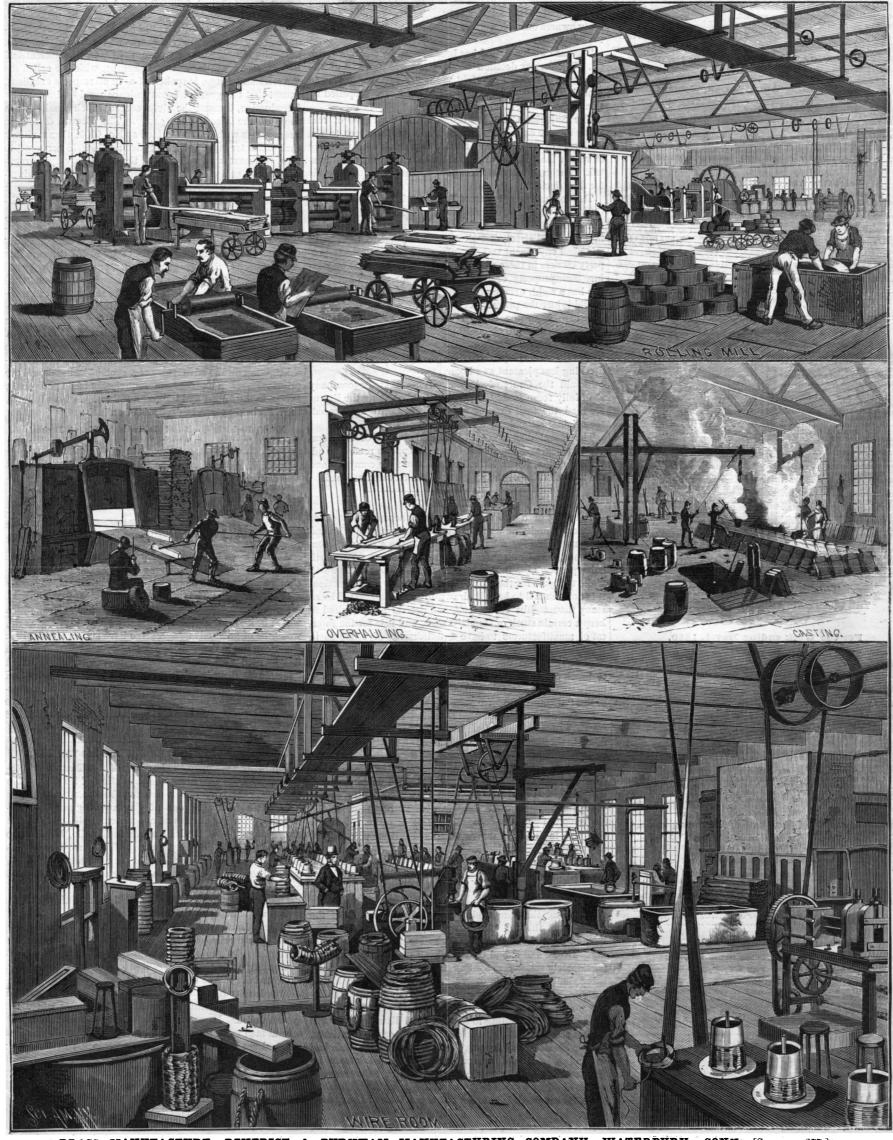
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART. SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLII.—No. 18. [NEW SERIES.]

NEW YORK, MAY 1, 1880.

\$3.20 per Annum.
[POSTAGE PREPAID.]



BRASS MANUFACTURE.—BENEDICT & BURNHAM MANUFACTURING COMPANY, WATERBURY CONN.—[See page 277.]

Scientific American.

MUNN & CO., Editors and Proprietors.

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

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN,

Clubs.—One extra copy of The Scientific American will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

To Advertisers.—The regular circulation of the Scientific American is now **Fifty Thousand Copies** weekly. For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the Scientific American Supplement is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month
Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information: (2.) Commercial, trade, and manufacturing announcements of leading house. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. (27 Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN EXPORT Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, MAY 1, 1880.

Contents.

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT No. 226,

For the Week ending May 1, 1880.

Price 10 cents. For sale by all newsdealers.

Price 10 cents. For sale by all newsdealers.

1. ENGINEERING AND MECHANICS.—The St. Gothard Tunnel. 5 large illustrations.—I. Engineer Bossi Passes through the Opening.—2. Professor Collodon's Air Compressors.—3. The Northern Entrance to the Tunnel at Goschenen, River Reuss. Switzerland.—4. The Completion of the Tunnel, February 29, 1880. The Meeting of the Workman.—5. The First Train through the Tunnel. 8591, 3592. The Railroad Signals Now Used. Block and Interlocking Systems.—The Interlocking of Switches and Signals.—Hall's Electric Signal.—Rousseau's Safety Railway Signal.—Bean's Amospheric Signal.—Bousseau's Safety Railway Signal.—Bean's Amospheric Signal.—Bousseau's Safety Railway Weirs and Dams in India. Communication from G. H. FAULK—NER. C. E., Calcutta.

Executive New Continuous Furnace for Gas Distillation. 2 figures.
Longitudinal and transverse sections.

Concerning Amber. By Erminner Saminand.

The Lace Manufacture of Calais.

Concerning Amber. By Erminner Saminand.

Signal Safety Railway Signal Safety Railway Concerning Amber. By Erminner Saminand.

Signal Concerning Amber. By Erminner Saminand.

Signal Safety Railway Safety Railway Safety Railway Safety Railway Safety Railway Safety Railw

II. MEDICINE, HYGIENE, ETC.-Yellow Fever. Dr. Jose de Goes method of treatment.
The Turkish Bath. What it is and what it does. By Dr. JNo.
STANBACK WILSON, Atlanta, Ga. Origin of Turkish bath.—Processes of the Turkish bath.—The physiological and therapeutic action of the Turkish bath.—Diseases in which the Turkish bath is useful.

III. TECHNOLOGY AND CHEMISTRY.-Varnishes for Protecting

TECHNOLOGY AND CHEMISTRY.—Varnishes for Protecting from On the Detection of Organic Matter in Water. By F. TREMENN and C. PREUSSE. A critical summary of the important methods hitherte employed.

Rosin and Fats in Cements and Lubricants.
Printing on Woolens. Three processes for machine work.
Ultramarine. By C. FURSTENAN Qualities.—Raw materials.—Fuel.—Labor.—Cost.—Standard Prices.
Inctate of Ferrous Oxide Developer.
New Application of Methyl Chloride.
Properties of the Gum of the Euphorbiacea.
Phosphorescent Powders
Oligiste from the Lava of Vesuvius.
Coloring Matter of Tomatoes, etc
Determination of the Proportion of Water in Alcohol.
Laboricants.

Ultra Sceling of Woolen Cloth.

IV. ASTRONOMY, GEOGRAPHY, ETC.—On the Secular Changes in the Elements of the Orbit of a Satellite Revolving About a Planet Destroyed by Tides. By G. H. DARWIN
Aztec Ruins, New Mexico. 1 figure...
The Canary Islands...

ELEVATED CITY RAILROADS.

The decision of the Superior Court against the Metropolitan Elevated Railroad Company, in the recent trial case, attaches a new interest to the subject of rapid city transit. This suit was brought by Dr. Caro, the owner of a house on Fifty-third street, to recover damages sustained by the passage of the elevated road in front of his dwelling.

This street is hardly surpassed for fine residences and beauty by any in the city. The effect of the elevated road has been to reduce the market and rental value of property on its line. When the road was first constructed the best houses were rapidly emptied of their occupants, and even at a great reduction in rent were difficult to fill with tenants. The people along the line of the railway have now become more accustomed to the railway nuisance, yet nearly the same reluctance holds to renting or locating on those avenues or streets where the railway exists. The injury done to property owners on such a street as the Fifty-third is no trifling consideration.

The case we have cited has been argued by eminent counsel. The former decision of the court was in favor of the company; it claimed the right to the use of the street, even though by a new and unusual way, as by cars propelled by steam upon an elevated road.

The Superior Court has decided that the rights of real estate owners extend beyond the limits of the street to the exclusion of whatever may tend to depreciate their property or render their homes unpleasant, unless properly remunerated. The case will doubtless pass to the Court of Appeals for final decision.

The concurring opinions of Judge Speir and Chief-Justice Curtis are elaborate, covering the grounds claimed by plaintiff. They set forth that plaintiff is owner of the premises in Fifty-third street, and as such is entitled to their undiminished enjoyment and advantage. The law protects property owners in these rights against everything that may injure their property or render their homes unpleasant. No one has a right, even on his own premises, to do aught that would injure the property of his neighbor. The decision in this case is to the effect that noxious gases, disturbing noises, shutting out air and light, are, in point of law, real invasions of the owners' premises. They depreciate greatly the market and rental value of the property, and render the dwelling less pleasant as a home.

shall fully remunerate the property holders along the line of except in the lowest and highest numbers. It is as follows, the road, the final expense must fully equal, if not exceed, the sizes being given in decimals of an inch: the original estimate of the underground line.

The recent decision has affected the price of the company's stock, and should the Court of Appeals render an adverse decision, it can but affect still more the company and the market value of the property of the elevated railroad.

THE WIRE GAUGE.

The want of a uniform and generally accepted system of numbering and grading the different thicknesses of wire and sheet metal has for a long time been felt as a serious inconvenience, both by manufacturers and consumers. For particular purposes, or in filling large orders, where it is worth while to figure for the size of wire to a very small fraction, it is not unusual to have it drawn to a size designated by so many thousandths of an inch, but dealers are required to keep a certain stock of standard sizes, and it is for the interest of manufacturers to have a uniformity of usage as to what shall be meant when a certain size of wire or thickness of plate are called for. We have not, in this country, had so much confusion, from the use of different gauges, as has been experienced in England, where, under what is known as the "Birmingham wire gauge," more than a dozen different scales of numbers are used to arbitrarily designate different sizes of wire, from those about half an inch in diameter down to the finest wires drawn. There is a pretty close agreement between several of these gauges for most of the numbers, but no one is acknowledged as a standard, and, unless the actual size as well as the number is given when ordering wire, mistakes and misunderstandings frequently occur. What the manufacturer may furnish as one number the dealer may, by using another scale, sell as quite a different size, and, in times of active competition, the opportunities to do this are frequent.

The present system of designating the sizes of wire by numbers has grown up with and been modified according to the development of the manufacture. What is known as unexpected. No. 1 is supposed to have been originally so designated as ing. Nos. 2 and 3, and the following sizes, were each proare now used, according to the increased diameter. By this system the different sizes varied from each other irregularly, become so large, and the common sizes so well known by

At a recent meeting of the Society of Telegraph Engineers, London, England, the differences between well-known wire gauges was made the subject of an elaborate report by a com the slightest degree. Each one appeared to be as sound as

mittee which had been appointed especially for that purpose. It was shown that there was an urgent necessity for some standard, and that the gauge, to be adopted should not vary materially from the present gauges principally used, which were "based on long practical experience, had become thoroughly rooted in technical language, and were well adapted to the practical requirements of trade." All of the principal gauges were referred to, and tables given showing the sizes, with percentage of reduction in weight and differences in size for the various numbers. Two general classes were made: empirical gauges or those in which the gradations between the respective sizes were formed by arbitrary differences; and geometrical gauges, in which the various sizes were fixed by perfectly uniform decrements of weight from size to size. The "Stubs" gauge, which is used to a considerable extent in this country, is one of the former. The committee say that, though very irregular in many of its gradations, it has been distributed in large quantities throughout the world, and "may perhaps be considered the most authoritative gauge in common use." Of the geometrical gauges, that made by Brown & Sharpe, which is called the "American" gauge, is spoken of as in all respects excellent, except that the greatest inconvenience would arise from its introduction, because the sizes are so much smaller than those of the Birmingham gauge. The Brown & Sharpe gauge starts with 0.46 of an inch as No. 0000; then multiply each diameter by 0.890522 (or deduct 10.9478 per cent) to form the next succeeding size, the numbers varying regularly in size and weight, and, of course, in electrical conductivity. As being preferable to this gauge, however, because the sizes more nearly approach those of the ordinary Birmingham scale, the committee recommend the Clark gauge, in which the intervals are so arranged that each size is exactly 20 per cent less in weight than the preceding one. By this scale the diameter diminishes by 10.557 per cent for each number as the sizes grow smaller, or increases by 11.803 per cent as they are enlarged; and, as with all geometrical gauges, a person knowing the size of one number can readily calculate that of any other. A sufficient number of intermediate sizes to fill all requirements for general use can be made by using half and quarter sizes, the thickness of which can be determined with precision. The committee strongly recommend this gauge for general adoption, as, beside, giving all the advantages of a geometrical scale, all the Should the Court of Appeals decide that the company principal sizes in use conform very closely to its gradations,

No. of Decimals gauge. of inch.	No. of Decimals gauge. of inch.	No. of Decimals gauge. of inch.
000492.1 00440.2 0393.7	10129 11115·4 12103·2	22083·8 23030·2 24027·1
1352·1 2315 3281·7	13092·3 14082·6 15073 9	25 024·2 26 021·6 27 019·4
4252 5225·4 6201·6	16066·1 17059·1 18052·8	28017 ³ 29015 ⁵ 30013 ⁹
7180·3 8161·3 9 144·2	19 047·3 20 042·3 21 037·8	31012·4 32 011·1

Although we have not experienced the trouble from the use of a multiplicity of gauges which has been felt by foreign manufacturers, there can be no doubt that, if we are ever to have any export trade in manufactures of metal goods, the general adoption of some geometrical standard, which would be known and acknowledged in all parts of the world, would be of great advantage. We have such a standard for American use in the gauge now largely used here, but with this is used also the "Stubs" gauge, and what is called "the old English;" and, between them all, mechanics and engineers are constantly giving orders for specific sizes, measuring by the thousandth part of an inch, as they would not feel called upon to do if there was a recognized standard of properly graded sizes.

THE FRACTURE OF THE DUILIO'S 100-TON GUN.

Following hard upon the bursting of the Thunderer's 38ton gun and the experimental destruction of its companion to discover the secret of that disaster, there comes a still more remarkable failure of one of the largest guns ever constructed. During a series of experiments with the 100-ton Armstrong guns of the Italian ironclad Duilio, March 6, to test, not the guns, for they were considered as beyond suspicion, but the smooth working of the accessory machinery, one of the guns gave way in a manner altogether novel and

The Arms representing the wire made from the first passing of the aware, are built up by the shrinking of a dozen or more rough metal through the draw plate, with such facilities as massive coils of wrought iron upon a steel tube forming the were in use before steam power was employed in wire mak- bore. These coils overlap, and are designed to resist the circumferential strain of the exploding charge. The need portionately smaller, according to the results obtained by of anything more than the friction of the coils upon each using similar means in drawing the wire down, the higher other and the tensile strength of the inner steel tube, to renumbers representing constantly diminishing sizes. To de-sist the longitudinal strain, does not seem to have entered signate thicknesses larger than No. 1, one or more ciphers into the maker's calculations. And just here is where the system failed. It was found after the disaster, in which several men were more or less seriously injured, that the both in diameter and in weight of metal, but the trade had gun had not burst, in the ordinary acceptation of the term; the interior steel tube had been entirely fractured across at their numbers among mechanics and dealers, before any de- the point where the enlarged powder chamber begins to termined effort was made to introduce a uniform standard slope toward the lesser part of the bore-the shoulder of scale, that the task is now one of more than ordinary diffi- the powder chamber, as it may be called. The rest of the gun, composed of various tubes made of coiled wrought iron, had simply disengaged itself as a glass stopper might be drawn out of a bottle, and the tubes were not broken in

when it had been shrunk on to its fellows. The whole of the muzzle, together with the trunnions and the coils immediately behind the trunnions, even including the inner one been the depression of the muzzle. The rest of the gun, inthe steel tube, from the shoulder of the powder chamber natives as being bewitched. backwards, had separated itself from the muzzle portion, and, being unsupported, had yielded to the force of the discharged powder and been dashed backwards against the wall of the turret, displacing two of the plates, cracking the steel lining like a mirror, and crushing the heavy wooden backing through the gap made between the two plates.

The gun had been loaded by hand with a battering charge of 550 pounds of Fossano powder and a 2,000 pound projectile. It is claimed in favor of the gun that it was not originally designed to be chambered, nor to fire charges of 550 lb. with a velocity of 1,700 feet. The contract was fulfilled when 440 lb. of English pebble powder gave an initial velocity of 1,585 feet, with a total energy to shot of 34,840 tons, which gives 627 foot tons per inch of circumference, with a pressure upon the interior of the gun not exceeding 17 tons per square inch. The charge which created the destructive effect almost entirely filled the chamber and left practically no air space. Besides it developed a total energy of 40,000 foot tons, an energy of 720 foot tons per inch of circumference, and an interior strain of 20 tons per square inch. This the gun proved unable to withstand. The friends of the gun claim that its failure under these conditions argues no inherent defect in the system, and that there will be no difficulty in adding to the longitudinal strength of the guns to any extent that may be desired. Nevertheless public confidence in the system has been seriously broken, and the indications are that this most popular British mode of building great guns will have to be entirely reconsidered.

A REMARKABLE OIL COMPANY.

In many respects the Columbia Oil Company of Pittsburg is unique, and its career a remarkable one. The common lot of oil (petroleum) companies is to "bust," to involve stockholders in ruin, and to go into dividendless oblivion. To these rules the Columbia is a marked exception. For nearly twenty years it has produced petroleum, and today its territory adds over 400 barrels to the daily yield of the oil regions. Since the organization of the company in 1861 its properties have produced 2,748,820 barrels of crude petroleum, of 42 gallons each. During the same period the price of oil has ranged from \$13 per barrel in July, 1864, to 65 cents per barrel in June, 1879. During its existence the company has declared and paid dividends to the amount of nearly four million dollars (\$3,980,100), and the selling price of its stock (par \$50) has ranged from \$105 per share all the way down to \$4.75 per share. The original shares numbered 10,000, but in 1864 were "watered" to 50,000 shares, making wealthy men of the "ground floor" stockholders. The oil-producing territory of the company comprises a number of farms in Venango, Butler, and McKean counties, Pennsylvania, but by far the most productive tract is the "Story Farm," located on Oil Creek, six miles from Oil City, Pa. In fact it is very doubtful whether a tract of the same area in the known world has been compelled artificially to yield so enormous a quantity of oil. The Story Farm comprises 600 acres, but the oil-producing portion of the tract is less than 100 acres. From this tract has been produced, up to April 1, 1880, 2,226,995 barrels of petroleum, and at present there is still 60 barrels per day coaxed out of this farm. This is done in a thoroughly systematic way, a single engine by means of "sucker rod" connections, pumping seven wells at once, thus reducing the outlay for wages to a minimum. A singular well was developed upon this farm some years ago, and its irreverent activity fully earned its title of the "Sunday Well." For months this well would flow only upon the first day of the week, refusing to respond to any known processes for inducing it to produce on week days. The headquarters of this veteran oil company are at Pittsburg, but the stock is held in New York, Philadelphia, and St. Louis. The last dividend was declared April 10, 1878, the low price of oil compelling this action.

THE GREAT GAS WELL OF PENNSYLVANIA.

Since the appearance of the article in these columns rethe well have been overwhelmed with letters from all portions of the country. These were mainly letters of inquiry from parties possessing similar wells, and indicate a widespread interest in the matter of the utilization of the vast storehouses of fuel tapped by the drill in various portions of the country. Recent tests of the Murraysville stream of gas indicated a pressure of 150 lb. per square inch as shown by a steam gauge. The test was necessarily imperfect and brief, inasmuch as the pipes showed signs of bursting. Owing to unforeseen delays, the carbon black works have only just commenced operations.

A Bewitched Telegraph Wire.

Mr. Siemens states that when he was engaged on the line this in a very effectual manner, for having found that at that or whether we should cut off any evil that we find to exist, 100 miles in any one day.

time of the year there was a thunder storm nearly every afternoon, during which the line, being insulated, was charged by induction, he brought about a gathering of the natives which surrounds the steel tube, remained fixed by the trun- and persuaded one of their notables to ascend a ladder and nions to the carriage. The only movement of this mass had touch the wire, saying the wire would defend itself. On doing so, the man received such a shock that he fell down cluding the whole of the breech, containing the rear part of the ladder, and the wire was considered after that by the

AMENDING THE PATENT LAW.

The raid upon our whole patent system, as it can only be properly characterized, which the proposed new law, referred to in our issue of March 6, promised to effect, seems now to be virtually defeated. There is no absolute safety against hasty and ill-considered legislation, it is true, so long as the matter remains in its present shape, but an effectual check has been put upon the operations of the would-be raiders. The exhaustive arguments presented to the Senate Patent Committee relative to the bill, with the amendments proposed by the members of the committee themselves, utterly destroy its force for the special end which was said to be the object of its promoters, and render it certain that the bill, if reported at all, will be so changed that its authors would not know it. It was conceded that the bill, as it passed the House, would be plainly unconstitutional, according to decisions already made by the United States Supreme Court; that it required a departure from all the fixed principles of jurisprudence; and, while the principal object or the ostensible plea made for its passage was, that it afforded the only way of stopping what were claimed to be unjust collections on account of the driven-well patent, it would have an equally disastrous effect upon thousands of other patents. One Senator asked why the bill should not, with equal justice, be made to apply to copyright cases, and it was apparent that there was no reason why it should not as well as to all other causes of action, as an effective way to stop vexatious litigation; because it not only deprived the plaintiff of any remedy, but actually put it in the power of the defendant to punish the plaintiff, where, on the merits of the case, the latter had been sustained.

Although influential supporters, and a certain number of votes in both Houses, can always be had for any measure which proposes to give infringers of patents a wider latitude, it is plain that the opposition to the driven-well patent at the West furnished the principal means by which this measure was passed through the House. This patent was obtained in 1866, after having been put in interference with two others for the same purpose; it was sustained by the Commissioner of Patents, and by the Supreme Court of the District of Columbia, but the controversy here gave the first opportunities for misrepresentation as to the validity of the patent, and, very soon afterward, driven wells began to be put down by parties not having the authorization of the patent which had been declared valid. It was not until 1871 that, in the hands of parties financially strong, earnest efforts were made to vindicate the rights of the patentee, and then a suit was commenced for this purpose which did not come to a decision till April, 1876, the testimony alone covering 2.800 printed pages, and the arguments being very exhaustive. During all this time the owners of the patent did not ask any royalty from users of the well, and, had the decision been against them, never could have collected anything. Upon getting a decision in their favor they immediately commenced to collect, but were met by such opposition that two more suits were necessary, one in Minnesota and one in Indiana, in both of which the patent was sustained. And now we come to the point which has given rise to all the excitement about the matter. The patentees gave notice that they well, but would make a deduction of one-half for all who voluntarily paid within twenty days.

Suits were commenced against those who did not, the Minnesota lawyers having at one time over four hundred juries of award. suits commenced, and in these cases they made the royalty and costs come to \$46.50 in each suit. The patentees did not receive any more than their royalty, but the case was one in which the lawyers had an opportunity for fine pickings, and the public was justly incensed. After a good deal of delay and trouble the patentees were enabled to place their | Estey & Co., organ manufacturers of Brattleboro. This business in different hands, so the costs might be made more action was originally brought several years ago to recover moderate, but the excitement had commenced, and, it being for the alleged infringement of a patent in the manufacture found that no relief can be had through the courts, the pat of organs. It was heard before the late Judge Johnson, ent having been everywhere sustained, a rush was made to but his death occurring before a decision was given, necessiobtain favorable legislation by Congress. The feeling in bon black works in process of construction, the owners of many quarters was, perhaps, something like that against the ford and Wheeler, who found for the plaintiff and referred Chinamen in San Francisco, when the populace demanded the case to ex-Governor Stewart, of Middlebury, with directhe abrogation of a national treaty and the passage of laws tions to compute the amount due. Governor Stewart rethat were unconstitutional, because they declared "the Chi-ported in favor of awarding Mr. Burdett \$149,039, to which nese must go," but, unjust and oppressive as the collection Judge Wheeler has added interest from December 4, 1878, of such costs were in these cases, it is not likely that the agitation against patents will be any more successful than was that against the Chinamen.

> What was really aimed at was to get rid of the enormous costs of the law suits, to regulate a mode of practice, but it will not do to strike down the patentee for this purpose. As was said before the Senate Committee. "Like any system of law, it will cause occasional inconvenience and occasional hardships in particular cases; like every system of law it

any annovance or inconvenience that arises under it. without regard to whether such change virtually destroys the life of the system or not." The patent law undoubtedly has its defects, but if we cannot remedy them without destroying its life we must submit, Western farmers as well as other men.

SOME ELECTRICAL MEASUREMENTS OF ONE OF WR. EDISON'S HORSESHOE LAMPS.

BY HENRY MORTON, PH.D., A. M. MAYER, PH.D., AND B. F. THOMAS, AT THE STEVENS INSTITUTE OF TECHNOLOGY.

(Additions and corrections to article on page 241.)

In reading the above named article in print we notice ome errors which require correction and some points calling for a more full explanation.

In the second column, ninth line from top, it is said that the loss of weight in one of the electrodes was 1.0624 grammes.

This was, in fact, the amount gained by the cathode, the loss of the anode being a trifle greater. The gain of weight was, of course, what it was intended to take, so that the error was only in the expression, and not in the process or result.

