

SCIENTIFIC AMERICAN

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

Vol. XXXVII. — No. 5.
[NEW SERIES.]

NEW YORK, AUGUST 4, 1877.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

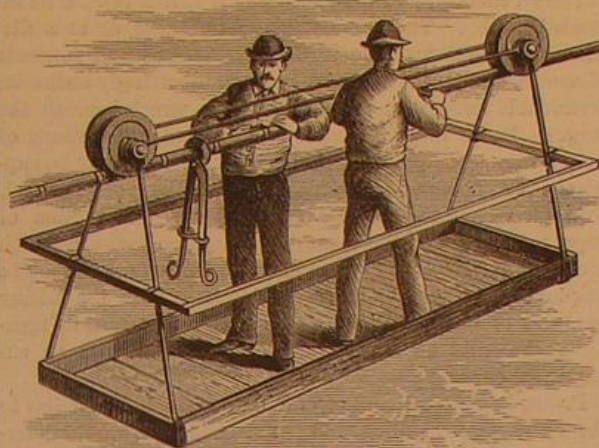
CABLE MAKING OF THE EAST RIVER BRIDGE.

The stage of work through which the great East River Suspension Bridge is now passing may be considered that which includes the first permanent steps toward the formation of the superstructure or bridge proper. Hitherto piers and anchorages have been erected, the river spanned by a slender foot bridge, and the attendant temporary guys and braces, but until the last few days it has been impossible to say that any integral portion of the vast mass of suspended wire has reached a finished state. Now, however, two huge strands, respectively belonging to two huger cables, are permanently fixed in their great shoes pinned between the colossal eye bars of the anchorages, and fixed in the graceful curve with which they sweep over the river, their centers marking the lowest point of the majestic structure which they are to aid in supporting. In order to clear up any doubt in the reader's mind as to what the main cables and their office are—for to these the strands now finished belong—it may be well to explain that the bridge is to be held up by four immense wire ropes, or more strictly bundles of wire, for, contrary to general supposition, there is no twist in them. These cables pass from anchorage to anchorage, rising over the tops of the piers, two crossing the latter near the middle and one at each end. Their course can easily be followed on the engraving of the bridge as it will appear when finished in our next issue. It will be seen that the roadway which extends straight across the river from floor to floor of the great arches to the piers, and then from piers to anchorages, is suspended by smaller vertical cables of constantly varying length.

Each one of these mighty principal supporting ropes is

composed of nineteen strands, and each strand is made of 260 steel wires. The size of wire now used is number 7. Number 8 was first employed, but the larger size was preferred. When these wires are laid side by side, they make a bundle 3

Fig. 2.



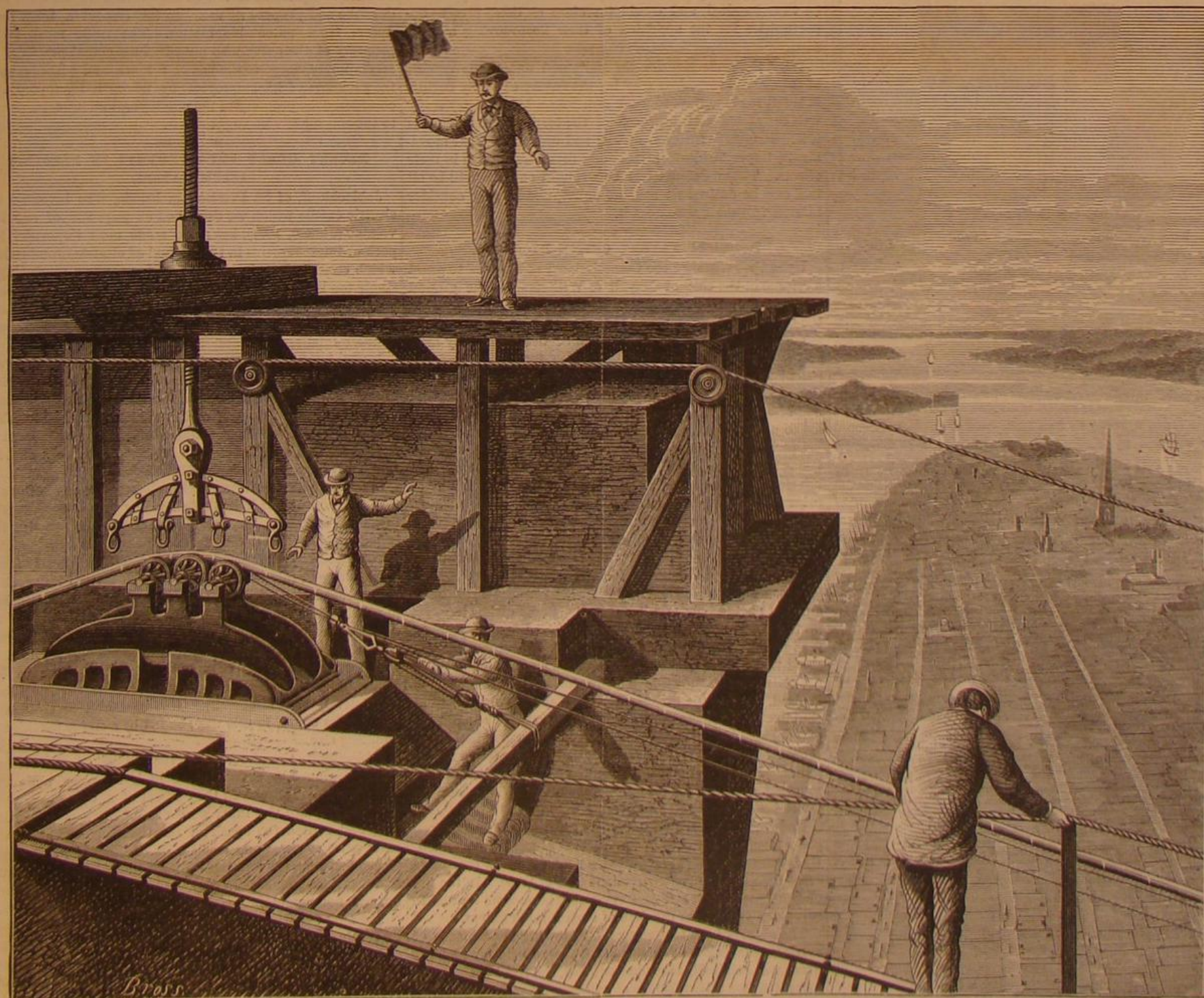
inches in thickness, and the weight and tension of the bundle extending as it does from anchorage to anchorage, appears in the shape of a pull of 40 tons at each end. So that each

entire cable will exert a strain of just nineteen times that amount.

In this and the following article we propose to explain how these main cables are made, for although we shall describe simply the preliminary operation of strand making and securing, it will readily be seen that further operations involve but a series of repetitions.

It may be remembered that after our examination into the way the steel wire was made (the results of which we embodied in an article some months ago) we left the wire in large coils some five feet in diameter. Following these coils now to the Brooklyn anchorage—where is the spinneret whence the great cobweb is emerging thread by thread—we shall find them dipped in oil, dried in the air, dipped again and again until a moderately thick coat of hardened grease has changed their bright zinc lustre into a dirty yellow. Then they are carried up on the top of the anchorage, reeled off on large wooden drums, and from these last they are paid off as required. We have already explained how the first wires were got across the river. One of the first conveniences afterwards put in place was the carrier rope. This is simply an endless wire cable which starts from the Brooklyn anchorage, passes over the two piers in turn, then to the New York anchorage, on top of which are two horizontal pulleys, around which it leads, then back to Brooklyn, and finally after passing around an immense horizontal engine-driven drum the ends are joined. One part of this carrier rope carries wire for one inner main cable, the other part for the corresponding outer main cable. On each part is attached a traveler wheel, which is represented in Fig. 3. This is a light

[Continued on page 66.]



CABLE MAKING OF THE EAST RIVER BRIDGE.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$3.00 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.

Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVII, No. 5. [NEW SERIES.] Thirty-second Year.

NEW YORK, SATURDAY, AUGUST 4, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

Adulteration of food.....	63	Lizard, Carolina.....	71
Air gun, new.....	73	Locust, the seventeen year.....	68
American Institute Exhibition.....	65	Meerschaum pipes, to color (59).....	74
Axle grease (49).....	75	Mole cricket.....	71
Bed bugs, remedy for.....	75	Nails, abut.....	73
Black fly in the Adirondacks.....	75	Open hearth steel works (26).....	75
Book, first English.....	75	Oyster culture in France.....	70
Butter packing, apparatus for.....	75	Patents, American and foreign.....	74
Chicken coop.....	75	Patent office decisions, notes of.....	64
Coal and water supply.....	67	Plow, rotary mould board.....	65
Coal area of the United States.....	67	Poorhouse, design for (43).....	76
Copper alloys, investigations on.....	67	Pump, new.....	70
Devil fish.....	74	Pumping with tight connections.....	68
Discharge from reservoir (47).....	74	Railroad strike, the great.....	65
Disintegrator, the Vapart.....	67	Right-handed, why are we.....	69
Doorspring (38).....	75	Rose of Jericho (52).....	76
Dry house (39).....	75	Rowlock.....	70
Dynamometer.....	65	Ruins of New Mexico.....	67
Earthquake in Tennessee.....	72	Scale in boiler (43).....	76
East river bridge, cable making.....	75	Sea monster.....	75
Eggs, to preserve (34).....	75	Smoke stack, rule for (3).....	75
Electric magnet.....	69	Smoke on trees, effect of.....	75
Electric light, portable.....	70	Small-pox, cure for.....	66
Electrical illumination.....	65	Soap making (53).....	76
Electrotyping (45).....	76	Stereoscopic relief.....	69
Emery wheels, balancing.....	65	Strawberry runners, cutting.....	72
Etruscan color in gold (27).....	75	Steam pipes, covering of (42).....	76
Fire engine in Prussia (37).....	75	Suffocation by smoke.....	75
Fusel oil, test of (41).....	75	Sugar extraction process.....	73
Goblet, self-cooling.....	72	Sutro tunnel.....	73
Grain scale.....	65	Telescope, the Lick.....	72
Hayden survey.....	65	Toad, the American.....	67
Horsefish as food.....	73	Tobacco, raw taste of.....	68
Ice water.....	70	Torpedo boats and monitors.....	72
Iron and neptunium.....	68	Torpedo defense.....	64
Ink, black (34).....	75	Tree planting in Massachusetts.....	71
Iron ship building.....	72	Volcano, South American.....	71
Iron furnaces.....	70	Windmill.....	76
Lawns, renovating.....	65	Wool clip for 1876.....	73
Lawns.....	73		

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT, No. 83, For the Week ending August 4, 1877.

- I. ENGINEERING AND MECHANICS.—Spruce Creek Tunnel, Pennsylvania Railway. 1 engraving.—A Railroad in the Clouds: Being a full account of the remarkable Peruvian Railway Works now extending over the Andes Mountains. 1 engraving.—Hock Railways. With 9 illustrations.—Hock Tunnel. Broad Wheel Tires. 2 illustrations.—Torpedo Boats. 2 illustrations.—Torpedo Boats used on the Danube.—The 130 Ton Armstrong Gun. 1 figure.—How to Construct Unsinkable War Vessels.—The Nicaraguan Canal. 1 engraving.—Mine Ventilation. By E. HAMER CARBUTT. 3 figures and tables. A valuable paper.
- New Ten Horse Power Engine, by Watts & Co. 5 engravings.
- The Tides. By Prof. ELIAS SCHNEIDER. A most interesting paper, giving a new and clear explanation of the phenomena. 2 figures.—Fine Water Drops.
- How Steam Increases its Own Heat.—Sulphurous Castings.—Fuel Used to Melt a Ton of Iron.—Process of Applying Oxygenized Air in Blast Furnaces. By CHARLES HORNOSTEL.—Improved Ore Washer. 2 figures.
- II. ELECTRICITY, LIGHT, HEAT, ETC.—Improved Electric Light. By NICOLAS EMILE REYNIER. P. 18. 3 illustrations.—Edison's Pressure Relay.—Capillary Electrometers. 4 engravings.—Red or Green?—Physical Society, London. Optical Bench. Thermometers. Electrical Selection.
- III. CHEMISTRY AND MINERALOGY.—Gases Enclosed in Lignite Coal and Mineral Resin.—Apparatus for Gas Analysis. By Dr. FRANKLAND.—Narcotin, Cotarnin, Hydrocotarnin. By Dr. WRIGHT.—Olio of Limes. By PRESS and WRIGHT.—Heptyl Alcohol.—Proceedings of Chemical Society, London.—Salts of Chrome Sesquioxide.
- IV. TECHNOLOGY.—Manufacture of Beet Root Sugar, by EDW. LEFROY COLL.—Defecation; the Milk of Lime; Carbonation and evaporation. A valuable paper.
- Photo Notes.—Removing Silver Stains from Clothing.—Blisters on Albumen Paper.—Iron Spots on Clothing.—Silvering glass.—Impressions of Negatives.—Washing Silver Pictures.—New Gold Salt for Photography.—Dry Coffee Process.—Chloride of Palladium Process.—Instantaneous Photography.—Accelerating Liquid.—Collodion.—Preparation of Photo-lithographic Paper. By Professor HUSNIC, Prague.
- Prizes offered by the Vienna Photographic Society.—Mounting Photographs. By WALTER H. WOODBURY.—How to enlarge and Photograph Microscopic Objects. By M. A. RUTOR.—Butterfly Color.—Purpurin.—Paper from Cactus.
- How to make Rubber Handstamps.—How to Extract Broken Screws.—Useful Alloy of Aluminium.—How to Oxidize Gold, Silver or Brass.—Japanese Mirrors.—Ornamental Chairs. 2 engravings.—The Art of Printing.
- V. NATURAL HISTORY, GEOLOGY, ETC.—Hair Snakes.—Mt. Diabolo Coal.—Freezing microtome, by Mr. LEWIS, 1 engraving.
- VI. AGRICULTURE, HORTICULTURE, ETC.—Prices of Nursery and Greenhouse products, Home and Abroad.—By PETER HENDERSON.—Best Method for Haymaking.—Indian Corn as Food for Man.—Utilization of Dead Animals.—Forests of Sweden.—The European Walnut.
- VII. MISCELLANEOUS.—Methods of Frauds on Life Insurance Companies.—European Labor.—Origin of the American Flag and other Flogs.

Terms.—SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, five dollars. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, seven dollars. CLUBS.—One extra copy of the SUPPLEMENT will be supplied gratis for every club of five SUPPLEMENT subscribers at \$5.00 each.
All the back numbers of the SUPPLEMENT, from the commencement, January 1, 1875, can be had. Price 10 cents each.
NOW READY.—THE SCIENTIFIC AMERICAN SUPPLEMENT for 1876. Complete in two large volumes. Over 80 quarto pages; over 2,000 engravings. Embracing History of the Centennial Exhibition. New Illustrated Instructions in Mechanical Drawing. Many valuable papers, etc. Price five dollars for the two volumes, stitched in paper; or six dollars and fifty cents, handsomely bound in stiff covers.
Remit by postal order. Address
MUNN & CO., PUBLISHERS,
37 Park Row, New York.

Single copies of any desired number of the SUPPLEMENT sent to any address on receipt of 10 cents.

TORPEDO DEFENCE—INVENTION WANTED.

An invention that will protect ships of war from attacks of torpedoes is wanted; and this want ought to stimulate the inventive skill of mechanics and scientific men. Torpedoes in some form have played an important part in the wars of latter years, but these torpedoes were not the infernal machines that are now being employed. In former days they were receptacles filled with explosive material, and were either anchored in the pathway of vessels or floated to the object that was desired to be destroyed. They were fired by concussion, clockwork, or time fuse. The location of such torpedoes could most generally be discovered, if proper attention was directed toward their places of concealment.

Torpedoes of that class were playthings compared with the inventions of Lay, Ericsson, Whitehead, and Thorneycroft. The approach of these messengers is submerged and their pathway cannot be discovered by the assailed party. From them the greatest danger is to be apprehended.

Let us take, for example, the Lay torpedo, notices of which performance have appeared in our columns, and there seems to be but little protection from its attack. It is launched silently, and with accuracy it speeds toward its intended victim. The operator being on shore, or at a distance, is able to navigate it through crooked and intricate channels, and direct it at his will to unerringly strike its formidable antagonist and sends him a wreck beneath the waves. But if this antagonist be anchored, precautions of safety may be employed. A net-work of iron may be supported on booms, or pendent below the vessel's keel, through which the torpedo cannot burst. A cordon of ropes may surround the vessel, supported on boats in which are watchful crews to give an alarm. Other devices may be employed; but they more or less interfere with the sailing qualities of the vessel, and would seriously retard its management should an antagonist present himself, and an engagement ensue.

Protruding spars may keep off a torpedo boat, similar to the Thorneycroft launch, and the electric light would determine its position. But let this vessel be attacked by the Lay torpedo, or others of like character, and such defense is futile. The net-work of wire will keep it at a distance, but the objections to its use, except at anchorage, are as given. At a recent attack of four torpedoes upon a Turkish vessel in the Danube, the commander saved his vessel by coolness and quick maneuvering. But the type of some war vessels is such, especially those heavily armored, that they cannot be thus handled, and would therefore at times present opportunities for the approach of their fleet-moving antagonists.

What the protection for the swift and unseen movements of submerged torpedoes may be, the future can only decide. It is left for inventors to work out. As a hint, we say study well the action and approach of the torpedo, submerged as it is. Remember they are swift and unseen in their movements, impregnable to attack, and most destructive in their effects. That a defence can be wrought out that will be all that can be desired we have no doubt, and he may consider himself fortunate who does it.

NOTES OF PATENT OFFICE DECISIONS.

Upon the refusal of the Commissioner of Patents to grant a reissue in the case of Mayall & Williams on the ground that an interfering application had been filed subsequent to the date of their patent, and that the grant of this reissue depended on a question of priority, to be determined by him, as between the interfering application for patent and the patent of Mayall, the Supreme Court of the District of Columbia declared this decision of the Commissioner void and of no effect, and decided that the appellants were entitled to a reissue and that the same be reissued to them.

Upon the rendering of this decree the rules of the Patent Office have been amended to accord with this decision. All interferences now pending between reissue applications of prior patents and later patents, or with applications for reissues of later patents, or with subsequent original applications, will be dissolved; but on motion, the record in the interference proceeding may be amended by the substitution of the reissued patent in place of the original patent. An application has been made by C. W. Siemens for a reissue of a patent on furnaces granted in 1869. Some claims were set up for devices contained in certain expired foreign patents, the inventions of the applicant. The Commissioner has decided that the applicant had no right to a reissue, and could not claim matter shown in a prior foreign patent that has expired. One of the reasons given is that the subject matter could not be protected in the courts, and on that account the patent should be refused, that in such cases no distinction should be made between the original application and reissues. No color should be given to an individual claim, by granting a patent purporting to secure a right, when the Office has no such right to confer.

Under the act of 1836, patents were limited to fourteen years from the date of foreign patents previously obtained. Under the act of 1861, all patents granted were to remain in force for seventeen years from the date of issue. In the act of 1870, patents granted to foreign inventors were limited to seventeen years from the date of such foreign patent.

The object of the reissue section is to provide a means of correcting individual patents; and if the period for which the grant was originally made has expired, the right to claim the invention in a reissue does not exist.

That portion of the invention patented in England in 1861

has not yet expired by limitation of seventeen years from its date, and can be retained.

An appeal from the decision of the Examiners, and confirmed by the Commissioner, has been made in the case of W. W. Bierce, for improvement in strip or ribbon tickets. The object is to use these tickets on street railways. The design was to sell these tickets in strips, with one or more tickets made to be redeemable. The decision was that this form of tickets was old, and that the system of redeeming tickets old also. The refunding of money to the possessor of certain tickets is not essentially an improved device or article, but rather a method of transacting business, and this method is not patentable, as it neither relates to a machine, manufacture, or composition of matter.

A claim had been made by James Arkell for a paper bag with a jaggedly cut mouth and also the method of making it. The claim for the article was rejected, which was acquiesced in and the claim stricken out. A few days before issuing the patent for the process, the applicant filed a claim for the article. He should have applied for a reissue, and included this claim therein. The Commissioners concurred in the views of the examiners that a notch had been used in others than these with a jaggedly cut mouth and for precisely the same purpose, to facilitate opening, and it merely resulted in the double use of an old device.

TRADE MARKS.

The registration of a trade mark that is not identical with yet so closely resembles another as to mislead the public, is denied to Coggin, Kidder & Co., as is also the addition of an arbitrary symbol of a Maltese cross to the trade mark, which is declared not to amount to sufficient difference to warrant registration. In the judgment of the Commissioner, the leading word was calculated to mislead the public, yet when the two words were seen side by side, the difference could readily be perceived.

In the application for a trade mark by W. S. Kimball, filed in eight different arrangements of figures in connection with the trade mark, to show the modes in which it had been applied and used, the decision was that the facsimile of the trade mark was sufficient, and that no protection is afforded to the use of scrolls, or figures that are not an essential part of the mark. To recognize them would tend to mislead the public as to the scope and nature of the registration.

The question of priority in the use of a trade mark in the case of Swift vs. Peters has been decided to have nothing to do with the question as to who first conceived the idea, or to describe and propose its use. In this respect a trade mark differs from patentable matter. The trade mark is the property of the party who puts it into actual practice. If an employee suggests the use of a mark and places it upon the packages of his employers, by whom it is adopted, it is considered the property of the employer, and its claim denied to the employee who suggested it.

RECENT GREAT IMPROVEMENTS IN ELECTRIC ILLUMINATION.

Jablochkoff, of St. Petersburg, Russia, who invented the electric candle which we described on page 339 of our last volume (June 2, 1877), has since made most important improvements in the method of electric illumination, which consist, first, in sub-dividing a current, producing a single too intense light in several smaller ones, say fifty, each producing a light of an intensity measured by one to fifteen gas burners; and, secondly, in abolishing the use of carbons in these smaller lights.

It may be well to observe here that the Russians are very deserving in the pursuit of science, especially the electrical branch: it was Jacobi, in St. Petersburg, who, forty years ago, made the first electrolytes and navigated the Neva with a boat propelled by an electro-magnetic motor; and now it is Jablochkoff who makes electric illumination such a success that it is bound to supersede other methods.

Since his first experiments with electric candles he found, that, if a continuous light is obtained by one single current in several of his candles, it is chiefly due to the fact that the isolating substance between the carbons is, at its upper end between the luminous points, in a highly heated and nearly fused condition. In this state it offers a much better conductor to the current than it finds between the carbon points attached to regulators where the current has to pass through the resistive atmosphere. Experience showed that with a certain tension of the current excited by the machine, the limit to which this current can be subdivided through the melted conductors is sufficient to generate several luminous points of relatively high luminosity. But no more than eight electric candles could, in this way, be fed by a single machine of middling size.

Jablochkoff, therefore, tried the action of the electric spark, produced by a current of high intensity, upon fire-proof bodies. He passed the current of a dynamo-electric machine through the inner wire of a Ruhmkorff induction coil, and caused the spark of the induced current in the outer wire to act upon small bars of kaolin, which were placed between the terminals of the outer coil. This current was strong enough to glow and melt small kaolin bars, but was not capable of making them highly luminous.

The next experiment was to pass the current through better conductors which would, as it were, attract the current, and which he fixed to the edge of the kaolin bar, which, being a conductor of great resistance, by passing a current of high intensity, became white hot, and emitted a fine light. A small consumption of kaolin was observed, which, during

the experiment, amounted to one millimeter (one twenty-fifth of an inch). The light, which in this way can be produced by the secondary wire of the induction coil, is seen in the form of a beautiful luminous band, which can be made to attain a much greater length than the induction spark obtained from the Ruhmkorff coil alone. But this luminous band, in place of disappearing with the spark, is a permanent source of light, which gives as quiet and steady a light as any other known source. In regard to the intensity of the light, this depends on the amount of wire and the size of the induction coil.

As it is possible to insert a great number of induction coils in the current of a Gramme machine, and as further the induced current developed by every coil can be subdivided into different sections, it is possible to attain a perfect subdivision of the electric light. Nothing is easier than to obtain in this way say 50 luminous points, of any desired intensity.

In the experiments referred to, induction coils of various sizes were used. The intensity of the light was various in proportion to the size of the coils. The intensity of the various luminous points was graduated in such a way that the weakest gave a light of 1 to 2 Argand burners, while the strongest was made equal to 15 burners. When machines producing alternate currents are used to excite the Ruhmkorff coils, the contact breakers and condensers of these coils become of course unnecessary. In this case the whole system of subdivision of the current can be reduced to one principal conducting wire, of which the function is performed by the primary wire of a Ruhmkorff coil, around which then as many secondary coils are wound as secondary currents are required. Every luminous point is then perfectly independent of every other luminous point, and can be ignited or extinguished without interfering with the others. The division of a current in a building to be illuminated with electricity becomes then similar to gas illumination. In a manufactory the illumination may be so arranged that the large rooms are illuminated by electric candles, the office, the entrances, the halls, etc., by the electric bands. The apparatus for small halls is of a surprising simplicity, and consists of a small porcelain rod, which is kept in incandescent condition with very little wear.

