.
Printed and folded sheets of paper, apparatus for gathering and classifying, Fricke & Schutz ... 428,598
Printing machine, J. Derrey ... 428,668
Pulley, H. T. Briggs ... 429,009
Pulley block, differential, J. Holt ... 428,675
Pulp, manufacturing and bleaching, C. Ramsey ... 429,097
Pump, P. Anderson ... 428,997
Pump, R. Lavery ... 428,682
Pump, air, H. & F. G. A. Schulze-Berge ... 428,638
Pump rod, compensating, Burnham & Miller ... 428,800
Punch, cheek, E. N. Sperry ... 429,100
Punching horseshoe bars, machine for, J. A. N. Rasmussen ... 428,949
Quilting machine, A. Beck ... 429,002
Rack. See Umbrella rack.
Railway chair, J. B. Wilson ... 428,988
Railway, electric, R. M. Hunter ... 429,093
Railway, elevated, J. N. Valley ... 428,871
Railway, etc., pleasure, L. A. Thompson ... 428,977
Railway rail, R. H. Pugh ... 428,948
Railway rail joint, J. P. Kelly ... 428,757
Railway system, cable, A. G. Bierbach ... 429,004
Railway trains, device for maintaining electrical connection between separate, Fike & Huffman ... 428,748
Railways, guard wire protector and lightning arrester for electric, E. Thomson ... 428,653
Railways, metal cross tie for, J. P. Taylor ... 428,869
Railways, staff apparatus for controlling traffic on single line, Webb & Thompson ... 429,074
Register. See Gas meter register.
Regulator. See Electric machine regulator. Feed regulator. Gas pressure regulator.
Rein guide, Stoakes & Frith ... 428,868
Rein holder, D. L. Croft ... 428,666
Rein slide, cam, D. Mosman ... 428,625
Respirator for firemen, G. H. Hurd ... 428,611
Rivet, W. C. Bray ... 428,824, 428,825
Rivets, making pronged, W. C. Bray ... 428,826
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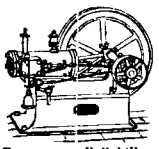

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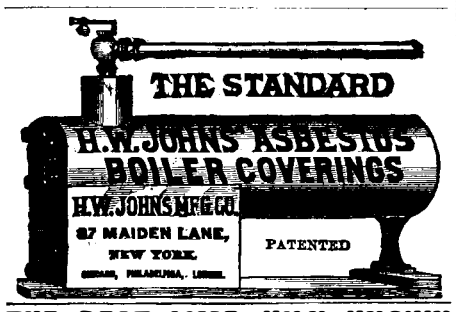

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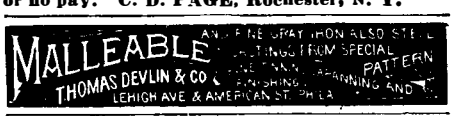

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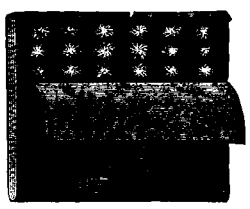

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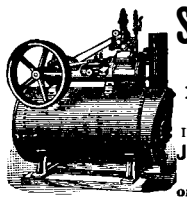

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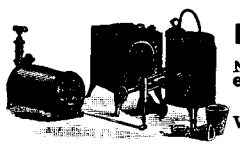

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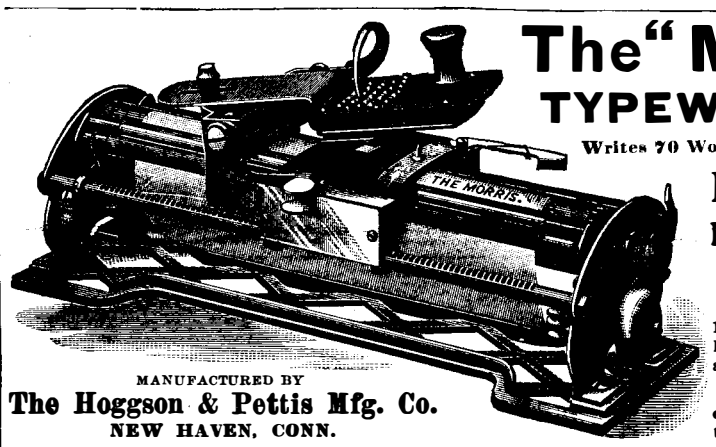

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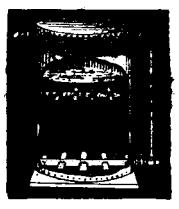

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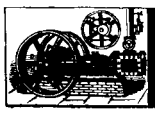

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