In the next place, in the foot note at the end of the same column, it is simply stated that the average of the maximum and minimum lights in azimuths at right angles and in the plane of the loop was taken as the average luminous power of the lamp. Our reason for this, however, was not mentioned, but was, in fact, that we found by measuring the light at every azimuth varying by ten degrees between 0° and 180°, that this was approximately the true expression for the total amount of light emitted. We see from the article of Profs. Rowland and Barker, in the American Journal of Science, that they, assuming certain conditions and discussing the same in a mathematical manner, have reached a different result; but as experiment shows this result not to be attained in fact, it is evident that the assumptions on which the mathematical reasoning is based do not include all the conditions present in the experiment.

Two other sets of experiments, made since those given in our paper of April 17, in which the candle power of the loop was in its best position, 17.6 and 19.8 candles, corresponding to averages of 11.7 and 13.2 candles respectively, showed a consumption of energy of 0.104 and 0.109 horse power per lamp, or 9.6 and 9.1 lamps per horse power. This would give 112 candles and 120 candles respectively per horse power of electric energy consumed or transformed in the lamp. These results certainly agree very closely with each other and with our former determinations.

The Philadelphia Wool Exhibition.

The International Exhibition of sheep wool and wool products, under the auspices of the Pennsylvania State Agricultural Society, will be held in the Permanent Exhibition Building, Fairmount Park, in September next. It is said by the officers of the society that the money realized at the fair held last year will enable them to offer unusual premiums for all classes of stock and machinery. Replies to circulars and letters addressed to prominent stock growers throughout the country already indicate that the exhibits will be so numerous that it will be difficult to accommodate them all, unless the exhibits already in the building are packed close together. The aggregate of prizes to be offered is \$40,000, including \$8,500 for cattle, \$7,000 for horses (racing prohibited), \$6,500 for sheep, \$3,000 for swine, \$1,500 for poultry, \$2,500 for the dairy, \$4,000 for tools, implements, and machinery, \$3,000 for State, county, club, and individual exhibits of farm, orchard, and garden products, and \$4,000 wanted ten dollars from each unauthorized user of a driven for wool and wool products and other manufactured goods. The sheep prizes are, for flocks \$450 and \$250, and for ram and five of his get, \$250, \$200, etc. No officers or members of the State society will be appointed for service on the

Heavy Patent Damages.

In the United States Court, Rutland, Vt., Judge Wheeler granted a decree giving judgment for the plaintiff for \$161,011.71, in the suit of Riley and Burdett against J. tated a reargument. This was had before Judges Blatchmaking the total judgment over \$160,000. The defendants will appeal to the Supreme Court.—N. Y. Sun.

Progress in Walking Matches.

It is but a few years since 500 miles were considered a great achievement in six-day walking matches. When the limit was pushed to 550 miles, it was thought that the extreme verge of human endurance had been reached. That distance was exceeded by a fraction over fifteen miles by will sometimes be badly administered. The question at Hart, in the recent contest in this city; and it is not a wild of the Indo-European Company between Djulfa and Tabreez the bottom of all propositions for amendment is, whether prediction to say that an average of one hundred miles he found it necessary to intimidate the natives, who rather we shall amend it so as to cut off the evils, at the same a day for six days will soon be made; probably by some fancied the wire for various purposes. He was able to do time preserving its substance, its purpose, and its spirit, swift and enduring walker, who will not be allowed to exceed

known, has long entered as an ingredient in popular remedies

for the eye; and the use of boracic acid itself is not by any

means as new as Dr. Theobald seems to suppose. It does

no harm, however, to occasionally call attention to the value

of old remedies, and which might otherwise be overlooked

Butter and Cheese by Machinery.

trations and description of the manufacture of oleomarga-

rine. We now publish from a correspondent of the Phila-

delphia Ledger an account of the process of making butter

"The milk is brought to the creameries in the morning,

and after being weighed, is run into long vats to undergo the

process of raising the cream. In the center of these vats is

a pipe about three inches in diameter, and in which are

smaller pipes, through which cold water is forced by steam

power, thus keeping the milk cold, and causing all the cream

in the milk to rise to the surface in from three to four hours'

time. The milk is then drawn from the vat, leaving the

cream behind. The cream is then placed in churns, each

holding about one hundred gallons, which are moved by

steam power until the butter is formed, the time required

being about thirty minutes. The churns have only two re-

volving wings, instead of four, as used in the ordinary hand

churn. The churn is not moved at any greater speed than

in the old process, but a regular and uniform motion is kept

up until the work of bringing the butter is completed. The

butter, after being removed from the churns, is placed upon

tables and worked by hand, a round bar being used. The

work can be done by machinery, but in most of the cream-

eries the process by hand is preferred. The

skimmed milk is taken to the cheese depart-

ment and placed in large tin vats, and hot

water, instead of cold, is forced through the

milk in which rennet has been placed to

make it curdle. When this process is com-

pleted, the product is put in boxes holding

thirty-five pounds, and pressed. It is then

stored for about thirty days, when it is ready

"The first creamery in the State, it is said, was started less than a year ago at Quaker-

town, Bucks County, and now some fifteen

of them, and more new ones are talked of. The establishments are generally owned by com-

panies, the capital required to start one of the

capacity of 4,000 quarts daily being from \$4,000 to \$6,000. What effect these estab-

lishments will have upon the supply of milk

to consumers in large cities, or its price to them, has yet to be seen. At all events, the

experiment of making butter and cheese by

the processes described above is fully under

to be sold in the market as cheese.

and cheese on a large scale from fresh milk:

In our last issue we gave considerable space to the illus-

Delicate Test for Albumen.

To Mr. Siebold belongs the credit of having introduced a modification of the heat test, which is adequate to the detection of albumen under conditions in which its presence might be completely overlooked. The following is the author's own account of the manner in which the test is to be applied:

"Add solution of ammonia to the urine until just perceptibly alkaline; filter, and add diluted acetic acid very cautiously until the urine acquires a faint acid reaction, avoiding the use of a single drop more than required. Now place equal quantities of this mixture into two test tubes of equal size, heat one of them to ebullition, and compare it with the cold sample contained in the other test tube. The least turbidity is thus distinctly observed, and gives absolute proof of the presence of albumen."

A NEW WAREHOUSE TRUCK.

We give an engraving representing an improved truck for mills, warehouses, railroad depots, etc., recently patented by Mr. Montgomery A. Reynolds, of Stanton, Mich. The truck frame is mounted on two large wheels turning on an axle located a little behind the middle of the truck, and is supported in front by two caster wheels whose pintles turn in a stout iron frame hung from a crosspiece attached to the under side of the truck frame near the forward end. A handle is attached to the forward end by means of two strong iron arms.

The platform is provided with side boards and end boards, end board has along its upper edge an iron rod which is it from running off should the wheel shrink.

bent downward at the ends so that when the end boards are in place the end of the rods may be turned down over the side boards and thus prevent them from being pressed outward when the truck is loaded. The truck, as its appearance indicates, is strongly built and intended to do good service wherever an article of this kind is required.

We are informed that these trucks will be exhibited at the Millers' Exhibition to be held in Cincinnati, Ohio, early in June.

A NEW VENTILATOR.

The accompanying engraving represents an automatic house ventilator recently patented in the United States and Canada by Mr. Walter S. Sayers, of Guelph, Ontario, Canada. This invention is intended to overcome in the simplest and most effective manner all of the difficulties which have stood in the way of ventilating from the top of windows without draughts of air on the occupants of the apartments. This ventilator is

independent of either sash, and does not interfere with lowering or raising them, it does away with the necessity of hanging them with weights for the purposes of ventilation, and does not in any way interfere with hanging the curtains in the usual way. The ventilator is completely hidden from view in the interior of the room by the curtains or lambrequins, and on the exterior of the building it presents the appearance of a neat Venetian blind above the sash, and is an embellishment rather than other wise.

tains are not used, the ventilator affords a good ground for stucco designs or other ornamental work. This ventilator admits pure air into the room without draughts; the air entering the room at the top of the window is directed by the air duct toward the ceiling, where it is distributed, displacing the vitiated air, which escapes by the ventilator. It is entirely automatic and requires no attention; the wind, on reaching a certain velocity, closes the pivoted guards, C, and prevents very strong currents of air from entering. The guards also exclude dust, and when the pressure of the wind diminishes the guards swing open automatically. If at any time it is desired to close the ventilatorand this will happen very seldomit may be done by closing the valve. B, which is worked by a cord hanging down at the middle of the window. The valve opens by its own weight, when the cord is released. To prevent the entrance of flies and insects a netting is placed over the cornice board. A.

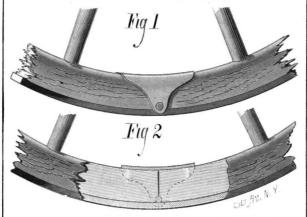
This ventilator can be used in connection with Venetian blinds or winter sash, as it does not in any

way interfere with them. The inventor informs us that he | which he has obtained from the use of boracic acid in the has had this ventilator in use in his own residence for the treatment of various affections of the eye; and, from these last eight months, giving the most complete satisfaction. results, he feels constrained to say that this remedy must, He also states that it is indorsed in the highest terms by ere long, obtain a position in ophthalmic therapeutics second

to this useful invention may be obtained by addressing the inventor and patentee.

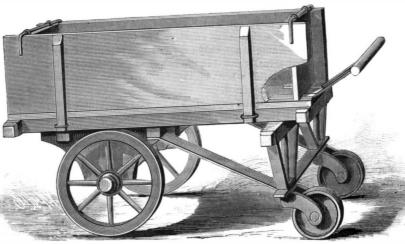
IMPROVED FELLY PLATE.

The annexed engraving shows an improved attachment for vehicle wheels, which is intended to strengthen the felly joints and at the same time keep the tires in place on the



CREMER'S FELLY PLATE.

wheels. The device is exceedingly simple, being nothing more than a curved plate fitted to the rounded portion of the felly over the joint and held in place by a single bolt passing through the joint near the tire. The extreme ends which may be used or not as occasion requires. Each of the plate project over the edges of the tire and prevent



REYNOLDS' IMPROVED TRUCK,

Fig. 1 shows a portion of a wheel with the felly plate way, and it will not take long for the parties interested applied, and Fig. 2 is a sectional view of a felly taken to ascertain how much profit there is in it. At prethrough the joint, showing the position of the plate in dotted

obtained by addressing the inventor, Mr. Charles Cremer, Cosumne, Cal.

Boracic Acid in Eye Diseases.

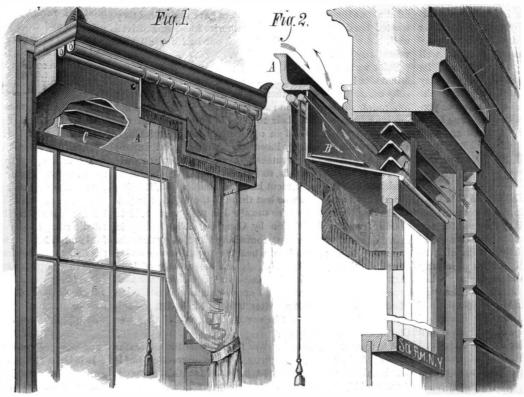
Dr. Saml. Theobald calls the attention of the profession, For windows in public buildings, offices, etc., where cur- in the Medical Record, to the astonishingly favorable results which promises to be exceedingly useful. It is considerably

sent, the great want in the establishments is milk enough to run them to their full capacity, but this want, no Further particulars in relation to this invention may be doubt, will be met as the farmers gain a knowledge of the demand."

Paper Leather.

The Paper World describes a new kind of paper sizing

cheaper than ordinary size, and it has the merit of making the paper waterproof without discoloration. In one experiment one hundred and eighty-five pounds of leather board were manufactured from hemp, which was made nearly fine in the engine, and then the new sizing added, mixed, precipitated, and beaten fine. The thin, endless sheets were woven around a cold cylinder, and when of sufficient thickness, cut, removed, and dried in the sun. Strips one-fourth of an inch thick. when dry and before rolling, were as pliant as most sole leather, and could be bent square over without cracking. This leather board can be made insoluble in either hot or cold water. A piece of it not perfected, and not wholly impervious to water, one-fourth of an inch wide, cut lengthwise of the fiber, held up seventy-seven pounds stone. By rendering the same board insoluble, the strength was increased from seventy-seven to two hundred and eleven pounds. Leather paper of less thickness, made in the same manner, is described as pliable, somewhat elastic, apparently durable, and suitable for the uppers of



SAYERS' AUTOMATIC VENTILATOR

physicians who have seen it. Further information in regard only to that of atropia. Biborate of soda (borax), as well of Norway.

ONE of the cars of the Edinburgh and Glasgow Railway which fell from the Tay Bridge, was picked up several weeks after the disaster by fishermen on the western coast

Hardening Small Tools.

It is said that the engravers and watchmakers of Germany harden their tools in sealing wax. The tool is heated to whiteness, and plunged into the wax, withdrawn after an instant and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine the tools are excellent for engraving, and also for piercing the hardest metals.

NEW TICKET OR CANCELING PUNCH.

The superiority of this punch over others consists in the manner in which the dies are inserted in the punch and the

accompanying engraving. Canceling punches are usually made with one or both dies cut out of the jaw of the punch itself, thereby necessitating the purchase of a new punch when the dies become worn, or a change in the die is required. In the punch illustrated the dies can be easily and cheaply repaired, or changed to a different design.

The uses to which the canceling punch can be applied are already very large and daily increasing. There are over three thousand railways in the United States, all using some sort of a canceling punch. Banks, countinghouses, grocers, eating houses, and all branches of trade in which canceling punches can be used to advantage, are adopting them.

All the detachable parts of the "Aiken ticket punch" are made of the finest cast steel and carefully tempered, thereby guaranteeing the longest wear that is possible to be obtained. The punches are highly finished and nickel plated. Many of the first railroads in the country have adopted them, and we are informed that all without exception pronounce

them to be the best punch in use. Further information may be | England. The substance belongs to the class known as the obtained from the patentee, Mr. J. B. Aiken, Franklin, N. H.

Consolation for the Bald,

Professor Fournier, in a lecture on alopecia, says of baldness: "There is nothing ridiculous or malformed about it, and it confers upon the physiognomy an expression of wisdom, experience, and venerability. It adapts itself marwig, and is the severe beauty represented in sculpture by the classic head of Æschylus."

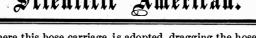
NEW HOSE CARRIAGE.

troubles experienced is that of properly irrigating the grounds. The device shown in the annexed engraving fills a need that has been long felt, and supplies a means of watering grounds thoroughly and conveniently.

The novel feature of this carriage is the arrangement by which water is conveyed through the hose connected with the hydrant to the hollow axle of the carriage, and the manner in which it is distributed by means of the short service pipe held in the hand.

The reel on which the hose is wound is secured to the hollow axle of the hose carriage, and when the reel is revolved in winding up or unwinding the hose, the hollow axle turns in the hubs of the hose carriage wheels. The inner end of the hose is connected with a nipple projecting from the hollow axle. The outer end of the hose is provided with a union or coupling for connecting it with a hydrant from which the water is taken. The s through the hose it is wound upon the reel, thence to the hollow axle, and out through the service pipe. The latter is connected with the axle by a swivel joint, so that the turning of the axle does not affect the service pipe. By

the service pipe in the other, one may walk along watering flowers, plants, or grass, on either side, as far as the force of the water will carry the spray. In this way one section after another may be watered without difficulty. The inventor informs us that a child ten years old is capable of using one of these carriages and taking the entire charge of The hose carriage has been thoroughly and practically tested, and has proved itself a complete success. A carriage of the size illustrated will hold 400 feet of three-quarter inch hose, or 300 feet of one inch hose; with these lengths a plat from 600 to 800 feet in diameter may be irrigated without disconnecting the hose from the hydrant.

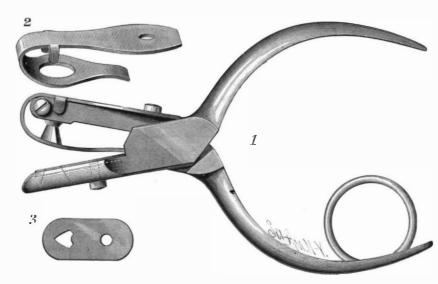


Where this hose carriage is adopted dragging the hose is entirely avoided, and the hose never kinks, but is always laid wear and tear of the usual methods of handling.

The wheels of the hose carriage are 36 inches in diameter. The reel wheels are made somewhat smaller, so that they will not touch the ground. The entire carriage is made of steel, iron, and brass, and is practically indestructible. They are made in various sizes to suit the requirements of different users. Further information may be obtained by addressing the inventor and patentee, Mr. J.B. Aiken, Franklin, N.H.

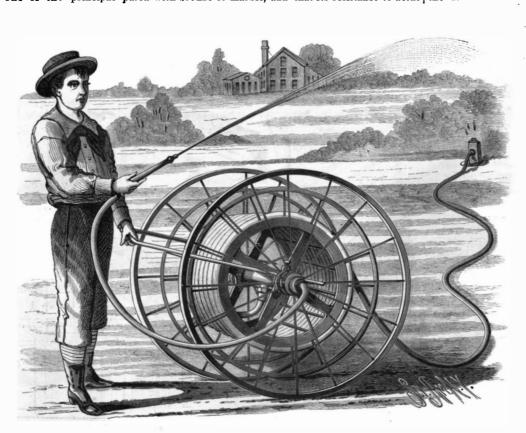
A New Compound.

A new metallic compound, applicable to many artistic



AIKEN'S TICKET PUNCH.

thiates or sulphur sulphides. Nearly a year ago Mr. J. Berger Spence discovered that sulphides of metals combined with molten sulphur formed a liquid. This liquid on cooling became a solid homogeneous mass, possessing great tenacity, and having a peculiarly dark gray, almost black color. It has a comparatively low melting point, namely, 320° Fahr., or rather more than 100° above the temperature velously to certain heads which would be deformed by a of boiling water. It would thus require only a small amount of fuel to reduce or to melt it. The new compound also expands on cooling-a property not shared by the majority of other metals or metallic compounds. For such purposes as joining gas or water pipes this expansion is of great Any one fortunate enough to possess extensive grounds importance. It is also claimed that the new compound reknows only too well the difficulties of keeping the lawns sists favorably atmospheric or climatic influences, as com-



AIKEN'S NEW HOSE CARRIAGE.

taking the handle of the hose carriage in one hand and is much superior to that of other metals or metallic compounds. These qualities, if sustained by further experience, would certainly render the new compound very useful in many ways.

A California Tunnel.

The longest of the series of tunnels on the South Pacific Coast Railway, in the Santa Cruz mountains, California. has just been completely pierced. The tunnel, which is over a mile in length, was begun a little over two years ago. The presence of petroleum in the formation has resulted in several disastrous explosions, involving many delays and considerable loss of life.

A New Way of Heating Railway Carriages.

French railway cars are warmed by means of hot water smoothly, and may be taken up very easily without the usual | bottles; that is to say, cases made of iron, about three feet long, six inches wide, and four inches thick, which are filled with hot water and put on the bottom of the car for passengers to place their feet upon.

It is reported from Lyons that the Compagnie Paris-Lyon-Méditerranée is now trying a new method of heating in express trains. The method was proposed by M. Ancelin, an engineer, and consists simply in the use of acetate of soda in the foot warmers. The substance has considerable latent heat; dissolving at a certain temperature, it thus absorbs a large quantity of heat, which becomes sensible during crystallization in cooling. All that interchangeability of the various parts, as illustrated in the and industrial purposes, has been recently announced in is required is to fill the ordinary cases with a sufficient

> quantity of the acetate, close them, and place them in a stove at about 100°. The cooling of a case thus charged and heated takes twelve to fifteen hours. The warmers are thereafter taken from the compartments and placed in a stove (where the crystals of soda acetate are re-dissolved); they are then ready for fresh use. The advantages of such a system are obvious-no necessity of changing warmers every two or three hours, or of maintaining a numerous body of men at stations to attend to them; economy in cost of heating, etc. Moreover, most of the existing foot warmers can be utilized. Acetate of soda is not very expensive, and it could easily be manufactured in much larger quantities than at present if the demand required it. The new system has been tried on the express train No. 5, leaving Paris at 7: 15 and reaching Perrache at 4:31. The compartments were each supplied at starting with two warmers containing acetate of soda. At Perrache most of the warmers were still so hot that one could not apply the back of the hand to them. From

Lyons to Marseilles the train was heated on the ordinary system.

Charles T. Chester.

Charles T. Chester, inventor and electrician, died recently at his residence in Englewood, New Jersey, at the age of fifty-four. Mr. Chester was for a number of years engaged in the manufacture of electrical apparatus in this city. He is best known as the inventor of the fire-alarm telegraph and originator of the law-telegraph system. At the time of his death he was electrician to the National Electric Light Com-

Mycenæ.

With respect to Dr. Schliemann's discoveries at Mycenæ, and gardens in prime condition; one of the principal pared with bronze or marble, and that its resistance to acids the Russian savant, M. Stephani, has expressed opinions

which have attracted considerable attention in Germany. The learned academician by no means disputes the great antiquity of many of the individual objects unearthed by Dr. Schliemann, but he holds that the remains include objects belonging to very different eras of history. He contends that the date of the tombs must be determined by the latest products of art or industry which have been discovered in them. The seal ring is especially important in this respect, as, according to his view, it is executed entirely in the style of the New Persian art. He is of opinion that the tombs originated with the barbarians who invaded Greece in the third century B. C., and made the citadel of Agamemnon one of the chief centers of their dominion. Here he believes they buried their chiefs, and decorated the tombs partly with such ancient relics of an earlier date as had fallen into their hands and partly with ornamental objects produced in their own times.

A Town Lighted by Electricity.

Wabash, Ind., boasts of being the first town to adopt the electric light for general illumination. A beginning was made March 31, with four Brush lamps of 3,000 candle power

each suspended on the flagstaff of the court house. A seven horse-power generator supplied the electricity. The contract called for a light equal to a gas burner at a distance of 2,640 feet from the lamps. The tests were said to be satisfactory. Many visitors from adjoining towns were present to witness the first trial of the new method.

THE following is the way the newspapers in the mining regions talk to their readers:

"A man at Dutch Flat picked up a rock, the other day, to throw at a cow. The weight of it attracted his attention, and on examination it was found to contain over a hundred dollars in gold."

The Exodus from Europe.

The prophecy of the Commissioners of Emigration that the current year would see a marked increase in the number of immigrants arriving from Europe is being fulfilled with a liberality quite unexpected.

The total number of immigrants who came to this port in 1879 was 175,589, which was very largely in excess of preceding years, being 59,723 more than in 1878, which exceeded 1877 by 20,811. During January and February of 1879 the arrivals numbered 5.143, while for the first two months of this year the aggregate was 13,765, an increase of 8,622. These are invariably the two lightest months in the year. During March, 1879, the record shows 6,085, while for the month just closed this year the official figures are 21,090, an enormous increase of over 15,000. During the first quarter of the present year there was landed 34,855, against 11,052 in 1879. A heavier immigration is expected this summer than ever before. The new arrivals are chiefly Germans. Since the Commission was organized in May, 1847, Germany and Ireland have sent in about equal numbers, the total figures to the close of 1879 being, for Germany, 2,195,398, and for Ireland, 2,042,046. This year, during January and February, the proportions were-Germany, 3,577; Ireland, 2,597. A large immigration will undoubtedly come from Ireland on account of the famine, but it has not yet set in.

The applications for newly arrived laborers are largely in excess of the supply; and, curiously, the number of immigrants registered as seeking employment is smaller than it has ever been in recent years. With the exception of the Hungarian arrivals, nearly all have definite plans for the future. They have money and friends, and usually go West to situations procured in advance by their countrymen resident here. The demands for immigrant labor are mostly for Germans, Swedes, and Scotch; but Superintendent Jackson says that, among these nationalities, scarcely one in a hundred stops at New York to seek employment.

NEW BOX MACHINE.

We give herewith an engraving of an improved machine for cutting box blanks from a block of wood, and at the same time grooving them preparatory to bending them into forms for making the rectangular sides of a crate or box, as shown in the engraving.

Fig. 1 is a perspective view of the complete machine, showing also the bed plate and knife detached. Fig. 2 is a vertical section taken through the block-holding and cutting

In the wide end of the main frame of the machine is arranged a knife, D, with its edge inward. This knife is firmly secured to the solid bed frame, so that it will not be liable to bend under a heavy strain. In front of the knife there is a gauge plate, which is movable lengthwise, being its outer side inclines to the angle of the cut on the other adjusted in this direction by a screw.

This gauge plate supports the plate, D, which carries a series of cutters for forming transverse grooves in the box blanks. The gauge plate has a series of wedge-shaped pro-

cavities in the under surface of the cutter plate, so that when the gauge plate is moved lengthwise by means of its adjusting screw, the cutter plate will be raised or lowered, as may be required, thus governing the thickness of the blank. The cutter plate is clamped firmly to the bed of the machine by two screws passing through slots in the gauge plate.

The cutter plate, B, is provided with the convex cutters for forming the transverse grooves in the box blanks, and also with inclined cutters for chamfering the ends of the blanks.

A traveling block-holder, A, moves over the bed of the machine and carries the block from which the box blanks are cut, back and forth over the knives in the bed, cutting at each forward movement a blank suitable for making a box like that above described. The block is held in place by a clamp, b, attached to a weighted follower that continually presses the block downward and feeds it automatically to the knives.

Whenever it is desirable to raise the weighted follower, it is done by turning a small windlass, a, journaled in the block-holder, and pro-

proper reciprocating motion is given the block-holder, A, by means of cranks and connecting rods connected with opposite ends. A check or holder, C, pivoted in the lower portion of the bed, is made, by an ingenious cam arrangement, to rise at each cut and support the blank. The machine is entirely automatic after the block is put in.