To recapitulate the results obtained by Jablockhoff we may say that they consist: 1. In a perfect subdivision of the electric light. 2. Perfect steadiness of the thus subdivided light. 3. The possibility to give any luminous point every desired degree of intensity. 4. Dispensing entirely with the carbons in lamps of smaller and medium luminosity.

NEW INVESTIGATIONS ON COPPER ALLOYS.

Professor R. H. Thurston has recently conducted, at the Mechanical Laboratory of the Stevens Institute of Technology, an extended series of investigations into the properties of the copper-tin and copper-zinc alloys. From the records of the researches we have, through the courtesy of Professor Thurston, gathered the more important results obtained, and they are herewith presented.

COPPER-ZINC ALLOYS.

The experiments upon copper-zinc were begun by casting one series of 21 bars, each 28 inches in length and 1 inch square in section, and then a second series of 20 bars of similar size. In the first series the proportions of zinc and copper differed regularly for each bar, to the extent of 5 per cent, bar 1 containing 5 per cent of zinc, bar 2, 10 per cent, and so on up to 100 per cent of pure zinc. In the second series the first bar contained 2½ per cent, and the last 97½ per cent of zinc, the relative differences being the same.

By examination of the color of these various alloys it appears that they may be divided into three clearly marked classes, viz: the yellow alloys, which excludes all those containing less than 55 per cent of zinc; the silver white and brilliant alloys containing between 60 and 70 per cent of zinc, and the bluish-gray alloys, containing more than 75 per cent of zinc. On applying tests for transverse strength, it appears that the first class above noted may be divided into two divisions, one showing considerably more strength than the other; in the first are included the bars containing from 17.99 to 33.50 zinc (and probably all the alloys from pure copper to the latter limit). These show a modulus of rupture (by which is meant a value proportional to the transverse strength of a bar, and which is theoretically equivalent to 1½ times the load which would break a bar of 1 unit in length, breadth and depth, supported at both ends and loaded in the middle) from 21,000 to 28,000, and are characterized by great ductility and an earthy fracture. The second division includes alloys from 38.65 zinc to 52.28 zinc inclusive, which show greater strength than the preceding. The point of maximum strength is determined to be between 38.65 zinc and 44.94 zinc. The second class of alloys show great weakness and lack of ductility. The minimum strength was found in alloy of 65 per cent zinc, the modulus of rupture being but ⅓ of the maximum. Alloys of the third class showed much greater strength than those of the second, but not equal to that of those of the first.

In tensile strength alloys containing up to 50 per cent zinc average 30,000 lbs. to the square inch and are classed as useful metals. 60, 65, and 70 per cent zinc alloys are very weak, the highest average being that of the 60 per cent alloy, which is 3727 lbs. to the square inch. The remainder of the 21, or third class, average from 18,065 to 5,400 lbs. per square inch; pure zinc being the weakest. The maximum strength is possessed by an alloy containing somewhat less than 44 per cent of zinc, and the minimum tenacity

is 1,774 lbs. per square inch in an alloy of 70 per cent zinc. In torsional tests the average results agreed with the foregoing. In compression the 55 per cent alloy showed a maximum of 121,000 lbs. to the square inch, pure zinc yielding at 23,000 lbs. Tests conducted on the second series of alloys closely confirm the results already stated and need not be detailed.

It is well known that, no matter how accurately alloys may be compounded, chemical analysis of the metal after casting often reveals a notably different composition. In analyzing the copper-zinc alloys above noted it was found that the only general differences, between the components of the original mixtures and those determined by analysis, was that in almost every case a smaller percentage of zinc appeared and a larger percentage of copper. The real decrease of zinc is believed to be due to volatilization of the metal in melting and casting. The average loss was from 1 to 2 per cent in a bar. In several bars a considerable amount of liquation took place, and in general the upper end of the bar contained the highest percentage of copper.

The variation of specific gravity with change of composition follows a very definite law, decreasing very regularly with the increase in percentage of zinc. None of the zinc-copper alloys have a greater density than that of pure zinc, the only apparent exceptions being caused by the presence of pores and other flaws.

COPPER-TIN ALLOYS.

In the experiments on the copper-tin alloys, bars of the same size as already noted were first cast. Two series of alloys were prepared, the first numbering 30 compositions, beginning with pure copper and then varying in percentages of tin from 1.9 up to 99.44 and ending in pure tin. The second series consisted of 20 bars ranging from 97½ per cent copper and 2½ per cent tin to 97½ per cent tin and 2½ per cent copper, with a regular difference of 5 per cent.

Alloys containing respectively 1.9, 3.73, 7.20, 10, 13.43, 20, and 23.68 per cent tin were found to have considerable strength; and all the rest of series 1 are stated to be practically useless where strength is a requirement. The dividing line between the strong and brittle alloys is precisely that at which the color changes from golden yellow to silver white, viz: at a composition containing between 24 and 30 per cent of tin. Alloys containing more than 24 per cent of tin are comparatively valueless. Tests by tension give results according with the foregoing. Generally it appears that the tensile and compressive strengths of the alloys are in no way related to each other; that the torsional strength is closely proportional to the tensile strength, and that the transverse strength may depend in some degree upon the compressive strength; but it is much more nearly related to the tensile strength as is shown by the general correspondence of the curve of the transverse with that of the tensile strength. The maximum crushing strength was given by the 30 per cent tin alloy and the minimum by pure tin.

The results of the tests for transverse strength on the second series do not seem to corroborate the theory given by some writers that peculiar properties are possessed by the alloys which are compounded of simple multiples of their atomic weights or chemical equivalents, and that these properties are lost as the composition varies more or less from this definite constitution. It does appear that a certain percentage composition gives a maximum strength, and another certain percentage a minimum; but neither of these compositions are represented by simple multiples of the atomic weights. Besides, there appears to be a perfectly regular law of decrease from the maximum to the minimum strength, which does not seem to have any relation to the atomic proportions but only to the percentage composition. On analyzing the copper-tin alloys there appears to be a greater loss of tin than of copper in the bars which contain the greater percentage of copper, and a greater loss of copper, than of tin in the bars which contain the largest percentage of tin; and that the bars which contain about equal amounts of the two metals show a great tendency to liquation. In the alloys containing less than 35 per cent of tin by original mixture there is a greater loss of tin than of copper, with but three exceptions. In the alloys containing more than 70 per cent of tin, there is a greater loss of copper than of tin, with only one exception. In all of the alloys of these two classes the extreme variation of a single mixture is 3.6 per cent, and generally it is less than 1 per cent. It further appears that the actual specific gravities of all the alloys containing less than 25 per cent of tin does not greatly vary from 8.95.

BALANCING EMERY WHEELS.

The proper balancing of emery wheels is of great importance, because the great speed at which they revolve causes the least defect in the balancing to vibrate the wheel when in motion. This vibration causes undue wear to the wheel as well as tending to throw the wheel out of true. Of late cast iron spindles are being introduced for emery wheels above 10 inches in diameter, and they require very careful manufacture to properly balance them. In the first place the existence of air holes is a great disturbing element, and in the next place the position in the mould, in which the iron is cast, is found to be of practical importance, because the iron at the bottom is found to be more dense and heavier than that at the top. To remedy these defects, the castings were given very large gates or runners, the cope of the mould being made extra deep for that purpose. This, however, proved successful for the prevention of air holes, but not altogether

so for equalizing the density, the difference between the top and bottom of the metal being very plainly perceptible. This led to the adoption of the plan of casting vertically as well as casting them in longer pieces, using only the lower end for the spindle. The result is, not only is the formation of air holes prevented, but the metal is at any part of its length of practically equal density diametrically. This, however, is of minor importance. The next consideration is to center the spindle to run as true as possible in the lathe, for the metal is always more dense at and towards the outside of the casting; and if more is turned off one side than the other the balance will be, to a like degree, affected. After the spindle is turned, its balance should be tested by placing it upon two knife-edged parallel pieces set horizontally true, and setting it in motion. Note the side that is downwards when the spindle comes to rest. If upon turning it upside down and end for end, and making several tests, the same side is always at the bottom when the spindle comes to rest, that side is the heaviest, and should be adjusted by boring a small hole, either in the end or upon the circumference.

The part of the spindle upon which the driving pulley fits should be made a neat driving fit to the pulley, so as to avoid the use of a key, which would destroy the balance. The centers of the spindle should be center drilled and countersunk, so that the spindle may keep true during the whole turning operation, the end faces being carefully turned true for the same purpose. The pulley should be cast with its diameter standing vertical, the hole should be bored out true and smooth, the wheel should be turned down to very nearly the finished size upon a temporary mandrel, and then placed in position upon the spindle and finished in the lathe while upon the spindle. Then the wheel and spindle together should be tried upon the knife-edged parallel strips in the same manner as the spindle was tested.

The washer should be cast flat and carefully turned true, the inside face being recessed to within about one quarter of inch of the circumference, which is done to ensure that it shall grip the wheel at and near its edge, thus holding it true as well supporting it as far out from the center as possible. The nut should be made very true, the thickness from the bore to each flat side being made quite equal. The best form of nut is a cylindrical one with two flat sides, which is the easiest form to make and ensure truth. The washer and nut should be placed upon the spindle, and the balancing of the whole again tested upon the parallel strips. The emery wheel may then be fastened upon the spindle, the bore being made a neat sliding fit, and then the strips should again be brought into requisition to test the balance while the whole are together. The wheel is very liable to require balancing, because it is very difficult to make a wheel of equal density throughout. If the wheel is out of balance it must be corrected in the wheel itself, and not by drilling holes in the spindle or pulley, because in that case the wheel, though balanced when new, will lose its balance as it wears smaller. It is necessary, therefore, to provide a center piece and to throw the wheel out of true in the lathe, taking care that the densest side is the prominent one; then by taking a cut down the radial face of the wheel, leaving it just true, the balance may be corrected. The center, however, should be thrown out but very little, and the balance tested. The process should be repeated till an exact adjustment is attained. By adjusting the balance in this manner, the spindle will, when once made, never require altering; and all that is necessary is to balance, in the manner described, each new wheel when it is put on, and the result will be sufficiently perfect for all practical use.

THE GREAT RAILROAD STRIKES.

The strike on the Baltimore and Ohio Railroad which commenced about the 16th inst. has assumed such character and proportions that the State authorities of Virginia were unable to cope with it, and the interference of United States authority has been called to quell the disturbance. If the organization of the train men is sufficiently perfect and extensive it will extend to many other roads. A strike and much trouble will result. It has already commenced on the Pennsylvania Central Road, and apprehensions of similar trouble are feared in Michigan. The strike on the Chesapeake and Ohio canal still continues. At Cincinnati developments indicate a strike on the several roads centering at that place. On the Central Ohio division, all freight trains have been detained. The employees of the Great Western Railroad of Canada are protesting against a reduction of wages, but have made no other move.

The employees of the western division of the Erie road have struck, demanding the pay received before the reduction and a free lease of property to squatters on the roadlands, and free passes to firemen, brakemen, switchmen, and trackmen, which the company refuse. Prospects are that the Ohio and Mississippi road may be included among the strike. The trouble on the Pittsburgh and Fort Wayne road is assuming a serious aspect. Meetings are being held by the employees of the Union Pacific, and an outbreak is feared.

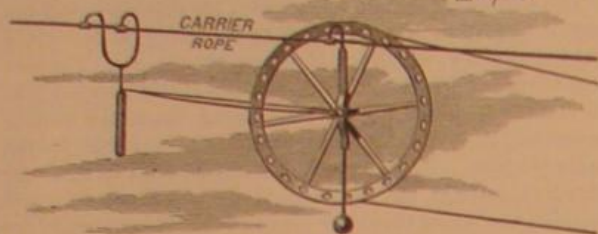
The central council of the Labor League of the United States held a meeting at Washington and have recommended moderation and to avoid strikes, and resolved that moral agitation is the strength and power by which labor can acquire tangible reformation and that mob violence and riot lead only to anarchy and final destruction of human liberty.

SHELLAC dissolved in alcohol will be found to be a good cement for broken furniture.

[Continued from first page.]

wheel of wood and tin, turning in bearings suspended from the rope; braces are arranged in connection with it to prevent oscillation. Over this wheel the bight of the wire to be laid is passed. One end of the wire is fastened, the other goes to the reel. Now the drum of the carrier rope turns, and the wheel attached to the latter starts on its journey. The wire gradually unwinds from the reel, the wheel goes on over the piers and finally comes to rest on the New York anchorage. There the bight of wire is slipped out of its groove and put around a massive iron shoe—about which we shall have considerable to say in our next article—and then the motion of the carrier rope is reversed and the empty wheel returns. At the same time another wheel carrying another bight of wire for the second cable starts across, and thus the work continues, a filled wheel constantly going out and an empty returning—two strands of two different cables being thus simultaneously made.

Fig. 3



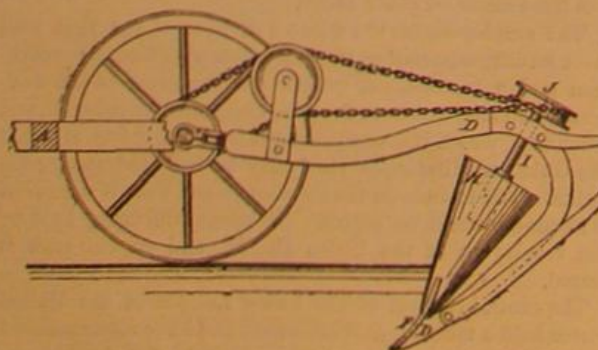
After each wire is laid it must be brought to the same curvature as the wire preceding it. To do this, after the carrier has passed the wire from the anchorage over the saddle at the top of the pier, it is stopped and a tackle attached as shown in the engraving. To ascertain the requisite amount of distance to be raised or lowered from the top of the pier to the anchorage is easily done, and we will suppose the tackle is released and the traveler has passed on its way to the opposite pier, where it is again halted and the tackle attached. Flagmen are stationed on the cradles, of which there are three between the piers, who report by means of pre-arranged moves of their flags to the flagman on the top of the pier the amount of deflection there may be in the wire, and it is accordingly raised or lowered, as may be demanded.

When the requisite number of wires are laid to form a strand, an apparatus called a "buggy," shown in Fig. 2, is attached to this strand and made to travel upon it. The workmen in the buggy gather the wires into a bundle and retain them with a pair of peculiarly shaped tongs and temporarily bind the strand with wire at intervals of about twenty-eight inches. When nineteen strands of the cable are finished and placed side by side, the wrappings about the strands will be removed, and the entire 5,700 wires will be bound together by encircling wires, so as to form a solid cable in which there will be no strands. After each strand is bound, the yoke, seen suspended above the massive saddle upon which the strand rests, is lowered; the clevises, of which there are four, are removed and, clasping the strand, are bolted in their former places. The capstan nut, seen at the top of the framework over the yoke, is rotated, and as it revolves on the screw to which the yoke is suspended, it raises both yoke and strand until the latter is clear of the pulleys on the saddle. The pulleys are then removed and the strand is lowered away into its bed in the saddle underneath the pulleys. The clevises on the yoke are then uncoupled, the yoke raised out of the way, the pulleys put in place, and another strand is laid similar to the previous one.

The saddles, to which reference has been made, are four massive castings resting on the top of each pier, and each one holding in its embrace one of the cables. The pulleys over which the strand passes are used for convenience in laying the strand and are removed entirely when the cable is complete and placed in its saddle. To allow for the difference in unequal contraction and expansion of the cable from anchorage and pier, and between the piers, the saddle rests upon a series of iron rolls, which allow of a change of its place, as the force of contraction or expansion is brought to bear upon it.

A ROTARY MOULD BOARD PLOW.

Mr. Charles V. Dyer, of Hallsville, Texas, has patented



through the Scientific American Patent Agency, May 22, 1877, the novel plow illustrated herewith. The rear parts of the beams, D, are curved forward to serve as standards for the plows, F. From notches in the top of the plow plates extend pivots which enter orifices in the ends of the cones,

H. The latter have spindles, I, which pass through the beams, D, and are surmounted by pulleys, J, to which motion is communicated by an endless chain actuated by the wheels. As the machine is drawn forward, the cones, H, are revolved so as to turn the soil as it rises upon the plows to one side, and at the same time break it up and pulverize it.

American Institute Exhibition.

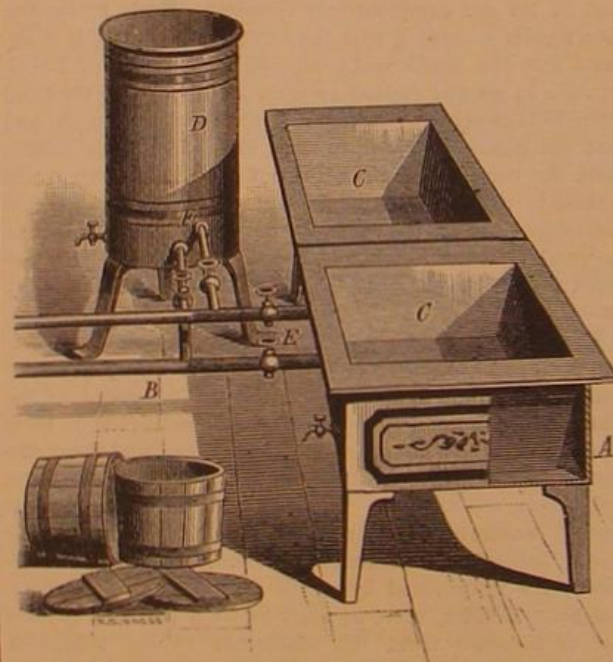
For forty-five years the American Institute of New York has opened its doors and invited American inventors and manufacturers to exhibit their productions; and again this year it renews its invitation to all. To such as wish to reach the capitalist and consumer, they must admit that New York is the place. For details apply to the General Superintendent, by mail or otherwise.

APPARATUS FOR PREPARING BUTTER FOR PACKING.

The usual way of softening butter for packing is to put it in a room that is heated by a fire to a temperature of from 80° to 100°, which takes from three to five hours to make the butter soft enough for work. Even then the butter is not uniformly softened, as some of it remains hard, while some is melted to oil, which is injurious to the quality of the butter. The invention which is illustrated is intended to obviate this defective feature. It consists of pans for holding the butter heated by a water bath, and connected with a regulating water tank, for taking up the excess of heat and hot water.

In the drawing, A represents a tank with entrance and exit pipes, B, for the steam or hot water, and valves, E, for admitting and shutting off the heat. The tank forms the water bath for the pans, C, into which the butter is placed for being softened. The tank is provided with a faucet for drawing off the collecting water, and the pipes, B, are connected with a water tank, D, having a similar discharge faucet. The water tank connecting pipe sections, F, has also valves which may be opened or closed, as required, the water in the tank serving to take up the excess of heat and hot water when the main valves, E, are shut off.

In operation the pans are to be heated to about 70° and the butter is placed therein, the workmen cutting up the rolls with ladles to expose the butter uniformly to the heat.



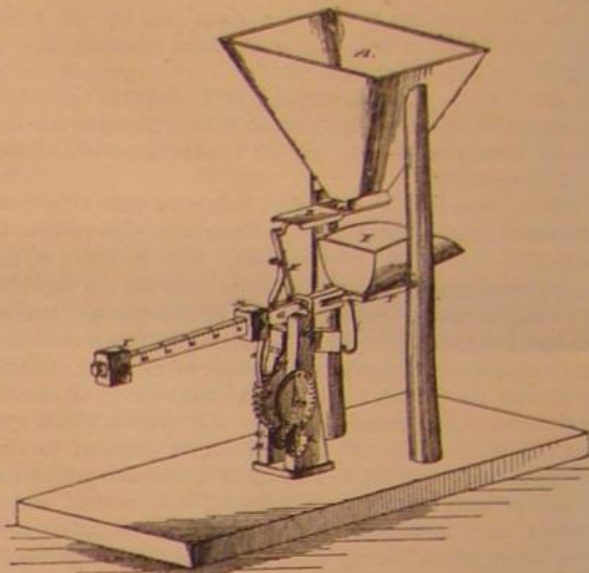
In from twenty to thirty minutes the butter is soft enough to be worked easily by hand with the ladle, the heat of the water bath producing thus about the same effect as the change of temperature from a cold to a warm day. The heat, however, is not sufficient to melt the butter so as to injure the same. Should the bath get too hot, the current of steam or hot water is shut off and conducted into the regulating tank.

Patented through the Scientific American Patent Agency, January 29, 1877, by Warren B. Bemis, of Cincinnati, Ohio.

IMPROVED GRAIN SCALE.

The annexed engraving represents a new machine for weighing and registering the weight of grain and other articles. A is the hopper or conducting pipe, from which the grain, etc., pass through an aperture in the bottom into the receiving vessel, F, to be weighed. Two rods, B, are fastened to the bottom of the hopper, one on each side of the aperture, for the purpose of connecting the slide, D, with the hopper, and on which the slide moves. C C are two pillars supporting the hopper. D is the slide which closes the aperture in the bottom of the hopper when the receiving vessel discharges its grain, and then returns to its former position, opening said aperture. E is an arm connected firmly to the upper side of the scale beam, G, and over the pivot, and attached to the slide, D, above, so as to govern the movements of the slide in opening and closing the aperture in the hopper. F is the vessel or scoop, resting, by means of the arms, T, on the large end of the scale beam, extending back under the hopper, from which it is filled, and when the weight balances the weight on the other end of the scale beam, it dips and turns on a pivot attached to the ends of the arms, T, and discharges its load. As the other end of the scale beam ascends, the slide, D, is forced back, closing

the aperture in the bottom of the hopper, so that no grain escapes while the vessel, F, discharges, after which weight, I, carries the vessel, F, back, withdraws the slide, D, and the vessel is again filled, the grain weighed, discharged, the weight registered, etc. G is the scale beam, H the movable balance, fastened with thumbscrew in the scale beam. O is a ratchet attached to the underside of the scale beam, so that as the beam returns horizontally, after the vessel, F, discharges, it turns the ratchet wheel one ratchet. P is the ratchet wheel between and supported by the pillars, and to



which the registering hand of the dial, R, is attached, and moves as the wheel moves, thus registering the quantity of grain weighed or the number of times the vessel discharges. U is a small cog wheel, arranged so that when the ratchet wheel, P, makes a revolution a small ratchet in the ratchet wheel strikes a cog and turns the wheel, which causes the hand of dial, S, to revolve from figure to figure, thus registering the number of revolutions made by the hand of dial, R, and the aggregate pounds or bushels weighed.

The device was patented February 27, 1877, by Mr. P. H. Cherry, of Parsons, Kansas.

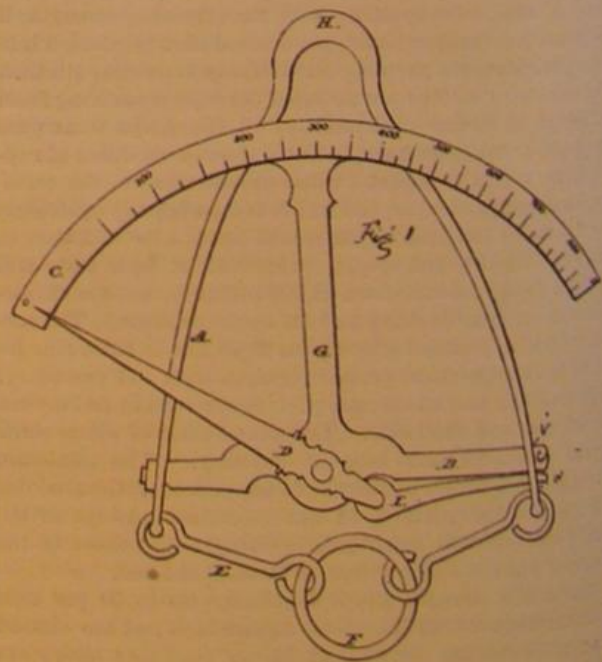
Cure for Small-pox.

Mr. Edward Hine, in the *Liverpool Mercury*, asserts that the worst case of small-pox can be cured in three days by the use of cream of tartar—an ounce dissolved in a pint of water, to be drunk at intervals, when cold. He pronounces it "a certain, never-failing remedy."

A NEW DYNAMOMETER.

This device consists in the employment of a bent spring, to the lower ends of which the draft connection is attached, and at the lower ends are slots through which pass a bar having one end rigidly secured to the spring, and the other end sliding in a slot in connection with a second notched bar, passing through a slot in the bent spring, the opposite end of the notched bar being pivotally connected with a pointer, which indicates, on a graduated arc, the draught force.