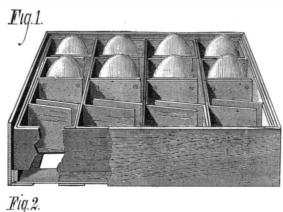
The machines are strongly built, and turn out the blanks very rapidly. They are made in various sizes; the largest made up to this date are 56 inches in width, but they may be made much larger. The only limit to the size is kind. It is inexpensive, durable, and effective. the length of the knife. A 56-inch machine will cut | Further information in regard to this useful invention | Mr. Milton W. Hazelton, of Chicago, Ill.

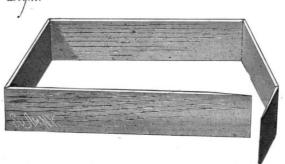
blanks for boxes from 9 by 18 inches by 10½ wide down to may be obtained by addressing Mr. J. D. Richards, P. O. Box the size of a match box.

This machine was recently patented by Mr. William Huey, of Cambridge, Md. Further information will be furnished by Mr. J. D. Richards, Box 43, Cambridge, Md.

NEW EGG CARRIER AND CRATE.

The engraving represents a novel egg crate and carrier recently patented by Mr. William Huey, of Cambridge, Md. The blanks for the crate and for the carrier are both made on the machine shown on the lower part of this page. These





HUEY'S EGG CARRIER AND CRATE.

blanks are sliced from a block of wood, and the transverse grooves which admit of making the boxes with bent joints at the corners, and with the adjoining ends lapped so as to form a strong yet perfectly smooth joint. Fig. 1 shows the egg crate and box with portions removed to show their construction, and Fig. 2 shows a box blank bent at the corners and about to be joined at the ends. In forming the box the inventor bends the shorter of the beveled ends inward until end. By this arrangement, if the parts are to be glued, the glue is not applied to the ends of the grain on both sides of the joint, and a strong joint is secured.

The arrangement of cells shown in Fig. 1 is designed for jections on its upper surface, which correspond to a series of transporting eggs and other fragile or perishable articles,

43 Cambridge, Md.

The Manufacture of Dynamite.

The industrial production of nitro-glycerine, the base of dynamite, has been attended with no little danger, as many terrible accidents bear witness. Among the prizes recently awarded by the French Academy of Sciences is one of 2,500 francs to MM. Boutmy and Foucher, who, by introducing new modes of producing nitro-glycerine in large quantity, and by various precautions, have rendered the manufacture of dynamite much safer, so that in their works at Vonges no life has been lost during the last six years, and the general health has been excellent. In the old method, in which fuming nitric acid, or a mixture of this and sulphuric acid, is made to act on glycerine, and the mass is suddenly immersed in water, the reaction often produced heat sufficient to decompose a part of the nitro-glycerine, occasioning violent explosions (in spite of the refrigerating processes adopted). The principle of the new process consists in obviating the greater part of the heat by first engaging the glycerine in a combination with sulphuric acid, forming sulphoglyceric acid, and then destroying slowly, by means of nitric acid, the sulphoglyceric compound. Two liquors are prepared in advance—a sulphoglyceric and a sulphonitric (the latter with equal weights of sulphuric and nitric acid). These disengage a considerable amount of heat; they are allowed to cool, and are then combined in such proportions that the reaction takes place slowly. In the old method the nitroglycerine is separated almost instantaneously and rises in part to the surface, rendering washing difficult. In the new it forms in about 20 hours, and with a regularity which prevents danger. It also goes to the bottom of the vessel, and can be washed rapidly.

MECHANICAL INVENTIONS.

Mr. John H. Parkinson, of Virginia City, Nev., has patented improvements in air compressors especially adapted for use at mines. The object of the invention is to construct a simple and durable apparatus, which will occupy but small space and require but little power to drive it.

An improved axle box, patented by Mr. George W. Thomas, of Bear River, Nova Scotia, is applicable to carriage, wagon, car, and all other axles, and to all shafting. The invention consists in the combination with friction rolls of an axle box journaled in rings connected by diamond-shaped bars extending the whole length of box.

A novel and simple apparatus to be used in the process of making ice by the absorption or pumping of ammonia gas, has been patented by Mr. Andrew J. Zilker, of Austin, Texas. The invention consists of two or more sheets of galvanized iron or other metal set in a tank of fresh water, one on either side of the evaporation pipes, and held in a position parallel to each other by anchors or yokes that connect them.

An improved vise for holding circular saws while filing and upsetting their teeth has been patented by Mr. James L.

> Glover, of Windsor Locks, Conn. It is so constructed as to hold the saws firmly while being operated upon.

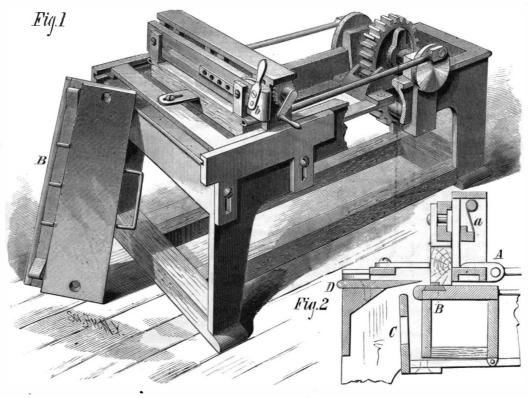
> Mr. George E. Bigelow, of Geneva, Neb., has patented an improved water elevator which consists of a conical axle carrying a chain or rope to one end of which a weight is fastened, said axle supporting also a wheel or pulley which carries a chain or rope, one end of which is attached to the wheel and the other end to a bucket.

A metal bending tool for use of blacksmiths and others having occasion to form angular bends in metal bars or plates, a tool which will en able the work to be done much more easily, quickly, and economically than by the ordinary means, has been patented by Mr. Samuel Patterson, of Altoona, Pa.

Mr. William H. Hottel, of Woodstock, Va., has patented an improved alarm attachment for grist mills, designed to give a distinct alarm fo indicating the irregularity of speed, whether in a mill or other class of machinery, which may be heard at any part of the mill, or which, by the aid of a telephone, may be heard at an office, residence, or other point remote from the machinery.

Messrs. Monroe Frank and Alfred Dickison, of Bowlusville. O., have invented an improved drag sawing machine, intended to be used by hand in sawing firewood. It is simple and well designed.

A stationary steam boiler, composed of hot water, steam, feed water, and air tubes laid horizontally, in coils or sections, one above another, in the order named, in a brick fire chamber, and having all the tube couplings and connections outside of the brick work, so that they may be readily got at for examination or repairs, and having also the steam and mud drums outside of the brick work, has been patented by



HUEY'S BOX MACHINE.

vided with a ratchet for holding it when required. The and the device consists in a case formed with parallel partitions subdivided so as to form cells, by elastic wings secured on one side to the parallel partitions and overlapping their free ends to form expansible cells or pockets, for receiving and protecting the eggs.

The wings are formed of thin strips of wood made on the machine described below. The transverse groove formed in the blank renders the wood thin and springy at the joint.

The advantage of a crate of this character will be seen by shippers and producers of articles requiring carriers of this

AMERICAN INDUSTRIES.-No. 41.

THE BRASS MANUFACTURE.

This department of metal working has, for several years past, been showing a steady and most wonderful growth, as a consequence principally of improvements made in ma chinery. The great ductility and malleability of brass—the ease with which it can be rolled, drawn, and hammered when cold-render it possible to use with great advantage, in working it, all kinds of modern punching and draw presses, and it is now employed in the making of an almost endless variety of articles in which its use was formerly unknown, or so small as to be quite insignificant.

Ordinary commercial brass, as now generally made, con sists of two parts by weight of copper and one of zinc, though the proportions vary according to the quality of the brass. Zinc is a good deal the cheaper of the two elements, but it melts more readily, and burns off to some extent in the fusion. Copper melts at 2,200° Fah., and zinc at 770° Fah. The best quality of brass is that known as "low brass," which has a greater proportion of copper than the "high brass," which is the cheaper grade. "Low brass' now sells at four cents a pound more than high brass. With still less copper, and proportionately cheaper, we have "yellow metal" for bottoming vessels, etc. The composition of the latter varies as much as does that of brass, the proportions being from thirty-seven parts zinc to sixtythree parts of copper to equal parts of each. What is known as "German silver" is made by melting nickel, onesixth to one-third in amount by weight, with brass. A small percentage of lead is sometimes used in brass, diminishing its ductility and increasing its hardness, one to two per cent. rendering the brass capable of being readily worked on the lathe, or filed, without clogging the teeth of the file. A tough brass for engine work is composed of twenty parts

The copper used is principally from the Lake Superior The company have a high reputation for the excellent quality of their metals, as their long experience in the business has enabled them to overcome many difficulties which formerly existed in making just the desired combinations. They have some workmen in this branch of the business who have been in their employ upward of a third of a century.

The large illustration across the top of the page shows the department where both the slabs for sheet brass and the flat bars for wire are rolled. The first operation here is to trim off the edge left rough from the mouth of the mould, and for this purpose immense shears are used, the working arm of one pair of which will weigh as much as a ton; this is worked with a powerful leverage, so that the thick bars and slabs of brass are trimmed off as easily therewith as a paper doll would be cut out with ordinary scissors. The huge rollers, arranged in gangs, are of different sizes, sixteen pairs being in operation. They work in iron frames of the greatest solidity, the motion being given by a loose or flexible joint, to admit of the upper roller being set at varying heights for the different thicknesses to which the brass is to be rolled. In some of the rolling one hundred and fifty horse-power is at times required to drive a single pair of rollers, and, strongly as they are built, they sometimes break under the great pressure they have to bear. Little streams of water are constantly pouring over them when in operation, and the first "squeeze" which the slab or bar of cast brass receives reduces its thickness by about a sixteenth of an inch, or rather more than is effected by each successive rolling thereafter. This operation, the metal being successively passed through the rollers, is continued, for sheet

from each other by almost imperceptible gradations, and they are tapering or slightly conical in form. The end of the rod of metal, having been put through one of these holes, is seized by pincers operated by machinery, and pulled through far enough to be made fast to an iron cylinder or upright roller, turned by power from the main shafting. The wire is in this way drawn through a series of smaller and smaller holes until it is reduced to the required degree of fineness, the wire being coiled up on the roller as it is drawn out. What is known as the "old English gauge" is the one by which wire is generally sold, while sheet metal is usually graded according to the "American" scale. In the latter the sizes run smaller in most of the numbers than in the former. The sizes of the "American" scale are graded on a uniform variation from No. 0000, which is 0.46 of an inch in diameter, to No. 40, which is 0.003444 of an inch thick. Other sizes than these are made to order when required.

The large view on this page, showing where tin, brass, and copper tubing is made, illustrates an important branch of the business done at Waterbury. Seamless tubes are now being much more generally used than they formerly were, and their greater strength and durability are obvious. In the other kinds of tubes the sheet metal is cut into strips of the required width and passed through formers, which fold the metal over so the edges are just ready to make a joint, and then a seam is brazed. For the seamless tubing the metal is cast in the form of a cylinder, about five feet long, with a core, so as to leave an inside diameter of about four inches. These hollow cylinders are then put through one drawing machine after another till they are drawn down to the required size, a steel arbor forming the inside of the brass, until the plates are reduced sufficiently thin for any tube as the draw plate shapes and finishes the outside. For purpose desired, but the bars intended for wire are only beaded and ornamented tubing, round, square, octagon, etc.,



BENEDICT & BURNHAM MANUFACTURING COMPANY.—BRASS MANUFACTURE.

of copper to three of zinc and three of tin, while for heavy | rolled down to about half an inch thickness, the size from | bearings a brass is made of thirty-two parts of copper to that point being diminished by the drawing. one of zinc and five of tin. "Pinchbeck" has generally copper to eighty of zinc and ten of tin.

In our illustrations to-day we show the principal operaoldest establishments of this kind in the country, and one of the largest in the world, that of the Benedict & Burnham Manufacturing Company, at Waterbury, Conn.

The "casting" is the first operation, as illustrated in the terior view of the foundry is given. The foundry building is 50 by 100 feet in size, and across the middle, from side to each side, giving facilities for the melting of forty-two heating. crucibles of metal at a time. The casting done here consists almost exclusively in the making of small slabs for the middle of the page, is something of an "inspecting" rolling into sheet brass, flat bars for rolling and then drawfacility that the old methods of manufacture are mostly done away with. The crucibles are of a size to hold from one hundred to one hundred and thirty pounds of metal each; in these are placed the desired proportions of copper and zinc, by weight, or of old metal or scrap, great care being taken to maintain the exact relative proportions of each, which requires close attention, as the zinc burns off rapidly at the heat required to melt the copper. The crucibles, when charged, are covered with charcoal and set in the furnaces, which are fitted with sliding plates to close the top, each furnace having an aperture at the back communicating with a tall stack, which carries off the volatile results of combustion and fumes of zinc. When the metal has been

The "annealing," as shown in the view on the left in the about four parts of copper to one of zinc, and a white metal middle of the page, is conducted in six large ovens heated largely used for cheap table furniture, etc., has ten parts of by wood. The fires are on each side of a space about five by eighteen feet, where the bars and slabs of metal are laid, after each successive rolling, until heated to a red heat. and tions of the brass manufacture, as conducted in one of the thence drawn out to cool slowly in the air. The metal, by the compression of the rolling or drawing, becomes comparatively hard and brittle, but the annealing restores its former softness and pliability. Chestnut wood is used for heating the annealing ovens, some four thousand cords a middle of the first page at the right hand side, where an inannealing the metal is subjected to a bath of dilute sulphuric acid, the acidity to the tongue being about equal to side, runs a bank of small, low furnaces, twenty-one on that of lemon juice, which removes the tarnish given by the

The "overhauling" or scraping, as shown in the view in operation for all roll and sheet brass. This is done only being into wire, and hollow cylinders from which seamless fore the final rolling, and is intended to remove all spots or tubing is made. Comparatively few articles are now cast imperfections, so that the brass, as it comes from the rollers in brass, as the metal can otherwise be worked with such the last time, will be as nearly perfect as possible. A great portion of this work is done by hand, but our representation shows some machines for this purpose, in which small scrapers are guided by the hand of the operator to scratch over and clean the surface of the metal where necessary.

Wire drawing is shown in the large view at the bottom of the page. The bars, having been rolled until they are about six inches wide by eighteen or twenty feet long, and something less than half an inch thick, are passed between rollers with interlocking sharp edged ridges and grooves, by which the metal is cut into rough square rods. One end of each rod is then made slightly smaller, so that it may be put through a hole of the size to which the whole rod is to be the moulds, which are of iron, held together by clamps. the largest to the smallest wire required. The holes differ silver, to be manufactured into spoons, forks, etc., and from

the metal is passed through draws of the required shape, and in which the pattern is cut in wheels to act as dies. A great many boiler tubes are drawn at this establishment, but the work includes every variety known to the trade, from tubes having a 41/2 inch inside diameter down to those of small wire with an inside aperture which the finest thread would fill.

The principal productions of the Benedict & Burnham Company are sheet and roll metal, and brass, copper, and German silver wire and tubing, but they make beyond this a great variety of other work. A large department is devoted to the manufacture of kerosene lamp fixtures, and here nearly all the work is done by punching and drawing presses. In this line of goods they export large quantities to every part of the globe. The establishment has, at different times, executed many large orders for the government. They regularly turn out rivets and burrs, chains, butts and hinges, drop handles and knobs, escutcheons and ornaments, etc., and have, since January 1, been making about 500 watches a day. This is a comparatively new branch of business with them, but their watch is made to sell at a very low price, and has met with so large a demand that they are now constructing additional machinery to enable them to greatly increase their production.

The State of Connecticut has been for many years "headquarters" in the brass manufacture, and the Benedict & Burnham Manufacturing Company dates from the very commencement of the business. The house was established in 1812 by Aaron Benedict, father of Mr. Charles Benedict the present head of the company. In 1824 Mr. Benedict introduced the first machines ever used in this country for rolling brass; they were imported from England, the rollers being 11 inches in diameter by 30 inches long, and elicited no little comment at the time. With the aid of this machinery they were able at once to commence drawn down. The draw plate is a thick plate of the finest supplying all brass workers with sheet brass, and their busiproperly fused it is poured direct from these crucibles into steel, perforated with holes of the various sizes from that of ness grew rapidly. In 1835 they began rolling German

that time to this their field of operations has been steadily construction, securing great strength and rigidity, and at the subjected to acid bath, for cleaning, and then buffed to renenlarged. They now employ over 600 hands, and their buildings cover about six acres of ground. They have one 400 horse power engine, and two water wheels; for one of the latter they obtain the water from the Mad river, and for the other from the Naugatuck, their works being beautifully situated along the left bank of the latter, just below the entrance of the Mad. The present company was incorporated in 1843; but even the extensive business which hinged leg, and is readily and easily placed and as readily it conducts hardly tells the full story of its success, for the detached and put aside when not in use. company or its members have at different times started sev-

eral other manufacturing industries, which are properly only offshoots, as it were, of the parent business, but which have now grown to be of large dimensions.

The company have stores at 78 Reade street, New York; 57 Oliver street, Boston, and 17 North Seventh street, Philadelphia. Mr. Charles Benedict is President and Treasurer of the company, and Mr. Charles Dickinson, Secretary.

A NOVEL SHADING PEN.

The annexed engraving represents a new instrument for plain and ornamental lettering, and is adapted to the use of bookkeepers, artists, markers, clerks, and penmen generally. 'The manipulation of the pen being purely mechanical and automatic, any person writing an ordinary hand can use it successfully and with satisfactory results. Its use familiarizes the eye with uniform design, so that the regular hand writing is rapidly improved. Shaded letters may be produced as readily as the plainest, and of such

lithographic work. Several widths of this pen are madeone eighth, three sixteenths, and one fourth—each of which ridge is supported by the pole, D. The frame folds comwill make any width of line, from that of a hair line to the pactly together, as shown in the perspective view, Fig. 2, full width of the pen. They are made entirely plain and transverse section, Fig. 4, and is secured by means of throughout their entire width, or arranged to shade one straps attached to the wooden pole, D. The chimney cap side of the line produced according to the taste of the

nearly every branch of business. Bookkeepers, with slight | tent fixtures, but the stove, and the frame is more compact practice, can make ledger headings so uniform and artistic and portable than the ordinary poles. This useful invention in appearance as to be quite beyond the comprehension of has been covered by two patents by Capt. Charles W. Hobbs, persons unfamiliar with the simple manner of their produc- of the U.S. Army. Mr. William A. Percy, of Plattsburg, tion. Any kind of ink may be used. The inventor in- Clinton county, N. Y., is agent and manufacturer. The informs us that more than seventy distinct and brilliant ventor may be addressed in care of Mr. Percy.

shades of color may be produced with the several colored inks adapted to this pen and in common use. The construction of the pen will be understood from the engravings, the larger view showing the pen in actual use, the smaller views showing the different sizes of pen.

Further particulars in regard to this useful invention may be obtained by addressing the patentee, Mr. J. W. Stoakes, Milan, Erie County, Ohio.

NEW WALL TENT AND STOVE.

A stove is often a necessity and always a desirable comfort in camp; for even in mid-summer there are chilly mornings and evenings and rainy days, when the comfort of a little heat in the tent is greatly to be desired. All who have had experience in camping know that the proverbially unmanageable stovepipe is most unmanageable in a tent. After ripping a hole in the tent, and getting the stovepipe in place, it is no uncommon experience to replace it again and again, after the wind has detached it from the stove and caused it to tumble; and should the pipe be permanently attached to the stove, the matter is made even worse, as not only the pipe but the stove also must sooner or later come down. These difficulties are not by any means all that can be brought as objections to the ordinary camp stove and its accessories is a cumbersome addition to the equipage, and takes up a great deal of valuable room in a tent where there is very little room to spare.

The Hobbs tent frame and stove overcome the difficulties enumerated, and afford a compact, light, and efficient cooking and heating apparatus, well adapted to the wants of military men, sportsmen, surveyors, and engineers, for camp meetings, pleasure camps, and for all who dwell in tents during a portion of the year. It is particularly well fitted for cooking, and its application to kitchen tents will not be among the least valuable of

its uses. The invention consists in substituting for the ordinary

tent poles a frame composed of a ridge and hollow upright of galvanized sheet iron, and a wooden pole of the ordinary

The hollow upright, forming the stovepipe as well as one of the supports of the tent, is of a special patented with copper or other metal by electroplating. It is next tion and convenient in use.

same time being very light. It sets in from the end of the tent a sufficient distance to prevent injuring the canvas by heating, and its upper end is provided with a chimney cap or cowl, which projects over the canvas. Near the lower extremity of the hollow upright a stove is attached in such a way that it accompanies the tent in all its swaying motions. The stove is supported by the upright and a single

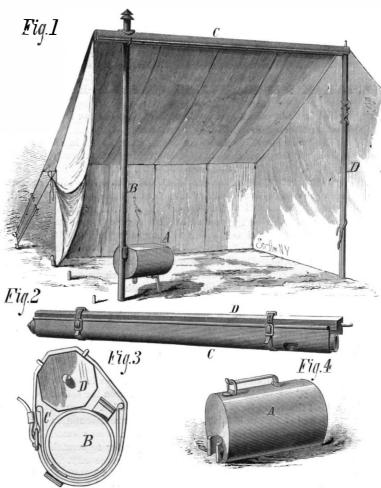
Referring to the engraving, A is the stove which is



STOAKES' AUTOMATIC SHADING PEN.

quality as to compare favorably with steel engraving or attached to the vertical pipe, B, and the latter extends upward through the hollow ridge, C. The other end of the is carried in the stove, and the leg of the stove is converted into a handle, as shown in Fig. 3.

These pens are inexpensive and must prove very useful in | It will be seen that nothing is added to the bulk of the



HOBBS' WALL TENT AND STOVE.

MISCELLANEOUS INVENTIONS.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improved process for giving an ornamental surface or finish to iron castings, which process is as follows: The casting is first rolled or tumbled in the usual manner, and improved trap for catching rats, mice, gophers, and other polished on the portions of the surface that are to have a polish on the finished article, and then the casting is coated number of animals in succession. It is simple in construc-

der the surface smooth and bright. It is then boiled in a tin or other metallic solution. The solution will deposit evenly over the entire surface, and the polished portions will be left brilliant, thereby forming a fine contrast with the unpolished surface and giving a fine polish and effect. The polishing previous to the electroplating, and the buffing subsequent thereto, are essential steps in the process, and by the boiling in a metallic solution the desired color and a bright clean finish are obtained without further labor.

An improvement in the class of automatic car couplings

in which a bar is employed as the connecting device in place of the link, and is made to engage with spring jaws or catches located within the draw heads, such jaws or catches being operated by levers and connecting rods for the purpose of withdrawing them from engagement with the bar when it is desired to uncouple, has been patented by Mr. James H. Henley, of Leadville, Col.

A simple, convenient, and effective device for stretching wires along posts in the making wire fences, has been patented by Mr. Joshua Fowle, of Iowa City, Iowa. The invention consists of a clamp provided with devices for adjusting and holding it upon a post, and provided also with crank and crankshaft for stretching and tightening the

An improvement in the class of invalid beds having adaptation and attachments for elevation of the head and shoulder portion, and for introduc tion of a bed pan beneath a removable section of the mattress, has been patented by Mr. Chambers M. Campbell, of Nashville, O.

An improvement in the class of ironing machines in which the clothes or goods to be pressed are carried between heated rollers or plates by means of endless traveling aprons, has been patented by Mr. Morris Steinbock, of New York city.

A simple, durable, and easily actuated alarm attachment for doors has been patented by Mr. Charles F. West, of Philadelphia, Pa. The invention consists of a peculiar arrangement of lever, striker, and trigger that render the alarm especially durable and of easy operation.

A safety appliance for releasing horses has been patented by Mr. Benjamin F. Strange, of Corvallis, Montana Ter. This invention consists in a hitching appliance so connected with the horse's halter that the halter will be cut if the animal should become entangled in it.

Mr. Mortimer Shea, of Nashville, Tenn., has patented an

improved device for attachment to gas meters, to guard against any adjustment of the meter that will cause gas to pass through without being registered, and to indicate to the inspector if there has been any attempt to tamper with the

An improvement in window sashes, patented by Mr. Alphonse Friedrick, of Brooklyn, N. Y., relates to lead sashes, such as are used in illuminated or ornamental windows. As heretofore constructed such windows have been strengthened by iron rods placed at intervals diagonally across the lead frames, and secured thereto by small wires twisted around the bars and soldered to the lead cross strips. Such bars are unsightly. They disfigure the designs, and in large windows the lead sash between the bars is not protected. The object of this invention is to strengthen the lead sashes where required by metal wires, which will be soldered to and hid by the sash.

An improvement in cannon has been patented by Messrs. Patrick P. Brannon and Thomas B. Bunting, of New York city. The invention relates to improvements in breech loading cannon, and particularly to the construction of the breech the breech block or wedge, and the manner of loading and firing the gun.

A simple device for stretching carpets on the oor, patented by Mr. John B. Eddv. of Stevens Point, Wis., consists of a T head, with claws for taking hold of the carpet, attached to a ratchet bar spliced to another bar carrying a lever, with which the first bar is moved out from the other, and a pawl or dog which engages the ratchet and retains the bar in the position into which it is moved by the lever.

A wash bench susceptible of being raised in height and of being compactly folded has been patented by Mr. Abram Severson, of Auburn, N. Y. It consists of a tripod, two of the legs

whereof are fixed to the head and provided with casters, while the third is pivoted in the head and can be folded around near the other two.

Mr. John A. Hollem, of New York city, has invented an animals, which is so constructed as to catch an unlimited

NEST-BUILDING FISH, GASTEROSTEIDÆ.

A. W. ROBERTS

There is nothing more repulsive than exaggeration in natural history. Surely the phenomena themselves are wonderful enough for the healthy mind if properly set forth. Readers and students are not drawn to the study of nature by such means; indeed, the overdrawn statements, or the classifying of odd and unusual facts, as if of ordinary and regular character, will soon repel the earnest seeker for knowledge, and even the searcher for wholesome entertain-

kind of pseudo-science. Sticklebacks are wonderful fish, siderable display of anger and much labor, at last drove

and with them many wonderful things are possible. I know of no other fish that harmonize their colors to the surroundings as do the sticklebacks. Take the many-spined stickleback as an example. In a pond at Maspeth, L. I., which has a bottom of white clay, and was so situated as to be under the full glare of sunlight nearly all day, the color of the sticklebacks was that of a dirty white. A half a mile beyond this pond was a ditch containing peaty water; here the same variety of sticklebacks were brown. A few yards beyond this ditch was a hole, the bottom of which was black creek mud; here the sticklebacks were jet black, even to their eyes. The male fish of the varieties Gasterosteus biaculeatus and aculeatus, are more wonderful still, as illustrations of this fact. The first indication that a male stickleback, of either of the above named varieties, is about to construct a nest is the taking on of green and red colors, the eye at the same time becoming blue. When the nest is completed, and the time has come to either coax or drive the female to deposit her ova in the nest, then the colors of the male become wonder-

retains these colors till he abandons the young sticklebacks to shift for themselves.

In nature the male stickleback always selects material for his nest that is in keeping and harmony with the surroundings. This is a wise precaution for masking the contents of the nest from other fish, particularly sticklebacks, who are very fond of their own ova. In the engraving, at lower left-hand corner, a male of the three spined mouth material for the nest, while Mrs. Stickleback, heavy with ova, waits behind the plants for the completion of the nest.

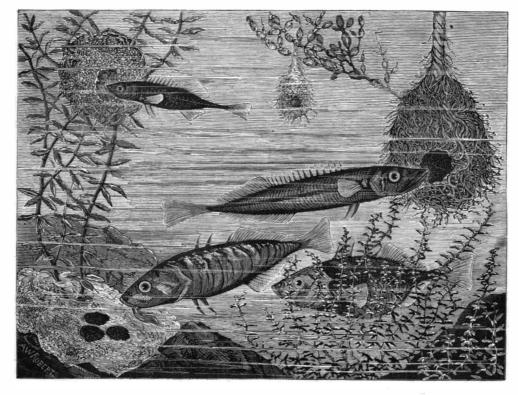
The following description of how a sticklebackery was established is taken from the "Young Scientist." I kncw it to be truthful in every particular:

number of panes of glass, I formed in a washtub a series of deposited, I withdrew the glass partitions; but terrible bat-gather its branches together round the eggs, at the same compartments, in the following manner: From the centles taking place between the males, I had to replace them. time weaving and incorporating all the rubbish that is lying ter of the tub the panes of glass radiated till they came Even then they would try to fight each other through the or floating round the nucleus. Mr. Couch mentions a case

in close contact. with the sides of the tub, thus forming a series of acute angles: the bottom edges of the glass were then crowded down through the three inches of sand till they rested on the bottom of the tub. In the apexes of the angles bunches of mermaid weed were planted: this also helped to sustain the glass comnartments as well as to keep up a thorough oxygenation of the water. In each compartment I placed a pair of sticklebacks, giving them a meal of angle worms before leaving them forthe night. Next morning, when I examined the tub, to my great surprise, many nests had been built during the night; in some of them the bright yellow eggs

showed plainly

vigorously ventilated by the male fish, who were hard at work fanning a current of water on them with their pectoral fins. In one compartment a male fish was tearing off small pieces of confervæ that grew on the mermaid weed, which he carried in his mouth to the nest, packing it down with his nose. After placing several mouthfuls in this way. he fastened the pieces together more compactly by pressing them down with the underside of his body, at the same time exuding a marine glue, so to speak, that cemented all together securely. In the center and on the top of each The nest-building stickleback is a good subject for this nest were four orifices, and into these the male, after a con-



NEST-BUILDING FISH, GASTEROSTEIDÆ

fully intense, the red becoming almost luminous. The male | the female, her head projecting far enough out to allow her | is a native of England. He is a long-bodied, long-snouted to breathe. In a few minutes the male drove her out of the fish. On certain parts of the English coast these fifteennest head first, he now passing through the nest and over the eggs, just to see if Mrs. Stickleback had laid her eggs in the proper place, and to make things all right. - In an instant he was out, flaring all over with blue, green, and orange, his eyes looking like small turquoises. When the openings of the nest became too large, he contracted them by patching on more confervæ. Over the nest he remained stickleback (Gasterosteus biaculeatus) is shown carrying in his | day and night, changing from one opening to another, constantly fanning a current of water through them. Whenever poor Mrs. Stickleback showed herself, her mate drove at her and formed of some albuminous secretion. The eggs are flercely, biting her till she was glad to hide in the mermaid laid in the middle of the nest, in several irregular masses of weed. The trouble was that she would have eaten all the eggs if she had had a chance, and he knew it. For this ova, which are of the size of ordinary shot, and of a whitreason I took all the females out as soon as they had depo- ish or amber color. It would appear that the fish must first "Up in the hayloft was a box of window glass; taking a sited their eggs. As each nest was completed and the eggs deposit its spawn amid the growing fucus, and afterwards

through the openings of the nest. Every nest was being glass. When all the eggs were hatched, and the bottom of each compartment seemed alive with young sticklebacks, I removed all the male fish and glass partitions, and in a few weeks was the happy possessor of a large school of inquisitive, restless baby sticklebacks."

The many-spined stickleback (Gasterosteus occidentalis) is called by dealers the "nine-spined" stickleback. At the upper left hand corner of the engraving is shown the nest and male of this variety. It is very seldom that the manyspined build when in confinement; I have known of only one instance, which occurred when connected with the aquaria at Barnum's (old) Museum. Unfortunately the nest was torn to pieces by a number of small eels before the eggs

had hatched. The drawing here presented was made from a sketch I made of the nest as soon as it was completed. This nest was constructed in the branches of a mass of Ludwigii, and was composed of small fragments of dead aquatic plants and confervæ. The fibrous structure of the confervæ, and the thready consistency of the glutinous excretion of the male, had been utilized for securely binding the nest to the branches of the Ludwigii. The male of this variety becomes black during the season of incubation. I have known this variety of stickleback to ascend small fresh water streams of Long Island, many miles above the brackish water, and remain there for several seasons before returning to the ocean. The largest sized specimen I have ever taken of this variety was two and a half inches long, which is very unusual. When a number of these nine-spiners are placed in an aquarium they are very apt to school and boss everything in the tank.

To the right-hand side of the engraving is a representation of the fifteen-spined stickleback (Gasterosteus spinachia) and nest. This fish

spiners have at times swarmed the coast in such vast quantities that they were used for manuring the land. The nests (says the "Naturalist's Library") of the fifteen-spined stickleback are about eight inches in length and pear-shaped, formed of branches of common fucus and various corallines. These are all bound together in one confused compact mass, by means of a thread run through and round in every conceivable direction. This thread is of great length, and as fine as ordinary silk, and somewhat elastic, whitish, about an inch in diameter, each consisting of many hundred

> teen-spined sticklebacks made their nest in the loose end of a rope, and from which the separated strands hung out about a yard from the surface. over a depth of four or five fathoms, and to which the materials could only be brought, of course, in the mouth of the fish, from the distance of about thirty feet. The nest was formed of the usual aggregation of the finer sorts of the red and green seaweeds, but were so matted together in the hollow formed by the untwined strands of the rope, that the mass constituted an oblong ball of nearly the size of the fish, in which had been deposited the scattered assemblage of spawn. This was bound into shape with a thread

where a pair of fif-



PANDA OR WAH. - [See next page.]

in various directions, while the rope formed an outside covering to the whole. A picture of this nest is shown in the illustration.

On our neighboring coast are several varieties of sticklebacks. The two best varieties as nest builders are Gasterosteus biaculeatus and G. aculeatus. They are distinguished by paws. the two prominent spines on the back and a smaller spine just in front of the dorsal fin. The size of these varieties varies from two and a half inches to three inches. The body is covered on each side with a series of narrow vertical plates. The general color of these varieties is olive green on the back and that of oxidized silver on the sides.

These fish reach our coast in schools from the ocean during the early part of March. This year they were taken by collectors as early as February. I have seen the margins of ditches of brackish water on Long Island fairly alive with both sticklebacks and sheepshead lebias that had been deposited there by the spring tides. The sticklebacks and lebias were nesting side by side in perfect harmony.

Some years ago I knew of a pond of water that had be-Wallabout Bay. In this pond were hundreds of three-spined sticklebacks, whose habits had undergone a complete change, viz., five and oftentimes as many as ten females had spawned the size of the nest to cover the extra deposits of ova, and at the same time taking entire charge of all the masses of eggs.

a large number of ripe sticklebacks, but not a particle of noticed in each of the lower corners of the tank a male in full color hovering over masses of brownish material, with that peculiar vibratory motion of the male stickleback when ventilating the eggs. On taking out one of the masses I discovered it to be composed of fine-cut chewing tobacco.

I have often placed obstructions on the nest of a stickleback during its formation, the male always removing them when not too heavy to carry in his mouth. The male when building constantly tests the specific gravity of the materials selected. He having selected what appears to be a suitable fiber, he carries it a little way, then projects it from his it is taken, if slowly it is rejected. When the young sticklebacks wander too far from the nest the male takes them in his mouth and deposits them near the nest. The eggs of the stickleback at first are of a light yellow color, but as they approach maturity they become darker; in course of time absorbed they should be placed in a tub, or other vessel abundant supply of natural food.

The best places to collect sticklebacks in the vicinity of at the rear of Gunther's Railroad Station at Coney Island. The ditches back of the railroad station at Canarsie generally contain hundreds of sticklebacks in the months of March, April, and May.

THE PANDA, OR WAH.

such refulgently beautiful fur as that which decks the body of the wah or panda, as it is also called.

chestnut-brown, which rapidly darkens into a peculiarly rich black upon the ribs and the outside of the legs. The head is of a whitish-fawn color, with a ruddy chestnut spot under each eye. The tail is of the same chestnut hue as the body, and is marked with a series of dark rings. The head is very short and thick muzzled, presenting a curious contrast to the coaitis and racoons. See engraving on previous page.

It is generally found among the trees that grow near rivers and mountain torrents, but does not seem to occur in sufficient numbers to render its beautiful fur an object of commercial value. This is the more to be regretted, as the coat of the panda is not only handsome in appearance, but is very thick, fine, and warm in texture, being composed of a double set of hairs, the one forming a thick woolly covering to the skin, phorescence recorded as occurring in these cryptogamic and the other composed of long glistening hairs that pierce plants, the light emitted is described as of the same charac-publishers, type founders, and school boards.

the surface of the fur. The soles of the feet are not merely defended by nailed and thickened cuticles, but are furnished with a heavy covering of woolly hair, which in some species is of a light gray color, and in others of a snowy white, that contrasts strangely with the deep rich black of the legs and

The food of the panda is usually of an animal character, and consists chiefly of birds, their eggs, and the smaller mammalia and insects, many of which it discovers on the trees whereon it is generally found.

Luminous Fungi.

There are no phenomena associated with fungi that are of greater interest than those which relate to luminosity. The fact that these plants under some conditions give out a phosphorescent light has long been known; and everyschool-boy is familiar with the luminous property possessed by rotting wood ("fox-fire"), and which is due to the mycelium of a fungus pervading its substance. This luminosity of fungi has been observed in various parts of the world, and where come land locked from the tide that had flowed into it from the species has been fully developed it has generally been found to be one of the toadstools belonging to the genus Agaricus. One of the best known species is the Agaricus olearius of Southern Europe, which was examined by in one nest, the male fish in attendance always increasing Tulasne with especial view to its phosphorescence. In his introductory remarks, he says that four species only of the Agarics that are luminous appear at present (1848) to be These sticklebacks had become very much dwarfed. Both known. One of them is the species just mentioned, another, in nature and in artificial confinement the male stickleback A. igneus, comes from Amboyna; the third, A. noctilucus, always selects for the situation of the nest a sunny spot. A has been discovered at Manila; and the last, A. gardneri, is good illustration of this fact was that of a stickleback that produced in the Brazilian province of Goyaz upon dead had nested in a self-supporting tank, which was so situated leaves. The Agaric of the olive tree (A. olearius), which is its apparently valuable properties. The fiber is prepared in that the sun shone on it for only half an hour each day, and itself very yellow, reflects a strong brilliant light, and rethat in a far off corner from where the nest was situated. So mains endowed with this remarkable property while it directly it is cut, as exposure to the sun dries and hardens anxious was the male fish to obtain the benefit of this sun- grows, or, at least, while it appears to preserve an active the stems, preventing the easy removal of the bark from light that every day he carried the mass of eggs in his mouth life and remains fresh. The phosphorescence is at first, and and placed them on the branches of an aquatic plant, where | more ordinarily, recognizable at the surface of the gills; but | it would otherwise be. the sun's rays were strongest, after which he replaced them in many cases, and among more aged fungi, the gills cease to give out light, and the stipe throws out a brilliant glare. At one time I had a tank of sticklebacks at Barnum's, the Tulasne, who examined this subject very carefully, infers bottom of which consisted of plain sand. In this tank were from his experiments that the same agents—oxygen, water, and warmth-are perfectly necessary to the production of nesting material. One morning, greatly to my surprise, I phosphorescence as much in living organized beings as in those which have ceased to live. In either case, the luminous phenomena accompany a chemical reaction, which consists principally in a combination of the organized matter with the oxygen of the air; that is to say, in its combustion, and in the discharge of carbonic acid which thus shows itself. Mr. Gardner has graphically described his first acquaintance in Brazil with the phosphorescent species which now bears his name (A. gardneri). It was encountered on a dark December night, while he was passing through the streets of Villa de Natividate. Some boys were amusing themselves with a luminous object, which at first mouth a short distance, and watches it fall; if it falls rapidly he supposed to be a large fire-fly, but on making inquiry he found it to be a beautiful phosphorescent toadstool, which, he was told, grew abundantly in the neighborhood on the decaying leaves of a dwarf palm. The whole plant gives out at night a bright light somewhat similar to that emitted by the larger fire-flies, having a pale greenish hue. From minute black spots appear, which are the eyes of the young fish inside of the eggs. The eggs of stickleback can be called by the inhabitants "Flor de Coco." The number of had at present been unattended with success. The interest hatched very easily, by placing them in slightly running recognized luminous species of Agaricus is not large, though water, or by changing the water twice a day. The young three or four others may be enumerated in addition to those fish are apt to die unless they are placed in water containing already cited. Of these, A. lampas, and some others, are large quantities of animalcula, which they devour in large found in Australia; and Dr. Hooker speaks of the phenomquantities. For this reason, as soon as the umbilical sack is ena as common in Sikkim, but he was never able to ascertain with what species it was associated. As regards Austrawherein the water has been under the influence of sunlight lian species, interesting information is given in regard to and the action of plants for some weeks, thus securing an two by Mr. James Drummond, in a letter from Swan River. These grew on stumps of trees, and had nothing remarkable in their appearance by day, but by night emitted a most curi-New York is in the standing ditches on Long Island; also ous light, such as he had never seen described in any book. One species was found growing on the stump of a Banksia, which was surrounded by water. It was on a dark night, when passing, that the curious light was first observed. When the fungus was laid upon a newspaper, it emitted by night a phosphorescent light, enabling persons to read the words around it, and it continued to do so for several nights with gradually increasing intensity as the plant dried up. There are few of the mammalia which are decorated with In the other instance, which occurred some years after, Mr. Drummond, during one of his botanical trips, was struck by the appearance of a large toadstool, measuring sixteen This beautiful creature is a native of Nepal, where it is inches in diameter, and weighing about five pounds. This known under the different names of panda, chitwa, and wah specimen was hung up to dry in the sitting-room, and on -the last mentioned name being given to it on account of passing through the apartment in the dark it was observed its peculiar cry. The fur of the panda is of a bright rich to give out the same remarkable light. The luminous property only ceased when the plant became dry.

In the current number of the Gardener's Chronicle, the Rev. M. J. Berkeley describes still another species, new to science, recently received by him from the Andaman Islands, and which, though small in size, exceeds in brilliancy any species that has hitherto been observed. In this species, which Mr. Berkeley names Agaricus emerici, the entire substance of the fungus is described as being most brilliantly luminous. There are a few other fungi belonging to genera other than Agaricus, which have been observed to be luminous under certain conditions; Thelephora phosphorea and Polyporus sulfureus, for example, the latter being a common American species. In all the cases of phos-

of animal substance, which was passed through and through through the wool and give the exquisitely rich coloring to ter, varying only in intensity. It answers well to the name applied to it, as it seems remarkably similar to the light emitted by some living insects and other animal organisms, as well as to that evolved, under favorable conditions, by dead animal matter-a pale, bluish light, resembling that emitted by phosphorus as seen in a dark room.

A New Fiber.

In the Paris Exhibition was shown a sample of a fiber named Malachra rotundifolia, sent from Bombay. This plant is, however, only found in South America—at least so says Dr. King, to whom the supposed Malachra rotundifolia was sent for identification, and he states that it is Malachra capitata, not Malachra rotundifolia. As a fiber, be it what may, it undoubtedly deserves attention, for it is said to be quite equal to jute. The following is the description given of it: "The fiber is in length from eight feet to nine feet, has a silvery appearance, with a peculiar luster, and is almost as soft as silk. In passing the fiber through the machinery damped with oil and water, as is commonly done with Bengal and Koukan jute, yarn was produced strong enough and nearly equal to that made from the second quality of Bengal jute. If the plant is carefully grown and well looked after, the fiber would then no doubt rank fully equal to Bengal and Bombay jute. Owing to the high prices ruling for jute in Bengal and elsewhere, the new fiber, if carefully prepared, would command a ready sale at 3.12 rupees to 4 rupees per Indian maund." There appears to be no difficulty in growing this plant, which belongs to the natural order of Malvaceae, in Bengal, marshy places within the tropics being considered favorable to its growth, and there is, therefore, every reason why a fair trial should be made of precisely the same way as jute, but requires to be steeped them, and rendering the fiber itself coarser in quality than

Human Filariæ and Mosquitoes.

The new investigations of Dr. Manson, communicated to the Quekett Club recently, appear to afford positive proof of a singular habit on the part of the filariæ. These microscopic worms periodically pass in and out of the circulation. Dr. Manson gives a table showing the hours of the day and night at which they are either present or absent in the blood. The worms are remarkably punctual in keeping to their appointed times. The evening inrush to the circulation commences about half-past seven, the over-crowding attaining its maximum at midnight. Into the clinical bearings of the subject it will be time to enter when the remarkable evidence brought forward by Dr. Manson has been fully published in the "Transactions" of the Club. In addition to some introductory remarks by himself, the President read brief communications on the subject of filariæ from Drs. Somerville, Mortimer-Granville, J. Bancroft, J. L. Paterson of Bahia, and others. The meeting was well attended, and in the course of the discussion which followed, Dr. Stephen Mackenzie stated that he had at present under his care, in the London Hospital, a patient from Calcutta, with chyluria. Although Dr. Lewis had found filariæ in the blood of of the various papers was much increased by the exhibition of drawings and specimens of the filariæ in all the stages of growth hitherto observed. Numerous infested mosquitoes were also shown. - Lancet.

New Observations concerning Bees.

Mr. E. A. Thompson writes to the American Naturalist that certain moths, Plusia precationis, having been caught by their tongues in the pollen-pockets of Physianthus albens, an Asclepiad plant, were stung to death and devoured by what were supposed to be ordinary honey-bees. Dr. Hermann Müller considers the fact of the moths being thus entrapped new and interesting; but mentions that his brother, Fritz Müller, in South Brazil, has observed bees eagerly licking the juice dropping from pieces of flesh which had been suspended to dry in the air. Mr. Darwin suggests that the bees may possibly tear open the bodies of the moths in order to get at the nectar contained in their stomachs. Both these distinguished naturalists recommend further observation. It is stated by Prof. A. J. Cook, of the Michigan Agricultural College, that bees kill the drones not by stinging, but by tearing with the mandibles.

Causes of Fatigue in Reading.

An important study has been made of this subject by Dr. Javal, director of the Laboratory of Ophthalmology of the Sorbonne, published in the Annales d'Oculistique. The fatigue of the eyes which is so often complained of by literary men he believes due to a permanent tension of accommodation; reading requires constant, steady strain of the eyes, while many other occupations demanding close, do not need constant, sight. His researches extend to the question of great economical importance: Given a surface of paper and a number of words to print upon it, what rule will secure the maximum of legibility? The answer is: Other things being equal, the legibility of a printed page does not depend on the height of the letters, but on their breadth. This fact is of special importance in the preparation of school books, and Dr. Laval's suggestions should receive the attention of

Correspondence.

The Edison Lamp Tests.

To the Editor of the Scientific American:

I have read to-day with much interest the results of Messrs. Morton, Mayer, and Thomas's experiments with an Edison electric lamp, published in the SCIENTIFIC AMERICAN of April 17. The results obtained, so far as they relate to the resistances of the loop while giving lights of different intensities, and the current required for a light of fifteen candles, are valuable, but those given relative to the cost of one hundred and twenty candles are of no value, because it is (evidently) premised that the twelve lamps are to be in series in a single circuit, whereas, in Mr. Edison's proposed system, each one of the twelve lamps would be placed in a branch circuit by itself, or in other words, in multiple arc; and the cost then would be much less than the Stevens Institute experimenters' report. The resistance of the armature of Mr. Edison's generator is so small that it may be neglected entirely, without seriously affecting the value of calculations, and the resistances of the leading wires may also be made so small that their neglect will not make any appreciable difference. This being the case, let us see what would be the actual amount of coal required to maintain twelve electric lights in multiple arc, having a total intensity of one hundred and twenty candles.

Before entering upon this calculation, however, let us determine the electro-motive force required to supply a current of 0.905 weber, in a circuit of 76 ohms resistance. Multiplying the current by the resistance gives $0.905 \times 76 =$ 68.78, which would be the required electro-motive force in volts. Now, then, place the twelve lamps of 76 ohms resistance each in multiple arc, and their joint resistance will be one twelfth part of that of a single lamp, or 6 1-3 ohms. As the current generated by the machine is to be divided among twelve branch circuits, so that each circuit will receive a current of 0.905 weber, it is obvious that the total current generated by the machine must be twelve times that required for a single circuit, or 10.860 webers. Multiplying the current by the resistance (as we did for the single lamp) gives 10.860×6 1-3 = 68.78, which is the required electromotive force, in volts, and is exactly the same as that required for a single lamp. Hence, even with a Brush or Siemens machine, where forty per cent of the original energy is lost, the amount of coal required to operate twelve lamps giving an intensity of one hundred and twenty candles, is only five twelfths of one pound, instead of five pounds, as calculated by the aforesaid experimenters.

This shows a pretty large margin below the cost of producing a somewhat less light by coal gas, and in practice the margin would be still greater, for Mr. Edison's generator is said to transform considerably more than sixty per cent of the original energy into effective current.

WM. C. RAMSDELL. Respectfully yours, Norwich, Conn., April 9, 1880.

AGRICULTURAL INVENTIONS.

A revolving hay rake, so constructed that the rake head may be raised to pass obstructions and miss hay without discharging the collected hay, may be conveniently adjusted with the teeth at any desired inclination, and may be readily tripped to discharge collected hay, has been patented by Mr. Jacob S. Oberholtzer, of Wadsworth, Ohio.

A spring harrow tooth, made in two parts, whose point is vertically adjustable in such a manner that it may be raised or lowered without altering its pitch or draught, and the tooth be thereby stiffened or made more flexible for deep or shallow work, has been patented by Mr. Perry A. Peer, of Comstock, Mich.

An improved sugar cane cutter, patented by Mr. Philip Seitz, of Baton Rouge, La., is an improvement on the machine for which letters patent No. 196,598 were granted to the same inventor, October 30, 1877.

An improved machine for removing bugs from potato vines, has been patented by Goodrich E. Risley, of Waterville, N. Y. The object of this invention is to furnish a new machine for removing bugs from potato vines and catching them, so that they may be readily destroyed.

Mr. John Hill, of Columbus, Ga., has invented a feed indicator for cotton openers. This invention relates to a concotton to be fed to cotton openers. The latter machines are devices which serve to tear up and loosen the tussocks of refer for evidence of the excellence of their clay. cotton as they come from the bale and distribute the fiber in the form of a fleece. In using these openers two are sometimes employed together to act successively upon the cotton; or one opener may be employed in connection with a lapping machine, the function of which latter is to press together and compact into a fieece. In either case a hollow trunk has been employed as a conduit, in connection with a blast of air passing through the same, to act as a vehicle to carry the fleece from one opener to the other, or from the opener to the lapping machine, which second machine is generally located upon a different floor, or at a point more or less remote from the first. This invention has more special reference to what is known as "Kitson's Trunk System of Opening Cotton;" but it can be used in any similar system where the opener is located at some distance from the second opener or lapper, and cotton is supplied from the first to the second through a trunk or five. The invention consists in making the boxes of the upper feed roll of the sec- Ely, J. C. Hoadley, Washington Jones, Wm. B. Cogswell, ond opener or lapper vertically adjustable and connecting F. A. Pratt, Chas. B. Richards, Wm. B. Bement, S. B. them with an index hand within sight of the operator at the Whiting; Treasurer, Lycurgus B. Moore.

first machine, so that the operator, at a point remote from the second machine, can tell the amount of cotton fed to the second machine by the rise or fall of the movable roller due is a signal to the helper to use the sledge, or to strike to the passage of a greater or less quantity of cotton to the second machine.