The spring, A, is preferably made of cast steel of suitable length and stiffness, rounded at its upper end to form a loop, H, by means of which it may be attached to the plow clevis, or other implement, the draught power of which is to be tested. Eyes, a, in the opposite or front ends of the spring, receive the links, E, and ring, F, forming the draught connection. B is a bar passing through slots, b b', near the outer ends of the springs, one end being rigidly secured by a bolt, or otherwise, to the spring, and the opposite end sliding in the slot, b', in the outer end of the spring. I is a bar notched at n, passing through the slot, b', the notch engaging in the



edge of the slot. To the opposite end of the bar, I, is pivoted the pointer, D. G is an arm attached to the bar, B, curved at its upper end, and carrying the indicator, C. Patented February 6, 1877, by Mr. Jesse Blackinton, of Roscoe, Ill.

THE AMERICAN TOAD.

The common American toad of the eastern United States is scientifically named *bufo lentiginosus*, Shaw; sub-species *Americanus*, LeConte (Professor Cope, and the Smithsonian Institution).

In Pennsylvania and New Jersey, from the latter part of March to the first week in April, according to the season, the toad quits its winter quarters. A week or so later it seeks a mate, when, most commonly at twilight, the buzz-whistling cry of the male may often be heard. The female deposits her spawn in the water, and the ova are fecundated by the male while they are being laid. They soon hatch, when myriads of larvæ, or little black toad tadpoles, may be seen in clusters in the shallow water of ponds and creeks, near the banks. The hind legs of the tadpole are the first to appear; the fore legs later, the tail disappears, and in a few weeks the young toads quit the water with the form they are to retain throughout life. In September the toad creeps into the mud of ponds and ditches, or digs a hole in a loose or sandy soil, and there hibernates.

This, like other batrachians, is insectivorous, devouring almost any kind of insect with which it meets, not excepting bees and wasps, although some have supposed differently. I have in several instances induced it to seize and devour pieces of raw beef, by impaling the meat upon the point of a piece of thin wire, and passing it in a swinging manner before the toad.

The toad has often proved itself to be a good collector of entomological specimens, for many rare and interesting insects have been found by extracting the stomach and examining its contents. By this means insects, not supposed to be found in a certain locality, have, on dissection, been found within a toad taken in that same locality. The prevalent supposition that, by handling a toad, excrescences will be produced upon the hands is entirely fabulous.

I have attempted to represent a toad creeping towards a beetle. This habit of creeping slowly upon its prey instead of always springing, I have also observed in various frogs (*rana*). Insects are sometimes frightened off by a sudden spring of a frog or toad before they can be captured, hence this habit of creeping.

Fig. 1 represents the internal organs of this *bufo*. Fig. 2 is the skull, viewed from above. Fig. 3 is the larva or tadpole.

C. FEW SEISS.

THE VAPART DISINTEGRATOR.

We annex an illustration, from *Engineering*, of a disintegrating machine largely used in France. It consists of a cast iron case provided with two doors, which can be opened, as shown, for inspection or renewal of the various parts. Through the middle of the case runs a vertical shaft, with bearings at top and bottom, and carrying at the upper extremity a pulley by which the shaft is driven. Within the case, three disks are mounted on the shaft at equal intervals. On these disks are bolted a series of radial ribs, as shown. Around the inner side of the case, as well as on the doors, are placed strong cast iron toothed segments, and beneath each segment is placed an inclined and curved plate. The operation of the machine is as follows: The material to be disintegrated is fed in from the top and falls upon the upper disk, and the quick rotation of the latter drives the material forcibly against the corresponding toothed segments. From here it falls down the inclined plates, and is delivered on the middle portion of the second disk, where the same operation is repeated on it, as well as on the bottom disk, whence it is delivered into a hopper below. The disintegration can be carried to any desired extent.

Cheap Coal and Water Supply.

Our manufacturers on the east branch of the Hoosac have been congratulating themselves on the abundant supply of water which they are now enjoying. This is like old times, when an equal and sufficient flow could be depended upon. The reason of this former affluence of water was that the native forests, as yet undestroyed, retained the water in the vast range of country over which they stretched, and rendered it gradually forth throughout the summer season. These growths of wood, when firewood was at so high a price, became, however, a rich source of income to our farm-

our factories to the former, and farmers, finding it of so little profit to hew wood on the mountain sides, have left off doing so. Consequently our young forests are springing up vigorously on every side, and the old localities are again being covered with a thick screen of verdure, which both attracts and retains moisture—hence the natural supply of water over which our manufacturers are now rejoicing.—*North Adams (Mass.) Transcript*.

Ruins of New Mexico.

The following notes, by William H. Jackson, of Profes-

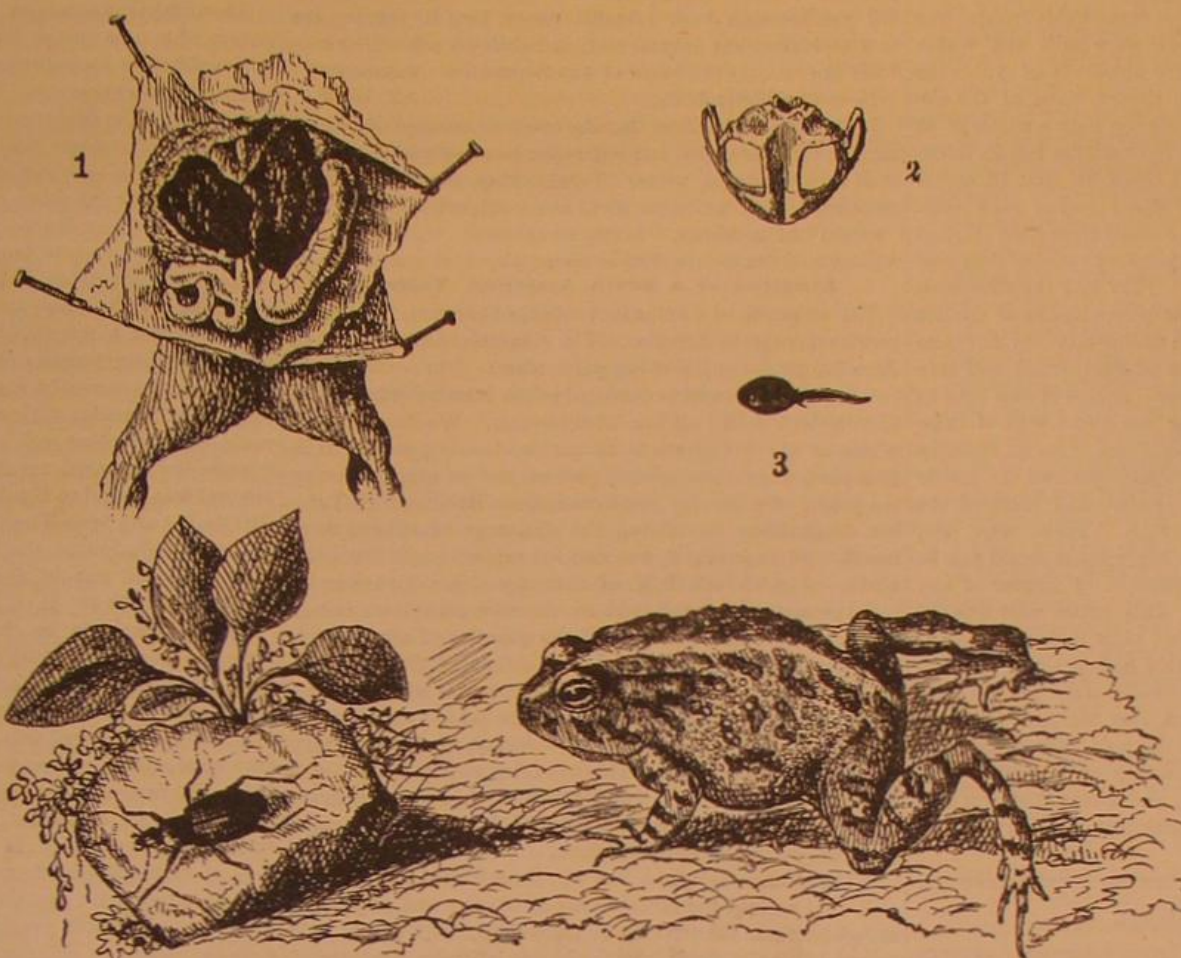
sor Hayden's survey, on the ancient ruins of New Mexico, and concerning a people about whom nothing is known, will be of interest to all readers:

Commencing with the first ruin, of the Pueblo Contado, as it is called, there are ten others along the cañon of the Chaos, two of them upon the bluff overlooking the cañon, and the others in the valley, all of similar workmanship, and manifestly the work of one people. They are remarkable in being dissimilar and immeasurably superior to any of the ruins yet discovered in America, or to any of the habitation of the present buildings. The large ruin in the Cañon-de-Chelly is of the same class, and is probably contemporaneous with them. The largest of the ten is the sixth, as we go down the cañon, called the Pueblo Bonits by Simpson, which is 540 by 310 feet in its diameter. The smallest is the ninth, and which is a regular parallelogram 78 by 62 feet. With but two exceptions all are built around three sides of a rectangle, with open court facing south and inclosed by a semicircular wall. One of the exceptions to this regular rectangular plan was the last one down the cañon, the

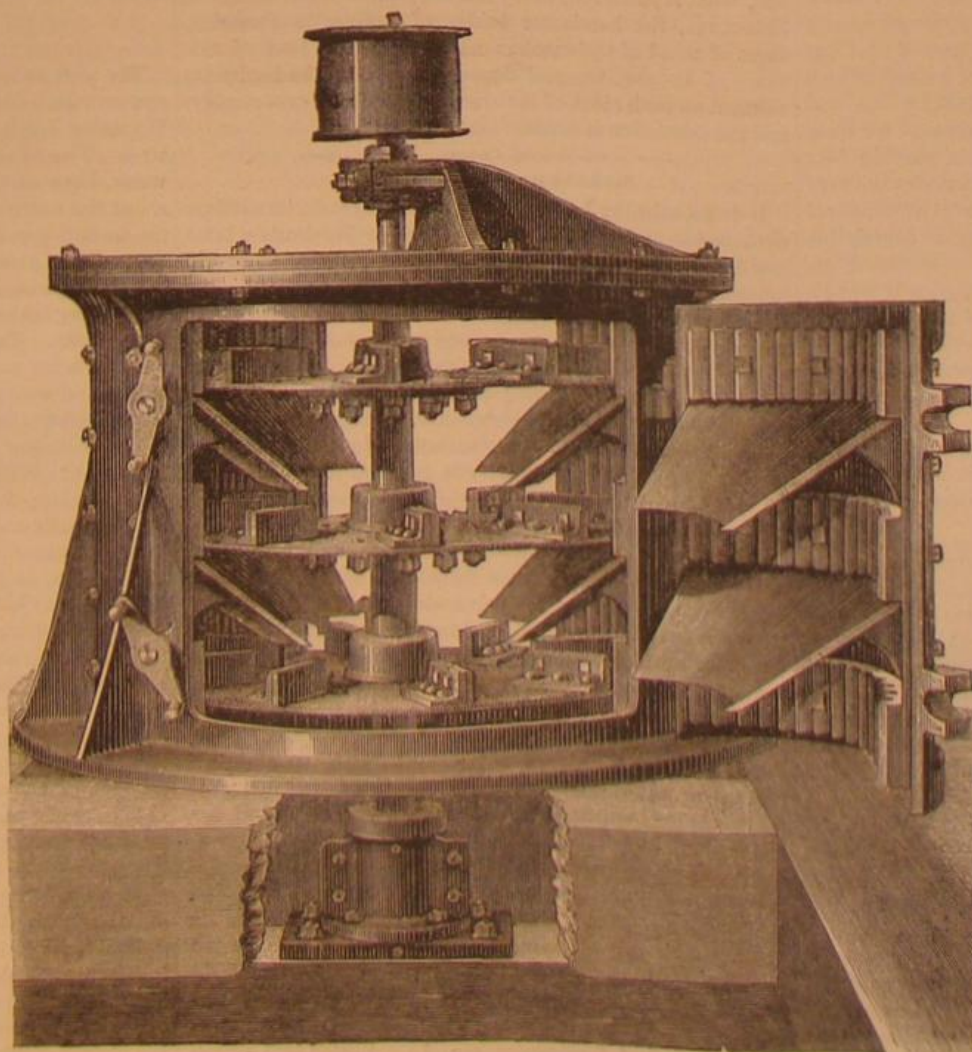
Pueblo Penasco Blanca, of perfect elliptical shape, 496 by 363 feet in its diameter, and the other, Pueblo Bonits, was a perfect half oval or of an egg-shape divided along its greatest diameter. In all, the ground plan of each could be made out with perfect instructions, and in nearly all an elevation through three or four of their stories.

A marked feature was the large size of the rooms. On the second flooring, in the Pueblo Pintado, the rooms averaged 12 by 20 feet, some being as large as 14 by 25 feet square and 12 feet in height. In the Pueblo Penasco Blanca the average length of the rooms on the second floor was 20 feet, some being as large as 18 feet. In the other Pueblos the average height between floors was 10 feet. This does not apply to the first or ground floor, which had a similar height and was divided into much smaller apartments. These were evidently for storage purposes, as is the practice with the Pueblos at the present time.

In five of the ruins we found entire and perfect rooms, preserved from the destruction by the strength of the regas or rafters supporting the floor above them. These we examined with much care and interest, and regretted that we had not the means of digging into others, which are intact beneath the *débri* of fallen walls. In all the rooms there was a notable neatness of finish, particularly of the ceiling, which, in the case of Penasco Blanca, were covered with thin boards of pine somewhat larger, but of the thickness of an ordinary shingle. All the larger beams, ten to fourteen inches through, were cut off square and smooth. Some of the rooms were plastered perfectly white, probably with the same *yaso* the Pueblos and Mexicans now use. On the walls of one of the small rooms of the Pueblo Bonits were scratched the names of Lieutenant Simpson and R. H. Kern, dated August 1849, and looking as fresh as if but a day old. There were at least two doors or windows in every apartment, of an average size of 26



THE AMERICAN TOAD.



THE VAPART DISINTEGRATOR.

by 42 inches. These were plumb to square, of equal width top and bottom, and in forming them the builders seem to have given their greatest care and attention.

A prominent feature in all these ruins were the circular rooms or *estufas*—their council halls or secret places for the practice of their ancient religion. The number of these from each Pueblo varied from but a single one up to as many as twenty-two; their average size was 25 feet in diameter, the largest being a trifle over 60 feet, and the smallest 15 feet in diameter. In two Pueblos these *estufas* had been divided into two or more floors, the beams still protruding from the walls. The interior walls were of the most perfect masonry and perfectly circular.

In all the ruined Pueblos the most remarkable feature was the skill with which the stone walls were built and which has enabled them to withstand for hundreds of years the ravages of human hands and the slower work of the elements. Commencing at the foundation with a width of 32 inches, each succeeding story was built a little less in thickness until the walls of the fourth floor are but 18 inches through, giving them a pyramidal shape and of such solidity that in some cases, although the floors have been crushed down and the crosswalks fallen, yet they remain firm and plumb nearly forty feet in height. They had their methods of laying the stone—big regular sandstone blocks of the size of two bricks, cut and ground to a uniformity—by alternate layers of these blocks with layers of very small and thin pieces of sandstone, generally three courses of the thin to one of the thick, and last by laying the entire wall of these excessively small pieces of thin sandstone. As an example of this last kind I measured off a square yard on the northern wall of the Pueblo of Chetto-Kethe, and counted the number of stones forming the surface. There were 450, each laid so close together that a knife blade could not be pushed between them, and not a particle of mortar of any kind appearing at the surface. This entire wall was 490 feet long, and originally fully 40 feet high and averaged 24 inches thick. Imagine the industry and patience of such builders. The interior of these walls were laid in with rougher stone, and with abundant clay mortar. Binding courses of pine sticks were laid in the wall, both transversely and longitudinally. Every doorway and window was framed with scrupulous exactness, and it would appear as if the plumb and square had been faithfully used in all their work.

Communications.

The Seventeen Year Locust.

To the Editor of the Scientific American:

H. J. Loomis, of Chesterfield, Ill., says, in the SCIENTIFIC AMERICAN of July 7, that what is termed the seventeen year locust appears every thirteen years. In 1829, 1842, 1855, and 1864 they appeared in that region. In Grundy county, Ill., they were numerous in 1854, and also in 1871. I read a few weeks ago that these locusts were appearing in great numbers, if I remember right, somewhere in Pennsylvania, and this is 1877. It does not correspond with either of the periodic appearances as noted above. Is it possible that Nature's operations are so widely variant in the same insect, in about the same latitude? One would think that a seventeen year locust, reasoning from analogy, would remain such in its habits, in obedience to the fixed laws of life; but if it be true that these three appearances of locusts (which by the way are not locusts at all, but cicadas) are one and the same species, can science reconcile or account for these wonderful discrepancies of their appearances, varying four years or more in different localities, and in latitudes not very widely apart? We think they must be different and distinct species. We regret we have not an entomological description of our seventeen year locust. One thing we distinctly remember, he had red eyes, which no other species of our acquaintance has. A specific description of a specimen of each of their appearances would determine the identity, or otherwise would show three species. Cannot the scientific readers of the SCIENTIFIC AMERICAN settle the question of identity?

Verona, Ill.

R. K. SLOSSON.

Pumping with Tight Connections.

To the Editor of the Scientific American:

In response to your wish for some experimental data in proof of my assertion as to the advantage of a tight connection, I relate the following. In 1874 I was employed by the Boston and Providence Railroad, to go to Mansfield, Mass., to make some soundings for water, which was wanted in large quantities. I drove two 3 inch wells 100 feet apart. They were 21 and 23 feet in depth driven through 3 feet of iron ore, which was very close and solid, effectually excluding air. In testing the wells as to supply, I used a Knowles steam pump, 2 inch suction, 1½ discharge.

When ready to make connection I found I had no reducing coupling suitable, and I inserted the suction pipe inside of the well tube in the same manner, but could not run my pump more than 15 minutes without drawing air, the pump running 34 strokes per minute.

Next day I made a tight connection and set my pump in operation. I was astonished at the result. I cannot give you any data on the first trial, for I kept none except the number of strokes per minute and the length of time of the run. On the second trial the pump was in operation one week constantly, from Monday morning at 8:45 until Satur-

day night at 5:30, pumping 165,000 gallons per day of 24 hours. I have tried the same thing many times and the result has always been the same.

Waltham, Mass.

J. R. SMITH.

Raw Taste of Tobacco.

To the Editor of the Scientific American:

I have been a slave of tobacco for so long that I have given up the idea of ever stopping the use of it. There is so much of the plug tobacco that causes the mouth to become raw, besides containing hair, feathers, and other little dainties too numerous to mention, that I have determined to use none but leaf tobacco hereafter. Will you be kind enough to tell me, through your valuable paper, how to remove the raw taste from the natural leaf, and oblige a subscriber who fully appreciates the value of the SCIENTIFIC AMERICAN?

New Cumberland, Pa.

J. W. F.

[ANSWER—We believe that the common method of removing the raw taste, that our correspondent complains of, is to soak the tobacco in urine. Tobacco thus treated and then sweetened with molasses dirt, is considered "lovely," the "solace" of mankind, "honey dew," etc.]

Eruption of a South American Volcano.

The eruption of a volcano, probably Cotopaxi, has caused serious damage in Ecuador. The Comercio de Guayaquil, of June 29, gives the following particulars:

"A volcanic eruption occurred in the interior at from 9:30 to 11 o'clock A.M., on the 26th instant. We do not know which of the volcanoes is in action, but suppose it to be Cotopaxi, which for a century past has had an eruption every ten years. On the day mentioned, from Babahoyo to Tumbez, detonations resembling the discharge of cannon were heard. At Yaguachi it was said the reports came from the north. At 6 o'clock P.M. of that day a heavy shower of ashes commenced to fall, and continued until this morning. A calculation has been made of the quantity of ashes which has fallen in thirty hours, and it is estimated that on each square kilometer of space 313 kilogrammes of ashes had fallen. A mineralogical analysis of the ashes is made with the following result: Volcanic ashes composed of exceedingly fine particles of lodestone, vitreous felspar, hornblende, and an amorphous substance. On account of the absence of acids in the ashes they are not likely to be injurious to the crops or cattle, as on previous occasions.

"The steamer Islay, on her way from Panama to Guayaquil, first noticed the fall of ashes at Manta, and continued to receive them till arriving at Guayaquil, from which it is inferred that the winds from the higher latitudes have carried them to a great distance. No doubt, as on other occasions, the ashes have been transported to a distance of two hundred leagues from the volcano which threw them out."

The authorities between Ambato and Guayaquil report that, at 10 o'clock on the morning of June 26th, a frightful noise was heard in Latacunga, which was followed immediately by a tremendous flood, which, taking the course of the rivers Cutuchi, San Felipe, and Yanayaco, and passing, washed the city to the chapel known as El Salto. The volume of mud and water was so great as to completely cover the hacienda Valle, including the distillery in front of Latacunga. The flood in its course carried with it many cattle, and, what is more sad, many human bodies. The bridge of Latacunga, the handsome bridge of Bolivar in Pansalco, those of wood of Culapachan and Patate, and that of masonry of Agoyan, were all destroyed. All of the haciendas situated on both sides of the river have suffered enormously, and the desolation is terrible and complete.

Renovating Grass Lawns.

It is astonishing how long a lawn will retain its verdure without assistance in the way of manure. No doubt a lawn gets impoverished in time by being continually cut; but still it seems to sustain little or no injury. The roots of grass appeared to be endowed with an extraordinary vitality, and the rains to which they are exposed recuperate them for the close cropping to which they are subjected, and perhaps the fact of the grass never being allowed to seed has also something to do with maintaining fertility. The vitality of grass roots is best exhibited in dry seasons. In the dry summer of 1868, I knew large trees to die through drought at the root, and many to be seriously injured; but though the lawn was as brown and dead-looking as if it had been scorched by fire, the grass was not killed. I thought it was in many places, for to all appearance the roots appeared shriveled up, as well they might be, being close to the surface, and the grass having been kept as closely shaven as a carpet till the drought came; but when the rains came in October it began to grow, and by next summer all traces of the drought had disappeared. It must not be supposed, however, that I approve of lawns being allowed to become exhausted; by no means. A starved sward is never a very green one, and greenness and freshness are everything in a lawn; and upon the whole it is not difficult to keep it in that condition, for, however neglected it may have been, it quickly responds to stimulating treatment. The best and most convenient plan is to apply artificial manure of some kind in the form of a top-dressing. Guano is good, but it does not produce the greenest verdure; soot surpasses it in that respect, and it is cheaper. It is not needful to top-dress the lawn annually, and when necessary most gardens should provide the materials. If all combustible rubbish in the way of prunings of trees, rakings of shrubberies, etc., be collected into a heap, they will serve not only to consume themselves, if set fire

to, and produce a good quantity of wood ashes, but will reduce to ashes all the short grass that has come off the lawn, weeds, roots, and other rubbish, and at the same time burn a considerable quantity of soil, which may with advantage be mixed with the ashes and the whole applied to the lawn as a top-dressing. There is hardly anything better than this for grass, and its effects are more lasting than guano or soot alone, and it may be applied without fear of injury. Should the lawn be mossy, it should be well harrowed with a rake first, and then cleaned and dressed.—Correspondent in the Garden.

The New Metals Ilmenium and Neptunium.

About thirty years ago R. Hermann announced the discovery of a new metal, ilmenium, accompanying tantalum and niobium in various minerals, and closely allied to them in its general characters. Several years later he relinquished his claims to the discovery, in consequence of researches by Marignac in the same field leading to entirely different results. Later investigations have, however, strengthened his belief in the existence of ilmenium, and in the February number of Kolbe's *Journal für praktische Chemie* he not only brings forward results tending to establish the individual character of ilmenium, but describes a new metal neptunium, belonging to the same group, and occurring in tantalite from Haddam, Connecticut. As the quantities obtained are small, the characteristic reactions limited, and as the spectral properties cannot be made use of, chemists will naturally reserve their opinion till confirmatory observations have been made by some other well known investigator. The following are the essential results obtained by Hermann. The mineral was found to consist of equal portions of columbite (ROMe_2O_2) and ferro-ilmenite (RO_2MeO_2). By fusion with potassium bisulphate the hydrates of the metallic oxides were separated out in the following proportions: Ta_2O_5 , 32.39; Nb_2O_5 , 36.79; Il_2O_3 , 24.52; Np_2O_5 , 6.30; total 100.