The Comet as Seen in Australia.

The Melbourne Argus says: "The tail of a large comet was discovered in the southwestern heavens, near the horizon, on February 2, soon after sunset. The nucleus could not be seen either on the 2d or 3d, but about 25° length of tail were visible. The extremity of the tail on the 2d reached to β Gruis, and next night it had shifted considerably to the northward so as to pass close by θ Gruis. On the first night it made an angle of 50° with the horizon, and on the second 80°. Owing to the misty state of the air and the closeness of the comet to the sun, no favorable observations could be made in Melbourne on the first or second night."

The Argus of the 5th of February says: "Owing to the presence of clouds and a hazy sky no continuous observation of the comet could be made at the observatory last night. The best view of the visitor was obtained at 8:35 P.M., when it extended 32° above the horizon. Occasionally the sky cleared, so that a view could be obtained nearly down to the horizon, but the nucleus of the comet was not visible. The tail had slightly diminished in brightness from the previous evening, and was rather less curved. It appeared to be almost perpendicular to the horizon, and had moved slightly to the northward. Its length had considerably increased since Tuesday evening. Until the nucleus has been observed no knowledge can be obtained as to the direction in which the comet is traveling or its actual position in the heavens. It will probably be two or three weeks before any definite information on these points can be obtained. We have received the following telegram: 'Perth, February 4. A long stream of lustrous light, resembling the tail of an immense comet, is visible a little above the horizon in the western heavens. It appears to be making an easterly course."

Canadian Weather.

Mr. H. G. Vennor, of Montreal, whose boldness in weather predictions has brought him into such prominence, says that the extreme cold of Canada is almost always produced by a wind blowing from a point to the north of west. Such a wind is both cold and dry. Being dry, in passing along it imbibes moisture rapidly, causing cold. Being also cold, it quickly absorbs heat from the surface of the earth; and when this continues for several hours of any day, and toward sunset it becomes calm, we then usually have the lowest state of the thermometer. In Canada, these extremes of cold usually last about three days; the nor'wester beginning about noon of one day, blowing fiercely for that afternoon, becoming almost calm in the evening-then a cold night. Next day the wind is not so high, but still from a northwesterly point. Again, toward sunset, there is a calm, with the thermometer more or less below zero. In the morning, it may be observed that the force of the cold is breaking. If the wind veers round to a point south of west, there will be a few flurries of snow, very threatening in appearance, but amounting to very little in reality, no snow storms of consequence coming from the west. If, on the other hand, the wind passes to the east, several hours of bitter cold may be expected, followed by a general snow storm lasting from twenty to thirty hours.

Paper Clay.

In view of the rapid rise in the price of paper, and the complaints of the paper makers with regard to the scarcity and increasing costliness of all sorts of paper stock, it is gratifying to see that one source of such raw material is not likely soon to fail us. Whatever may happen to rags, wood pulp, and the thousand other sorts of fibrous material supposed to enter into the composition of paper, the clay bank promises to be inexhaustible. True, the majority of people who pay a high price for paper may have a prejudice against that material, but evidently the owners of the clay banks have not; for in a prominent journal devoted to the paper trade, they boldly print a large cut of their "clay works," showing a long stretch of snowy bluff out of which a huge venient and certain means for determining the quantity of section has been cut, presumably to supply the needs of "all first-class mills, east and west," to whose owners they

The American Society of Mechanical Engineers.

The organization of the American Society of Mechanical Engineers was completed April 7, at a numerously attended meeting in the hall of Stevens Institute, Hoboken. The society will embrace members, honorary members, associates, and juniors, and is open to mechanical, civil, military, naval, mining, and metallurgical engineers, and architects of practical attainments as designers, constructors, or teachers, if they apply for full membership. A junior must have been in practice for two years, or must be a graduate of an engineering school. The first regular annual meeting will be held in this city in November next. The election of officers resulted as follows: President, R. H. Thurston; Vice-Presidents: H. R. Worthington, Coleman Sellers, Eckley B. Coxe, General Q. A. Gillmore, U. S. A.; Wm. H. Shock, U. S. N.; Alex. L. Holley; Managers: W. P. Trowbridge, Theo. N.

Blacksmith's Hammer Signals.

When the blacksmith gives the anvil quick light blows it quicker.

The force of the blows given by the blacksmith's hammer indicates the force of the blow it is required to give the

The blacksmith's helper is supposed to strike the work in the middle of the width of the anvil, and when this requires to be varied the blacksmith indicates where the sledge blows are to fall by touching the required spot with his hand ham-

If the sledge is required to have a lateral motion while descending, the blacksmith indicates the same to the helper by delivering hand hammer blows in which the hand hammer moves in the direction required for the sledge to move.

If the blacksmith delivers a heavy blow upon the work and an intermediate light blow upon the anvil, it denotes that heavy sledge blows are required.

If there are two or more helpers the blacksmith strikes a blow between each helper's sledge hammer blow, the object being to merely denote where the sledge blows are to fall.

When the blacksmith desires the sledge blows to cease, he lets the hand hammer head fall upon the anvil and continues its rebound upon the same until it ceases.

Thus the movements of the hand hammer constitute signals to the helper, and what appear desultory blows to the common observer, constitute the method of communication between the blacksmith and his helper.

Strawberries in South Carolina.

A Charleston newspaper notes a steady decline in the price of strawberries in South Carolina since they were first cultivated for northern markets. In 1872, they brought an average price of 57 cents a quart; in 1873, 33 cents; in 1874, 38 cents; in 1875, 291/2 cents; in 1876, 21 cents; in 1877, 20 cents; in 1878, $11\frac{1}{5}$ cents; in 1879, 14 cents; and this year the average is estimated at about 12½ cents. The decline in price is, of course, easily traceable to the increase of the crop raised, and to the nominally lower price of all products due to the return of the currency to a specie basis. Taking the acreage this year at 225, and the average yield at 4,000 quarts to the acre, the yield will be 900,000 quarts, which at an average of 121/2 cents a quart, will return an income of **\$112,500.**

The Fish Hawk Finished.

The new steamer Fish Hawk, especially designed for the propagating work of the U.S. Fish Commission, is at last ready for work. She is a double screw steamer of about 600 tons, fitted up so as to be able to take the spawn of any variety of fish, and complete the hatching of the young fry in their native waters. This obviates the necessity of the long and expensive journeys with young fish which have entered so largely into the labors of the commission heretofore. Besides in the propagation of many species of fish, the floating hatchery is found to be much more successful and satisfactory than any establishment can be on shore.

The Brooklyn Bridge.

A new impetus has been given to the work on the Brooklyn bridge by the passage and signing of an appropriation bill at Albany, ordering the City of New York to pay \$750.-000, and the City of Brooklyn \$1,500,000—total, \$2,250,000, to enable the trustees to finish the work. The president of the Board of Trustees of the bridge reports that the speedy execution of the various contracts in connection with the superstructure will be insisted on, and that there is no reason to suppose that there will be any further delays. The removal of the remaining buildings in the way of the approaches to the bridge is going on, and the rapid execution of the rest of the great work is confidently promised.

The Vesuvius Railway.

Tourists are now able to visit the crater of Vesuvius without the labor of climbing, the railway being complete. The depot is situated at a height of 810 meters, or 210 meters above the Observatory. A restaurant and café capable of accommodating 100 people is attached to the depot. The angle of inclination of this railroad attains at various points 40°, 50°, and 63°. There are two passenger cars, the Vesuvius and Etna, accommodating 12 persons each. The system adopted in the construction of the railway is of American nvention, and is known as "the prismatic system."

Pioneer Paper-Makers.

Two veteran paper makers, Stephen Thacher and Joseph Reed, have lately passed away. Mr. Thacher was within a week of reaching his hundredth year. He built the first paper mill at Lee, Mass., thus laying the foundation of what has become the great industry of that town. Of late years he has resided at Saratoga Springs, N. Y. Mr. Reed was ninety years of age when he was killed on a railway near Springfield Station, Pa. He was poor as well as old, and apparently without near relatives. Personally, he was probably known to more paper-makers than any other man of the

If an invention is worthless and it fails of public support, no one suffers but the inventor. If it is good and succeeds, the whole world reaps the benefit. The public, which pays nothing in the one instance and gains enormously in the other, is thus vitally interested in the encouragement of inventions and the upholding of our patent system.

Business and Lersonal.

The Charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue, The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

OFFICE BIGELOW BLUE-STONE COMPANY, 247 BROADWAY, NEW YORK, April 8, 1880. H. W. Johns M'f'g Co., 87 Maiden Lane, New York.

GENTS: Owing to the fire which occurred on the morning of February 1, at the works of our blue-stone and planing mills, situated at Malden, on the Hudson, we shall shortly require more of your roofing material, and would like quotations for same. That portion of the building covered with shingles was entirely consumed. but we take pleasure in stating that when the flame reached that part covered with your Asbestos Roofing the edges fell over that part of the roof and prevented further progress of the flames. The building would have been a total loss had it not been for your roofing.

You are at liberty to make any use you choose of this letter, and refer any one to us as to the merits of the Asbestos Roofing. Respectfully yours.

JOHN MAXWELL, Le G. W. Baker, Wil., Del., makes the Post Band Saw for

hand foot, and steam. Will cut 7 inches thick of hard wood. For round text hand and for a pen to stand hard

usage, try Esterbrook's Exquisite, No. 50. Ask your stationer for them. Wanted-Situation by Draughtsman. Technical edu-

cation; bridge work; general machinery or tools. Address A. B. C., Davis St., Elmira, N. Y. Power, Foot, and Hand Presses for Metal Workers.

Moderate prices. Peerless Punch and Shear Co., 52 Dey St., New York. Valuable Patents for Sale or Lease on Royalty to

good party. Address P. E. Bird, Jenkintown, Pa. H. L. Perrine, Mech. Draughtsman, 6177th St., Wash-

ington, D. C. Drawings for inventors from sketches or

For Sale.-U. S. and Canadian Patent for a Blind Stitch Sewing Machine; a valuable invention. Address P. Hoffman, 197 East Genessee St., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for infomation. C. H. Brown & Co., sole manufacturers, Fitchburg, Mass.

Catalogue of Useful Books on Applied Science sent free. E. & F. N. Spon, 446 Broome St., New York.

Blake Lion and Eagle Imp'd Crusher. See adv. p. 236. Foundry and Machine Shops for sale. Established in 1846. Write for description to E. J. Hoen, Addison, Steuben Co., N. Y

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa. Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickor John Fitz, Martinsburg, West Va.

For the best Stave, Barrel, Keg, and Hogshead Ma chinery, address H. A. Crossley, Cleveland, Ohio.

Collection of Ornaments.-A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of \$2. Palm & Fechteler, 403 Broadway, New York city. Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y. Split Pulleys at low prices, and $\,$ of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a spe cialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels-The Solid Original Emery Wheel - other kinds imitations and inferior. Caution .- Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J. Nickel Plating. -Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York

Wright's Patent Steam Engine, with automatic cutoff. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses. Dies, and Tools for working Sheet Metal. etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y. Bradley's cushioned helve hammers. See illus. ad. p. 269.

Forsaith & Co., Manchester, N. H., & 213 Centre St., Hand Fire Eng. & Hose Carriages, New & 2d hand Machine obtain such information without remuneration.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only \$20. tached to any instrument. T.Shaw, 915 Ridge Ave.Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, \$12. Roberts, 107 Liberty St., N.Y. Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 238.

Peck's Patent Drop Press. See adv., page 236.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 252. For Separators, Farm & Vertical Engines, see adv.p.251.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Mineral Lands Prospected, Artesian Wells Bored, by

For Patent Shapers and Planers, see ills. adv. p. 251. For Alcott's Improved Turbine, see adv. p. 270.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., man**h**f'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery,

For Mill Mach'y & Mill Furnishing, see illus. adv. p.254. Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa

Chase's Pipe Cutting & Threading Machine. Send for circular. Chase Machine Co., 120 Front St., New York.

Silent Injector, Blower, and Exhauster. See adv. p. 269. Telephones repaired, parts of same for sale. Send stamp for circulars. P.O. Box 205, Jersey City, N.J.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor. Stiles & Co., Riegelsville, N. J.

Horizontal Steam Engines and Boilers of best construction. Atlantic Steam Engine Works, Brooklyn, N.Y.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10.000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 268. Diamond Planers. J. Dickinson, 64 Nassau St., N. Y. The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 270. The "Fitchburg" Automatic Cut-off Horizontal Engines. The "Haskins" Engines and Boilers. Send for pamphlet. Fitchburg Steam Engine Co., Fitchb'g, Mass. We will purchase or manufacture on royalty, patented

articles of real merit. Farley & Richards, Phila., Pa. Millstone Dressing Machine. See adv., page 269.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in Scien-

TIFIC AMERICAN of last week. The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck. The best Truss ever used. Send for descriptive circu-

lar to N. Y. Elastic Truss Co., 683 Broadway, New York. Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p.108 Telephones.-Inventors of Improvements in Telephones and Telephonic Apparatus are requested to communicate with the Scottish Telephonic Exchange, Limi-

ted, 34 St. Andrew Square, Edinburgh, Scotland. J. G. Lorrain, General Manager. Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg

New Economizer Portable Engine. See illus. adv. p. 269. Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Steel Casting Company, Pittsburg, Pa.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p.269. Totten & Co., Pittsbur 3



HINTS TO CORRESPONDENTS.

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

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

We renew our request that correspondents, in referring $% \left(1\right) =\left(1\right) \left(1\right$ to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

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

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, chouc is first dissolved by digestion and occasional agi-N.Y. Bolt Forging Machines, Power Hammers, Comb'd as we cannot be expected to spend time and labor to

Any numbers of the Scientific American Supple-MENT referred to in these columns may be had at this office. Price 10 cents each.

(1) H. L. R. writes: I have an upright tubular boiler, and it leaks around the tubes in the head. I have expanded the tubes several times, and they do not stay in their places. What can I do to make them stay? I thought that they could be fixed by putting a ferrule on the inside and then expand it. Would that do? A. Your trouble may arise from a deposit of sediment on the lower tube sheet or crown sheet of the furnace. or the tubes may be worn so thin that they cannot be made tight. Ferrules might help you, but they should be of cast iron and turned.

(2) H. & D. D. ask: 1. Can a common machinist make a phonograph that will repeat what has been spoken into it? If so, will you please tell us where we can get a description of one. We are both pretty fair hands with our tools, and we would like to make one. A. Yes. For directions see Supplement 133. 2. Is there any way that we could make carbon?

with a cylinder 1 inch by 2 inches, and what size of boiler would it require to drive it, the piston making 26 strokes per minute, using 45 lb. of steam? A. If you mean 26 strokes, it is one-third horse power; if you mean 26 revolutions, two-thirds horse power. In the first case, 6 square feet heating surface in boiler, and in the last 12 square feet. 4. Are the two cylinders of a double acting engine equal to both added together: as, for example, take 11 inch by 20 inch hoisting engine. If we were to use a 22 inch by 40 inch single engine, would it give the same amount of horse power using same pounds steam in both cases? A. Yes: equal to one of 11 inch diameter by 40 inch; but a cylinder 22 inch by 40 inch is equal to four of 11 inch by 40 inch, or eight of 11 inch by 20 inch.

(3) W. J. N. asks: What makes the best polish to clean up and brighten old furniture, pianos, etc., and coffin varnished surfaces? A. Dissolve 4 oz. orange shellac in 1 quart of 95 per cent alcohol; to this add 1 quart of linseed oil and 1 pint of turpentine; when mixed add 4 oz. of sulphuric ether and 4 oz. of aqua ammonia, mix thoroughly and well before using. Apply with a cloth or sponge, and rub the surface to which it is applied until the polish appears.

(4) J. F. M. writes: To tighten a pipe box that has turned and worn the hub away so that it cannot be wedged. Center the box, secure it with three thin strips of wood, and pour melted sulphur around it. As the sulphur cools it expands and holds the box per fectly tight.

(5) J. A. M. writes: I notice quite a difference in the formulas you give in regard to the horse power of belting. Some time ago I took the formula as follows from your paper, of which I have many volumes: W, in inches \times S, in feet per minute = H P.

Then February 14 some belting establishment furnishes the following for a 6 inch belt

600

2×33000 = H. P. $6\times4^8\times1200$

Then in the number for March 27, in answer to G. I. B. you say 800 feet inches = H. P. A. The formula $\frac{W \times S}{600}$ =H. P. is considered a good practical rule for

belts of average width and length, and is used by many engineers. The formula $\frac{W \ S}{800}$ =H. P., is safer for

narrow and short belts running on small pulleys. These formulæ are very simple, and meet the want of prac-

(6) O. asks: Can illuminating gas be made from water? If so, how? A. Yes; when superheated steam is passed slowly through a large body of ignited carbon (coal) it parts with its oxygen to the latter. The resulting gas—composed chiefly of hydrogen and carbon monoxide—has very little illuminating power, but this is remedied by introducing a small quantity of the vapor of some rich hydrocarbon-as naphtna—into the retort with the gases

(7) G. M. T. asks for a recipe for a reliale shoe gloss. A. Shaw's patent blacking is made as follows: Soft water, 1 gallon; logwood extract, 6 oz.; dissolve by gentle heat; soft water, 1 gallon; borax, 6 oz.; shellac, 11/2 oz.; boil until solution is effected; potassium dichromate, % oz.; water, ½ pint; dissolve and add all together. It is preferred to add to this before boiling 3 oz. of spirit of ammonia or aqua ammonia.

(8) R. A. S. asks how to make a cement for uniting metals to glass. A. Take 1 lb. shellac dissolved in a pint of strong methylated spirit, to which is to be added 0.05 part of solution of India-rnbber in carbon bisulphide; or take 2 ounces of a thick solution of glue, and mix with 1 ounce of linseed oil varnish, or ¾ of an ounce of Venice turpentine; boil together, and agitate. The pieces cemented should be fastened for 50 or 60 hours to get fixed.

(9) F. B. asks for a good waterproof cement. 1. Soak pure glue in water until it is soft; then dissolve it in the smallest possible amount of proof spirit by the aid of a gentle heat. In 2 oz. of this mixture dissolve 10 grains of gum ammoniacum, and while still liquid add half a drachm of mastic dissolved in 3 drachms of rectified spirit. Stir well, and for use keep the cement liquefied in a covered vessel over a hot water bath. 2. Shellac, 4 oz.; borax, 1 oz.; boil in a little water until dissolved, and concentrate by heat to a 3. Ten parts of carbon disulphide and one part oil of turpentine are mixed, and as much gutta percha added as will readily dissolve. 4. Melt together equal parts of pitch and gutta percha, apply warm, and press the parts firmly together until quite cold. 5. The ordinary marine glue consists of caoutchouc, 1 oz.; genuine asphaltum, 2 oz ; benzole or naphtha, q. s. The caouttation, and the asphalt gradually added. The solution

wheel shaft 8 feet long, band wheel 9 feet in diameter. What change can be made to lighten the draught? As it is it takes five horses to run a 40 saw gin. I want to decrease the draught to 2 or 3 horses. A. With the best rrangement you cannot drive a 40-saw gin properly with less than 4 horses. By putting your machinery in line and in good order, you may decrease the friction, so that 4 horses will drive the gin with the present ma-

(11) W. M. asks: Which is the best for the health of the human kind, beef steak so rare that the blood will follow the kuife, or steak cooked through only? A. The cooked meat is best.

(12) A. E. P. asks for a receipt for stain to apply to holly wood to imitate black walnut. A. Paint ver the wood with a solution made by boiling 1 part of catechu, cutch, or gambier, with 30 parts of water and a little soda. This is allowed to dry in the air, and then the wood is painted over with another solution Pa. Diamond Drill Co. Box423, Pottsville, Pa. See p. 353. We have been experimenting with an electric light, and 1 made of 1 part of bichromate of potash and 30 parts of 1 lb. These are maximum working strains.

would like to try and make our own carbon points. A. water. By a little difference in the mode of treatment, You will find formulæ for electric light carbons in "The and by varying the strength of the solutions, various Electric Light," by Higgs; but we would not advise you. shades of color may be given with these materials, to try to make them. It is far better and cheaper to which will be permanent, and tend to preserve the wood purchase. 3. What part of a horse power is an engine After drying, slightly oil and finish with shellac varnish if desired.

> (13) C. L. T. asks how to put on the vatered or mottled appearance to brass articles. A. The brass is first polished to the required degree, and if it is a fine surface, the mottled appearance is imparted by rubbing over it with a gyratory motion a Scotch gray stone moistened with water. If the work is not very fine, a piece of fine emery paper may be used in the same way. If it is coarse, a dead smooth file may be used. Another method is to secure emery cloth or paper to the end of a small round stick, placing the stick in the universal chuck of a lathe, holding the work against it with a light pressure, and moving it along while the lathe revolves.

(14) R. H. G. asks how to stain light colored wood a dark mahogany, cherry, or rosewood color, something that will not have to be applied hot. A. 1. Boil 1/2 lb. logwood in 3 pints of water, and add 1/2 oz. salt of tartar. 2. Boil 1/2 lb. madder and 1/4 lb. fustic in 1 gallon water. 3. Boil 1 lb. Brazil wood and 1 oz. of washing soda in 1 gallon of water, apply, and then brush over it before dry a solution of 2 oz. alum in 1 quart of water. With these wood, ifdry, may be stained in the cold; but the dyeing will be accomplished far more quickly and satisfactorily if the liquids are applied hot.

(15) J. W. writes: In placing a heater of a series of pipe in flue from boiler to stack, I circulate the feed water through and heat the water to say 50, 100, 150. 200, or 250° by thermometer, what saving per cent of coal should I have when thermometer indicates at the different figures, or does the saving vary at the different figures? A. In the use of heaters for the feed water of steam boilers the gain can be estimated by the fol-

lowing formula: $\mathbf{E} = \frac{t'-t}{\mathbf{T}-t'}$ in which **E** is the economy or gain percent, T total temperature (sum of latent and sensible heat) t—the temperature of feed water entering the heater, to the temperature of water entering the boiler after passing through heater. Example: T=1,200°, t=50°, t'=200°; then $E=\frac{200^{\circ}-50^{\circ}}{1000^{\circ}}=0.15$, or 15 per cent

(16) O. F. R. writes: I have 24 inches (miner's, 1 in. hole, 10 inches pressure of water). I have a 5 stamp mill, stamps weighing 480 lb. each, each stamp must drop 80 to the minute. What size overshot wheel and what size drums will it require to run the mill of 5 stamps, 80 drops to the minute, with 24 inches of water? A. To work the stamps would probably require 15 horse power=495,000 foot lb. Allowing that an overshot wheel will give 60 per cent of the power of the fall, you would require a wheel about 30 feet diameter.

(17) J. A. H. asks: 1. Will three plain cylinder boilers, each 30 feet by 36 inches, with grate surface 6 by 9 feet, afford sufficient steam for two 11x18 engines? A. Yes. 3. Will a 50 horse engine doing 30 horse ork require more steam than a 30 horse engine worked to its full capacity? A. Very little, scarcely appreciable No more if the 50 horse is worked expansively to the best advantage.

(18) W. E. S. writes: I am about to construct a small steam skiff about 12 feet long by 3 in width; please inform me what size cylinders it will require to run it, provided I have one engine on each side of the wheel. A. Two engines, 21/2 inches cylinder and 3 inches stroke.

(19) S. H. H. asks: 1. Which way will two engines, coupled together on the same crank or fly wheel shaft, give the most power, with the cranks quartered like a locomotive so there is no dead point, or set exactly opposite each other? A. There would be no difference in power, but set at right angles, will work steadier and better for all purpose

(20) E. T. asks how to detect alum in bread. A. M. Buchner, a French scientist, discovered that a single drop of alcoholic extract of Campeachy wood, placed upon pure flour or bread, will cause a brownish yellow stain. If the flour contains alum, in the proportion of one or two per cent, the color will turn to a gravish blue or violet grav. With one half per cent of alum the lint is reddish yellow, with a border of gray blue, and small blue spots can be discovered by examining it with the lens. One fourth per cent of alum is the limit of reaction, when the blue border disappears, although the small spots are faintly discernible.

(21) J. A. G. asks: 1. How can I stop leaks in steam pipes? A. It depends entirely upon the metal of the pipes and character of the leak. If the pipes are defective they should be replaced. If the leak is due to poor fitting the only proper remedy is to do the work over. If the leak is due to unequal expansion the pipes must be re-arranged. 2. How many cells would be required to make a good magnet of a steel bar (10) A. H. writes: I have a driving or cog weighing about 1 lb.? A. About 4 cells of Bunsen batwheel, 8 feet in diameter, the piston 12 inches, band tery. 3. Where can I find instructions for making a small magneto electric machine? A. In Supplement, No. 161.

> (22) G. S. L. asks what size boiler is needed for running small engine, 2 inch stroke by 1 inch bore? Also, can I heat the same by oil: if so, what kind of oil would be best for the purpose? A. Your boiler should have about 10 square feet of heating surface. You can run such a boiler with kerosene, but gas is much better.

> (23) C. W. N. asks: How many pounds strain will the cogs on two wheels support, one wheel being 12 inches the other 7 inches in diameter (the strain being steady); size of cogs: length 17%, width at base %, width at top %, depth %; two cogs in mesh at a time? A. If the teeth bear fairly, one tooth 450 lb., two, 900 lb.; in actual use, not more than one-fourth these pressures should be allowed. 2. How much will a 5% wire cable chain support on a steady strain—how many pounds? A. For a short link chain made of % inch wire, 6,700 lb.; and for wire rope % inch diameter, 4,000

- (24) W. S. J. writes: We have a tubular boiler, upright, 32 2-inch flues. The boiler is made of five-sixteenths iron, 24 inches diameter; length of flues 36 inches. What would be the safe working pressure for such a boiler? Is this size boiler large enough for a 4 horse power engine? A. If all other parts are equal to the strength of the cylindrical shell. 150 lb. The government rule would allow more. It is equal to 4 horse power with good fuel and a sharp draught.
- (25) W. E. H. asks: 1. Is it practicable for me to convey power for my elevator (say 4 horse power) from a mill 500 feet distant by a wire rope? A. Yes, by dividing the distance and putting up an intermediate carrier shaft and pulley. 2. What size wheels and rope do I want? I know wire ropes are run in this vicinity for like purposes for short distances. A. A rope threeeighthstor seven-sixteenths in diameter, on 4 foot pulleys, making 120 to 140 revolutions per minute, will be ample
- (26) B. and B. write: The suction pipe of a steam pump being 21/6 inches inside diameter, the ends plugged up, how many holes of 1/4 inch in diameter should be put in the pipe (to serve as a strainer) to per fectly supply it with water? A. One hundred.
- (27) L. P. L. writes: The mercury in my thermometer has separated. How can I remedy it A. By gently jarring the separated portion down.
- (28) J. G. R. writes: 1. I wish to make the small French battery used by physicians, called the French pocket battery. It uses some salt of mercury in the battery. A. You will find this battery described in SUPPLEMENT, No. 159. 2, How many layers, and what is the number of wire in the primary coil? Also, what is the number of wire in secondary, and how many layers? A. Primary, No. 20, 4 layers; secondary, No. 40, 10 or 12 layers. 3. What is the size of core and number of the iron wire? A. Core, 3/4 inch, composed of No. 20 iron wires. 4. How long, and how big round is the spool? A. 31/2 inches long, 1 inch to 11/8 inches in diameter. 5. What is the salt used in the battery? A. It is proto-sulphate of mercury. 6. Of what does the negative pole consist? A. Zinc. 7. How heavy ought the armature iron to be? A. One or two pennyweights. 8. What are the proportions of peroxide of manganese and carbon in the porous cell of the Leclauche battery? A. About equal parts.
- (29) M. N. asks: Suppose a thin band cylindrical or slightly conical, about the screw of a ship. Would not some of the force, wasted in moving the water in a direction perpendicular to the axis of the screw, be made useful in propelling the ship? A. Such bands have been tried repeatedly, but without advan
- (30) A. W. J. asks how long a first-class air pump should hold its vacuum-air pump with sin gle brass barrel? A. If pump valves, joints, and pipe be practically tight, for many hours.
- (31) W. W. & S. ask how much difference is there between one ton hard coal and one tou soft coal in heating power? A. The evaporative power of good anthracite coal is rather higher than that of bituminous with suitably proportioned boilers. 2. Does it injure a boiler more firing with hard coal than soft? A. No, if the coal be free from sulphur.
- (32) W. P. writes: I have a yacht 24 feet long, 6 feet beam, 3 feet deep; which I am going to run with a 6 horse power engine and 8 horse power boiler; intend it for pleasure and light towing in slack water Am not so particular about speed as power. Will you please inform me in your valuable paper what sized propeller I need for this engine? A. Judging from the information given, we would say about 30 inches diame ter and 3 feet pitch.
- (33) J. L. asks: 1. Can the steam from an 8x24 be condensed in a cistern 8 feet wide and 16 feet deep? A. Yes, but you must have means of changing the water, as it would gradually get hot and become incapable of condensing the steam. 2. Would the water from the condensed steam be fit to be used again for the boiler? A. Yes. 3. How could I make an electric battery so as to run it with vinegar? A. A zinc and copper plate plunged into vinegar will generate an electric current, but it does not make a desirable battery.
- (34) E. D. asks for a recipe for a black ink for use on the "copygram." Colored inks are prohib ited in the army, and I know no place where labor can be saved to better advantage with a "copygram" than in the army, with its duplicates, triplicates, etc. I can take ordinary copying ink and get two or three impres sions, but not entirely satisfactory ones. A. Try a strong aqueous solution of nigrosin, soluble aniline
- (35) J. M. asks where the stone is found from which plaster of Paris is made. A. Gypsum is found in New York, Michigan, Virginia, Ohio, Canada West, Nova Scotia. The most important beds are those of the Paris basin at Montmartre.
- (36) F. M. O. asks what materials, and the what is now considered to be the best copying pad, with directions for mixing them. There have been se many receipts printed, that it is difficult to tell which is the best. I want to make one pad 10x12 inches. A. See page 325, Vol. 41, SCIENTIFIC AMERICAN.
- (37) L. S. W. asks what the dimensions and the size and number of tubes of a boiler for a horse power engine are, and have it plenty large enough; also, what would be the cost of such an one. A. Thirty inches diameter and 61/2 feet high. 40 or 42 tubes, 2 inches diameter and 48 or 50 inches long, cost about \$290.
- (38) F. S., referring to the electric machine described in Supplement, No. 161, asks: 1. Would the power of the machine be increased any if made larger, say 1/2 or twice as large as the drawings given? A. Yes. 2. Is it necessary to have the bearings at each end of the armature secured to the sides of the magnet, and if not, will they have to be insulated from the base? A. The bearings of the armature may be secured to the base of the machine. They need not be insulated. 3. Will it do for the two arms of the magnet to be joined at the bottom? A. They may be joined by some non-

magnetic material such as brass, rubber, wood, vulcanized fiber; but they should not be united or joined by iron or steel as the magnetic current would then be through the ends of the magnet and the connecting piece, instead of through the armature. 4. Would it do to have the commutator made of hard wood covered with rubber or gutta percha? A. Hard wood without the covering of rubber will answer very well.

- (39) M. T. J. asks for the best method of magnetizing large size horseshoe magnets? If large quantity battery and electro-magnet is used please give proper proportions. A. The simplest method of mag netizing horseshoe magnets is to draw them from the bend to the poles across the face of an electro-mag net, breaking the current as the poles of the steel magnet come opposite the poles of the electro-magnet. This operation is repeated until the steel is fully charged. The electro-magnet for this purpose should be about 6 inches long, with soft iron cores 1 inch in diameter wound with eight layers of No. 16 cotton covered copper wire. The battery should be 4 to 6 cells of Bunser which may be connected either for tension or quantity
- (40) E S. F. writes: 1. I am making one of the telephones described in No. 142 of SUPPLEMENT. I should like to know what kind of wire I must us Will No. 24 copper wire do? If not, what size shall I take? A. The size of wire is given in the article referred to. It should be No. 36 or No. 38 silk covered copper wire. No. 24 will not answer. If you make the telephone shown in Fig. 2, in SUPPLEMENT 142, you should make the spool as thin as possible, and the clamp which binds the magnets together should be of brass rubber, wood, or some other non-magnetic material. 2. I am making in connection with this an electric call-bell, and I should like to know also if one bell of a common gravity battery will do? The distance between the telephones will be about 550 feet. A. See telephone calls, in Supplement 162. One cell of gravity battery will do. if everything connected with the line is adapted to it; but it is preferable to use 2 or 3.
- (41) C. E. asks (1) how to make a chea magic lantern. Have a lens 21/2 inches diameter as about 7 inches focal distance. A. You cannot make very satisfactory instrument with a single lens, althoug you may use it for projecting very transparent slides of a small screen by arranging a box for containing the lamp and receiving the slides and making an adjust able tube for holding the lens from 5 to 8 inches fro the slide. 2. How to silver glass for mirrors, say tw or three inches square? A. For methods of silvering plass, see Supplement 105.
- (42) A. E. R. asks (1) how to make a Edison transmitter? A. See Supplement 163, for full description of Edison's transmitter. 2. I have made an Edison transmitter, but it does not work perfection, it seems to be loud enough but it "buzzes Can you tell me the cause? I use a carbon taken from common carbon battery. Is there anything better? Use lampblack collected from the chimney of a petr leum lamp. 3. I have read that the primary wire of the induction coil should be on the outside, but I have mir on the inside: which is correct? A. Either will do. Is there a spring used in a transmitter, and if so, for wh purpose? A. There is no spring in Edison's transmi
- (43) F. H. B. writes: I am thinking of pu ting up a telephone with another room. Will you please describe the most easily made receiver and a transmi ter that will transmit, perfectly and distinctly, word spoken in a moderately low tone? I would like to have the transmitter made to appear from without, somewh like the one that looks like a small box, with the di phragm in the center of the door. The greatest di tance that the telephones will have to work is about 15 to 200 feet. Please also tell me if, for this distance there is an instrument that will take the place of both receiver and transmitter, and will transmit speed nearly as well? A. The Blake transmitter described of p. 274, Vol. 41, Scientific American, would answer your purpose. One of the telephones described in Sur PLEMENT 142 will answer as a receiver. It is probab. that some of the best forms of magneto-telephon would answer both as transmitter and receiver, but yo will get better results by using a transmitter and a ba
- (44) D. P. D. asks: What is the difference between the velocipede and tricycle? The derivation of the latter and bicycle tells me the one has three wheels, the other two. But what the velocipede is contradistinction to the other two is unknown to m A. The word velocipede means swift foot, and applied properly to two, three, and four-wheeled vehicles pr pelled by foot.
- (45) W. H. S. asks: 1. Does the copper win wound on a horseshoe magnet require to be insulated A. Yes. 2. What batteries will be required and wh sized magnet to lift twenty pounds? A. Use two cel of Bunsen battery. Make the magnet four inches lor with half inch cores, and wind with eight layers of N

NEW BOOKS AND PUBLICATIONS.

THE FARMER'S FRIEND AND GUIDE. Fran Harrison & Co. 206 Broadway, New York city. Price 50 cents.

A quarto volume of 200 pages of matter carefully selected from leading publications at home and abroad, pertaining to farming, stock raising, poultry, bee culture, gardening, etc.

JAPANESE ORNAMENTATION. Jesse Haney & Co., New York.

This is a handsome quarto volume containing a great number of Japanese designs useful for painters and decorators, and entertaining to everybody.

This is the title of one of the best edited and most interesting literary newspapers that comes to this office, and our exchange list numbers more than

INDEX OF INVENTIONS

AND EACH BEARING THAT DATE.

-		
lls,	Air engine, J. Ericsson Alloy, manufacture of nickel zinc, T. Fleitmann.	226,052
lo,	Animal trap, G. W. & I. B. Roberson	225,977
it;	Auger, hollow, J. H. Smith (r)	
	Axle. car. I. C. Plant	225,998
ap	Back band hook and buckle, S. Ward	226,135
nd	Balances, attachment to, Le Noir & Chunn	226,083
a	Barrels for white alcoholic liquors, manufacture	
gh	of, H. De Bus Bathing attachment for piers, L. Kirkup	
on	Bed bottom, J. Bowen	226,026
he	Bed frame, T. L. Odell	
st- om	Blacksmith's shears, W. S. Reeve	226,105
wo.	Bolt heading and pointing machine, A. Magnuson	226,090
ng	Books with metallic staples, machine for stitching, C. Lieb	996 006
	Boots and shoes, sand paper roll for, Rathbun &	220,000
	Adams	226,104
ın	Box, H. W. Goodnow	
a	Braid holder, D. Goff	
we	Brick and tile machine, J. W. Penfield Brick for evaporating pans, G. W. Russell	
to ."	Brick or building block, and method of laying the	~~0,114
a.	same, J. Perchment	225,945
A.	Broom head, J. R. Spencer	
.0-	Burglar alarm, G. W. Cooley	
he	Button, H. Wexel	
ne	Buttons, die for forming, C. R. Wickes	226,140
4.	Car, cattle, W. C. Alston	225,911
at	Car, convertible grain, C. C. Coffin	225,918
it-	Car coupling, A. Guyer	
ĺ	Car coupling, P. H. Wendel	226,009
ıt-	Car, railway, C. Barrett	
- [Car, stock, J. Huy	
se it-	Car, stock, S. P. Tallman	226,131
ds	Carbureter, I. A. Hyams	225,931
ve	Carbureting apparatus, G. Smyers	226,122
at	Caoutchouc, treating waste valcanized, L. Heyer	
ia-	Carriage, child's, N. B. Welsh	
is-	Carriage clips, roll for forming, J. C. Richardson.	
50	Carriage jump seat, J. Finnegan	226,053
e,	Carriage spring, O. C. Coggins	
th	Cartridge, J. Saget	
ch	Chair seat, J. Lemman	226,082
on	Check register, J. Crawford	
er P-	Clevis, E. Wansbrough	
ole	Clothes hook, P. Miles	
es	Clothes line adjusting device, E. Weber	
ou	Combustion, promoting, B. F. Sherman	
at-	Commode, W. J. Winghart	226,011
	Corn, implement for shocking, W. C. Tolles Corsets, manufacture of, J. C. Tallman (r)	226,007
ce	Cotton press, A. Temples	226.132
on	Cylinder engines, triple, F. A. Gardner	226,055
ee	Dental burrs, sharpening, M. A. Richardson	226,110
in	Door spring, I. S. Davis	
ıe.	Drill, J. L. Bryant	
ies	Elevator, B. B. Keyes	226,077
ro-	Elevator, C. R. Otis	
	Elevators, operating, R. Dunbar	
re	Emery wheel, G. Hart	
1 ?	Envelope machine, A. A. Rheutan Extinguisher, E. Mercier	
at	Fan, automatic, J. Wurzner.	
lls	Farm gate, J. F. Potter	226,102
ng .	Feed water apparatus, C. M. Wilcox	226,141
lo.	Feed water apparatus for steam boilers, H. Berg-	996 001
	strom	226,021
=	Feed water apparatus for steam boilers, s.c. stead Feed water for boilers, purifying, S. J. Hayde et al.	
	Fence wire, machine for manufacturing metallic	
	barbed ribbon for, A. Cary	226,034
ık	Fertilizers, force feed distributer for, Sheldon &	
w	Donosek	996 191
***	Peacock	226,121 225,940
***	Peacock	225,940 225,994
se-	Peacock	225,940 225,994 225,938