The hydrates can be changed into double fluorides, and from the greater solubility of potassium-neptunium fluoride, it may be obtained free from tantalum and ilmenium salts but retaining a small quantity of the niobium salt; these, however, on being changed into niobate and neptunate of sodium, may be separated on account of the greater solubility of the latter. By fusion of the neptunate of sodium with potassium bisulphate and treatment with water, the hydrate of neptunic acid was obtained in a pure condition. Neptunium may be distinguished from niobium and ilmenium by its having, along with tantalum, the property of forming an amorphous insoluble precipitate on the addition of caustic soda to the boiling solution of the fluoride; the other two form crystalline and easily soluble compounds. The very soluble character of neptunium potassium fluoride as compared with the corresponding tantalum salt serves to distinguish it from that metal. The reactions with phosphorus salts in the inner part of the Bunsen flame are the following: tantalac acid, colorless; niobic acid, blue; ilmenic acid, brown; neptunic acid, wine yellow. Addition of tincture of galls to solutions of the sodium salts give characteristically colored precipitates. The atomic weight of neptunium, determined from the double salt $4\text{KFl} + \text{Np}_2\text{Fl}_2 \cdot 2\text{H}_2\text{O}$, was found to be 118. Hermann has also obtained ilmenium in the form of a black powder by heating potassium ilmenium fluoride with potassium chloride and potassium.—*Nature*.

The Hayden Survey.

The area to be surveyed includes something over 30,000 square miles, divided into three districts, lying mainly in Wyoming Territory, but trenching on Utah and Idaho on the west. Two of these districts, the Green River and Sweetwater, have as their southern line the parallel 41° 45' (or about the northern boundary of Clarence King's survey of the fortieth parallel), and the parallel 43° as their northern line. They extend from longitude 107° to longitude 112°, and are separated by meridian 109° 30'. The Sweetwater Division taking the eastern portion and the Green River Division the western. The Snake River Division works an area extending as far north as 44° 15', and having the same meridians at east and west boundaries. The organization of the Green River Division is typical of all. It is composed of the following persons: Henry Gannett, Topographer in charge; Dr. A. C. Peale, Geologist; J. E. Mushback, Assistant Topographer; F. M. Eastman, Geological Assistant; two packers and a cook. Mules are used both for riding and for the conveyance of the outfit; i.e., tents, baggage, bedding, instruments, and rations. By using pack-mules we are rendered entirely independent of roads, and can move our camp to within a short distance of the mountain summit, and also feel sure that they will be able to endure a campaign where horses and ponies would be sure to fail us. All our mules have been in service since 1873, and after the first few days out fall into line like old veterans. It is amusing to watch them the first day. While the *aparejos* or pack saddles are being put on, they puff themselves out and hold their breath as long as the packers pull on the circingle. When the load is on and the mule allowed to go, the circus commences; and if any animal in the world knows all the inside mysteries of "bucking," it is a Western mule. Our packers, however, are tried men, and put the load on to stay, which fact the mule is not long in finding out, and after one or two mornings he travels along so demurely after the bell-mare that you can scarcely believe him the same animal. Packing is an art, and the head packer is an important person in the camp. He has charge of the constantly diminishing cargo which each morning has to be made up into "loads" of equal weights.

He also has charge of the train on the march while the scientific men are at work in the surrounding hills and mountains. The plan of work is about as follows: After breakfast the head of the party leaves word for the train to travel 8, 10, or 15 miles in a certain direction, and then to camp while the scientific corps spends the time in occupying the stations of the day. These are generally the highest points in the region, from which the topography can be readily made out. All mountain peaks, spurs, junction of streams, and hills are located by means of angles in connection with angles taken from other stations. The station is located by angles on the primary points determined by the party of primary triangulation, which traverses all the districts. Contour and profile sketches of the surrounding country are made, and elevations taken with mercurial and aneroid barometers, and by depression or elevation angles are taken with the gradimeter. The geologist makes sections of the rocks, giving their position, character, and thicknesses, notes the absence or presence of mineral matter, and makes a sketch showing the areas occupied by the different geological formations. Besides this, the general character of the country and its agricultural capabilities are noted. By 4 or 5 o'clock the work of the day is generally completed, and the party turns campward, striking the trail of the train, which is followed until the camp fire is sighted.—*Correspondence of the New York Tribune.*

The Adulteration of Food.

We take the following extracts on the adulteration of food from an article which recently appeared in the *Evening Post*: "While it is certain that needless alarm is frequently excited by exaggerated statements regarding food adulteration, there can be no doubt that many of the articles of food met with on our tables often contain foreign ingredients which are introduced either for the purpose of lessening their cost or improving their taste and appearance.

Flour is subjected to adulteration with other and inferior meals, such as rice, beans, rye, potatoes, and Indian corn, the addition of which cheapens the price and in some cases bestows a good color upon a damaged or inferior grade, or causes it to take up an abnormally large quantity of water. The addition of foreign meals to flour is practised, however, almost exclusively in Europe, as most of the substances of this class used have in this country a greater value than pure wheaten flour. A more probable illustration with us is the use of alum and mineral substances; the former is occasionally employed to impart a white color to the flour, the latter, which include sulphate of lime, kaolin, chalk, and bonedust, being used to produce increased weight. It has quite recently come to light that a flour containing ten per centum of a mixture of chalk, plaster of Paris, and barytes has for some time formed a steady article of export from Holland into other European countries. The presence of such substances as these can be detected by placing the flour in a long tube nearly filled with chloroform, shaking the mixture, and allowing it to stand, when the pure flour will rise to the top of the liquid, the heavier mineral adulterants sinking to the bottom.

Bread naturally contains the foreign ingredients added to the flour from which it is made; but in addition to these, other substances are sometimes used in its preparation. Alum is employed to prevent the action of the diastase upon the starch, and to prevent the bread from becoming sour and mouldy; and although this salt undoubtedly tends to accomplish these results and imparts a fine white appearance to the bread, its use is not justifiable. When taken into the stomach it is liable to occasion acidity and dyspepsia; furthermore, it prevents the solution of a large proportion of the gluten of the bread, thereby causing a decrease in its nutritious value. A far more reprehensible adulteration consists in the addition of sulphate of copper, which has the same effect on the color of the bread and on the diastase. Although this salt is but seldom employed, and then in very small amounts, its use is to be condemned in the strongest terms, as it acts as a virulent poison, and its effects are cumulative. A simple and delicate test for detecting the presence of copper is to moisten the suspected bread with a few drops of solution of ferrocyanide of potassium, which will cause a pinkish color to become apparent if the metal be present.

Pickles and preserves are often artificially colored. The deep green color frequently noticeable in the former is almost invariably due to the presence of a sort of copper (the sulphate or acetate), which is either directly added to them or is produced by using copper vessels in their preparation, both methods being recommended in several cooking books. This adulteration can be detected by allowing a piece of clean and polished iron to remain immersed in the pickling vinegar for a few hours; in presence of copper a thin coating of this metal will be deposited upon the iron.

The condiments used at the table are also frequently far from pure. Additional acidity is often imparted to vinegar by the addition of sulphuric acid, the use of which was formerly considered necessary in order to prevent its decomposition, and was allowed by law in Great Britain; but although the fallacy of this belief has been demonstrated, the practice is still resorted to. A few weeks ago five carloads of vinegar received in Washington from Chicago were found to contain over fifty-four grains of sulphuric acid per gallon, in the form of sulphate of lime, in addition to five grains per gallon of the free acid. On adding a little nitrate of baryta to vinegar containing sulphuric acid, a heavy white precipitate will be immediately formed.

The sophistications practised upon tea are large in num-

ber and often harmful in character. The greater part of the adulteration occurs in China, but the English and Americans appear to have become skillful imitators of the Chinese in at least some branches of this nefarious industry. Mineral and organic substances are used to increase the weight and bulk of the tea; fictitious strength is imparted to it by the addition of certain vegetable substances, and pigments are employed in order to produce a desirable color. The operation which is most generally carried on, at least in this country, is the artificial "facing" or coloring of teas. This practice is almost entirely confined to green teas, of which, it is said on high authority, but few grades reach the consumer in a pure state. The pigments most used for coloring green teas are Prussian blue, indigo, turmeric and china clay; the peculiar glossy appearance they frequently present being produced by means of black lead, talc, and soapstone. Other and far more dangerous substances, such as arsenide of copper, chromate of lead, and Dutch pink, are said to be sometimes employed. When hot water is poured upon a faced tea, the coloring matter present often becomes detached and either rises to the top or sinks to the bottom of the liquid, forming a sediment which can be readily recognized as a foreign body, especially by aid of a magnifying glass.

Coffee is probably more extensively adulterated than any article yet mentioned. When sold in the ground state it almost invariably consists of a mixture containing little or no coffee and a great deal of chicory and roasted grains, such as peas, beans, rye, and wheat. The addition of chicory is frequently defended on the ground that it improves the taste and quality of the coffee; but owing to its comparative cheapness, there is a great temptation to use an undue quantity of this substance, and unless the amount of the addition is specified on the packages (as is required in several European countries), it undoubtedly constitutes a true adulteration; moreover, chicory itself is very often mixed with foreign substances. Pure coffee will remain floating upon the surface of the water for some time, and fails to impart a perceptible color to it, whereas chicory and beans (especially the former) at once sink to the bottom and color the liquid decidedly. Other substances which also rise to the surface of the water can be easily distinguished from coffee by their appearance and taste. A simple test is to spread the coffee out on a slip of glass, slightly moisten it with water, and then touch the layer in different parts with the point of a needle; in this way the presence of soft, non-resisting foreign ingredients can be easily detected.

The artificial coloring of confectionery also merits consideration, owing to the important sanitary effects involved. One of the most common and deleterious substances used in the coloring of confectionery is chromate of lead, which is employed for the production of a yellow color. Red, another favorite hue, is obtained by means of cochineal, but such poisonous compounds as red lead and vermilion are also sometimes used for its production. Green and blue colors, which are fortunately less often met with, are usually produced by means of Prussian blue, Brunswick green, Scheele's green, etc., all of which must be classed as dangerous substances. These colors can be obtained by using vegetable dyes which are quite harmless; and although the tints are then less brilliant, this fact is certainly no excuse for resorting to poisonous pigments.

In most foreign countries effective means have been adopted to expose and prevent the adulteration of food, but with us little has been accomplished in this direction. In Europe boards of public analysis are appointed, who carefully examine suspected articles of food; here this duty usually devolves upon some member of the local Board of Health, whose time, as a rule, is fully occupied by other employment. During the last few years our Custom House officials have exercised commendable care in regard to the quality of the drugs admitted through the customs, and the question naturally arises: Should not at least equal importance be attached to the subject of the purity of the food sold by our grocers and consumed by our families?

Why are we Right-Handed?

Investigations which were very recently carried through by a French physician, Dr. Fleury, of Bordeaux, have adduced facts showing that our natural impulse to use the members on the right side of the body is clearly traceable to probably physiological causes. Dr. Fleury, after examining an immense number of human brains, asserts that the left anterior lobe is a little larger than the right one. Again, he shows that, by examining a large number of people, there is an unequal supply of blood to the two sides of the body. The brachiocephalic trunk, which only exists on the right of the arch of the aorta, produces, by a difference in termination, an inequality in the waves of red blood which travel from right to left. Moreover, the diameters of the subclavian arteries on each side are different, that on the right being noticeably larger. The left lobe of the brain, therefore, being more richly hematosed than the right, becomes stronger; and as, by the intersection of the nervous fiber, it commands the right side of the body, it is obvious that that side will be more readily controlled. This furnishes one reason for the natural preference for the right hand, and another is found in the increased supply of blood from the subclavian artery. The augmentation of blood we have already seen suggested; but the reason for it is here ascribed to the relative size of the artery, and not to any directness of path from the heart. Dr. Fleury has carried his investigations through the whole series of mammalia; and he

finds that the right handed peculiarities exist in all that have arteries arranged similar to those of man. At the same time such animals, notably the chimpanzee, the seals, and the beavers, are the most adroit and intelligent.—*The Eclectic.*

Stereoscopic Relief in Microphotographs.

It is not improbable that the announcement of a prize being offered by the Photographic Society of Great Britain for the best microphotograph will act as an incentive to those who may be halting between two opinions concerning the production of photographs of this kind for the forthcoming exhibition. To those feeling an interest in practical microphotography, whether they be intended exhibitors or not, we purpose giving a few practical suggestions and hints regarding this branch of science, although in connection with a certain department about which little appears to be known—that of producing stereoscopic effects in the enlarged images of minute objects to be pictorially delineated.

It is commonly believed that in order to obtain stereoscopic microphotographs a binocular microscope is essentially necessary. From what follows it will be seen that not only is this instrument unnecessary for the production of that class of work, but that in a majority of cases better results can be obtained without than with such an appliance. It is necessary that in all descriptions of binocular photography both images should be photographed under precisely similar optical conditions. In the case of that form of binocular microscope which has attained the highest measure of popularity in this country, such conditions are not possible, because of the dissimilarity of the images, one of them having to be transmitted through a prism, in the course of which it undergoes two reflections, while the other is projected onwards without having to undergo such treatment.

There are two other forms of binocular instruments in which both the dual images are necessarily similar, namely those of Nachet and Stephenson. In these the deflecting prisms are constructed in such a manner as to render both images strictly identical. But, however perfectly they may be constructed, they are still open to two objections—that of not being much used in this country, and of necessitating the formation of each of the images with only half a lens, or, at any rate, with one half of the objective. In a method we adopted several years ago, these drawbacks are entirely eliminated.

A single-barreled or monocular microscope of any convenient form must have fitted to it a super-stage attached to the main stage, and capable of being influenced by the rectangular or mechanical adjustment of that stage. This super-stage is so constructed as to allow of the small platform upon which rests the object slide to oscillate from right to left within a limited sphere. This is easily effected by having the slide holder pivoted at its two sides into guiding side pieces, the axis of motion being adjusted in such a manner as to nearly, if not quite, coincide with the object to be photographed.

The super-stage having been depressed at one side, a photograph of any suitable object is taken; after which, without moving the light, the camera, or any of the lenses, a tilt in the opposite direction is given to the stage, and a second photograph taken. The pictures obtained in this manner, when combined in the stereoscope, will show an amount of relief very astonishing.

The nature of the action by which this stereoscopic effect is obtained will easily be understood from the following illustration, which will approve itself to the ordinary, in contradistinction to the microscopic, photographer: At the distance of a few feet from an ordinary portrait camera let a bust or statuette be placed on a table. Now take a negative of the bust, and then, without moving the camera, or doing anything else than very slightly rotating the bust on its axis, let a second negative be taken. Prints from the negatives thus obtained will possess all the solidity of binocular pictures if examined in the stereoscope; nay, not only so, but unless special care have been taken not to move the bust too much when rotating it between the first and second exposure, the effect of relief in the stereoscope will be much exaggerated.—*British Journal of Photography.*

Improved Electro-Magnet.

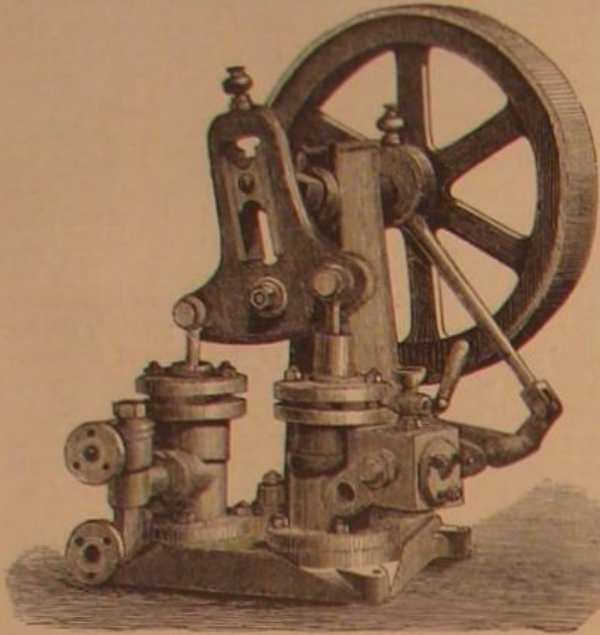
M. Cance has called the attention of the French Academy to a new system of electro-magnets with multiple cores, similar to that of Camacho, but with series of small rods of soft iron substituted for the tubular cores, and enveloping the different coils. The rods are all put in contact with the breech of the electro-magnet, and strongly fastened at their base with a bronze collar, so as to make one solid piece. This arrangement is said to offer the following advantages: 1. Retaining permanent magnetism very little (as the demagnetization of the rod is almost instantaneous). 2. Giving a sphere of lateral attraction as extensive as may be desired (since it is in relation to the number of rod cores). 3. Easier construction than that of electro-magnets with tubular cores. The sole inconvenience is that the system gives pretty strong sparks of extra current; but with systems of interrupters by deviation from the main circuit, or condenser, the evil may be obviated.

A Remedy for Bed Bugs.

A correspondent writes to the *British Medical Journal* as follows: "The best remedy for bugs in hospitals is a bug-trap made by boring a series of holes in a piece of wood with a gimlet, and placing this under the mattress of each cot. The piece of wood is to be placed periodically into a basin of boiling water. This is an Indian hospital plan."

NEW PUMP.

The novel pump illustrated herewith may be operated either directly or by steam, by the intermediation of a belt or by hand. The advantages are its solid construction, the vertical movement of its pistons and the small motive power required. When steam is used, but one of the two pump bodies acts as a pump—the other serving as a steam cylinder to operate the machine. If the fly wheel is replaced by a pulley, and the steam cylinder by a pump cylinder, the capacity of the pump obviously becomes doubled. The normal speed is between 60 and 120 revolutions per minute. The weight is 303 lbs. when steam is directly used, or 242



lbs. when the belt pulley is substituted for the fly wheel. When single the capacity of the pump is from 2 to 4 gallons. The apparatus is the invention of Mr. A. Schmid, of Zurich, Switzerland. We take our illustration from the *Revue Industrielle*.

The Black Fly in the Adirondacks.

There is such an insect as the black fly in the Adirondacks. He is a quiet, orderly little fellow, a hard worker, who goes steadily about his business, and earns his living by constant application. There is much to admire in this little insect. In the first place, he is industrious; he is also a generous liver; he is orderly in his habits; he goes to bed regularly at sunset, and arises regularly at sunrise. We think that he is a little more regular in getting up than he is in going to bed. He is also friendly to man. He will cleave to you closer than a brother. The constancy of his affection is remarkable. Once having formed an attachment he never deserts you, but clings to you until death do you part. He is not by any means a gourmand. He has a taste, and discriminates. His favorite feeding spot is just back of the ear, although in case of necessity he is satisfied with the nose. He likes a large nose, and we have never seen one so small that he could not make it larger in less than two days. We saw a nose last summer—at least, we suppose it was a nose—the man who owned it said it was—that was so enlarged that the gentleman expressed grave doubts as to his ever being able to take it home with him. We are inclined to think that he succeeded, for when we came out we heard of that nose until we reach Martins, where we were told it took the stage for Plattsburg.

But to sober statement. The black fly is not a very troublesome insect. It ordinarily disappears the first week in July. In wet seasons it carries a week or two longer. Care in selecting your camp ground, a piece of fine muslin three yards square to hang in front of your lodge, and a bottle of tar and oil for emergencies, give ample protection not only from black flies, but from the mosquito and gnat, which are, we think, far worse. It is the unanimous voice of our family that we have suffered more from mosquitos in Connecticut and Massachusetts, yes, and in the city of Boston even, than we have in the Adirondacks. With the precautions that we have suggested, and the exercise of a moderate amount of ingenuity, a party will not be greatly troubled.—*Golden Rule*.

Oyster Culture in France.

Under the fostering care of the Government, oyster culture in France is becoming more and more productive. A recent report by M. Bouchon-Brandely to the Minister of Marine contains a description of nearly thirty different localities, embracing some hundreds of beds, where the industry is carried on. One of the most curious facts in the report is that at Courseulles the oysters are actually trained to keep their shells closed, and thus retain their freshness while being carried to market. As regards the quantity of oysters which a small bed will produce, the following statistics may be quoted. At Grand Camp there were, at the time of M. Brandely's visit, 3,000,000 of oysters ready to be delivered for consumption. In 1875 the owners of a bed at L'Orient sold 5,500,000 oysters, 2,500,000 of which were ready for consumption. In an establishment at Le Breneguy 4,401,000 dredged oysters were placed on the beds in 1875-6, of the value of 118,425f., and in the same period 7,538,150 oysters were sold out of the same beds, valued at 202,801f. The difference between these two figures represents, to a certain extent, the annual repro-

ductive powers of the beds. The number of spat sold during the same time, either to the establishments on the coast or to strangers, and resulting from the clearing of the tiles used for collecting, was 26,176,309, representing a value of 192,385f. The growth of the oyster may be estimated from the fact that in 1873 there were placed on the beds at Regneville 83,000 young bivalves, measuring only two or three centimeters across. In 1874 no less than 65,000 of these same shellfish were sold in the markets, measuring seven to eight centimeters in diameter. The collectors used for catching the spat or infant oysters have been greatly improved during the last few years.

Portable Electric Light.

An ingenious little electric light apparatus has been invented by a Mr. Facio, of Paris, and is applicable to watches, walking sticks, and such like. The watch, for instance, to which it is applied, is united by a chain to a link bar, which may be placed in a buttonhole; another chain communicates with a pile which may be carried in the waistcoat pocket; to the link bar another chain is attached in communication with a receptacle or box containing wick, and a "Geissler" tube, which will transmit the spark produced by the electricity. Thus the time can be seen in the dark. The apparatus is composed of other conducting chains coming from the pile, and of a receiver which may be perfectly independent, the receiver being provided with a wick or bobbin, and the receiver may be made like a locket or other article, if desired; communication between pile and locket or other article may be produced by means of a button or other suitable appliance placed in any convenient position. The chains may be formed or composed of two wires and surrounded by insulating material, which latter may be covered with some precious metal or other material, as fancy or taste may dictate. The lighting material may be carried by the watch itself, or the light-generating apparatus may be provided with a case to hold the watch or other object to be lighted up, in such manner that the glass which covers the aforesaid case will receive the action of the lighting tube containing the "Geissler" tube, and the case itself will be independent of the object to be lighted.—*Exchange*.

IMPROVED CHICKEN COOP.

The object of the invention herewith illustrated is the preservation of chickens from the depredations of animals that prowl around during hours when the coops cannot be conveniently watched.

As shown in the engraving, an upright post bears upon its upper end a bar that is pivoted at the center. To one end of this bar is attached the coop, and to the other end a cord or line is fixed. When it is desired to place the coop in a position of safety, it is sufficiently raised by pulling on the cord, and is then held in place by belaying the cord to a cleat attached to the lower portion of the post. The at-



tempts of marauders will be futile to molest the poultry so protected.

This invention was patented June 5, 1877, by Robert L. and Nancy J. Todd, of Shamrock, Mo.

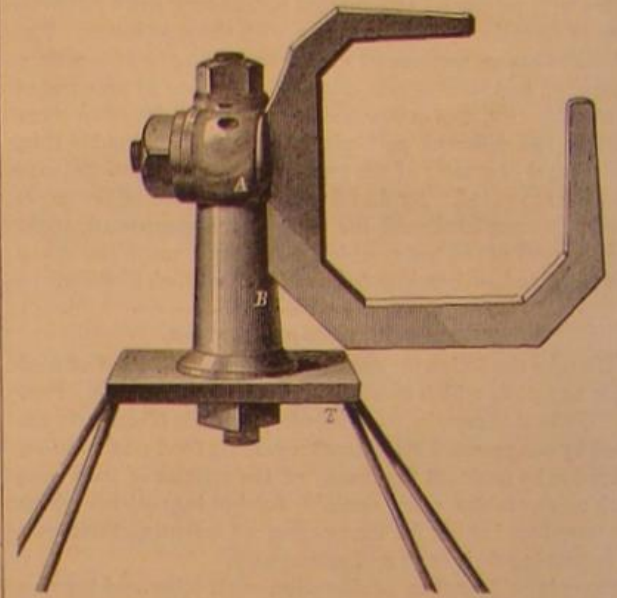
Iron Furnaces.

The whole number of completed furnaces in the country at the close of 1876, which were either active or capable of being transferred to the active list on short notice, was 714, against a similar total of 713 at the close of 1875. Ten new furnaces were completed in 1876, and 9 old furnaces were abandoned. The greatest activity in the erection of new furnaces has been shown in the Hocking Valley, in Ohio, where several bituminous furnaces have been built since the beginning of 1876, while others are now in course of erection or definitely projected. Of the furnaces which were built in 1875 and blown in in 1876, one of note was the Centennial

furnace of the Cambria Iron Company, 75 feet high by 20 feet at the bosh. Of 714 completed furnaces at the close of 1876, 236 were in blast and 478 were out of blast. Of 713 furnaces at the close of 1875, 293 were in blast, and 420 were out of blast. The productive capacity of the furnaces of the country is at least twice the actual yield of either of the last two years. The consumption of pig iron in 1876 was equal to that of 1871, when the "iron famine" began.

SPELMAN'S IMPROVED ROWLOCK.

The improved rowlock herewith illustrated is claimed to be so constructed as to reduce friction between it and the oar to a minimum. The inventor informs us that it mate-



rially increases speed in rowing, and that, while it is specially applicable to racing boats, it is equally well suited to boats to the gunwale of which it is attached instead of upon outriggers.

The construction is exceedingly simple and scarcely needs description. The lock is made square, with an opening sufficient for the admission of the oar, the loom of which completely fills the inclosed space. Upon a side bar of the lock is a journal which works in the pin block, A. Said pin block, in turn, works upon the pin, B, which is secured to the outrigger or to the gunwale by the nut shown. The hole in the pin block for the lock journal is on the inboard side of the main pin.

Patented through the Scientific American Patent Agency, May 15, 1877. For further particulars address the inventor, Mr. William Spelman, 37 Portland street, Portland, Me.

Ice Water.

The Cincinnati *Commercial* has recently published a series of articles pointing out the evil effects of ice water, and condemning its use in the strongest terms. In one of its articles it says:

A man, who in a state of perspiration, with the sweat oozing from every pore in his skin, should suddenly strip off his clothing and shut himself up in a refrigerator would be set down in public estimation as a natural fool, who defied Providence itself to save him from death. Such a thing actually happened in this city a few years ago, and the man was taken out of his icebox dead as a herring and stiff as a pikestaff.

Ice water arrests digestion, if it does not absolutely drive out all animal heat, and it is not resumed till the water is raised to the temperature required to carry it on.

Habitual ice water drinkers are usually very flabby about the region of the stomach. They complain that their food lies heavy on that patient organ. They taste their dinner for hours after it is bolted. They cultivate the use of stimulants to aid digestion. If they are intelligent they read up on food and what the physiologists have to say about it—how long it takes cabbage and pork and beef and potatoes and other meats and esculents to go through the process of assimilation. They roar at new bread and hot cakes and fried meat, imagining these to have been the cause of their maladies.

But the ice water goes down all the same, and finally friends are called in to take a farewell look at one whom a mysterious Providence has called to a clime where, so far as is known, ice water is not used. The number of immortal beings who go hence to return no more on account of an injudicious use of ice water can hardly be estimated.

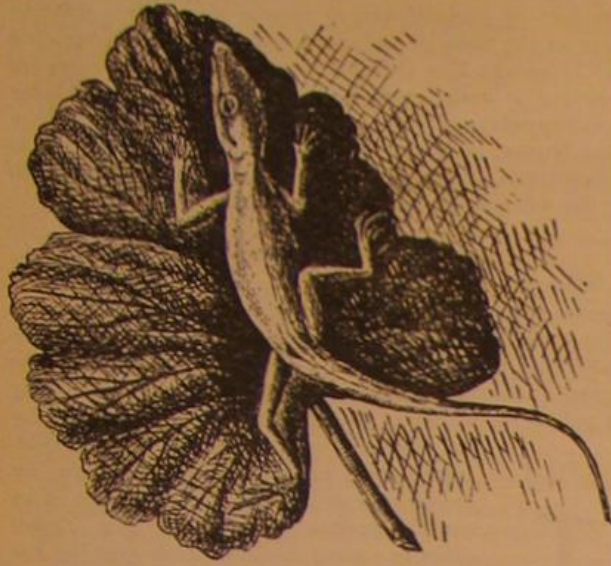
The article proceeds to show that in numberless cases fine teeth are totally destroyed by its use. It chills the teeth and cracks the enamel, then follows rapid decay and frequent visits to the office of the dentist.

In conclusion the article says: These remarks seem to be necessary, because ice is abundant and cheap this year, and the water drinkers are increasing in numbers, through the missionary efforts of the disciples of Francis Murphy. There is no objection, certainly, to the exclusive use of water, if taken as the Creator intended it should be. It is the excessive use of water, reduced below its average temperature with ice, that is to be condemned. It is an abuse of the stomach to use it, as it is an abuse of the stomach to put into it fluids that inflame its coatings and finally eat them away. We must put ice water and whiskey into the same *index expurgatorius*. They should be banished from private tables and banqueting halls, or used only to preserve articles of food in pickle or in the refrigerators.

THE CAROLINA LIZARD.

This little lacertilian reptile, of the family *Anolis*, is known to herpetologists by the name of *Anolis principalis* (Linnaeus). It is the *Anolis Carolinensis* (Cuvier) of Holbrook. It has been called a chameleon. It does not, however, possess the prehensile tail and elongated and extensible tongue of the true chameleon, but resembles it only in the changing hues of its skin.

The specimen in our possession, upon which the few following observations were made, was captured in Florida. Its prevailing color is grayish brown, with a slight greenish tint. In the night, when in a state of repose, the color has always been when observed, of a clear bright green above; the labials and inferior parts white, or grayish white. A few times only during the day has it assumed the green hue, yet this is the common color of the Carolina lizard when in a wild



state. The reason of this may be want of light-colored and green insect food. I have seen it of a uniform grayish-brown color above, with a few spots of clear green dispersed over the body. At one time it changed from lead-brown to clear, bright green, after it had crawled and remained upon some geranium leaves for a few minutes. It retained this color for over ten minutes, when, without quitting the leaves, it gradually faded into a uniform grayish-brown.

The inferior surface of the epidermis of this lizard seems to contain numerous minute glands or chromatophores, by means of which the animal can, by secreting pigments into them, or withdrawing the same, change from one color to another. Thus, when all pigment is entirely withdrawn from the chromatophores, the whole upper part of the animal is bright green colored; when partly filled, grayish-brown with a greenish tinge; and when entirely filled, dark grayish-brown approaching to lead color. When one portion of the pores is empty and the other filled, the animal is bi-colored, or spotted with green and grayish-brown.

The assertion that every scale of the animal is furnished with sets of muscles, and that the change of color is produced by the action of light alone, is at best doubtful. On the inner parts of the scales of the epidermis I observed numerous minute glands or ducts, but no separate muscle attachments.

Before the old skin is about to be cast from the head, it becomes whitish in color on the occipital and frontal regions, and around the orbits. From the anterior part of each eye, also around the eye, and extending to beneath each nostril, the skin is broken by forcing outward the eyes, and the muscles around them. The edge of the skin is then observed

to spring loose from the occiput, after which it is pushed off from the entire head by the fore feet of the lizard.

After the skin of the head had been removed, the skin of the new tail became lighter in color, and then parted along the dorsal line, when the whole of it slipped from the tail, a longitudinally hollow piece. When purchased our specimen was minus part of its tail, but a new one soon began to sprout, and now, an inch of new tail has been developed.

Our lizard is an expert fly-catcher, and it feeds almost entirely upon common house flies. It has eaten several Croton bugs (*Cetobia germanica*), also small beetles, day flies, moths, and butterflies. It does not swallow its prey whole, in the manner of a frog, but tears and mashes it with its teeth and jaws, before swallowing. It drinks often, licking drops of water from the leaves, and from the sides of its cage.

It became quite excited on seeing its reflected image in a small looking glass, and made a bold advance towards it, at the same time erecting and depressing its head rapidly. This nodding motion I have also observed in the horned toad (*Phrynosoma cornutum*, Harlan). As it is practised only at the meeting of individuals, it is reasonable to suppose it to be an action of greeting, or, in other words, a how-do-you-do nod.

From that remote period in the great chain of human development, when our forefathers were yet lizards, even to the present enlightened period, a nodding of the head was and is an action of salutation or friendly greeting; and although forgotten in many intervening links, it still survives!

A Move in the Right Direction.

The Massachusetts Society for Promoting Agriculture has offered a series of prizes for the encouragement of tree planting in this State—the awards to be made 10 years from the 1st of March next for the best results produced in the interval. The white ash, the European larch, and the white and Scotch pine are the varieties especially favored. Something has been done already toward promoting a new centennial growth of trees, and the inducements here offered will give another impulse to the work. Mr. Sargent, of the new Arboretum of Harvard College, estimates that over 1,000,000 trees will be planted in Massachusetts this year. In Connecticut the General Assembly of this year gave public sanction and encouragement to the same enterprise by exempting from taxation all plantations of timber trees to be thereafter planted, for a period of 10 years after such trees have grown to an average of 6 feet in height.

THE SEA MONSTER.

We are indebted to Lieut. W. P. Haynes, of H.M.S. *Osborne*, for the sketch of the sea monster seen by the officers and crew of that vessel off the north coast of Sicily on the 2d inst., notice of which we gave in the SCIENTIFIC AMERICAN for July 14. In a letter accompanying the sketch he says: "My attention was first called by seeing a long row of fins appearing above the surface of the water at a distance of about 200 yards from the ship, and 'away on our beam.' They were of irregular heights, and extending about 30 or 40 feet in line (the former number is the length I gave, the latter the other officers); in a few seconds they disappeared, giving place to the fore part of the monster. By this time it had passed astern, swimming in an opposite direction to that we were steering; and as we were passing through the water at 10½ knots, I could only get a view of it, 'end on,' which I have shown in the sketch. The head was bull-shaped, and quite 6 feet thick, the neck narrow, and its head was occasionally thrown back out of the water, remaining there for a few seconds at a time. It was very broad across the back or shoulders about 15 or 20 feet, and the flappers appeared to have a semi-revolving motion, which seemed to paddle the monster along. They were about 15 feet in length. From the top of the head to the part of the back

where it became immersed, I should consider 50 feet, and that seemed about a third of the whole length. All this part was smooth, resembling a seal. I cannot account for the fins unless they were on the back below where it was immersed."—*London Graphic*.

THE MOLE CRICKET.

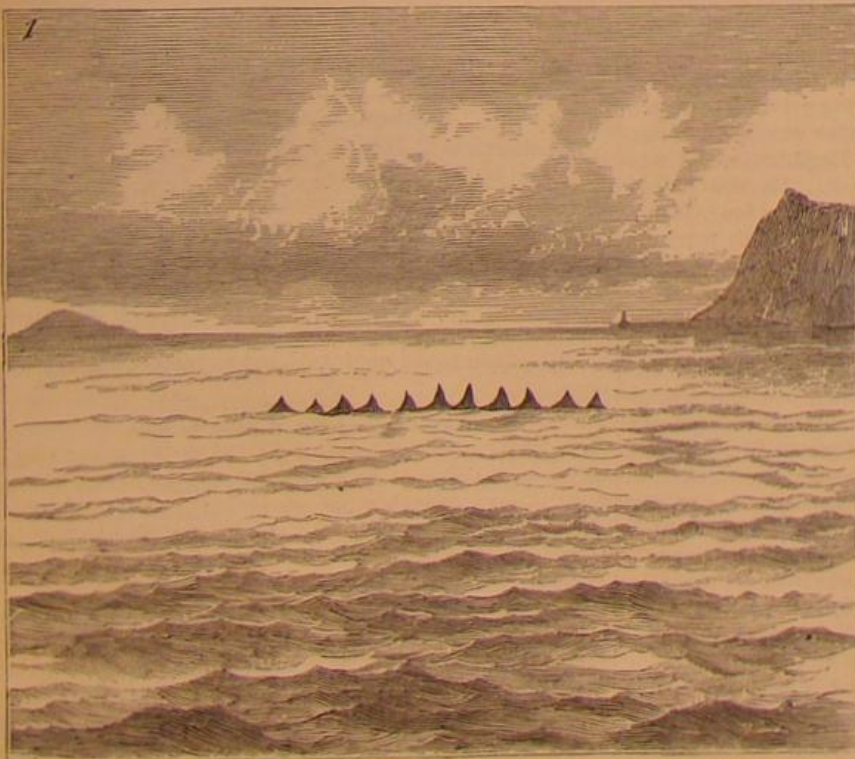
This insect is one of the most curious of all the orthoptera, to which order earwigs, crickets, grasshoppers, cockroaches, locusts, and the strange looking leaf and stick insects also belong; it is widely distributed over the world, from the torrid zone to the arctic circle; allied species inhabiting Java, China, Australia, Van Diemen's Land, North



and South America, and even Melville Island. It has been variously called eve-churr, churr worm, jarr worm, and crocker, names derived from its peculiarly jarring song; also fen cricket, earth crab, and mole cricket, the last being by far the most appropriate, and that by which it is generally known. With its powerful fore limbs it burrows underground, raising ridges in its progress. Its shape is long and cylindrical (a full-grown specimen measures 2½ inches in length by barely half an inch across the thorax), just that best fitted for locomotion through long narrow galleries; its color is a rich, dark, velvety brown of various shades, its thorax is very hard, and so formed that the head can be withdrawn into it, much after the manner of some tortoises; its whole body is covered with fine down. It has a long sensitive pair of antennae or horns projecting in front of its head, and another pair on its tail, projecting backwards, also very sensitive; and as it moves with equal facility either forwards or backwards, should danger threaten from front or rear, it is ready to escape without turning round, an operation which would be difficult or almost impossible in its narrow tunnels. Like all the crickets and grasshoppers, its nearest allies, its hind legs are formed for jumping; though perhaps not often employed for this purpose, they form the ordinary locomotive organs of the animal, both below and on the surface of the ground; the middle pair being comparatively weak, while the fore pair are carried raised up.

The fore limbs are rarely used in walking, but are the tools with which the insect burrows. They bear a very close outward resemblance to the fore pairs of a mole.

The mole cricket is furnished with two pairs of wings, the



A SEA MONSTER.

upper pair being small and serving as covers for the lower ones, which, when expanded, measure two and a half to three inches from tip to tip. They fold up very much in the manner of a lady's fan; and when in this condition, the points project somewhat beyond the end of the body.

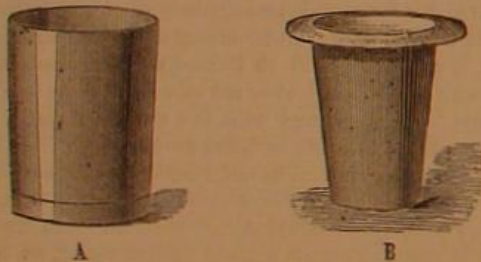
In May or June the female lays 300 or 400 eggs, which are about the size of turnip seed, but oval and yellowish, in a nest which she makes for the purpose underground, and which is thus described by Gilbert White: "There were many caverns and winding passages leading to a kind of chamber, neatly smoothed and rounded, and about the size of a moderate snuffbox. Within the secret nursery were deposited near 100 eggs, of a dirty yellow color, and enveloped in a tough skin. The eggs lay but shallow and within the influence of the sun." In a few weeks, according to the heat of the weather, the young are hatched. At first they are very small creatures, somewhat resembling black ants, very active and voracious in their habits. They grow rapidly, changing their skins three times before winter, when they hibernate, and, according to Rösel, cast a fourth skin during this period. The warmth of spring revives them, when they appear, having the rudiments of wings; and after one more change they become perfect insects, possessed of ample wings and in all respects similar to their parents.

Though having such large wings, the mole cricket does not appear to make as much use of them as might be expected. They never fly by day, remaining concealed in their burrows, but towards evening they may be found sitting at the mouths of the tunnels, uttering their "low, dull, jarring note," caused by the friction of one wing case over the other; and it is at this time, and during the night, that they are occasionally found upon the wing.

So destructive are these insects that they have been known to destroy a sixth, nay, even a fourth part of a crop of young corn. They are particularly fond of barley, young peas, and beans, and Mr. Brackenridge says "nothing in the herbaceous way is proof against its ravages." Many and various schemes have been suggested for their extermination. Louis XV. even purchased a recipe to kill them by first filling their burrows with water, and then adding some oil. Turpentine, soapsuds, soot, lime, and similar materials have also proved efficacious.

A SELF-COOLING GOBLET.

M. Toselli proposes the convenient little device illustrated herewith for cooling a tumbler of water by refrigerating mixtures. It is well adapted for localities where ice cannot readily be obtained, as by its aid a glass of fresh cool water can be produced in a few moments.



A is a simple cylindrical vessel which holds the water or beverage to be cooled. B is a smaller vessel with a flange around the rim, and which is placed within the goblet or tumbler, A. In the inner vessel, B, is dissolved the refrigerating mixture, about five ounces of nitrate of ammonia in water. The solution is agitated and in a few minutes the cold produced is said to be sufficient to lower the temperature of the water in the outer vessel some 50° Fah. The salt can be used over and over again, indefinitely, as it is merely necessary to pour the solution on a flat dish, when re-crystallization will take place as evaporation progresses.

The Great Lick Telescope.

Richard S. Floyd, one of the trustees of the Lick Trust, has just returned from an extended European tour. During his absence he has talked with many scientific men of this and other countries, but almost invariably found them afraid to commit themselves to an opinion as to whether a greater success can be obtained with a reflecting or refracting telescope. Professor Newcombe, of the Observatory in Washington, after his visit to Europe to look into this matter for Mr. Lick, reported warmly in favor of a gigantic refractor, and forwarded estimates as to cost. He has since changed his opinion, however, and now recommends a silver-on-glass reflector of about seven feet diameter. Ross's, Herschel's, and other celebrated telescopes have speculum metallic reflectors, which have until lately been considered the best. Now the palm is claimed for an invention of Leon Foucault's by which silver in solution is deposited on glass. Foucault made a reflector upon this system about thirty-one and one fifth inches in diameter, and excellent work has been accomplished with it. After his death a reflector upon his plan about four feet in diameter was constructed for the observatory. Owing to some not thoroughly explained cause, this has not proved a success, and another of the same dimensions is being constructed to replace it. Great interest is manifested in the result of this second experiment, which cannot be proven for a year yet. Dr. Huggins, the well known astronomer, also favors a large reflector, as it is better for spectroscopic analysis, his favorite study. It is natural that he should prefer a reflector, as he desires to have the field of physical astronomy enlarged.

Theoretically, a reflector of 4 feet in diameter is about equal to a refractor of 26 inches. The Ross reflector is 6 feet in diameter, only 4 feet of which are effective, and so far it has not been proven that more than 4 feet of a reflector can be made effective. The great trouble with the reflector is that it is very sensitive to atmospheric changes, while with the refractor the difficulty lies in the secondary spectrum. The object glass of the refractor is composed of two glasses joined, the outer being of crown glass, the inner of flint. Rays passing through the crown glass are refracted. The consequence is that perfect achromatism is impossible, and the difficulty of compensating these refractions increases with the size of the object glass. The largest refractor in the world is that in the Washington Observatory; it is 26 inches in diameter, and is an excellent instrument.

Mr. Floyd said that, after a careful examination as he could make, he is inclined to believe that the best interests of the fund will be served, to have constructed a larger refractor than any yet made. This ought not to cost complete more than \$150,000. Then there will be a subsidiary refractor, about four feet in diameter, supplied with both silver-on-glass and speculum metal mirrors. Such an instrument has been offered, or rather parties have agreed to construct one, for about \$20,000. Tell, of Paris, will undertake to make crown and flint glass disks for the object glass of a forty inch refractor for \$20,000—stipulating that he shall be allowed two years for construction.—*San Francisco Bulletin*.

Preventing Suffocation by Smoke.

I will give some suggestions for the prevention of suffocation by smoke. A pillow case, well saturated with water, and having a small hole torn in it to look through, placed loosely over the head, will be found an admirable impromptu respirator in the densest smoke. I am indebted for the idea to Vice-Admiral Jerningham, who told me how, when he commanded the Cambridge training ship at Plymouth, he made his first experiment with this pillow case respirator. He had 12 lbs. of loose powder exploded in a confined part of the ship, which, although screened off with fear nought, emitted so dense a smoke that those outside had to lie down on the deck. A common pillow case, with a small eye hole, was placed over the head of a man, who, with the hose in the hand, went inside and remained ten minutes, when, to assure his friends outside of his safety, he sang a comic song.—*W. H. Lewis, in London Times*.

Fight between a Turkish Monitor and Four Torpedo Boats.

A most interesting affair occurred on the Danube here during the operations attending the passage of the Danube—a fight between a Turkish monitor and four Russian torpedo boats. It was somewhere near the mouth of the Aluta. This monitor had been giving the Russians a good deal of trouble, and showed an amount of activity and energy very unusual with the Turks, continually shelling the Russian batteries, and destroying the boats. The Russians accordingly determined to destroy it.

Four torpedo boats were prepared and sent against the monitor. Hiding behind an island, they laid in wait, and when the vessel was steaming past suddenly darted out from their hiding place, and bore down on her in broad daylight. This monitor, it soon became evident, was handled and commanded in a very different manner from others with which the Russians have had to deal here. With wonderful quickness and skill she was prepared for action, and, nothing daunted by the fate of others, made a successful defence against the four terrible enemies, a defence of which the Russians speak with the greatest admiration.

Her commander began by likewise thrusting out torpedoes on the end of long spars, thus threatening the boats with the danger of being blown into the air first, at the same time opening a terrible fire on them with small arms and mitrailleuses. He beside manœuvred his boat in a most skillful manner, with a dexterity and address which, with the torpedoes protecting, made it impossible for the Russian boats to approach sufficiently near. He beside tried to run them down and very nearly succeeded in doing so. The reason soon became evident. The commander was a European, whom the Russians believe was an Englishman, and who directed the movements from the deck. He was plainly visible all the time, and was a tall man, with a long, blonde beard, parted in the middle. He stood with his hands in his pockets, giving orders in the calmest manner possible.

The torpedo boats continued their attempts for more than an hour, flitting round the monitor and seeking the opportunity to get at her, but without success. The monitor was equally active in trying to run them down, avoiding a collision by quick and skillful movements, backing and advancing, turning, and ploughing the water into foam as she pursued or avoided her tiny but dangerous adversaries—a lion attacked by a rat. At one moment one launch, in rapid manœuvres, found itself between the monitor and the shore, with no great distance between them. The monitor's head was in the other direction, but her commander instantly began backing her down on the torpedo boat, with the intention of crushing it against the bank.

Just at this moment the engineer of the launch was wounded. There was some confusion and delay in starting the engines, while the current carried her head aground in such a position as to render escape impossible. One of the crew sprang out into the water and pushed the ground, while another started the engines just in time to escape with a scrape, the shave was so close. One Russian officer sprang

ashore, and seeing the captain of the monitor coolly standing on the deck with his hands in his pockets emptied his revolver at him, three shots, at a distance of not more than forty feet. The captain of the monitor, in answer, took off his hat and bowed, not having received a scratch. Later, however, the gallant fellow seems to have been killed or wounded, for he suddenly disappeared from the deck. The monitor immediately afterward retired precipitately from the scene of action.—*London Daily News' Turin-Magurelli Correspondence*.

Iron Ship Building.

The report of the Secretary of the American Iron and Steel Association furnishes the following statistics of iron shipbuilding. Of the 25 vessels built in the fiscal year 1876, 2 vessels, aggregating 139-78 tons, were built at Buffalo; 1 vessel of 12-99 tons was built at Burlington, N. J.; 11 vessels, aggregating 11,980-94 tons, within the jurisdiction of the port of Philadelphia; 9 vessels, aggregating 8,298-08 tons, in the State of Delaware; and 2 vessels, aggregating 915-12 tons, at New Orleans. At the present time there are building or under contract on the Delaware river, 9 large iron steamships of the best class, ranging from 1,800 to 2,500 tons burden, including two monitors for the United States Government, besides a number of powerful iron tugs of 200 or 300 tons burden, and other small craft.

Cutting off Strawberry Runners.

When it is not desired to propagate young plants, strawberry runners should have their runners removed several times during the growing season; and where half an acre or more is cultivated, the trouble and expense are considerable. The operation is usually performed with shears, or by pinching or pulling off by hand. To save the back ache induced by the operation, we publish (Fig. 1) an engraving showing an attachment to the shears by means of which the work may be done in an upright posture. The *Rural New Yorker* gives two other devices which expedite the operation, and make it far less wearisome. In Fig. 2, B is a circular piece of iron, from seven to ten inches in diameter, one inch wide, about one quarter of an inch thick at the top and beveled to an edge at the bottom; two iron strips, P P, are welded or riveted at opposite sides, as shown, and bolted to the handle. By placing the cutting ring, B, around the hill and pressing downwards, all the runners underneath the edge are instantly severed. Should the soil be hard, or the cutting edge dull, a quick thrust with the foot upon the rest, A, will do the business.

By this plan a large patch can be freed from runners in a few hours. A cheaper implement is shown in Fig. 3. H is a circular and thin wheel, of iron or steel, from four to six inches in diameter, ground sharp at the edge, and attached to a stick (an old hoe handle will answer). If inserted in a slit made with a coarse saw and held in place by a rivet, it revolves easily. Run it half round the hill in one direction, then as far in the other, and it is done; you can cut as close to a hill or as distant from it as you like. It may also be used for cutting seeds in squares, preparatory to being cut loose at the bottom with a shovel.—*Weekly Globe*.

Earthquake in Tennessee.

The afternoon of July 14, a distinct shock of earthquake was heard by the residents of Memphis, Tenn. There were two heavy shocks, accompanied by a rumbling noise which once heard can never be forgotten. The "shocks," so to speak, lasted several seconds, in fact almost half a minute, during which time buildings quivered and windows rattled, as moved by the mysterious force within. In several instances the floors of the dwellings were sprung and caused no little alarm to the occupants, but no further damage was done.