Talboys and two or three other gentlemen well known in literary and art circles, and within the short time it has been published it has met with a good degree of suc-	Harness loop fastening, J. Shaffer	226,003
	Harness loops, manufacture of, J. Shaffer Harvester rake, O. Cooley	
cess. The editorials are carefully written and the sub-	Hat brims and bands, making, J. E. Peters	225,996
jects judiciously selected. The Hour has appropriately	Hat holder, G. W. Lindsey	226,041
a minute-and-second department, in which as the title implies, the topics of the day, society news, and other	Hay knife, A. Zimmerer	
items of interest are skillfully served up in short paragraphs. Published weekly, at 52 University place, New	Hinge, Green & Roberts. Hinge, lock, M. L. Cummings.	225,980
York city. Terms, \$6 per annum, single copies 15 cents.	Hoe, J. W. Ells	226,050
	Horse powers, spring draught attachment for, A. E. Morris	226,097
[OFFICIAL.]	Hose carriage, J. B. Aiken	
· · · · · · · · · · · · · · · · · · ·	Hydrant, J. P. Kenyon	225,934
INDEX OF INVENTIONS	Iron and steel, manufacture of, J. A. Jones	
FOR WHICH	Iron in the puddling process, dephosphorizing, W. A. O. Wuth	
Letters Patent of the United States were	Key fastener, D. D. Barton	226,016
Granted in the Week Ending	Lincoln	
March 30, 1880,	Knitting machine, circular, W. H. Mayo Knob attachment, A. M. Smith	226,123
AND EACH BEARING THAT DATE.	Lace show box, J. Loeb	
[Those marked (r) are reissued patents.]	Lamp, D. R. Lowden	
A printed copy of the specification and drawing of any	Lantern, L. Henkle	225,983
patent in the annexed list, also of any patent issued	Lathe, Davies & Chidester Lathing and plastering, W. J. Garvey	226,056
since 1866, will be furnished from this office for one dol-	Line fastener, H. Fenton	
lar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row,	Lubricator, Hodges & Parshall	
New York city. We also furnish copies of patents	Medical compound, W. I. Lewis	226,084
granted prior to 1866; but at increased cost, as the speci- fications not being printed, must be copied by hand.	Metallic hoop, E. Hale	225,960
- Controls not being printed, mast be copied by name.	Mower and reaper knife, D. F. Sutton Mower and reaper knives, machine for sharpen-	226,129
Air engine, J. Ericsson	ing, J. M. Connel Mower cylinders, device for facilitating the drill-	226,037
Animal trap, G. W. & I. B. Roberson 225,948 Auger, hollow, J. H. Smith (r)	ing of, J. Braun	225,966
Axle, car, I. C. Plant 225,998	ing of cutters to, J. Braun	
Back band hook and buckle, S. Ward	Musical instrument, stringed, W. H. Percival Nail assorting machine, O. P. Cobb	
Barrels for white alcoholic liquors, manufacture of, H. De Bus	Nailing machine, L. Goddu Necktie, C. C. Hancock	
Bathing attachment for piers, L. Kirkup 225,989	Nozzle, spray, C. E. Glazier Oil from metal chips, mechanism for extracting,	
Bed bottom, J. Bowen 226,026 Bed frame, T. L. Odell 226,099	C. F. Roper	
Blacksmith's shears, W. S. Reeve	Oiling steam valves, device for, G. W. Baker Paddlewheel, feathering, Pratt & Lewis	
Books with metallic staples, machine for stitching, C. Lieb	Padlock, permutation, G. M. Hathaway Pail or tub cover, E. Rice	
Boots and shoes, sand paper roll for, Rathbun & Adams	Painter's stand, carriage, J. H. Frey	225,926
Box, H. W. Goodnow	Paper box machine, G. Boyce	225,915
Braid holder, D. Goff	Paper cutter, E. Leger Paper feeding machine, F. Ecaubert	225,974
Brick for evaporating pans, G. W. Russell 226,114 Brick or building block, and method of laying the	Paper pulp engines, bed plate for, O. Morse Paper pulp from wood, making, G. D. King	•
same, J. Perchment. 225,945 Broom head, J. R. Spencer 226,124	Paper pulp, machine for preparing, G. H. Ennis Paper pulp, wood grinder for making, S. M. Allen	225,976
Burglar alarm, G. W. Cooley 225,972	Paper pulping engine for the reduction of wood,	•
Button, H. Wexel	straw, etc., W. E. Farrell	226,081
Buttons, die for forming, C. R. Wickes	Pen, stylographic fountain, C. Baur Photographic apparatus, T. H. Blair	
Car, convertible grain, C. C. Coffin 225,918	Planter check rowing attachment, corn, R. W.	,
	Johnson	225 986
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009	Johnson	226,116
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913	Planter, corn, M. Runstetler	226,116 226,027 225,993
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073	Planter, corn, M. Runstetler226,115, Plow, sulky, B. C. Bradley	226,116 226,027 225,993 226,118
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,331	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,132 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,122 Caoutchouc, etc., making goods from, H. Gerner 226,058	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951 225,964 225,953
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 225,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,122 Caoutchoue, etc., making goods from, H. Gerner 226,070 Caoutchoue, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951 225,964 225,953 226,018 225,930
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 228,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,122 Caoutchoue, etc., making goods from, H. Gerner 226,028 Caoutchoue, treating waste valcanized, L. Heyer 226,070	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951 225,964 225,953 226,018 225,930 226,093
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage ipup seat, J. Finnegan 226,058 Carriage spring, O. C. Cozgins 225,970	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951 225,964 225,953 226,018 225,930 226,093 226,005 225,946
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,132 Carburetting apparatus, G. Smyers 226,122 Caoutchouc, etc., making goods from, H. Gerner 226,082 Caoutchouc, treating waste valcanized, L. Heyer 226,132 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,138 Carriage spring, O. C. Coggins 225,052 Carriages, extension bow iron for, J.W. Anderson 226,015 Cartridge, J. Saget 226,117	Planter, corn, M. Runstetler	226,116 226,027 225,993 226,118 226,094 225,951 225,964 225,950 225,930 226,003 226,005 226,009 226,009
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,122 Caoutchoue, etc., making goods from, H. Gerner 226,070 Carriage, child's, N. B. Welsh 226,132 Carriage clips, roll for forming, J. C. Richardson 226,132 Carriage jump seat, J. Finnegan 226,053 Carriages spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriages, extension bow iron for, J.W. Anderson 226,015 Check register, J. Crawford 225,920	Planter, corn, M. Runstetler	226,116 226,027 225,998 226,118 226,198 226,195 225,964 225,953 226,098 226,098 226,098 226,008 226,008 226,008 226,008 226,008 226,008
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,137 Clock movement, calendar, W. L. Bundy 225,930	Planter, corn, M. Runstetler	226,116 226,027 226,027 225,913 226,118 226,994 226,951 225,964 225,953 226,098 226,098 226,005 226,005 226,006 225,910 226,008 225,910 226,008 225,910 225,910 225,910 225,910 225,910 225,910 225,910 225,910 225,910 225,910
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,122 Caoutchouc, etc., making goods from, H. Gerner 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,138 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Cartridge, J. Saget 226,117 Cheix register, J. Crawford 225,920 Clevis, E. Wansbrough 226,137	Planter, corn, M. Runstetler	226,116 226,027 225,932 226,118 226,194 225,951 225,964 225,930 226,005 226,005 226,009 226,048 225,910 226,048 225,912 225,992 9,132
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 225,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,932 Caputethouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,058 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,109 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Cartriages, J. Saget 226,117 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,137 Clock movement, calendar, W. L. Bundy 225,938 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,120	Planter, corn, M. Runstetler	226,116 226,027 225,932 226,118 226,194 225,951 225,964 225,930 226,005 226,005 226,009 226,048 225,910 226,048 225,912 225,992 9,132
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,122 Caoutchoue, etc., making goods from, H. Gerner 226,070 Carriage, child's, N. B. Welsh 226,132 Carriage clips, roll for forming, J. C. Richardson 226,138 Carriage spring, O. C. Cozgins 225,90 Carriages spring, O. C. Cozgins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriages, Extension bow iron for, J.W. Anderson 226,015 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 226,022 Clock movement, calendar, W. L. Bundy 225,932 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,011 Commode, W. J. Winghart 226,017 Cor, implement for shocking, W. C. Tolles 226,007	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,964 226,953 226,018 226,930 226,005 226,009 226,009 226,008 225,940 226,948 225,941 225,940 225,956 226,017
Car coupling, A. Guyer 225,980 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 226,137 Clock movement, calendar, W. L. Bundy 225,938 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,120 Commode, W. J. Winghart 226,011 Corrests, manufacture of, J. C. Tallman (r) 9,137 Cotton press, A. Temples	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 225,953 226,018 225,930 226,098 225,930 226,046 226,019 226,048 225,961 225,961 225,961 225,956
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,122 Caoutchouc, etc., making goods from, H. Gerner 226,070 Carriage, child's, N. B. Welsh 226,132 Carriage, child's, N. B. Welsh 226,133 Carriage jump seat, J. Finnegan 226,053 Carriage spring, O. C. Coggins 225,900 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriages, Expertence 226,017 Check register, J. Crawford 225,912 Clevis, E. Wansbrough 226,082 Clock movement, calendar, W. L. Bundy 225,932 Clothes line adjusting device, E. Weber 225,942 Commode, W. J. Winghart 226,10 Corn, implement for shocking, W. C. Tolles 226,007 Corsets, manufacture of, J. C. Tallman (r)	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,948 226,951 225,954 225,953 226,018 225,950 226,005 225,960 226,009 225,910 226,008 225,910 226,008 225,910 226,019 226,019 226,019 226,019 226,019 226,019 226,019 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,961
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Cozgins 225,930 Carriages, extension bow iron for, J.W. Anderson 226,112 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clok movement, calendar, W. L. Bundy 225,982 Clothes hook, P. Miles 225,982 Cothes line adjusting device, E. Weber 225,982 Commode, W. J. Winghart 226,101 Corn, implement for shocking, W. C. Tolles 226,007 Cortton press, A. Temples 226,132 Cylinder engines, triple, F. A. Gardner 226,035<	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 225,953 226,008 225,930 226,098 225,940 226,008 225,940 226,008 225,940 226,008 225,940 226,008 225,956 225,960 226,008 225,961 226,079 226,083
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,122 Caoutchoue, etc., making goods from, H. Gerner 226,070 Carriage, child's, N. B. Welsh 226,132 Carriage clips, roll for forming, J. C. Richardson 226,132 Carriage spring, O. C. Coggins 225,90 Carriage syring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriages, extension bow iron for, J.W. Anderson 226,015 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,920 Clevis, E. Wansbrough 226,032 Clothes line adjusting device, E. Weber 225,932 Clothes line adjusting device, E. Weber 225,932 Commode, W. J. Winghart 226,011 Corn, implement for shocking, W. C. Tolles 226,012 Cotton press, A. Temples	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,948 226,951 225,964 225,952 226,005 226,005 226,009 226,009 226,008 225,961 225,961 225,969 226,07 226,07 226,07 226,07 226,07 226,07 226,07 226,07 226,07 226,08 225,966
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage jump seat, J. Finnegan 226,058 Carriages spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,131 Check register, J. Crawford 225,920 Clock movement, calendar, W. L. Bundy 225,920 Clothes hook, P. Miles 225,942 Clothes line adjusting device, E. Weber 225,932 Commode, W. J. Winghart 226,131 Corn, implement for shocking, W. C. Tolles 226,132 Cotton press, A. Temples 226,132 Cylinder engines, triple, F. A. Gardner	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,954 226,958 226,008 226,008 226,009 226,008 226,009 226,008 225,940 226,017 226,057 226,079 226,142 225,999 226,048 226,048 225,990 226,048 225,996
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 225,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,128 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,109 Carriage jump seat, J. Finnegan 226,058 Carriages spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,132 Clothes hook, P. Miles 225,932 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,107 Corri, implement for shocking, W. C. Tolles 226,007 Corri, implement for shocking, M. A.	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,904 225,953 226,018 225,953 226,008 225,900 226,009 226,009 225,910 225,910 225,961 226,042 225,964 226,046 226,046
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,028 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,038 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Cozgins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clok movement, calendar, W. L. Bundy 225,932 Clothes hook, P. Miles 225,942 Clothes line adjusting device, E. Weber 225,932 Commode, W. J. Winghart 226,101 Corn, implement for shocking, W. C. Tolles 226,011 Corn, implement for shocking, W. C. Tolles <t< td=""><td>Planter, corn, M. Runstetler</td><td>226,116 226,027 226,938 226,118 226,941 226,954 226,958 226,964 226,968 226,008 226,009 226,008 225,961 226,019 226,048 225,961 225,961 225,961 226,07</td></t<>	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,958 226,964 226,968 226,008 226,009 226,008 225,961 226,019 226,048 225,961 225,961 225,961 226,07
Car coupling, A. Guyer 225,960 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 225,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Captureting apparatus, G. Smyers 226,132 Caoutchouc, etc., making goods from, H. Gerner 226,052 Cauriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,100 Carriage spring, O. C. Coggins 225,900 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriage, J. Saget 226,017 Check register, J. Crawford 225,900 Clevis, E. Wansbrough 225,132 Clock movement, calendar, W. L. Bundy 225,968 Clothes hook, P. Miles 225,968 Clothes how, P. Miles 225,988 Combustion, promoting, B. F. Sherman 226,007 Corrsets, manufacture of, J. C. Tallman (r) 9,137 Cotton press, A. Temples 226,015 Cylinder engimes, triple, F. A. Gardner 226,016	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,948 226,951 225,954 225,953 226,018 225,950 226,005 225,961 226,009 226,008 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,961 225,968 225,961 225,961 226,028 225,964 226,038 225,966 226,130 226,040 226,044 226,044 226,044 226,028
Car coupling, A. Guyer 225,861 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,311 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,028 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,137 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,932 Clock movement, calendar, W. L. Bundy 225,932 Clothes hook, P. Miles 225,942 Clothes line adjusting device, E. Weber 225,932 Clothes line adjusting device, E. Weber 225,932 Commode, W. J. Winghart 226,131 Corn, implement for shocking, W. C. Tolles 2	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,958 226,018 225,964 226,098 226,008 226,009 226,008 226,009 226,008 225,910 226,008 225,910 226,014 225,956 226,017 226,057 226,057 226,057 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,067 226,068 226,068 226,068 226,068
Car coupling, A. Guyer 225,960 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,028 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage jump seat, J. Finnegan 226,058 Carriage, sytension bow iron for, J.W. Anderson 226,137 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,930 Clevis, E. Wansbrough 225,932 Clothes hook, P. Miles 225,942 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,132 Commode, W. J. Winghart 226,011 Correts, manufacture of, J. C. Tallman (r) 9,137	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 226,953 226,038 226,930 226,098 226,098 226,098 226,019 226,048 225,946 226,019 226,048 225,946 226,017 226,057 226,079 226,142 225,969 226,084 226,046 226,128 226,084 226,080 226,080
Car coupling, A. Guyer 225,960 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 225,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,731 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Captureting apparatus, G. Smyers 226,132 Caoutchoue, etc., making goods from, H. Gerner. 226,032 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson. 226,109 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson. 226,052 Carriage, J. Saget 226,015 Carriage, J. Saget 226,082 Check register, J. Crawford 225,930 Check register, J. Crawford 225,932 Clock movement, calendar, W. L. Bundy 225,938 Clothes hook, P. Miles. 225,938 Clothes hook, P. Miles. 225,938 Commode, W. J. Winghart 226,007 Corrsets, manufacture of, J. C. Tallman (r). 9,137 Cotton press, A. Temples. 226,120 C	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 225,954 225,954 225,950 226,005 226,009 226,009 226,009 226,009 226,009 226,009 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 225,960 226,048 226,040 226,046 226,049 226,049 226,049 226,045 226,049 226,045 226,049 226,045 226,049 226,045 226,049 226,045 226,049 226,045
Car coupling, A. Guyer 225,861 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,131 Carbureter, I. A. Hyams 225,931 Carbureting apparatus, G. Smyers 226,028 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage giums seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,132 Check register, J. Crawford 225,926 Clevis, E. Wansbrough 226,132 Clock movement, calendar, W. L. Bundy 225,932 Clothes line adjusting device, E. Weber 225,932 Clothes line adjusting device, E. Weber 225,932 Clothes line adjusting device, E. Weber 225,932 Commode, W. J. Winghart 226,011 Corn, implement for shocking, W. C. Tolles 226,031 Corn, implement for shocking,	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 226,952 226,098 226,098 226,098 226,098 226,098 226,006 226,019 226,088 225,990 226,088 225,991 226,088 225,996 226,017 226,079 226,142 225,998 226,142 226,098 226,142 226,098 226,142 226,098 226,142 226,098 226,142 226,099 226,142 226,000 226,045 226,128 226,145 226,049 226,045 226,145 226,145 226,145 226,145 226,147 226,989 226,148 226,049 226,049 226,045 226,148 226,049 226,045 226,148
Car coupling, A. Guyer 225,981 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,331 Carbureting apparatus, G. Smyers 226,028 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,109 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,152 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,932 Clevis, E. Wansbrough 225,132 Clock movement, calendar, W. L. Bundy 225,932 Clothes line adjusting device, E. Weber 225,938 Clothes line adjusting device, E. We	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,946 226,951 225,964 225,953 226,008 226,908 225,946 226,019 226,008 225,961 225,962 225,962 225,966 226,017 226,057 226,079 226,142 225,963 226,063 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,065 226,064 226,064 226,064 226,064 226,064 226,065
Car coupling, A. Guyer 225,861 Car coupling, P. H. Wendel. 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, S. P. Tallman 226,031 Car, stock, S. P. Tallman 225,331 Carbureter, I. A. Hyams 225,932 Cabutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,058 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 226,137 Clock movement, calendar, W. L. Bundy 225,938 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,132 Commode, W. J. Winghart 226,011 Corr, implement for shocking, W. C. Tolles 226,102 Corriant adjusting device, E.	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 226,951 225,964 226,098 226,098 226,098 226,098 226,006 226,019 226,088 225,940 226,019 226,088 225,956 226,017 226,079 226,142 225,969 226,142 225,969 226,046 226,142 225,969 226,046 226,142 225,969 226,046 226,147 225,958 226,046 226,147 225,958 226,049 226,040 226,045 226,045 226,045 226,045 226,105 226,045 226,105 226,045 226,105 226,045 226,107 226,108 226,045 226,108 226,045 226,108 226,045 226,108 226,045 226,108 226,045 226,108
Car coupling, A. Guyer 225,980 Car coupling, P. H. Wendel 226,009 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, S. P. Tallman 226,131 Car, stock, S. P. Tallman 225,931 Carbureter, I. A. Hyams 225,931 Cabutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage clips, roll for forming, J. C. Richardson 226,109 Carriage piump seat, J. Finnegan 226,053 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,015 Carriage, J. Saget 226,082 Check register, J. Crawford 225,920 Clevis, E. Wansbrough 225,938 Clock movement, calendar, W. L. Bundy 225,938 Clothes hook, P. Miles 225,938 Clothes ine adjusting device, E. Weber 225,938 Combustion, promoting, B. F. Sherman 226,120 Commode, W. J. Winghart 226,017	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 225,964 225,954 225,950 226,005 226,009 226,008 225,966 226,019 226,008 225,966 226,019 226,082 225,966 226,019 226,083 225,966 226,017 226,057 226,063 226,048 225,969 226,048 225,969 226,048 225,969 226,048 225,969 226,048 225,969 226,048 225,969 226,048 225,969 226,048 225,969 226,048 226,049 226,046 226,049 226,045 226,049 226,049 226,049 226,049 226,049 226,049 226,049 226,045 226,049 226,049 226,049 226,049 226,049 226,049 226,049 226,045 226,049 226,049 226,049 226,049 226,049 226,049 226,049 226,045 226,049
Car coupling, P. H. Wendel. 225,981 Car coupling, P. H. Wendel. 226,002 Car, railway, C. Barrett. 225,913 Car, stock, J. Huy. 226,032 Car, stock, S. P. Tallman. 226,131 Carbureter, I. A. Hyams. 225,931 Carbureting apparatus, G. Smyers. 226,028 Caoutchouc, etc., making goods from, H. Gerner. 226,058 Caoutchouc, treating waste valcanized, L. Heyer. 226,058 Carriage, child's, N. B. Welsh. 226,138 Carriage clips, roll for forming, J. C. Richardson. 226,058 Carriage pump seat, J. Finnegan. 226,058 Carriage spring, O. C. Coggins. 225,970 Carriages, extension bow iron for, J.W. Anderson. 226,117 Chrisea, L. J. Lemman. 226,682 Check register, J. Crawford. 225,920 Clevis, E. Wansbrough. 226,117 Chiar seat, J. Lemman. 226,682 Clothes hook, P. Miles. 225,942 Clothes line adjusting device, E. Weber. 225,932 Clothes line adjusting device, E. Weber. 225,932 Cormode, W. J. Winghart. 226,011	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,958 226,018 226,950 226,008 226,009 226,008 226,009 226,008 225,956 226,019 226,048 225,956 226,019 226,048 225,956 226,019 226,048 225,961 226,048 225,961 226,048 225,956 226,019 226,048 225,956 226,048 225,956 226,048 225,956 226,048 225,956 226,049 226,040 226,046 226,046 226,046 226,045 226,045 226,112 226,103 226,116 226,045 226,117 226,1103 226,126 226,128 226,139 226,139 226,147 225,951 226,1004 226,045
Car coupling, A. Guyer 225,801 Car coupling, P. H. Wendel. 226,002 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, S. P. Tallman 226,131 Car, stock, S. P. Tallman 225,331 Carbureting apparatus, G. Smyers 226,022 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage jump seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,117 Chair seat, J. Lemman 226,082 Check register, J. Crawford 225,930 Clock movement, calendar, W. L. Bundy 225,932 Clothes hook, P. Miles 225,942 Clothes line adjusting device, E. Weber 225,958 Combustion, promoting, B. F. Sherman 226,132 Commode, W. J. Winghart 226,011 Corrests, manufacture of, J. C. Tallman (r) 9,137 Cotton press, A. Temples 226,132	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,951 225,964 226,951 225,964 226,018 225,930 226,098 226,098 226,019 226,019 226,048 225,946 226,019 226,048 225,946 226,017 226,079 226,142 225,969 226,084 225,960 226,084 226,086
Car coupling, P. H. Wendel. 225,981 Car propeller, street, W. F. Rothenberg 226,002 Car, railway, C. Barrett 225,913 Car, stock, J. Huy 226,073 Car, stock, S. P. Tallman 226,173 Car, stock, S. P. Tallman 226,073 Carbureter, I. A. Hyams 225,931 Cabutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, etc., making goods from, H. Gerner 226,058 Caoutchouc, treating waste valcanized, L. Heyer 226,070 Carriage, child's, N. B. Welsh 226,138 Carriage giums seat, J. Finnegan 226,058 Carriage spring, O. C. Coggins 225,970 Carriages, extension bow iron for, J.W. Anderson 226,132 Carriages, extension bow iron for, J.W. Anderson 226,132 Check register, J. Crawford 225,926 Clevis, E. Wansbrough 226,101 Clock movement, calendar, W. L. Bundy 225,932 Clothes line adjusting device, E. Weber 225,932 Clothes hook, P. Miles 226,102 Commode, W. J. Winghart 226,011 Corra, implement for shocking, W. C. Tolles<	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,958 226,958 226,098 226,098 226,098 226,098 226,098 226,098 226,098 226,098 226,019 226,08 226,019 226,08 225,961 226,019 226,08 225,961 226,017 226,079 226,128 225,996 226,049 226,040 226,040 226,040 226,040 226,045 226,128 226,049 226,049 226,045 226,128 226,138
Car coupling, A. Guyer	Planter, corn, M. Runstetler	226,116 226,027 226,918 226,118 226,932 226,118 226,941 226,951 225,964 226,952 226,008 226,009 226,009 226,009 226,009 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,001 226,002 226,003 226,004 225,930 226,004 226,006 226,126 226,006
Car coupling, A. Guyer	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,948 226,954 226,958 226,038 226,038 226,039 226,008 226,009 226,048 225,956 226,017 226,057 226,057 226,057 226,067 226,067 226,068 225,919 226,048 225,919 226,106 226,048 225,956 226,017 226,057 226,057 226,057 226,067 226,067 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,068 226,078 226,089
Car coupling, A. Guyer	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 226,954 226,951 225,964 226,958 226,098 226,098 226,098 226,098 226,098 226,009 226,008 226,019 226,008 225,961 226,017 226,079 226,142 225,969 226,142 225,969 226,142 225,969 226,142 225,969 226,046 226,128 226,049 226,046 226,128 226,049 226,046 226,128 226,049 226,041 226,041 226,041 226,041 226,041 226,041 226,041 226,041 226,041
Car coupling, A. Guyer	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,946 226,951 225,964 225,953 226,008 226,008 225,946 226,019 226,008 225,961 225,962 225,963 225,963 226,079 226,142 225,963 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,064 226,065 226,064 226,065 225,968 225,968 225,968 225,968 225,968 226,079 226,108 226,086 225,968 225,968 226,086
Car coupling, A. Guyer	Planter, corn, M. Runstetler	226,116 226,027 226,938 226,118 226,941 225,954 226,953 226,038 226,038 226,036 226,036 226,048 225,956 226,017 226,057 226,057 226,067 226,064 226,048 225,940 226,048 225,950 226,048 225,950 226,048 225,950 226,048 225,950 226,048 225,950 226,049 226,038 226,040 226,045 226,046 226,045 226,045 226,045 226,045 226,045 226,045 226,045 226,046 226,045 226,045 226,045 226,045 226,045 226,045 226,045 226,046 226,045 226,045 226,045 226,045 226,045 226,045 226,045 226,046 226,04

Tap, J. T. Hayden 22	26,067
Tap bushing and valve, combined, K. C. Gillette 22	26,059
Tether, E. H. Angell 25	26,014
Thill adjuster, E. Covert 22	26,039
Thill coupling, C. T. Brockett 25	26,032
Thill coupling jack, Best & Higgins	26,020
Thill couplings, anti-rattler for, E. Ely 22	25,975
Tire upsetting machine, N. S. Cary	25,916
Tower, extension, D. M. Pfautz 25	26,101
Truck, M. A. Reynolds	
Umbrellas, machine for forming and tempering	
paragon ribs for, C. H. Morgan	25,943
Vegetable cutting and grating machine, W. Mild. 22	26,096
Vehicle dash rail, A. Z. Boda 22	26,025
Vehicle spring, C. M. Blydenburgh 22	25,965
Vehicle spring, G. N. French	
Wagon bodies, device for elevating, D. Booker 22	
Washing apparatus, W. B. Le Noir (r)	9,134
Water elevator, T. J. Adams 22	25,909
Water meter, C. H. Bacon	25,963
Water meter, A. Bocklet 22	26,023
Waterproof fabric, F. Brigham et al 22	26,031
Weighing and transferring apparatus, grain, E. S.	
Richards 25	26,108
Whiffletree clip, L. W. Frederick 22	25,924
Windmill, T. Bright	26.030
Windmill, O. Colvin 25	26,036
Yoke, neck, P. J. Vehlen 22	26,134

DESIGNS.

Carpet, H. Horan	11,710	
Carpeting, E. Poole	11,713	į
Curtain pole, J. Berbecker	11,708	
Draught stand for aerated and other beverages,		ı
F. H. Shepherd	11.714	i
Horse block, W. Eddy et al	11,709	
Jewelry pendant, F. Dimier	11,716	
Spurs, A. Buermann	11,715	
	٠ ,	

TRADE MARKS.

Asphalt, crude, or crushed, or otherwise manufactured, also mastic or any other compound of asphalt with bitumen, or other substance, also pavements made wholly or partly from the same, Neuchatel Asphalt Company. Medicinal preparations, certain, A. A. Solomons... 7,862 Paper for checks, bank notes, promissory notes, 7,865

English Patents Issued to Americans From March 26 to March 30, 1880, inclusive.

Beer drawing apparatus, A. J. Spencer, San Jose, Cal. Bending metal strips for tubes, apparatus for, J. Hooven. Norristown, Pa.
Horseshoe machinery, T. S. Very, Boston, Mass

Ice making machinery, C. M. Tessie et al., N. Y. city. Motor, electro-magnetic, W. W. Griscom, Phila., Pa. Motor, electro-magnetic, W. W. Griscom, Phila., Pa. Separating liquid from solid matter, machine for, S. S. Hepworth, Yonkers, N. Y. Smelting ovens, R. P. Wilson et al., New York city.

Springs, compound and apparatus for making, N. Jen-kins, New Haven, Conn.

Telephones, E. Marx et al., New York city.

Advertisements.

Inside Page, each insertion --- 75 cents a line. Back Page, each insertion --- \$1.00 a line. (About eight words to a line.)
Engravings may head advertisements at the same rate per tine, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue. The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

"BIG STORY—BUT TRUE."

NEWTONYILLE, MASS., April 2, 1880.

Messrs. BAUDER & Co.:

License and Sample (Eastlake Clothes Stick) received.

Have sold 1,200 already—not all delivered yet. Bigg est
thing out. Sells like hot cakes. You can make any use
of this you please. Big story—but true.

Yours, etc.,

KARL THAXTER.

County License and Sample sent, prepaid, for One
Dollar. Circular Free. Address

BAUDER & CO., Birmingham, Ohio.

FOR SALE.—PATENT RIGHTS FOR THE LATEST Improvements in Odorless Privy Cleaning Machine. R. A. McCAULEY, 87 Fort Ave., Baltimore City, Md.

FOR SALE.—THE WHOLE OR ONE-HALF OF A valuable pate nt, suitable for iron workers. Address A. B. DOB BS, 143 F ourth St., Brooklyn, E. D., N. Y.



-A NEW AND GALVANIC BATTERIES.valuable paper. By George M. Hopkins. Containing full instructions and working drawings for the construction of nearly every known form of Battery, and its maintenance. This paper includes all of the principal maintenance. This paper includes all of the principal batteries used for Experiment, Telegraphy, Telephony, Electro-metallurgy, Electric Light, running Induction colls, and other purposes. Also, Earth-batteries, Drand Moist Piles, Simple Batteries, costing only a few cents. Sulphate of Copper, Nitric, Chromic Acid, Quicksilver, Gas, Secondary, and Thermo-electric Batteries are included. It is the most comprehensive paper yet published on the subject. Ilmstrated with nearly Fifty Engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS 157, 158, 159. Price 10 cents each. To be had at this office and of all newsdealers.

STEAM PUMPS.

HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water St., Boston. 709 Market St., St. Louis, Mo.

THE WORTHINGTON PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations. WORTHINGTON STEAM PUMPS of all sizes and for all purposes.

Prices below those of any other steam pump in the market.

WATER METERS. OII. METERS.

"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879.

For Macadam Road making, Ballasting of Railroads, Crushing Ores, use of Iron Furnaces etc. Rapidly superseding our older styles of Blake Crusher on account of its superior strength, efficiency, and simplicity. Adopted by important Railway and Mining Corporations, Cities, and Towns First Class Medal of Superiority awarded by American Institute. BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

50 Pin-a-4, Chromo, Lily, Lace, Marble, etc., Cards, in case, 10c. GLOBE CARD Co., Northford, Ct.

COMPARATIVE VALUE OF GAS AND COMPARATIVE VALUE OF GAS AND COAL.—By Geo. S. Dwight. An interesting paper, giving some curious speculations about the wastes of coal due to the extravagant methods now in vogue in all civilized centers in obtaining the thermal effects of this fuel showing how a reformation of so glaring an evil may be effected, and how the losses may be reduced; and pointing out the advantages to be derived from the use of watergas, which the author believes is destined to become the "fuel of the future." Contained in SCIENTIFIC AMPRICAN SUPPLEMENT, No. 216. Price 10 cents. To be had at this office and from all newsdealers. The same number contains a valuable article on the "Heating Power of Coal Gas," by Dr. Wm. Wallace.

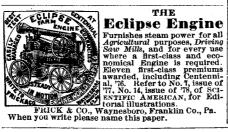
WESTON DYNAMO-ELECTRIC MACHINE CO

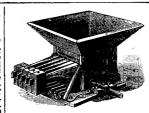
Machines for Electro-plating, Electric Light, etc. In addition to testimonials in our Catalogue of Jan. 1, we beg to refer to the following houses: Meriden Britannia Co.; Russell & Erwin Mrf G Co.; Ricel & Barron; Hall, Elton & Co.; Richardson, Boynton & Co.; WM. H. JACKSON & Co.; STANLEY WORKS; ROGERS CUTLERY CO.; CHAS. ROGERS BROS.; EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NORWALK LOCK CO.; HAYDEN, GERF & CO.; DOMESTIC SEWING MACHINE CO.; EBERHARD FABER; JOS. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 700 others. Outfits for NICKEL, SILVER, BRONZE, Plating, etc. The two highest Centennial Awards, and the Centennial Gold Medal of American Institute, and Paris, 1878. Prices from \$125 to \$500. New Catalogue will be out in June.

CONDIT, HANSON & VAN WINKLE Sole Agents NEWARK, N.J.

New York Office, 92 and 94 Liberty St.

MAGNETIC REACTIONS.—BY THEO. du Moncel. An interesting and instructive paper, by one of the most eminent of French electricians, demonstrating that the effects of magnetism, like those of electricity, are of two different natures, according as magnets act as currents or as charges in the static state. Static action and dynamic action defined. How static magnetism is distributed in a simple magnetic system shown by magnetic phantoms. The effects which result from reactions exchanged between a magnet and its armature. Apparatus for showing this. Magnetism, from a static point of view, shown to behave like electricity in a condenser. Magnetic condensation. Remanent Magnetism, and how it differs from Condensed Magnetism. Illustrated with 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 217. Price 10 cents. To be had at this office and from all newsdealers. MAGNETIC REACTIONS.—BY THEO.





APPLE GRATER APPLE GRATER.
First-class in every respect. Has iron cylin ders, iron frame, steel knives, adjustable concaves, and is not surpassed for quantity of work. For catalogue of cider machinery, address BOOMER & BOSCHERT PRESS CO., Syracuse, N. Y.

AN EASILY MADE SMALL, STRONG, AN EASILY MADE SMALL, STRONG, AND CHEAP BOILER, for little Steamboats. By H. K. Stroud. With an engraving. This excellent little boiler is made of wrought iron mercury flasks, which may be readily obtained, ready for use. Seven flasks are screwed together with ordinary gas fittings. This boiler has been used for a year past, with much success, in the steam Sharple yacht Mannelita, Length of boat, 16 ft. 5 in; beam, 4 ft. 6 in; propeller, 16 inches diameter. For further description of boiler, boat, and engine, with method of securing the propeller shaft in stern post, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 182. Frice 10 cents. To be had at this office and of all newsdealers.

50 Perfumed Cards, best assortment ever offered, 10c. Agts. Outfit, 10c. Conn. Card Co., Northford, Ct.

Cigar Box Lumber,

MANUFACTURED by our NEW PATENT PROCESS. The Best in the World. SPANISH CEDAR, MAHOGANY POPLAR.

Also thin lumber of all other kinds, % to % in, at corresponding prices. All qualities. Equal in all respects to any made, and at prices much under any to be obtained outside of our establishment. Send for price list.

GEO. W. READ & CO.,
186 to 200 Lewis Street, N. Y.



50 Chromo, Tortoise Shell, Cupid, Motto, Floral Cards, 10c. Outfit, 10c. HALL BROS., Northford, Ct.

PROGRESS OF INDUSTRIAL CHEMIS PROGRESS OF INDUSTRIAL CHEMISTRY—By J. W. Mallet. The latest and most approved processes, and the latest experimental results in the manufacture of the following important commercial products: Niter, Potassium Chloride, Potassium Sulphate, Potassium Chlorate, Pyro-Chromate, Potassium Serro-cyanide, Potassium Cyanide, Sodium Chloride, Sodium Nitrate, Sodium Sulphate, Borax. Ammonium Chloride, Calcium Chlorate, and Magnesium Sulphate. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 214. Price 10 cents. To be had at this office and from all newsdealers.

STEAM PUMPS, FOR EVERY DUTY. VALLEY MACHINE CO., EASTHAMPTON, MASS.

SPY GLASSES,

JAMES W. QUEEN & CO.,

924 CHESTNUT ST., PHILADELPHIA, PA.

Part 1.—Mathematical Instruments. Part 2.—Optical Instruments. Part 3.—Magic Lanterns. Part 4.—Philosophical Apparatus.

FARM LAW. BY HON. EDMUND H.
BENNETT. This paper, which was read by the author before the State Board of Agriculture of Massachusetts, is rull of important information regarding points of law not generally known, and with which not only farmers but yeary person in business should be acquainted. It bells how to buy a farm or other property, how the deed should be drawn, what constitutes farm boundaries, what a deed of a farm or property legally includes, what rights the owner has in the roadway, what the law is in regard to fences, the law as concerns the impounding of catile, the farmer's hability for trespasses of his animals, the question of liability for and protection against dogs, the law in regard to the ownership of fruit hanging over the law in regard to the ownership of fruit hanging over the boundary line between two properties, or over roads. About Hiring Hap, what the laborer is entitled to fin o bargain is made; what he forfeits by leaving before his time expires, etc.; hww on the subject. The Employer of the bundary line between two properties, or over roads. About Hiring Hap, what the laborer is entitled to his time expires, etc.; hw on the subject. The Employer of the bundary line between two properties, or over roads. About Hiring Hap, what the forfeits by leaving before his time expires, etc.; hw on the subject. The Employer of the subject of the farmer to burn brush, and how far he is responsible to his neighbor for damages arising the liability of rallway companies for damages arising the liability of rallw



"RELIABLE"

Engines a complete success. Prices still 40 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from \$250 for 10 H. P., to \$400 for 30 H. P. All complete, with Governor, Pump, and Heater.



SOME OF THE MODIFICATIONS OF THE MICROPHONE AND TELEPHONE. By George M. Hopkins. Practical instructions for making several new and greatly simplified forms of Microphones and Micro-telephones. The several microphones here described and illustrated are remarkably simple, easily constructed, inexpensive, and obviate most of the defects that accompany the ordinary forms of this instrument. These microphones used are transmitters, a Bell telephone being used as receiver. They are capable of performing the feats usually expected from microphones, such as transmitting the sound of theticking of a watch, the tramp of a fly or ant, whistling, music, etc. Directions for making a new form of instrument fuffilling the requirements of both microphone and transmitting the plane and capable of transmitting articulate speech as loudly and clearly as any of the well-known forms of telephone. It requires no call or alarm, as a loud sound made into the mouth-piece will produce a noise in the receiving instrument which may be heard in any part of a room of ordinary size. Full instructions for making an extremely simple and cheap microtelephone of entirely new form. The simple device here described, and which any one can easily construct, when placed on the table indicates in the receiving telephone the slightest touch on the table or on the instrument; in fact, it is capable of doing all done by other instruments of an analogous character. This article, illustrated with eight engravings, is contained in Scientific American Scientificans form all newsdealers. The same number contains an article on "Simple Microphone," illustrated with one figure; a description of "Uarley's Musical (ondenser," illustrated with one figure. SOME OF THE MODIFICATIONS OF



PATENT Steam Hoisting Machines.

Four Sizes-4 to 10 Horse Power. The Four Horse Power will raise 1,200 lb. 150 ft. per minute. Other

NOBLE & HALL. ERIE, PA.

THE DINGEE & CONARD CO'S

THE BEST IN THE WORLD.

Our Great Specialty is growing and distributing these Beautiful Roses. We deliver Strong Pot Plants, suitable for immediate bloom, sofely by mail at all postoffices. 5 Splendid Varieties, your choice, all labeled, for \$1, 12 for \$2; 19 for \$3; 26 for \$4; 35 for \$5; 75 for \$10; 100 for \$13. LF Send for our New Guide to Rose Culture—60 pages, elegantly illustrated—and choose from over Five Hundred Finest Sorts. Address

Address, for circular,
HEALD, SISCO & CO.,
Baldwinsville, N. Y.

Sorts. Address
THE DINGEE & CONARD CO.,
Rose Growers, West Grove, Chester Co., Pa.



50 Chromo, Glass, Scroll, Wreath, and Lace Cards, 10c. Try us. Chromo Card Co., Northford, Ct.

To Business Men.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth \$4 per line to advertise in one of fortyeight thousand.

The circulation of the SCIENTIFIC AMERICAN is guaranteed to exceed FIFTY THOUSAND every week.

For advertising rates see top of first column of this page, or address

> MUNN & CO., Publishers, 37 Park Row, New York.



CEO. P. ROWELL & CO.

Newspaper Advertising Bureau.

For Ten Cents: One hundred page Pamphlet with Lists of Newspapers and Advertising Rates.

For Ten Dollars: Five lines inserted one week in Three Hundred and Fifty Newspapers.

Spruce St. N. Y



PRICE YORK FERNING Over 1,000 of these Wheels in operation in this and Foreign countries.

Pamphlet sent free.

THE EAR.—BY CHAS. H. BURNETT. M.D. A valuable paper, giving a report of four cases, among many others, in which is shown the beneficial effect derived from the prolonged and uninterrupted wearing of cotton pellets as artificial drum-heads, and which the author claims are the only usefulkind of artificial drum-heads that have ever yet been devised. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 217. Price 10 cents. To be had at this office and from all newsdealers.

50 Motto, Gold, Floral, Scroll, Snowflake Cards, 10c. Agts. Samples, 10c. Stevens Bros., Northford, Ct.

AHEAD OF ALL COMPETITION! 1880.



EIGHT SIZES FOR HAND USE.

Weighing from 22 to 51 lbs.

THREE SIZES FOR HORSE POWER.

The very large increase in our sales last year prove that these machines fully sustain the awards "AS THE BEST" made to them at the great Centennial "hundred day trial," in Philadelphia, in 1876, and their complete "letory at the Paris Exposition in 1878, we offer for 1880, Machines from endrely new patterns and greatly improved in every respect.

Examine our New Lawn Sweepers. Hand or Horse size

GRAHAM, EMLEN & PASSMODE

GRAHAM, EMLEN & PASSMORE,
Patentees and Manufacturers.
631 Market St., Philadelpha Pa,
Send for Descriptive Catalogue with prices.

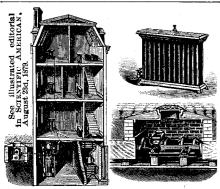
Founded by Mathew Carey, 1785.

BAIRD'S

OUT PURIOR OF THAT I HALL INICIA.

OUT OUT ON THE CONTROL OF THE C

HENRY CAREY BAIRD & CO., Industrial Publishers, Booksellers, and Importers, 810 WALNUT STREET, PHILADELPHIA.



THE HOLLY SYSTEM FOR HEATING cities and villages, under the Holly Patents, is in practical operation in many places. For economy, comfort, and convenience, is superior to any other principle. Licenses granted to corporations for the use of this system. Holly Steam Combinatin Co., Lim., Lockport, N.Y.

50 Gold. Chromo, Tortoise, Scroll, Marble, and Bow CARDS, 10c. SEAVY BROS., Northford, Ct.

PENNSYLVANIA LAWN MOWER. Surpassing all others, and pronounced the best.



ADVANTAGES.
Lightness combined with Requires less repairs. strength.
Runs more easily.
Will cut longer grass.
Is more durable.

Every Mover warranted.

LLOYD, SUPPLEE & WALTON, PHILADELPHIA.

MACHINERY FOR SALE. Three large lathes; also, one large planer. For particulars, address THE HAR! FORD FOUNDRY AND MACHINE CO., J. S. HUNTER, Prest., Hartford, Conn.



Damper Regulator.
Superior in every respect to all other regulators. The greatest fuel-saving appliance ever invented. In sures safety from explosion. In ordering mention steam pressure. Illus. catalogue sent on application. We set it up and guarantee performance. Price, 475.00.

AMERICAN STEAM APPLIANCE CO.

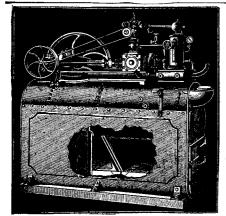
13 & 15 Park Row, SOLE MANUFACTURERS, NEW YORK.

MERICAN JOURNAL NDUSTRY

Most widely circulated industrial journal in the Union Try it three months, only \$1.00. Advertisements and illustrations published at remunerative rates.

JOURNAL OF INDUSTRY CO., Pittsburg, Pa.

Legant Autograph Album, gilt covers, 48 pages, illustrated with birds, scrolls, etc., in colors, and 47 Select Quotations, 15c. Agents' Outfit for Cards (over 60 samples), 10c. Davids & Co., Northford, Ct.



PORTABLE AND STATIONARY EN-gues and Boilers, 2½ to 15 H. P. Return Flue Boiler, large fire box, no sparks. Do not fail to send for circular to SKINNER & WOOD, Erie, Pa.

THE

MOSS ENGRAVING CO.,

(MOSS'S NEW PROCESS,)

535 PEARL STREET, COR. ELM,

ONE BLOCK FROM BROADWAY.

JOHN C. MOSS, Supt.

NEW YORK.

MR. JOHN C. Moss, having disposed of all his interest in the Photo-Engraving Co. 67 Park Place, has arranged with this Company to superintend its operations, which will be conducted on an extensive scale under the improved process recently invented by him, which is greatly superior to the old. The lines are much deeper, and the cost of production

OUR MOTTO IS

"THE BEST WORK AT LOW PRICES, ALWAYS ON TIME."

Parties having engraving to do, will find it to their interest to give our NEW METHOD a trial.



Pulley Blocks Iron Sheaves. Phosphor Bronze Self-Lubricating Bushings. PENFIEL BLOCK WORKS, Lock Box 99, Lock-

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, Eastman's Pat. Miter Machines, and Wood-Working Machinery generally. Manufactured by WITHERBY, RUGG & RICHARDSON, Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.)

AGENTS Catalogue free. \$7 per day made easy of the control of the



THE STRONGest, most complete, and retiable
of Engines and
Boilers. Special
sizes, 4 to 40 H. P.
Others on application. Also
jointless steam
kettles and machinery generally. Geo W. Tifft,
Sons & Co., Buffalo, N. Y.

JOHN R.WHITLEY & CO. European Representatives of American Houses, with First-class Agents in the principal industrial and agricul-tural centers and cities in Europe. London, 7 Poultry, E.C. Paris, 8 Place Vendôme. Terms on application. J. R. W. & Co. purchase Paris goods on commission at shippers' discounts.

The George Place Machinery Agency Machinery of Every Description. 121 Chambers and 103 Reade Streets, New York.



Grain Speculation in large or small amounts. \$25 or \$25,000. Write W. T. SOULE & CO., Commission Merchants, 130 La Salle St., CHICAGO, ILL., for Circulars.

SPARE THE CROTON AND SAVE THE COST. Tube Wells Driven or furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 285 Broadway, N.Y., who control the patent for Green's American Driven Well.



RUBBER BACK SQUARE PACKING. BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps. B represents that part of the packing which, when in use, is in contact with the Piston Rod.

A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from 1/2 inches square.

JOHN H. CHEEVER, Trens. NEW YORK BELTING & PACKING CO., 37 & 38 Park Row, New York.

Pond's Tools, Engine Lathes, Planers, Drills, &c. DAVID W. POND, Worcester, Mass.



SWEEPSTAKES, WITH THE ELLIS
Patent Journal Box. The best Planer and Matcher ever
made. Planing 20 in. wide, 6 in. thick, weight 2,100 lbs.,
\$300; planing 24 in. wide, 6 in. thick, weight 2,000 lbs.,
\$300. Beading, Arbor, and Head, extra, \$30. Sash, Door,
and Blind Machinery a specialty. Send for descriptive

CATARRH Successfully Treated and Permanently CURED in every case. No Pay Till Cured. OR. J. K. ROSS, CENTREVILLE. IND.



An engine that works without Boller. Always ready to be started and to give at once full power.

SAFETY. ECONOMY.

CONVENIENCE
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance.

THE NEW OTTO SILENT GAS ENGINE. Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUMM & CO., 3045 Chestnut Street, Phila, Pa. H. S. Manuing & Co., 111 Liberty St., N. Y., Agents. XX COT (not painted,) White Duck \$2.



Makes a perfect bed. No mattress or pillows required. Better than a hammock, as it fits the body as pleasantly, and lies straight. Folded or opened instantly. Self-fastening. It is just the thing for hotels, offices, cottages, campmeetings, sportsmen, etc. Good for the lawn, plazza, or "coolest place in the house." Splendid for invalids or children. Sent on receipt of price, or C. O. D. For 50 cts. extra, with order, I will prepay expressage to any railroad station east of Mississippi River and north of Mason and Dixon's line. For 75 cents, in Minnesota, Missouri, and Iowa.

and Iowa.

HERMON W. LADD, 108 Fulton St., Beston; 207 Canal St., New York; 165 North Second St., Philadelphia. Send for Circulars.

FREE Illustrated CATALOGUE of Chromos, Watches, Revolvers Novelties. CHEAPEST & la Chromos, Watches, Revolvers and SUNUS
CHEAPEST & largest SUNUS
ent in the U. S. E. F. NASON, 111 Nassau St., N. Y.

Lathes, Planers, Shapers Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

B. W. PAYNE & SONS, CORNING, N. Y.



Patent Spark-Arresting Engines, mounted and on skids. Vertical Engines with wrotbollers. Eureka Safety powers with Sectional bollers. ers with Sectional boilers—can't be exploded. All with Automatic Cut-Offs. From \$150 to \$2,000.
Send for Circular. State where you saw this.

ROCK BREAKERS & ORE CRUSHERS. This machine has for twenty years stood the TEST, and found to be the best one made for breaking all kinds of hard and brittle substances, such as ORES, QUARTZ, EMERY, etc., etc. Mr. S. L. Marsden, for the past twenty years connected with the manufacture of this machine, superintends its manufacture.

chine, superintends its manufacture.

FARREL FOUNDRY AND MACHINE CO., Manufrs., Ansonia, Conn.

THE DRIVEN WELL.

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by

WM. D. ANDREWS & BRO., 235 BROADWAY, NEW YORK



MACHINISTS' TOOLS. New AND IMPROVED PATTERNS. Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

ROOTS' NEW IRON BLOWER.



POSITIVE BLAST. IRON REVOLVERS, PERFECTLY BALANCED IS SIMPLER, AND HAS

FEWER PARTS THAN ANY OTHER BLOWER. P. H. & F. M. ROOTS, Manuf'rs,

CONNERSVILLE, IND. S. S. TOWNSEND, Gen. Agt., & Cortlandt St., 8 Dey Street, WM. COOKE, Selling Agt., 6 Cortlandt Street, JAS. BEGGS & CO., Selling Agts., 8 Dey Street,



ELEVATORS.
All kinds of Hoisting Machinery a specialty. Steam, Hydraulic, and Helt Fower for Passengers and Freight. Iron Furnace Lifts, Portable Hoists. STOKES & PARRISH.
30th and Chestnut St., Phila, Pa.

SALESMEN \$125 A Month and Expenses WANTED SIZE SEARCH SEARCH CHARS WANTED SIZE SEARCH SEARCH

\$777 A YEAR and expenses to agents. Outfit Free. Address P. O. VICKERY, Augusta, Maine.

52 Gold, Crystal. Lace, Perfumed, and Chromo Cards, name in Gold & Jet 10c. Clinton Bros. Clintonville, Ct.



CAVEATS, COPYRIGHTS, L. REGISTRATION, E.C.

Messrs. Munn & Co., in connection with the publication of the Scientific American, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY EARS' EXPERIENCE, and now have unequaled facilities WILCOX, SHINKLE & MILLER,
Mill Furnishers,
PITSBURGH, PA.
Established in 1848.
United States, Canada, and Foreign Countries. Messrs. United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Registration of Labels, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents .- We also send, free of charge, & Synopsis of Foreign l'atent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five paterts-embracing Canadian, English, German, French, and Belgian-will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and s:eam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is \$75; German, \$100; French, \$100; Belgian, \$100; Cana-

Copies of Patents.-Persons desiring any patent with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications

Any patent issued since November 20, 1866, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office \$1.

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

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

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every pat-entee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free.

Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN, 37 Park Row, New York.

BRANCH OFFICE—Corner of F. and 7th Streets,
Washington, D. G.

Advertisements.

Inside Page, each insertion --- 75 cents a line. Back Page, each insertion --- \$1.00 a line. (About eight words to a line.)

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

The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

OOFIN

H. W. JOHNS M'F'G CO., 87 Maiden Lane, New York,

manufacturers of genuine Asbestos Liquid Paints



SUPPLIES FROM
HYDRANT PRESSURE
the cheapest power known.
Invaluable for blowing
Church Organs, running
Printing Presses, Sewing
Machines in Households.
Turning Lathes, Scroll
Saws, Grindstones, Coffee
Mills, Sausage Machines,
Feed Cutters, Electric
Lights, Elevators, etc. It
needs little room, no firing
up, fuel, ashes, repairs, engineer, explosion, or delay,
no extra insurance, no coal
bills. Is noiseless, neat,
compact, steady; will work
at any pressure of water
above 1b lb; at 40 lb, pres-WATER MOTOR

But any pressure of water above 15 lb.; at 40 lb. pressure nos 4-horse power, and capacity up to 6 or 8 horse power. Prices from \$15 to \$250. Send for circular to THE BACKUS WATER MOTOR CO., Newark, N. J.

FIRST GRAND

Millers' Exhibition,

EXPOSITION BUILDINGS, IN CINCINNATI,

May 31st to June 26th inclusive.

Six Automatic Cut-off Engines to be

Ten Complete Flour Mills in Opera-

A Complete Vienna Bakery.

Mill Machinery from all Quarters of the Globe.

Reduced Railroad Rates.

Ample Hotel Accommodations.



"BUCKEYE" LAWN MOWER. The lightest and easiest running MOWER ever made.
STRICTLY FIRST CLASS. MAST, FOOS & CO., Springfield, Ohio.

Mill Stones and Corn Mills We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.

J. T. NOYE & SONS, Buffalo, N. Y.

FOR SALE,
Extra Strong Screw Presses, Calender Rolls, and other
machinery connected with the manufacture of R. R.
cards and tickets. This offers an excellent opportunity
for any one desirous of a profitable business with an unlimited demand. Address GEO. BAILEY, 290 Pearl St.,
Buffalo.



PATENT **Galvanized Iron Tackle Blocks**

For all Hoisting Purposes. Light, Easy Running, Durable. Superior to all Wood Blocks. Cheaper than all other Iron Blocks.

PROVIDENCE TOOL CO.,

Providence, R. I.

H. A. WILLIAMS, U. S. Com. Agt. L. H. WILLIAMS. WILLIAMS BROTHERS,

Commission and Forwarding Agents, GRAND BASSA, LIBERIA, W. C. AFRICA, Will sell any consignments of American specialties for West Africa. Classes and qualities of intended consign-ments should, in every case, be advised before shipped.

BIG PAY to sell our Rubber Printing Stamps. Samples free. Taylor Bros. & Co., Cleveland, O.



PERFECT

NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$4.150 by mail, or \$1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.

MUNN & CO.

Publishers SCIENTIFIC AMERICAN.

THE MACKINNON PEN OR FLUID PENCIL.



MACKINNON PEN CO., Patentees and Mannfacturers, 200 Broadway, New York.





SHEPARD'S CELEBRATED \$50 Screw Cutting Foot Lathe. Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO., 331, 333, 335. & 337 West Front Street Cincinnati, Ohio.

The New York Ice Machine Company,

21 COURTLANDT STREET. ROOM 54.

Low Pressure Binary Absorption System. Advantages over other Machines.
Makes 25 per cent. more Ice. Uses only 14 water of condensation. No Pressure at rest. Pressure in running 14 pounds. Self-lubricating. No Leaks, non-inflammable. No act on on Metals. Easy Attendance.

IMPLEMENTS, MACHINERY, ETC. Catalogues, prices. and Agency terms solicited. Unexceptional references. OSKAR NETZLER, Agent in Brisbane, Queensland, Australia.



COLUMBIA BICYCLE

A practical road machine. Indorsed by the medical profession as the most healthful of outdoor sports. Send 3 cent stamp for 24 page catalogue, with price list and full information, or 10 cents for catalogue and copy of The Bicycling World. THE POPE M'F'G CO... 89 Summer Street, Boston, Mass.

Gear Molding without Patterns

Scott's Gear Moulding Machines,

AIR COMPRESSORS & ROCK DRILLS DELAMATER IRON WORKS, Boiler Makers, Engine Builders, and Founders,

FOOT OF W. 13th ST., North River, NEW YORK. ESTABLISHED 1841

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

TELEPHONE Works 1 mile Price \$3.50. Pat'd Circulars free. HOLCOMB & Co., Mallet Creek, Ohio.

THE PICTET

ARTIFICIAL ICE COMPANY, Limited Ice Machines to make from 20 pounds per hour to 50 tons per day, at 36 Cortlandt St., New York. P. O. Box 3083.

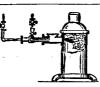
PORTLAND CEMENT,

From the best London Manufacturers.

K. B. & S. AND BURHAM CEMENTS.

For sale by JAMES BRAND, 85 Beekman St., New York

BI-SULPHIDE OF CARBON, E.R. TAYLOR, Cleveland, O.



THE FORSTER-FIR-THE FORSTER-FIRMIN GOLD AND SILVER
AMALGAMATING COMP'Y
of Norristown, Pa., will grant
state rights or licenses on
easy terms. This system
works up to assay, and recovers the mercury rapidly.
Apply as above.

Agents Wanted. T. NEW, 32 John Street, New York.

WM. A. HARRIS PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE With Harris' Patented Improvements, from 10 to 1,000 H. P.



THE No. 3 **Eureka Band Saw**

has advantages over any other manufactured. Is first-class in all respects, cheap, and durable. Also Pony Piangers and Upright Shaping and Variety Moulding Machines, and a large variety of Wood Working Machinery. For particulars, address



WOOD SOLE SHOES.
The cheapest, most durable, warm, good looking, and thoroughly waterproof shoe Particularly adapted to Brewers, Miners, and all classes of laborers. Send stamp for circular and price list. CHAS. W. COPELAND, 122 Summer St., Boston, Mass

BUY NO BOOTS OR SHOES
Unless the soles are protected by Goodrich's Bessemer
Steel Rivets. Guaranteed to outwear any other sole. All
dealers sell them. Taps by mall for 75 cents in stamps.
Send paper pattern of size wanted. H. C. GOODRICH,
19 Church St., Worcester, Mass.

HARTFORD

STEAM BOILER

Inspection & Insurance COMPANY.

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

CORRUGATED AND CRIMPED IRON
ROOFING AND SIDING,
Iron Buildings, Roofs, Shutters,
Doors, Cornices, Skylights, Bridges,
etc. MOSELEY IRON BRIDGE
AND ROOF CO., 5 Dey Street,
New York.

The Asbestos Packing Co., Miners and Manufacturers of Asbestos

BOSTON, MASS., OFFER FOR SALE:

PATENTED ASBESTOS ROPE PACKING, LOOSE "
JOURNAL "
WICK " 66 MILL BOARD, SHEATHING PAPER, FLOORING FELT.



GENUINE BABBITT METAL

E. STEBBINS M'F'G CO., SPRINGFIELD, MASS.

The Rodier Patent Single Iron Plane.



Made of extra quality Iron. A practical labor saving tool. Cuts against the grain equally as well as with it. Can be adjusted instantly to cut a coarse or fine shaving, and excels any double from plane ever produced. Address J.AFLIN MANU-FACTURING CO., North Elm Street, Westfield, Mass.

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

Working Models And Experimental Machinery, Metal or Wood, made torder by J. F. WERNER, 62 Centre St., N. Y.

SCREW PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.



THE NORWALK IRON WORKS CO., SOUTH NORWALK, CONN.

ORGAN BEATTY PIANO
NEW ORGANS 138 Stops, 32 set Golden Tongue Reeds, 55 Oct's, 26
Knee Swells, Walnut Case, warn'd 6 years, Stool & Book 898.
New Planons, \$44.35 to \$25.55. \$27 Newspapersent FreeAddress Daniel F. Beatty, Washington, New Jersey.



The attention of Architects. Engineers, and Builders is called to the great decline in prices of wrought durable. Also Pony Plant Upright Shapling and Variety in Machines, and a large variety working Machines, and a large variety working Machinery. The work of the the work of

THE TANITE CO., STROUDSBURG, PA.

EMERY WHEELS AND CRINDERS.

LONDON-9 St. Andrews St., Holborn Viaduct, E. C.
LIVERPOOL-42 The Temple, Dale St.

ROCK DRILLING MACHINES AIR COMPRESSORS

MANUFACTURED BY BURLEICH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCH BURG MASS.

FRIEDMANN'S PATENT

Are the cheapest and most effective machines in the market for

Elevating Water and Conveying Liquids

from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweits, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to

NATHAN & DREYFUS, anufacturers, NEW YORK.



Bookwalter Engine.

Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of HORSE POWER.....\$240 00

6½ " " 29 00 137 O 00 137 O 00 JAMES LEFFEL & CO., Springfield, Ohlo. or 110 Liberty St., New York.

ASBESTOS MATERIALS, Made from pure Italian Asbestos, in fiber, mill board, and round packing. THE CHALMERS-SPENCE CO., 40 John Street, and Foot of E. 9th Street, New York.

hafts,Hangers. At low prices. Largest assortment. A.& BROWN, 57, 59, & 61 Lewis St., New Yor



American Scientific

The Most Popular Scientific Paper in the World.

VOLUME XLII. NEW SERIES.

Only \$3.20 a Year, including postage. Weekly. 52 Numbers a Year.

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

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

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

Clubs.—One extra copy of The Scientific American will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

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

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

MUNN & CO., 37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, German, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, 84, gold, for Scientific American, 1 year; \$9, gold, for both Scientific American and Supplement for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenthand Lombard Sts., Philadelphia, and 50 Gold St., New York.