Coal Area of the United States.

There are only 450 square miles of anthracite coal in the whole United States. The Reading Company owns no less than one third of the whole. Of bituminous coal land there are in America 200,000 square miles, and 8,000 square miles in Great Britain.

One of the old landmarks of Baltimore, the City Hall, on Holliday street, is soon to be torn down. It was built by Rembrandt Peale in 1813, as a museum, and was a popular place of resort for nearly seventeen years, when it was purchased by the Common Council. It was the first building in the city that was lighted with gas—Mr. Peale charging a small fee in 1816 for the exhibition of carburetted hydrogen gas.

About Nails.

Most people have to use nails of one kind or the other every now and then, yet few persons know how or where they are made, or have given any thought as to the way in which they are disposed of. As in the case with pins, nails are to be bought very cheaply, and are so abundant that one naturally inquires where they all go. Hardly any description of hardwares can boast of a more respectable antiquity than nails, inasmuch as they are mentioned in the fourth chapter of the Book of Judges in conjunction with the killing of Sisera by Jael, and in sundry other parts of the Bible. There can be little doubt, nevertheless, that the nails of olden times were but clumsily shaped pieces of iron, which undoubtedly served the purposes for which they were used, but would be very unlike the articles bearing the same name nowadays.

Throughout the Middle Ages the only way in which nails were made was by hand, and it was not until the seventeenth century that it dawned upon one mind, at least, that it was possible to produce them by means of machinery. The first evidence of this interesting fact we find in a State paper, which records that in the year 1606 letters patent were granted by our well beloved monarch, King James, to his trusty knight Sir Bevis Bulmer, for the latter's invention of this ilk. We find it recorded that the said Sir Bevis Bulmer "hate invented a new, Apt, or Compensious forme or Kinde of Engine or Instrument to be put in vse, driven, and wrought withall by Water or Waterworks as well for the concerning a Quicker and more Apt and Speedy Ways and Meanes then Knowne, expimented, and vsed within our Realmes and Domynions within the Tyme of Man's memory for, in, about the cutting of iron into small Barrs or Rodd to serve for the making of Nayles, for the necessary vse and service of vs and our subjects," and so on, with much more ingenious, but tedious, legal verbiage. Sir Bevis, however, does not appear to have been very successful with his nail rod machinery, and as time grew older other trusty subjects of various subsequent sovereigns tried to mend matters, with no very encouraging success—in fact, it was not until the beginning of the present century that machinery began to be utilized in a practical and commercial way.

In the year 1811 a Birmingham firm made the experiment of cutting nails out of sheets of iron by ingeniously contrived machinery, and by the year 1820 such improvements had been made as had placed the experiment beyond the bounds of hypothesis, and within the circle of trade routine. About the same time some American manufacturers adopted similar processes, so that the use of this kind of machinery would appear to have been almost contemporaneous in both countries. Since that time there have been hundreds of patents taken out in this and other countries for inventions and improvements in the making by machinery of the multitudinous sorts of nails; but in all, the leading principle has been the same, so that the inventions of to-day are simply more or less ingenious variations of the original idea.

Despite the great and important magnitude of the cut nail industry—all machine-made nails are called cut—at the present time, there is still a large business done in hand-made articles, and many thousands of workpeople, of both sexes, are employed in their production. The Black Country—at Dudley, Netherton, Sedgley, Gornal, Wordsley, Rowley, Cradley Heath, Lye Waste, Harborne, Birmingham, Stourbridge, West Bromwich, and other towns and villages—is the center of the wrought or hand-made trade; but it is also very extensively carried on at Sheffield, Rotherham, Grenoside, Belper, and many smaller places in Derbyshire, Worcestershire, and South Yorkshire. Prior to the general use of machinery there were something like 50,000 hands employed in the trade in Staffordshire alone, whereas at the present time the number of wrought nailers in that district does not exceed 17,000 or thereabouts.

Formerly the great London dock companies—the East India, West India, London, etc.—used to contract for nearly 200 tons of hand-made nails annually—most of them for tea chests; but now they only use an infinitesimal proportion of the same goods. In the same manner the Admiralty, 50 years ago, had nearly 700 tons of wrought nails yearly, a quantity which has dwindled away to almost nothing before the growing cheapness and quality of cut nails. Then, too, foreign competition has been a serious matter for the hand nailers, inasmuch as the American manufacturers have not only learned to supply the requirements of their own country, but now also furnish the Canadians with all the cut nails they need. On the continent of Europe the same thing has taken place, the Belgian production of machine-made nails being, roughly speaking, 30,000 to 35,000 tons yearly—a portion of which is sent to this country. The hand workers, however, have all along made a running fight against the machinery, which has, nevertheless, so surely usurped their places, and have on many occasions committed acts of such violence as have placed them beyond the pale of public sympathy. Their employers—all of whom find the iron and pay so much per 1,000 or per lb. for the nails made therefrom—reduced their wages in 1837, in 1838, and in 1842. In the last mentioned year there were very serious disturbances in the neighborhood of Dudley, but in the end the poor nailers were worsted, as they have been on many subsequent occasions. At one time the vile truck system flourished in no trade so boldly and mischievously as in this, but since 1850 the practice has to a great extent fallen into desuetude, although still in vogue in an underhand and surreptitious manner here and there. The men work at their trade in little smithies attached to their dwellings, and in many instances their wives and children also labor in the same manner. The men can earn

about 10s. to 16s. weekly, women 6s. to 8s., and children from 3s. to 5s. weekly. The work is not, as a rule, heavy, yet requires a dexterity only to be acquired by long practice and powers of endurance which the younger workers cannot possibly possess, and the want of which is necessarily most prejudicial to their wellbeing.

In one branch of nail making, however, the application of machinery has not as yet been attended with any very marked success—that is, the manufacture of horse nails. As a consequence the men that make them are better paid than the common nailers, and they are more self-assertive or independent, as is evinced by the numerous strikes that are constantly taking place. The chief seats of the horse nail making branches are near Dudley, in Staffordshire, Belper in Derbyshire, and Sheffield in Yorkshire. Altogether it employs nearly 3,000 persons—about 2,000 at Dudley, 500 at Belper, and 250 or 300 at and near Sheffield. Belper is supposed to be the most ancient seat of the industry, and claims to have ruled even Staffordshire at one time in the matter of wages and prices. Continual disputes—particularly one in 1850—drove away the trade, however, to a great extent, and it seems now to be centralized around Dudley.

Horse nail makers are paid at rates varying from 4s. to 4s. 8d. per 1,000, at which prices good workmen may earn 23s. to 30s. weekly, when work is abundant, as is generally the case in this branch of the industry. The men aver that horse nails will never be successfully made by machinery, and have, in consequence, pursued the suicidal policy of keeping up wages, by restricting the number of apprentices and other artificial means, which in the end must of necessity prove abortive.

The cut nail trade is very extensive nowadays, being carried on not only at Birmingham and in various parts of South Staffordshire, but in Wales and Scotland, as well as at Newcastle, Darlington, Leeds, Sheffield, and Warrington. All machine-made nails are cut from sheets, strips, or bars, and can be produced in great quantities at a very cheap rate. About 20,000 to 25,000 tons are made every year in Birmingham alone, and fully as many more in the other places just alluded to. The men who attend to the machines are paid at the rate of 30s. to 50s. weekly, women and boys 10s. to 17s. 6d., and the mere laborers 20s. to 25s. per week. As may be imagined, there is an immense variety of nails, whether wrought or cut, each of which has its distinguishing name and peculiarity. Some of them are so small that 1,000 only weigh an ounce and a half, whilst the "tenpenny" sort, eight inches long, weigh a hundredweight to the same quantity. Altogether there are about 2,200 different sorts of nails and rivets—which come in the same category—made, and used for an almost infinite variety of purposes. They are made, too, not only for this country, but for use all over the world, as is evinced by the fact that we annually export something like 17,000 tons of them. Our best country is Australia—that great colony which is yearly becoming of more importance to us as a manufacturing nation—to which we send 4,000 tons annually. British India ranks next on the list with about 1,800 tons, the British West Indies next with 1,500 tons, and then British North America with 1,300 tons. Russia, too, is not a bad customer, as she takes from us 800 tons yearly, and the Foreign West Indies contribute over 600 tons toward the aggregate. Brazil is a capital buyer, her last year's purchases of this class having reached over 900 tons; Germany takes over 300 tons per annum, Holland 400 tons, France 300 tons, Spain 250 tons, British South Africa 400 tons, and other countries, or our own colonies, quantities ranging from 100 to 200 tons.

\$20,000 Prize for a New Sugar Extraction Process.

The General Council of Guadeloupe offers a prize of \$20,000 to the inventor of a new process of extraction of juice of sugar cane or of sugar fabrication. This prize will be given to whoever obtains from the cane a yield of 14 per cent of sugar. The cost of application of the new process should not exceed 40 per cent of the value realized. Experiments will continue four years, terminating June 30, 1880, and will take place at Guadeloupe under the auspices of a government commission. All cost of transport, etc., must be defrayed by competitors, and applications, etc., must be addressed to the Director of the Interior, Basse Terre, Guadeloupe.

The cane raised at Guadeloupe contains 18 per cent of sugar. Hitherto a percentage of 9.4 on an average has been obtained by the ordinary factory machinery. Recently M. Ducharsaing has invented an imbibition process, the details of which are not given in the legislative document before us, but which it appears increased the yield from 9.4 to 11.64 per cent. The inventor himself claims a greater advantage, and insists that the additional percentage of gain by his process is 2.33 instead of 1.64. Even on the lower estimate M. Ducharsaing's invention was deemed sufficiently important to warrant the awarding to him of a \$20,000 prize. The present premium is therefore a second one, and the winner is called upon to make a still further improvement. The experiments must be conducted on at least 600,000 lbs. of cane.

The Sutro Tunnel.

A correspondent of *Engineering and Mining Journal* declares the Sutro Tunnel second to no enterprise in the West. He says: "Its mouth is in the valley of the Carson river, a stream which washes the eastern base of the Washoe range, in which the Comstock lies. It has been driven a total distance of 17,000 feet up to date, and is making progress at

the rate of 300 feet per month. Not more than 2,800 feet now intervenes between the breast and the nearest mine on the Comstock, the Savage, so that, if the present rate of progression be maintained, about 10 months more will suffice to complete the connection. The lode will be cut at a depth of about 1,800 feet perpendicularly below the surface, and very nearly the center, measuring by the extent of the surface workings. It is then proposed, either by the Sutro Company or by a combination of owners along the vein, to run a drift north and south through each claim until the ends of the veins laterally are reached. This will connect every mine on the vein with the tunnel; will drain the entire workings; and, should these lateral drifts be put under one management and made a common highway, will afford the means of working the entire vein through one opening. It is now eight years since work was first begun at the town of Sutro on the Carson river. The expense of prosecuting the work has averaged about \$1,000 per day, and when the Comstock is reached the total cost will have amounted to about \$3,000,000. The tunnel is double-tracked, as straight as an arrow in its course, with a rise just sufficient for drainage. Three air shafts have been sunk along its course. At the mouth of the tunnel the Sutro Company have laid out a town, have secured magnificent water powers, and expect to realize largely on that part of their investment by the removal of most of the mining and milling operations on the vein from Virginia City to Carson."

The Wool Clip for 1876.

The wool clip of the United States for 1876 was about 200,000,000 lbs.; of England, Ireland, and Scotland, about 162,000,000, mostly combing; of the Continent of Europe, about 463,000,000; of Australasia, about 350,000,000; of Buenos Ayres and River La Plata, about 207,000,000 lbs. These are the principal wool-growing countries of the world, and produce 1,382,000,000 out of the estimated 1,419,000,000 produced on the entire globe. The selling value of the total clip would probably aggregate \$450,000,000. Out of fourteen hundred and nineteen million pounds of wool (the estimated clip), there would be fully a loss of 567,000,000 lbs. in scouring, making the net yield of clean wool about 852,000,000 lbs.

The First English Book.

At the Caxton Exhibition in the South Kensington Museum in London may now be seen the earliest book printed in the English language, the "Recuyell of the Histories of Troy," upon which William Caxton began his career as a printer about 1474. The copy on exhibition is particularly interesting as having once belonged to Elizabeth Woodville, Queen of Edward IV. and sister of Earl Rivers, Caxton's patron. It now belongs to the Duke of Devonshire, having been bought by the late Duke at the sale of the Roxburgh library, in 1812, for 1,010 guineas.

Effect of Smoke on Trees.

Mr. Alcock, who for twenty-five years has been making experiments with trees planted in the vicinity of his cotton mill, near Manchester, England, finds that the plant which does better than any other tree in London smoke will not grow at all in that of Lancashire; but, on the other hand, he has been very successful with the beech, sycamore, birch, wych elm, and Turkey oak, but the lime does best of all. Here is a hint for Pittsburgh and Cincinnati. There is a society in Manchester called the Field Naturalists' and Archaeologists' Society, which is urging the planting of trees in and about Cottonopolis.

Horseflesh for Human Food.

In 1875 the horse butcheries of Paris furnished for public consumption 6,865 horses, asses, and mules; in 1876 they furnished 9,271, giving 1,635,470 kilogrammes of neat meat. At Lyons, the number has diminished from 1,263 in 1875 to 1,088 in 1876. On the 1st of January there were 58 butcheries in Paris and only 7 in Lyons. At its meeting, on January 9, the committee de la Viande Cheval awarded a silver medal to M. Petard, who has nine butcheries in Paris, as a reward for his enterprise.

A New Air Gun.

A patent has recently been granted to a well-known firearm manufacturer in Gotha, in Germany, for an improved air pistol, which is likely to be largely adopted by the German army, not for use on actual service, but as a means of instructing men in shooting. The advantages claimed for the new weapon over any pattern of air gun previously designed, are simplicity of construction and ease in manipulation. The principle, it is said, can easily be adapted to any firearms at very little cost.

Lawns.

Mow lawns sufficiently often to preserve a neat appearance, as, when the grass is allowed to get too long without cutting, instead of saving it entails more labor. During the summer months mowing machines should be set so as to leave the grass half an inch longer than earlier in the season and late in the autumn; this is especially needful where the land is dry, and the roots of the grass are liable to be burnt up.

A LINE of steamers is established between Boston and London, to sail under the Belgian flag; and two steamers of 1,800 tons each have been purchased. The first left London for Boston direct July 8th.

The Devil Fish.

At a meeting of the Chicago Academy of Sciences, Dr. Velle made a report of his explorations along the coast of Florida, in search of natural and archaeological curiosities. On this trip, he was accompanied by his brother, Mr. A. E. Velle, of Aurora, and Dr. Hammond, of Geneseo, Ill. The expedition was rich in results, and the Doctor brought home with him a very large collection of valuable specimens for the museum of the academy. His report was very brief, consisting of little more than a description of his voyage and a list of the curiosities which he had collected.

Not the least of these was a devil fish, which formed the subject of a paper by Professor Peabody, who entered minutely into its character, disposition, and habits. The body of the fish was large, the transverse exceeding the longitudinal diameter; skin rough, but without any evident tubercles or spines; head not distinct from the body, subtruncate in front, slightly convex; mouth subterminal, with very small teeth in seven or eight rows; nostrils small, and placed near the angles of the mouth; eyes prominent, lateral, and placed on eminences at the bases of the frontal appendages: bronchial apertures narrow, linear varying from one to two feet in length, with valvular covering; tail long, slender, subcompressed, terminating in a slender extremity; dorsal fin at base of tail, small and triangular. The dimensions of Dr. Velle's specimen are as follows:

Width at pectorals, 10 feet 2 inches; length, exclusive of tail, 5 feet 5 inches; length of tail, 4 feet 2 inches; thickness of body, 1 foot 6 inches; length of frontal appendages, 1 foot; width of frontal appendages, 6 inches.

The back of the male is black, while the female has a broad, angulated belt of a lighter color crossing the back immediately behind the eyes. The specimen captured by Dr. Velle is a female. It is a comparatively small fish, as those described by Elliott and De Kay were seventeen or eighteen feet in width, and others of equal dimensions have frequently been encountered, though rarely captured.

Professor Peabody related several anecdotes illustrative of the strength of the devil fish. One, eighteen feet broad, towed a thirteen ton schooner, with all sails set, in the face of a brisk wind, until the harpoon drew out and the fish escaped. Dr. Velle experienced great difficulty in making his capture. He harpooned five other fish, but lost them all. The one captured succumbed only after an hour's struggle. Among the means of assault which the fish possesses are its frontal appendages, which are movable, and with which it can seize and hold, as by power of suction, anything coming within reach. In this respect only does it resemble the devil fish known to the readers of Victor Hugo. The food of the devil fish has been supposed to be crustaceans. Some scientists are of opinion that it lives on other fish, but no scales have ever been found in its stomach. The stomach of Dr. Velle's specimen contained a large quantity of a reddish, moss-like substance, which Professor Reinsch of Bavaria, one of the members of the Chicago Academy, identified as seaweed, possibly a new species.—*Chicago Tribune.*

Recent American and Foreign Patents.**Notice to Patentees.**

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.**IMPROVED LINK-MOTION FOR STEAM ENGINES.**

Frederick Fischer, New York city.—This invention is to provide for locomotive and other engines an improved link-motion, by which the travel of the slide valve may be modified in such a manner as to move at greater speed when closing and opening the ports, so that the steam engine may be worked more effectively for expansion by retaining the steam longer, and also facilitating the entrance and exhaust of the same.

IMPROVED TIRE HEATER.

William E. Stewart, Xenia, O.—This invention consists in a tire heater formed by the combination of a hollow base, a semi-ring trough provided with holes, and a cap, made in sections, hinged to each other, and having flanges formed upon their side edges.

IMPROVED COILED SPRING.

James Ludlum, Pompton, N. J.—This invention consists in the peculiar construction of the ends, whereby an improved bearing is secured and the spring is made stronger and more durable.

IMPROVED GRINDING MACHINE.

Louis Bollmann, Vienna, Austria.—This is an improved machine for grinding by means of emery wheels, and feeding the work by an elastic yielding pressure to the emery wheel, controlling the grinding process, and preventing any danger that may arise from the bursting of the wheel. A reciprocating slide rest feeds the work with yielding pressure, and allows the grinding action of the emery wheel during the forward motion only of the slide rest. The slide rest and its operating mechanism are laterally movable for adjustment in the main frame. A hood mounted on an elastic support over the emery wheel guards against danger from bursting.

IMPROVED ATMOSPHERIC GAS ENGINE.

Joseph Wertheim, Bornheim, Frankfurt-on-the-Main, Germany. The principle of this motor is the alternate action of the explosive force of a gas and air mixture and of the pressure of the atmosphere as motive powers. The arrangement consists in the explosion dome, with its main slide valve, igniting apparatus, and appendages for regulating the speed of the engine and admitting the escape of the gases of combustion, of the siphon pipe for the liquid piston, with a paddle chamber and valves at the lower part, in connection with mechanism for transmitting motion, and of a liquid reservoir.

IMPROVED TOOL HANDLE.

Lazare Landeker, San Luis Obispo, Cal.—The end of the handle is tightened in the eye of the head by wedges. A small metallic bar, the edges of which are beveled off, fits into a dovetailed groove formed across the forward side of the head and across the end of the handle. The bar is made of such a length that its ends may be flush with the sides of the head, and of such a thickness that its outer surface may be flush with the forward side of said head. Through the center of the bar is formed a hole to receive a screw, which is screwed into the end of the handle, and the head of which is countersunk into the bar.

IMPROVED DUMPING CAR.

Henry S. Bower, Mulberry Grove, Kan.—This invention relates to an improved dumping car for the more rapid discharging of grain, gravel, and other articles shipped in bulk. It consists of a car body hinged to center posts of the truck frames, so as to swing to either side of the truck, the body being supported by hinged and braced posts at both sides of the center uprights, which posts are swung down at the proper side when dumping. Swinging rack irons at the bottom of the car body lock into a slotted plate to retain the car in dumped position. The side boards of the car are hinged and locked in suitable manner.

IMPROVED HORSE POWER.

Darius K. Hungerford, De Witt, Iowa.—This consists mainly in a double tread power, constructed with the treadles arranged in planes inclining in opposite directions, and geared to a single driving shaft. The device also consists in means applied to the outer or free ends of the treadle frames for giving them any desired degree of inclination, whether the horses be working or at rest.

IMPROVED CAR COUPLING.

Charles D. Norman, Ames, Iowa.—This invention is an improvement in the class of car couplings in which the drawhead is provided with spring jaws, hinged near the front thereof, and inclining inward or toward each other at their rear ends, whereby they are adapted to engage with an arrow-head drawbar. The object of the invention is to simplify and cheapen the construction of this class of coupling and increase their efficiency and value. For details, see patent.

IMPROVED WATER WHEEL.

James J. Bourgeois, St. Cloud, Minn.—The present invention relates to an improvement upon that for which the same party has received letters patent of the United States, No. 171,088, dated December 14th, 1875. In the former invention horizontally sliding gates are arranged over the wheel to regulate and cut off the flow of water to the wheel. When there is a full head of water, the vertical pressure on the gates causes so much friction that it is difficult to operate them. To avoid this result the inventor has devised a hinged gate, and arranged it beneath the wheel. For details, see patent.

IMPROVED STATION INDICATOR.

James W. Graydon, Indianapolis, Ind.—The names of the cross streets or stations (as the case may be) are printed on a transparent apron which is moved intermittently to expose the names successively to view. The means for operating the apron are primarily a chain wheel and pulley, the former being provided with radial arms, with which an intermittently reciprocating pusher comes in contact at the required time, for turning the chain wheel one quarter of a revolution. The said pusher works vertically in suitable guides, and is operated by contact of a shoe, upon which it rests, with an inclined plane attached to the sleepers between or alongside track rails.

NEW MISCELLANEOUS INVENTIONS.**IMPROVED PICTURE FRAME.**

Edward Maux, New York city.—This invention consists of a passe-partout with a backing having a suitable opening for the pictures, and being placed back of face lining of the covering glass.

IMPROVED PAINT PENCIL OR CRAYON.

William J. Holton and James E. Field, Milwaukee, Wis.—The paint is thoroughly intermixed in a body of tallow while warm. A resinous matter is also mixed in. The whole is moulded or pressed into pencils of such a size and shape as may be desired. This paint pencil is not affected by water, and cannot be rubbed off a surface when applied without great difficulty; and furthermore, it marks on a polished surface with equal ease to that of a rough surface, thus forming a substitute for the marking pots and brushes now commonly in use.

IMPROVED APPARATUS FOR ILLUMINATING SCALE BEAMS.

Joshua W. Wood, Loami, Ill.—This consists in the combination of an illuminating device with the sliding loop to which the weight is attached, and also in the combination of reflectors with the loop and with the beam, for the purpose of throwing light upon the side of the scale beam, which would otherwise be dark.

IMPROVED ROLLER RAZOR SHARPENER.

Welmer T. Jahne and Charles H. White, Jersey City, N. J.—Two wooden rollers are covered with leather, and have emery flour applied to them. They are held together to bear against the sides of the blade by U springs. By suitable gearing the said rollers are caused to revolve together and in opposite directions to grind both sides of the blade equally.

IMPROVED INKING APPARATUS.

John G. Kurtz, Milton, Pa.—This invention consists of a fountain for printing ink having a tightly fitting piston fed forward by a screw rod, so as to force the ink through a bottom feeding cloth or screen, the same being placed, after use, into an airtight seat plate holding water to keep the feeding cloth moist.

IMPROVED COMBINED SNAP HOOK AND BUCKLE.

Francis J. Delez, Pierce City, Mo.—This combined snap hook and buckle is for connecting the ends of the breast strap with the hame ring. It is so constructed as to clamp the strap, and thus take the strain off the tongue of the buckle.

IMPROVED INDEXING.

David A. Roberts, Columbus, O.—The book has one slit in each leaf, each succeeding slit being cut a little lower down than the preceding one. A blade is placed upon the first page of the set, and is moved downward, passing through the notches until it is opposite the name of the party whose account is looked for and the number of the page upon which that account is kept, and the blade is then raised, opening the book.

IMPROVED OIL CAN.

Jacob F. Cappel, Havana, Ill.—This improvement consists in the particular construction and arrangement of a pump with two pipes and two valves or cocks, whereby the one pump which is located upon the tank may, by reversing the valves, be equally as well employed for transferring from the barrels as for dispensing from the can.

IMPROVED HOG ELEVATOR.

George Wheeler, Newark, O.—This invention consists mainly of uprights or standards detachably and adjustably connected to a base, and having adjustable horizontal bars for supporting the carcasses, and a windlass for hoisting it. The invention further consists in so constructing the base of the hoisting apparatus that a platform may be detachably connected therewith.

IMPROVED BOX FASTENER.

Jerome C. Millard, Pultneyville, N. Y.—This device is applicable to various uses, but is intended particularly as a fastening for physicians' hand

medicine cases or boxes. It consists of a catch of irregular shape having a projection that engages a notched stud projecting from another plate, the said plates being respectively designed and adapted for attachment to the body and cover of the case or box.

IMPROVED SAFETY STIRRUP.

William B. Conway, Blacksburg, Va.—This invention is an improved safety stirrup designed to prevent the rider from being dragged by the foot if in being thrown from the horse he should get his foot caught in the stirrup. The improvement consists in pivoting, in the sides of the stirrup just above the space for the foot, a protector or guard which is extended above its pivots around the connecting bar at the top of the stirrup in the form of a hooked plate, which passes between the connecting bar and the two higher metallic rods so as to secure the stirrup to the stirrup strap by a metallic loop entered between the two upper bars and caught by the hooked plate of the pivoted guard. Should the rider fall, the toe deflects the guard and allows the stirrup to drop with the rider.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.**IMPROVED FIRE ESCAPE.**

Richard J. Macdonald, New York city.—This invention consists of a hollow cornice or cap above the top of the window casing, which is provided with a bottom aperture closed by a movable seat, that is, raised or lowered by a drum and suspension cord, in connection with a lowering cord and drum and an endless tension cord and pulleys for hoisting or lowering the seat.

IMPROVED LAMP SHADE HOLDER.

Patrick J. Clark and Joseph Kintz, West Meriden, Conn.—This lamp shade holder is so constructed that the shade may be turned back to allow the lamp or lamp chimney to be detached, and enables the shade to be conveniently detached from the holder when desired.

IMPROVED ELLIPTIC SPRING.

Noah J. Tilghman, Tyaskin, Md.—This invention belongs to that class of springs in which the plates are made of a single continuous piece of metal bent around in elliptical form without end joints and placed one within the other. The improvement consists in bringing the ends of the plates together, so that the free ends of each abut, and in riveting said free ends to a lap joint plate which performs the double function of connecting the ends of the plate and of separating and removing any one spring of the series from the next adjacent ones, so that such springs do not touch each other at this point, and whereby each spring is rendered capable of free, easy, and independent movement without impinging against the others, which to a great extent obviates creaking.

NEW AGRICULTURAL INVENTIONS.**IMPROVED COMBINED POTATO AND CORN PLANTER.**

Joseph Caster, Goshen, O.—This improved seed planter is so constructed that it may be readily adjusted for planting potatoes or corn. To the side of the seed box are attached the ends of the curved guard plate, which incloses the space around the discharge hole through the bottom of said box, and beneath the lower edge of which the dropping plate passes, so that no more seed can be carried out by said dropping plate than is contained in its holes. To the forward part of the guard is attached a knife, which, when planting potatoes, will cut off any parts of potatoes that may project above the plate to enable the rest of the potato to be carried within the guard and dropped to the ground. The guard and knife are adjustable, so that they may be adjusted according to the thickness of the dropping plate.

IMPROVED GATE.

Ell Wayland, Salisbury, Mo.—This gate is so constructed that its forward end may be raised and so supported that the gate may be swung open and shut, and may thus swing over snow and ice, and allow small stock to pass beneath it, while preventing the passage of large stock, and which will be simple in construction, strong, and durable.

IMPROVED POST DRIVER.

William Kindermann, Troutville, Pa.—This invention is for the purpose of driving fence posts, etc., and is an improved, powerful yet simple driving machine, that may be readily adapted to any inclination of the ground, and used with horse power to drive the posts in rapid and effective manner.

NEW HOUSEHOLD INVENTIONS.**IMPROVED LAMP REFRACTOR.**

August Schaeffer and Anton Pfrunder, Louisville, Ky.—This invention consists of the combination, with a gas or other lamp, of one or more hinged and adjustable refractors, having pivoted and self-adjusting shades. The refractors are hinged and clamped to a detachable collar, attached to the neck of the lamp or base of the burner.

IMPROVED LAMP CHIMNEY FASTENING.

George Richards, Flatbush, N. Y.—This invention consists in the inwardly projecting notched flange formed around the lower edge of a lamp chimney to receive springs attached to the top plate of the burner; and in the springs attached to the top plate of the lamp burner, and having outwardly projecting lugs formed upon their ends to overlap an inwardly projecting flange of a lamp chimney.

IMPROVED LAMP BURNER.

James Cain, Pittsburg, Pa.—This is a new lamp burner, into which a new wick is inserted with great facility, and which is easily kept clean of gum and burnt wick, the wicks being also readily reached and kept in order. The burner is split diametrically and lengthwise through the wick tube into two sections, which are hinged and locked together, and have fixed or removable ratchets.

IMPROVED PLAITING MACHINE.

John E. Chapin, New York city.—This consists of a plaiting board with hinged plates and plaiting needles pivoted at one end to the same. A detachable side strip of the plaiting board, with catches or hooks, locks the needles, and releases them simultaneously on being taken off. The tension of the fabric to be plaited is regulated by a tension rod at one end.

IMPROVED FOLDING TOILET SCREEN.

Edward S. Lathrop, Savannah, Ga.—The object of this invention is to provide for use in sleeping apartments an improved screen for protecting the person from observation while bathing, dressing, or performing other operations of the toilet. The frame of the screen is attached to the toilet or washstand, and is made adjustable in order that the curtains pendant therefrom may be extended when required, and at other times drawn back or folded against the wall so as to be out of the way and form an ornamental article of furniture.

IMPROVED BURGLAR ALARM.

James K. Johnston, St. Louis, Mo.—The fastener consists of a toothed plate having a hinged extension to which a bell alarm and sliding trigger are attached in such manner that the latter will trip the alarm in case the door is forced open. The advantages of the device are compactness, portability, simplicity, and cheapness of construction, and the facility with which it can be applied to and removed from a door.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

For Sale—New Steam Launch, 30 x 8 feet; "fast;" Black walnut and Nickel finish; \$1,200; also Side Wheel Steamer, 50 x 16 feet, \$3,000. S. E. Harthan, Worcester, Mass., Manuf. of Engines and Launches.

An American, experienced in the manufacture and refining of Beet Root Sugar, speaking German, French, and some Spanish, seeks employment. Good testimonials. Address P. O. Box 4182, New York city.

What have you in the kitchen, furnishing, or hard ware line you want made on royalty for the Western trade. W. C. Seavey & Co., Chicago, Ill.

For Sale—Foundry and Agricultural Works, cheap, as I wish to move to my farm. Address Box 189, Sodus, N.Y.

See our Advertisement. Parties writing please state what kind of machinery is wanted. Steptoe, McFarlan & Co., Cincinnati, O.

Good Second-hand Steam Engine, cylinder 12 x 24 in.; flue boiler 40 in. x 25 ft.; smoke stack and connections complete; for sale cheap. C. S. Green, Roaring Branch, Lyeomg Co., Pa.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsyth & Co., Machine Dealers Manchester, N. J.

Reliable Oak Leather and Rubber Belting. A specialty of Belting for high speed and hard work. Charles W. Army, Manufacturer, Phila., Pa. Send for price lists.

Shaw's Noise-Quelling Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quells all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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

"Abbe" Bolt, Forging Machines, and "Palmer" Power Hammers; best produced. Prices greatly reduced. Also sole builders Village and Town Combined Hand Fire Engines and Hose Carriages, \$350. Send for circulars. Forsyth & Co., Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Removal.—Fitch & Meserole, Manufacturers of Electrical Apparatus, and Bradley's Patent Naked Wire Helices, have removed to 40 Cortlandt St., N. Y. Experimental work.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N.Y. Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., 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.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Help for the weak, nervous, and debilitated. Chronic and painful diseases cured without medicine. Pulvermacher's Electric Belts are the desideratum. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Small Fine Gray Iron Castings a specialty. Soft and true to patterns. A. Winterburn, 16 De Witt St., Albany, N. Y.

Skinner Portable Engine Improved, 2 1/2 to 10 H. P. Skinner & Wood, Erie, Pa.

Wanted—A first-class Machine forger. One who is a good performer on any instrument in Brass Band. References required. Address H. B. Smith, Smithville, Burl. Co., N. J.

All nervous, exhausting, and painful diseases speedily yield to the curative influences of Pulvermacher's Electric Belts and Bands. They are safe and effective. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y. More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use prove them stronger and more durable than wrought iron. See advertisement, page 75.

Emery Grinders, Emery Wheels, Best and Cheapest. Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Reliable Information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence, R. I.



C. H. W. is informed that we cannot find the address he mentions.—Will A. D. T. in "Minerals" of June 16, send his address to C. H. W., Boston, Mass.—A. K. Q.—Your question is too indefinite. We do not understand what you wish to know.—A correspondent writes a card from Primrose, Wis., but the ink is so pale we cannot read it. Will he write again?—J. W. is informed that we know of no method of using mercury as a lifting power. He must ascertain by experimenting.—J. T. G. is informed that there is no rule applicable to setting idler pulleys. His judgment must dictate the place to put them.—J. H., of Canada.—We cannot turn to the item you refer to. The recipe has

been tried and was not satisfactory. You had better apply to a chemist, who can give some good recipes.—C. D.—We could not republish the diagram. If you cannot find the number containing it, it is probably one of the missing ones which we can perhaps supply.—A. M. S.—If you will give us the number and year of the paper containing the article we can probably send it to you.—E. C. H. is informed that the method of balancing cylinders of threshing machines which he mentions is the one in general use, and is, perhaps, the best that could be employed.—T. F. R. asks for a depilatory, and is referred to Cooley's "Cyclopedia of Practical Receipts," under the head of "Depilatory."

(1) G. R. asks: What sized boiler do I need for a small engine, 1 1/4 inch bore and 3 inches stroke? Would it run a circular saw 7 inches in diameter to saw 1 inch pine? A. To do this work you will need a boiler with from 18 to 20 square feet of heating surface.

(2) S. E. says: Please give a rule for calculating the capacity of smoke stacks, which are found in practice to give the best results? A. A good proportion for the chimney is to have its cross section about 1/2 of the grate surface, and its height from 40 to 50 feet. Some chimneys having a cross section of only 1/4 the grate surface give good results when the boiler is carefully set, but the first figure is safer for general practice.

(3) G. W. K. asks: 1. Is there a way to determine the amount of power a motor will furnish by means of a friction lever brake, saving the number of feet the pulley will run and the number of lbs. pressure on friction bearing, the pulley to be smoothly turned? A. Multiply the unbalanced weight in lbs. by the circumference in feet that the point of attachment would describe if free, and by the number of revolutions of the motor per minute. Divide the product by 33,000. 2. I have a water wheel running on cast step with cast toe. It wears well; is there unnecessary friction? A. We think not. 3. What speed should a 30 inch top runner burr have under 15 horse power for grinding corn? A. About 400 revolutions a minute.

(4) P. W. N. asks: 1. How much more water will run through a gateway in a dam 10 feet wide and 30 feet high than will run through one 10 feet high and 30 feet wide. A. About 3 1/2 times as much in the first case. 2. Also the weight of 1 cubic foot of water? A. See p. 184, vol. 32.

(5) S. B. says: Some of the users of steam engines in this city (Portland, Me.) practice putting salt water in small quantities into the boilers to form a scale to prevent the action of Sebago water on the iron, claiming that the water, being very soft, has too much action on it. Is it a good practice? A. If the feed water is pure, we think the action is questionable.

(6) W. E. M. asks: If I confine steam in a hemisphere, will its force be centrifugal or centripetal? Can there be a motor made on this principle? A. The steam will press outward.

(7) B. F. T. says: What is the effective actual horse power (not therefore nominal) of a non-condensing engine 14 inches cylinder, 24 inches stroke, 100 revolutions per minute, 70 lbs. steam? I am endeavoring to obtain some simple formula by which correct results may be obtained, and that can be explained to persons not educated machinists or engineers, in connection with our business in furnishing water for horse power. The formula furnished by the SCIENTIFIC AMERICAN ought to be considered standard and satisfactory. A. The effective horse power of a particular engine cannot be exactly determined by a general rule, but must be found by experiment. It would be impossible to give an approximate rule of any value for the data sent. Such a rule that would answer tolerably well for one class of engines might be useless for another.

(8) C. D. H. says: A customer wishes me to siphon the water from a well 50 feet deep, having 30 feet of water in it. I have a fall 150 feet. I tell him I can only lessen the depth of water about 12 feet, when the siphon will cease to work. He claims it will empty the well. Which is right? A. You have the right idea.

(9) J. G. asks: Which will make the loud-est report, a gun with a perfectly straight bore, or one that widens a little toward the muzzle? A. Some of the patriots who have recently celebrated the anniversary of the nation's birthday will doubtless be glad to throw some light on the subject.

(10) C. D. O. says: The engine I am running has slipped its eccentric. The owner in setting it placed it so that it is a little back of the quarter stroke. I claim that it ought to be set a little ahead of the quarter. Which is right? A. We imagine that your view of the case is the more correct of the two.

(11) W. K. asks: 1. Whether a boat 30 feet long and 6 feet beam, run by steam, just for sporting purposes, would require a government test and license? A. It does, according to the law. 2. How large a wheel does it require for two engines with 2 1/4 inch by 4 1/4 inch stroke? A. Diameter 26 to 28 inches, pitch 3 feet.

(12) J. A. R. asks: Can a person see light or the object through the aid of light? A. Light, according to Watts, "is the agent which makes us acquainted with the existence of bodies through the organ of sight."

(13) J. B. T. asks: If two bodies, one weighing 1 lb. the other weighing 10 lbs., both being equal in bulk, if let fall from the same height, will strike the ground at the same time? A. Yes.

(14) L. P. F. says: To F. G. W.'s inquiry you say do not put flues in your boiler as small as 1 inch. I have just completed a boiler with nine 1 inch flues, heads of cast iron, 1 inch thick and 10 inches diameter, 30 inches long, to be set on a stove, and we can get no draught. I have made them of the same dimensions with one 4 inch flue, and they work well. A. We would be glad to hear from our readers who have been using boilers with flues of this size. So far as our experience goes, they generally give satisfactory results.

(15) O. C. writes: I wish to construct a vertical boiler and engine attached to back to develop 1 horse power at a pressure of 50 or 65 lbs. Please give me dimensions of cylinder and boiler, and if I use steel

for boiler shell what thickness? If I put in tubes, how many and what diameter? A. Cylinder 2 x 3, boiler 20 inches diameter, 3 feet high. Steel shells 1/4 of an inch thick. Tubes 1/4 or 2 inches in diameter. 2. Do you think it practicable to drive a carriage on a good road by steam engine and boiler located on the same and carrying its own coal and water, to travel a distance say of ten miles? A. Yes, if properly constructed.

(16) A. D. S. says: In making experiments with small vessels to try the resistance they suffer in passing through or over water, how much should be the allowance for adhesion or friction? A. We think you will find full particulars in Mr. Froude's papers, published in the Transactions of the Naval Architects.

(17) W. D. M. O. says: Can you tell me the best work on air, and all its properties, such as motion, resistance, use as a motive power by compression, and similar mechanical uses? Also a work on the generation of gas for power purposes, and compounds which are used to produce gas by contact in a reservoir, and the best work on ballooning? A. Rankine's "Treatise on the Steam Engine" contains a summary of the laws relating to air and various gases. You will find numerous examples of the application of these principles in the files of technical periodicals. There is an aeronautical society in England, and we imagine their transactions contain the kind of information you desire. There are also numerous valuable papers in our back numbers.

(18) W. E. S. asks: Is the fulcrum point on a vessel's mast below or above deck when she heels or inclines by the pressure of wind while sailing? The object vessel is 65 feet on the water line, 20 feet breadth of beam, about 48 tons new burden, 10 feet draught, and ballasted with 27 tons of iron and lead, with about 55 feet hoist of sails. A. It is a good question for young philosophers to answer.

(19) F. E. asks: Is there any difference in the power required to operate stamps, with short armed or long armed cams, provided the stamps have the same lift and fall in distance, are of the same weight and have the same number of drops per minute? A. There should be no difference, if the resistance due to friction is the same in each case.

(20) C. E. L. asks: Can you give me a rule to cut paper for a tissue paper balloon 10 feet high, so that when paper is pasted together the balloon will be in good proportion? Also what size should the ring at bottom be? A. You will find directions in Blinn's "Tin, Sheet Iron, and Copper Plate Worker."

(21) G. P. H. asks: 1. If I build a boat 16 feet long and of 4 feet beam, of good model, how much power, and what size of a screw propeller must I put in to realize 8 miles per hour in low water against the current in the Ohio river? A. Cylinder 3 x 4, propeller 22 inches diameter, 3 feet pitch. 2. Is a boat of the above dimensions, drawing when well ballasted, 2 feet, capable of crossing the Gulf from New Orleans to Cedar Keys? A. At certain seasons of the year, when the weather is generally calm, such a voyage might be made.

(22) J. R. G. says: I have got an aquarium with a cast iron bottom; what can I put on it that will keep it from rusting and not injure the fish? A. Dry the iron thoroughly and give it a good coating of melted paraffin. A layer of fine white sand may be sprinkled over this as it cools.

(23) R. G. asks: How can I make a strong extract of tonka bean? A. Take 1 lb. of the beans, reduce to a coarse powder, and percolate with alcohol to make 1 gallon.

(24) W. C. L. says: I desire a liquid preparation to close the pores of eggs to preserve them. It should be cheap, dry rapidly, and not color the shell. A. Thin gum arabic solution is commonly used for this purpose. Eggs are often packed in charcoal. A good method is to store the eggs in water containing about 50 grains of salicylic acid to the gallon. The Germans use linseed oil, which seems to answer the purpose admirably. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 65, p. 1030.

(25) W. B. says: A doctor asked a chemist what iron was composed of. The chemist said that iron was an element, and could not be divided. And the doctor thought it must be composed of something. Which is right? A. The chemist was right; iron is an elementary substance.

(26) W. E. T. asks: Where are open hearth steel works located? A. Open hearth furnaces are in operation at Boston, Mass., Providence, R. I., Nashua, N. H., Trenton, N. J., Beaver Falls, Pittsburgh, Nicetown, Philadelphia, and Harrisburgh, Pa., Cleveland and Canton, Ohio, Springfield, Ill., and Hartford, Conn.

(27) W. B. asks: Can you give the recipe for making the Etruscan color in gold? A. Alum and fine table salt each 1 oz., powdered saltpeter 2 ozs., hot rain water sufficient to make solution. Add sufficient muriatic acid to produce the color desired. The solution is best used warm. After coloring wash in soft water, then in alcohol, and dry in clean sawdust.

(28) J. G. L. asks: 1. How many vibrations per second are required to produce the musical tone known as middle C? A. 264.

Can I make a fine finish on wood by rubbing on boiled linseed oil repeatedly, allowing each coat to dry thoroughly? A. Not what is termed a fine finish.

(29) C. E. D. asks: I would like to know how to get rid of a small red mite on canaries? A. Try any of the insect powders found in the market.

(30) M. A. B. asks: Does your SCIENCE RECOGN contain "Practical Mechanism," by J. R. A. No. It is published in book form under the title of "Complete Practical Machinist."

(31) E. C. H. asks: How can I melt cast iron in quantities ranging from 10 to 15 lbs.? A. In a small furnace having a good blast.

Is there such a thing as a demijohn cupola, and how is it constructed? A. We never heard of it.

On my lathe, driving wheel is 30 inches diameter, and pulley 3 1/2, making 8 to 1. I wished to use another

speed of 4 to 1, with same belt, and calculated size of pulleys the following way, made the sum of one half the circumference of pulleys (pulley and driver) in each set the same, but it did not work at all. Will you please inform me how I can get the size correctly? A. You will and rules for calculating cone pulleys in "Wrinkles and Recipes."

(32) L. E. M. asks: Will you give me a practical rule for finding gearing for compound geared lathes? A. You will find the information in No. 7, vol. 34, p. 107, that we think will be what you require.

(33) G. P. asks: Will a spring of the following dimensions, 4 inches long, 1/2 inch diameter, and 1/4 inch pitch, made out of 1/4 inch steel wire, enclosed in a chamber subject to 70 lbs. of steam to the square inch, keep its rigidity under a bolt screwed at 25 lbs.? A. Yes. 2. Will the steam affect its rigidity? A. No; but if it comes in contact with steam in moisture it could be nickel plated.

(34) E. H. M. asks: Will you give a plain rule or reference to some book plainer than Haswell, to ascertain the pitch of teeth in pattern making? A. The information you desire will be shortly published in "Practical Mechanism."

(35) A. W. asks: Is it advisable to grease cog gearing, and the reason why? A. It is best to grease cog gearing in cases in which the wheels can be kept from becoming clogged with dirt, etc.

(36) M. M. M. asks: 1. What is a suitable metal or composition for making castings for an oscillating engine 2 x 4 inches, the castings to be made in a smithy? The blacksmiths tell me that I cannot cast iron as it will "burn." A. Make your castings of a mixture of 6 parts copper and 1 part tin. Or use old composition metal such as bell metal, and add one tenth its quantity of tin after the mass is melted. 2. How large should the steam and exhaust ports be? A. Make the steam ports 1/2 the area of the cylinder, and the exhaust 1/3. 3. Would plaster of Paris be suitable to cast in? A. Cast in a sand mould faced with plumbago. 4. How could I burnish the castings after I had them made? A. Polish with file, scraper, and emery paper.

(37) R. d'H. says, in answer to query (7) July 21, as to the time when the first movable steam fire engine was used? I know of a very powerful one to have been in use in Berlin, Prussia, as early as 1838, may be earlier. Its great defect was that it took hours before it was ready for service, so that it was jokingly remarked notice of the occurrence of a fire should be given some hours ahead. When finally at work it could throw a number of streams, it was said seven, and by concentrating its full force upon one stream, threw down stout walls. It was contemplated to be sent, if not actually done, to the large Hamburg conflagration in May, 1841.

(38) C. M. B. says: A very cheap and serviceable door spring can be made as follows: Take an old hoop skirt and place it in the fire, keeping it there just long enough to burn the cloth off the wires; remove from the fire and plunge it into cold water. Press and bend the springs together so as to form a bundle or rod a foot or more in length. Secure one end of the bundle to the door frame, twist it very tight, and, keeping it twisted, fasten the other end to the door above the end fastened to the frame, and the door spring is complete. By twisting the springs one way, they will keep the door shut; and by twisting them the other way, they will keep it open.

(39) W. F. W. says: I wish to build a dry house 50 x 50 feet square, to be divided into four rooms. I have a steam boiler 44 inches in diameter, 13 feet long, that I wish to use as a heater. What is the cheapest and best way to construct the heating part? I wish to use the house for drying green ash, and want to get heat up to 190° to 220°. A. See SCIENTIFIC AMERICAN, p. 123 vol. 34, February 19, 1876, paragraphs (30) and (31); also p. 107, vol. 36, paragraph (1); also, p. 123, vol. 36, February 24, 1877, paragraph (6).

(40) G. W. W. asks: Why is it that sap of sugar maple at the right season, boiled down, produces dry, brittle, grain sugar; but as soon as the weather gets warmer so as to swell the buds, the product is wax, that is, it will not grain. A. This is due to the presence of a free acid in the juice. Stir in a little solution of carbonate of soda, boil down, run into a wooden tub with a bung in the bottom, and, when solidified, remove the bung and let drain.

(41) G. H. E. asks: 1. What is the most sensitive and accurate test of the presence of fusel oil in liquors distilled from various grains? A. Evaporate the alcohol down to a small bulk over a water bath, add an equal volume of ether, agitate for a few minutes, and then add an equal volume of water. The ether will dissolve any amyl alcohol (the basis of fusel oil), and the ethereal solution separate into a layer distinct from the diluted spirit. This solution should be drawn off with a pipette into a small dish, and allowed to evaporate in the air. To a portion of the residue in the dish add a few fragments of iodide of potassium, and gently agitate. In the course of a few minutes, if the original spirit contained any fusel oil, a distinct yellow color will appear. This color is distinctly visible in a solution containing 0.2 per cent of the oil. The reaction is due to the volatile acids of the oil, and not to the amyl alcohol. Mix another portion of the residue with 1/4 parts of concentrated (pure) sulphuric acid; a red viscid liquid (amyl-sulphuric acid) indicates amyl alcohol. When digested with sulphuric acid and acetic acid or an acetate, fusel oil yields acetate of amyl, having the odor of pear oil. Fusel oil has a strong characteristic odor, and an expert can readily detect very small quantities of it in spirits by evaporating a small quantity of the spirit on the palm of the hand, when the less volatile oil remains after the alcohol has evaporated, and is recognized by the sense of smell. 2. What is the present plan in distilleries, employed to get rid of fusel oil? A. Retainers, made of wire gauze filled with coarsely powdered charcoal, are fitted in the helm of the still so that the distillates pass directly through them; the charcoal retains the oil.

(42) S. N. B. & Co. say: We desire to pipe steam from our boilers to dry houses that are 300 feet

away, and then return the condensation back to boilers, both feed and return pipes to be carried underground. What fall will be necessary to return the water? Also, will it be necessary to have the feed and return pipes laid with expansion joints, and what is the best material to cover with? A. Very little fall is necessary to the pipes to return the water of condensation to the boiler. A few inches will be sufficient in the distance you mention. The inclination of the pipes of the coil in the dry house ought to be about half an inch in ten feet. The pipes do not need to be connected with expansion joints. Some persons declare they are more plague than profit. If necessary, provide for expansion and contraction by a U bend. The material used for covering pipes is generally calcined plaster of Paris, and often mixed with asbestos. To use the plaster, mix with water and apply before it hardens. As it is liable to crack and peel off, it would be well to cover it with some kind of box or jacket. A method is in use here in New York city which is to encase the steam pipe in a larger pipe, made of sheet iron or cast iron; the steam pipe is supported centrally in the large pipe by means of disks of wood through which it passes. These disks can be sawed from long pieces after they are bored. Slip these disks on the steam pipe as it is being connected, and then encase in the outer pipe. It will be necessary to have the outer pipe airtight.

(43) L. S. D. says: I am about getting up a design for a poor house, and desire to heat it with steam or water and steam. How large an apparatus do I want to heat a building 40 x 75, two stories high, and cut up into suitable rooms? A. See SCIENTIFIC AMERICAN p. 123, vol. 34, of February 19, 1876, paragraph (32); also, p. 74, vol. 34, January 29, 1876, paragraph (13); also, p. 123, vol. 36, February 24, 1877, paragraph (7).

(44) N. H. D. says: I am about to make a small windmill, the wheel of which will be 30 inches in diameter, having 8 equal arms, the broad part being 9 inches wide at the top, 6 inches at the bottom, 9 inches long, the wheel and its shaft being geared to a perpendicular rod, and small gear wheel being 1 inch, large one being 1 1/2 inches. Give the size of water pump that can be used, and size of air pump. A. See SCIENTIFIC AMERICAN, vol. 32, No. 16.

(45) A. W. C. says: I have a 20 foot x 50 inch tubular boiler, iron chimney 42 feet high, size 28 inches. My draught is poor. I am about to put on a fan blast over my wheat burr; will it increase my draught sufficiently to attach a pipe to the fan and connect it to the chimney? If not, what length of chimney will I have to put in, in order to insure a good draught? A. The details are not sufficient to enable us to form a definite opinion. It seems probable, however, that the boiler is imperfectly set. 2. What shall I use in my boiler to remove scale? A. If you can freshen the water by the use of a heater with sediment collector, the scale will be gradually removed. The third question seems to be a query for judicial decision.

(46) L. P. M. says: 1. I have a Daniell's battery and am trying to do a little electrotyping, but not with very good success. I have set up my name and residence with type and taken a wax mould of it, and have covered the letters with good plumbago and connected it with a battery. The copper deposits thick on the wire and the smooth part of the mould, but does not take hold of the letters, or only a thin film around them. Can you tell me the reason? A. See that every point of the matrix is covered uniformly with an unbroken film of the plumbago, and then, after blowing out the excess of dust with a small hand bellows, lay the mould face upward, pour a little water over it, and see that the water enters freely every letter; careful manipulation with a small camel's hair brush will remove air bubbles. Then immerse in the bath and proceed with the plating. 2. In "Munspratt's Chemistry," issued by Mackenzie, p. 799, in speaking of Daniell's constant battery, says: "m and n are brass rods fixed longitudinally over the trough; to the former, m, are suspended the moulds, to the latter, n, sheets of copper exactly facing the moulds. The zinc of the battery is connected with the rod, n, and the copper of the battery with rod, m." The diagram shows the reverse of this. Which is correct? A. Join the cathode or rod to which the moulds are affixed to the zinc pole of the battery; a wire then joining the coppers of the battery with that of the bath properly completes the circuit. 3. On p. 798, in charging the battery, it says the copper cylinder is filled with sulphate of copper acidulated with 1/4 of bulk of sulphuric acid. Would not the latter have a tendency to eat the copper? A. It is not advisable to add sulphuric acid; a little sulphate of zinc is commonly used instead, or, what is better, after charging with copper sulphate, short circuit the battery for a few hours, at the expiration of which time it will be found to have attained its full power.

(47) T. M. says: I. I. says large reservoir, 30 feet deep, 300 feet fall, 2 pipes equal in size and length, one at bottom the other near top (does not say how near top), which will discharge most water 2 miles distant. Suppose we drop the 300 feet fall, insert the pipes one at bottom and the other at 6 inches below the surface enough to be sure and fill the upper pipe and a constant head. It is plain, without calculation, which will discharge with the greatest velocity, and of course the greatest quantity; now we will add the 300 feet fall by laying the pipes to the town. The extra fall cannot, it seems to me, decrease the velocity of water at bottom of reservoir; now does not the lower pipe have the advantage of an initial velocity, due to the head of 30 feet at reservoir; and discharge at the town a correspondingly greater quantity? A. In case of the pipe near the surface, it would be necessary to add to the 300 feet fall the difference of level between the two pipes.

(48) J. F. says: I am running or have charge of a stationary boiler of the locomotive type. The water I am feeding the boiler with is very hard, leaving a scale on the tubes and crown sheet from 1/4 to 1/2 thick, and so hard that it will take a very sharp chisel and a smart blow with the hammer to pierce it. At one time I put a box of concentrated lye in the boiler to see if it would have effect on the scale. It did not even make the boiler prime, and on examination the scale was about the same as before. Since then I have been putting "Catsup" in, pumping it in with the feed. It makes the water prime or foam, but not so as to deceive

me. One week ago I examined the scale in the boiler. In places on the crown sheet I found broken pieces 1/4 and 1/2 of an inch thick. Was it the strong action of the fire at times, or was it the sudden contracting of the iron after all the water was blown out, that caused the scale to break off in places? A. Probably the scale was broken off by sudden contraction. It is a bad plan to blow off a boiler as soon as the fire is hauled. Let the water remain in the boiler until it has become quite cool, and then run it out. By pursuing this course the scale will frequently be softened so that it can readily be removed.

(49) J. B. says: What is the best and cheapest method of making axle grease? A. One part of fine black lead, ground perfectly smooth, with four parts of lard.

(50) A. G. S. asks: Is there any way to color moerschm pipes otherwise than by confined smoking? A. See SCIENTIFIC AMERICAN No. 12, vol. 36, p. 186 (40).

(51) W. M. asks: What will make a good black paint for painting boiler heads, smoke stacks, etc.? Is there a fireproof cement for laying brick in lining furnaces? A. See No. 3 present volume SCIENTIFIC AMERICAN, p. 43 (46), and No. 4, p. 50 (14).

(52) T. B. S. asks: Will you give me some information regarding the "Rose of Jericho"? A. This name is given to an oriental plant which is found in northern Africa, Syria, and Arabia. It is an annual and grows in sandy wastes. The stem is very short, with branches a few inches long spreading in all directions. After the plant has flowered, and when the pods begin to ripen on the approach of dry weather, the branches drop their leaves and begin to curl inwardly, and in time the whole resembles a ball of wickerwork at the top of a short stem. When the rain falls, or the plant is placed in moist situations, the curled and dried leaves unbend, and become as a green plant. In its native country it is surrounded by various superstitions. In Palestine it is called *rosa Maria* and *raf Maryam* or Mary's flower. It is sometimes called the Resurrection Plant.

(53) W. T. asks for information about making soap, and says: I undertook the manufacture of common washing soap for clothes. I succeeded in making a soap of good quality, but altogether too soft, and not capable of hardening although exposed to the air for a long time. A. If you were to obtain "A Practical Treatise on the Manufacture of Soaps," published by John Wiley & Son, New York city, or "A General Treatise on the Manufacture of Soap," by Professor Dussance, published by H. C. Baird, Philadelphia, you would find all the information you require.

(54) T. C. asks for information about making black ink: A. The following recipe is said to make a very fine and durable ink: Aleppo galls (bruised) 12 lbs.; soft water, 6 gallons; boil in a copper vessel and add water to make up that lost by evaporation; strain, and again boil the galls with 4 gallons water for half an hour; strain and boil the third time with 2 1/2 gallons water. Mix the liquors and while hot add 4 1/2 lbs. coarsely powdered green copperas and 4 lbs. gum arabic. Agitate until dissolved, and strain for use. Product, 12 gallons fine and durable ink.

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

J. S.—It is galena—a sulphide of lead. Galena usually contains a little silver.—R. F. G.—(Minerals in red box). It is marcasite or white iron pyrites. See article on p. 7, vol. 36.—J. M. G.—It contains silicates of alumina, soda and alumina, and sulphate of lime. It may be used in the manufacture of pottery, etc., and on the farm.—C. B. K.—The substance is nearly pure metallic lead. It is possible that the small granules (some of which approach crystalline form) may be native lead—a substance almost unknown. It is, however, far more probable that they were at one time musket balls. The coating is plumbic carbonate and sulphate. You should send larger quantity if possible.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On an African Continental Railroad. By A. W.
On Sizes of Safety Valves. By R. H. T.
On a Simple Way to Make Ice. By —
On a Thread Snake. By A. B. A.
On the Divining Rod. By J. L. H.
On Carrying a Bar of Iron. By S. B. E.
On Speed of Rafts, etc. By C. G. C.
On Snakes Catching Fish. By W. S. B.
Also inquiries and answers from the following:
E. T. L.—J. M., Jr.—A. M. S.—C. H. W.—E. T. L.—C. P. W.—H. P.

HINTS TO CORRESPONDENTS.

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

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

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

Hundreds of inquiries analogous to the following are sent: "Who sells instruments for mining engines? Who sells long staple cotton gins?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL. INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States were Granted in the Week Ending June 26, 1877, AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Accordion, F. Zogbaum	192,478
Animal catcher, J. L. Wiggin	192,523
Axle box, F. Keiser	192,435
Baby walker, J. L. Butler	192,413
Bale tie, J. M. Goldsmith	192,430
Bale tie, W. A. Wright	192,477
Bar for jails, T. J. Toland	192,471
Barrel cover, D. F. Dodge	192,335
Barrels, J. F. Budke	192,358
Bee hive, J. P. Long	192,520
Beer cooler, J. Staugler	192,539
Blowpipe, D. R. Porter	192,452
Boiler furnace grate bar, R. J. Hancock	192,331
Boiler, Barber & Porter	192,481
Boot and shoe machinery, C. F. Moore	192,341
Boot and shoe counter, Mann & Rankin	192,442
Booting jack, J. Buzzell	192,465
Brick machine, W. L. Gregg	192,431
Bridge, T. Mullin	192,450
Bucket ear, J. Wasmer	192,519
Buckle, D. V. Bradley	192,412
Buckle, E. M. Kinne	192,516
Building, A. W. Louth	192,441
Butter carrier, W. H. & T. Dulaney	192,430
Butter worker, W. Johnston	192,372
Camp chest, B. M. Descombes	192,439
Car axle box lid, G. W. Morris	192,534
Car coupling, Dowling & Perry	192,419
Car coupling, C. Hall	192,506
Car coupling, F. P. Shorey	192,464
Car coupling, W. J. Trimble	192,544
Car frame, metallic, B. J. La Mothe (r)	7,768
Car starter, J. R. Johns	192,375
Card screen, S. S. Getchell	192,429
Ceiling, W. E. Worthen	192,400
Chair, W. Lovell	192,380
Chair, A. B. Stevens	192,467
Chest garment, C. A. Fuller	192,366
Chimney, etc., L. B. Silver (r)	7,766
Chisel, E. Carney	192,323
Churn, A. F. Morgan	192,449
Churn, A. J. Stoll	192,540
Cider mill, H. & S. M. Willson (r)	7,770
Collar box, J. Levine	192,373
Colter and jointer, G. K. Smith	192,538
Cooking cereals, L. S. Chichester	192,362
Copper, separating, W. B. Young	192,431
Corn crib, B. F. Bedwell	192,410
Corn flour, A. L. Murdock	192,535
Corn marker, H. C. & W. T. Sharp	192,534
Cotton ball separator, J. A. Smiley	192,336
Cradle, C. Barlow	192,406
Crape, restoring, A. J. Shriver (r)	7,763
Crucibles, H. Wile	192,399
Crucibles, Park & Hay	192,345
Cuff, E. S. House	192,333
Cultivator, J. Sherrill	192,462
Cultivator, G. Storm	192,541
Cultivator tooth, G. D. Rowell	192,390
Cultivator, J. Poetz	192,367
Door and draw plate, F. H. Seymour	192,533
Door threshold, R. B. Hamor	192,432
Doors, sliding, A. K. Rider	192,435
Dress supporter, G. Schwab	192,522
Drying machines, R. J. Walker	192,397
Earth auger, W. Shaw	192,463
Electromagnetic apparatus, B. F. Card	192,361
Elevator way, A. J. Judge	192,335
Elevators, H. S. Lansdel	192,517
Engine, rotary, R. Valle	192,547
Envelope, A. Christey	192,363
Envelope, C. K. Marshall	192,522
Evaporating pan, G. T. Jones	192,376
Exercising machine, W. M. Marshall	192,338
Fence, C. A. Root	192,300
Fence supporter, J. R. Gorby	192,501
Fence, barbed, T. D. Stetson	192,468
Fence wire tightener, G. Duffey	192,494
Fire escape, L. H. Allen	192,403
Fire escape, J. P. Duncan	192,364
Fire escape, F. E. Goble	192,500
Fire escape, L. Meyer	192,339
Fire escape, A. Warth	192,518
Fire escape, J. Welch	192,551
Fire place heater, C. M. Coulter	192,416
Flanging machine, Morgan & Godley	192,448
Fluid pressure apparatus, G. F. Deacon	192,487
Fruit drier, C. W. & E. A. Jones	192,513
Fruit jar, H. Purdy	192,453
Fruit jars, etc., Hirt & Mahler	192,509
Funnels, S. M. Preston	192,545
Furnace blower, T. J. Hickey	192,453
Furnace, smelting, Sturdy & May	192,409
Gas and air carburetor, W. H. Winn	192,309
Gas apparatus, W. W. Upp	192,554
Gas or water stopcock box, A. W. Morgan	192,540
Gate, W. Rinehold	192,456
Gate, farm, S. S. & J. G. Sherman	192,536
Gate, flood, N. J. Sweeney	192,470
Glass furnace, G. W. & C. W. Foster (r)	7,764
Glass, F. Siemens	192,537
Grain binder, J. P. Johnson	192,374
Grain separator, J. F. Hatfield	192,505
Grain separator, W. T. McCulla	192,445
Grasshopper catcher, Wilson & Rhode	192,533
Hair dressing, N. Helmer	192,506
Harness maker's machine, Berger & Shoup	192,359
Harness tug, etc., H. R. Woodcock	192,476
Harrow, F. Barnes	192,407
Harrow, J. W. Carpenter	192,414
Harrow, J. Weber	192,336
Hides, collaring, T. W. & W. K. Appleyard	192,479
Horse collar pad, W. Dippert	192,375
Horse rack, Hercholtz & Schenacker	192,332
Horsehoe, E. Murraine	192,342
Hose reel, C. W. Tremain	192,543
Hydrant, W. Kaiser	192,336
Hydrant, S. W. Lewis	192,379
Hydraulic jack, Weaver & Noble	192,472
Ice machine, E. Fixary	192,597
Ingot, soft center, J. Park, Jr.	192,346

Inhaler, J. B. De Guise	192,498
Journal box, J. S. Atkinson	192,405
Knob fastener, O. Mayo	192,443
Knobs, M. C. & S. S. Niles	192,543
Lamp lighter, J. A. Plant	192,347
Lamp post, W. De Lany	192,418
Lathes, tool holder, S. Gissinger	192,499
Leather straps, machinery, S. B. Randall	192,528
Letter sheet, etc., W. T. Berry	192,411
Lifting jack, G. W. Hunter	192,370
Lifting jack, J. G. Winters	192,554
Loading etc., apparatus, J. W. Castleman	192,415
Lock for satchels, etc., R. Flocks	192,327
Locking latch, J. J. King	192,515
Locomotive fire box, J. C. Hayward	192,507
Loom, D. E. Keating	192,514
Loom picker, J. W. Barlow	192,482
Low water alarm, B. R. Singleton (r)	7,767
Lubricator, G. Lytle, Jr.	192,387
Lubricator, P. Bloomsburg	192,357
Lumber, trimming, T. J. Frazer	192,499
Millstone balancing, L. Read	192,454
Mower knife sharpener, Z. Frost	192,437
Oil can, J. F. Coppel	192,466
Package holder, J. H. Randall	192,388
Pail bottoms, etc., machine, G. W. Parker	192,385
Paper box, A. D. Schaeffer	192,530
Pavement, Rock & Phillips	192,349
Pen holder, S. B. Ladd	192,439
Pencil, C. Walpuski	192,555
Picture exhibitor, H. E. Ezekiah	192,365
Picture frame, J. W. Fleischmann	192,365
Pictures, W. T. Murphy	192,384
Pipe plug, R. H. Dalzell	192,324
Piston, R. M. Beck	192,409
Plane, bench, C. L. Adancourt	192,462
Planing machine, W. W. Brewster	192,322
Pneumatic tube, W. P. Lewis	192,443
Postmarking, T. Leavitt	192,519
Pressure gage, B. M. Johnson	192,373
Printing machines, Hoe & Tucker	192,510
Pruning implement, J. R. Hunter	192,434
Pump valve, J. Gates	192,367
Push pin and watch key, Fisher & Lucas	192,425
Reflector, H. O. Baker	192,321
Refrigerator, H. Siegelstly	192,465
Rein holder, etc., C. T. Ellsworth	192,405
Road scraper, J. T. Currier	192,417
Roll, sectional, A. B. Seymour	192,392
Roofing tile, P. Pointon	192,451
Rounding and straightening rods, J. S. Seaman	192,469
Rowing gear, J. W. Melcher	192,382
Ruling machine, J. McAdams	192,444
Sash balance, Kolb & Osberghaus	192,435
Sash fastener, D. T. Gerrish	192,438
Sash fastener, S. Rush	192,529
Saw circular, S. N. Pool, Jr.	192,535
Sawing machine, J. S. Baker	192,480
Scaffolding, H. Batt	192,408
Seal, F. C. Hamilton	192,504
Seed sower, J. W. Gamble	192,323
Sewing machine, C. Turner	192,546
Shears, Foltz & Miller	192,426
Sheet metal can, H. Miller	192,446
Sheet metal machine, T. W. McKeever	192,361
Shutter, A. G. Hanmann	192,500
Sled, G. F. Shaver	192,461
Sleigh, G. H. Laub	192,515
Sleigh shoe, B. F. Sweet	192,394
Smoke house, H. T. C. Kraus	192,377
Soldering furnace, J. Burgess	192,360
Soldering ease troughs, J. Huth	192,475
Sorghum, mill, E. A. Withers	192,475
Spindle, G. P. Whitman	192,473
Spindle and bobbin, G. Draper	192,433
Spinning machinery, B. Saunders	192,391
Spinning ring holder, W. F. Draper	192,460
Spool holder, etc., J. M. Montgomery, Jr.	192,523
Spooling machines, F. Fearon	192,424
Stanchion, Z. W. Smith	192,466
Steam generator, J. A. Reed	192,389
Steam pipes, covering, G. B. Wiestling	192,474
Stock holder, G. Sax	192,457
Stopeck, E. Hoxie	192,511
Stove door, J. Martin	192,521
Stove, W. P. Brophy	192,484
Stove pipe damper, H. B. Todd	192,386
Stump elevator, Dunnebach & Linden	192,421
Sugar cane apparatus, J. Bromley	192,483
Sugar cubes, cutting, C. Raetz	192,327
Sugar, manufacture of, L. E. Schmalz	192,521
Suspenders, S. B. Sharp	192,535
Tellurian, F. Howes	192,369
Textile fabric, H. D. Dupree	192,491
Thill coupling, F. G. Arter	192,424
Trace fastener, H. H. Schroeder	192,458
Trunk catch, H. Vogler	192,355
Tunnels, shield for, T. Jeynes	192,512
Tu, ere, I. S. Van Winkle	192,396
Umbrella, H. Falcina	192,469
Valve attachment, W. H. Garrecht	192,329
Valve gear, Scott & Roth	192,459
Valve gear, E. N. Dickerson (r)	7,763
Valve, G. M. Weinman	192,550
Vanilline, F. Tiemann	192,542
Vehicles, C. J. Ellsworth	192,422
Velocipedes, E. H. Turner	192,543
Vent bung, Pentlize & Hirsch	192,386
Wagon end gate, E. Rowland	192,351
Wagon hound, etc., C. F. Whipple (r)	7,769
Wagon spring, A. W. McKown	192,583
Washing machine, F. N. Griffith	192,330
Watchman's time detector, W. Imhauser	192,384
Weather strip, E. T. Ingalls	192,371
Whip, W. H. Millikin	192,447
Windmill, W. A. Guseman	192,302
Window blind, T. A. Smith	192,353
Wire-straightening machine, I. A. Kilmer	192,487
Wool-combing machine, L. Smith	192,362
Wrench, tap, C. Elterich	192,428

DESIGNS PATENTED.

10,068.—CASKET HANDLE LUGS.—C. Barmore, Cincinnati, Ohio.
10,069.—CASSIMERES.—O. F. Chase, Thompson, Conn.
10,070.—TOBACCO BAGS.—W. J. Cussen, Richmond, Va.
10,071.—CARPETS.—E. Daniel, Paris, France.
10,072 and 10,073.—ORGAN CASE.—S. Hayward, Boston, Mass.
10,074.—COVERS FOR SMOKING PIPES.—J. Kirschbaum, Waterbury, Conn.
10,075.—CRADLES.—L. E. Minott, Sheboygan, Wis.
10,076.—GROUP OF STATUARY.—John Rogers, New York city.
10,077.—MILK JUGS.—T. C. Smith, Greenpoint, Brooklyn.
10,078.—FURNERAL ORNAMENT.—W. M. Smith, West Conn.
[A copy of any one of the above patents may be had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]

Advertisements.

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

THE SEASIDE LIBRARY.

Choice books no longer for the few only. The best
standard novels within the reach of every one. Books
usually sold from \$1 to \$3 given (unchanged and un-
changed) for 10 and 20 cents.

1. EAST LYNNE, By Mrs. Henry Wood. (Double No.) 20c.
2. JOHN HALLIFAX, GENTLEMAN, By Miss Mu-
lock. (Double No.) 20c.
3. JANE EYRE, By Charlotte Brontë. (Double No.) 20c.
4. A WOMAN-HATER, Charles Reade's new novel.
(Double No.) 20c.
5. THE BLACK INDIAN, Jules Verne's last new
novel. (Single No.) 10c.
6. THE LAST DAYS OF POMPEII, By Sir Edward
Bulwer Lytton. (Single No.) 10c.
7. ADAM REDE, By George Eliot. (Double No.) 20c.
8. THE ARUNDEL MOTTO, By Mary Cecil Hay.
(Single No.) 10c.
9. OLD AXDELTON'S MONEY, By Mary Cecil
Hay. (Single No.) 10c.
10. THE WOMAN IN WHITE, By Wilkie Collins.
(Double No.) 20c.
11. THE MILL ON THE FLOSS, By George Eliot.
(Double No.) 20c.
12. THE AMERICAN SENATOR, By Anthony
Trollope. (Double No.) 20c.
13. A PRINCESS OF THULE, By William Black.
(Double No.) 20c.
14. THE DEAD SECRET, By Wilkie Collins. (Single
No.) 10c.
15. ROMOLA, By George Eliot. (Single No.) 20c.
16. THE EIGHTH OF THE NORTH POLE, By
Jules Verne. (Single No.) 10c.
17. HIDDEN PERILS, By Mary Cecil Hay. (Single
No.) 10c.
18. BARBARA'S HISTORY, By Amelia B. Ed-
wards. (Double No.) 20c.
19. A TERRIBLE TEMPTATION, By Chas. Reade.
(Single No.) 10c.
20. OLD CURIOSITY SHOP, By Charles Dickens.
(Double No.) 20c.

For sale by all Booksellers and Newsdealers, or sent
postage prepaid, on receipt of price by
GEORGE MUNN & CO., Publishers,
21, 23, and 25 Vandewater St., N. Y.

YALE VERTICAL MILL.
Iron Frame; French Burrs; Self-feeding;
Self-balanced; Self-feeding; Long Bear-
ings. Best, Simplest,
Cheapest, and for qual-
ity and quantity ground
no superior.

YALE IRON WORKS
NEW HAVEN,
CONN.

TWO LARGE IRON PLANERS FOR SALE VERY
cheap. E. E. ROBERTS, 119 Liberty St., N. Y.

NO MORE SLIPPING BELTS. MY NEW
Patent Pulley Cover will do double the work before the
belt will slip. Put on without disturbing shafting.
Agent wanted in every city. Circulars free.
JOHN W. SUTTON, 35 Liberty St., New York.

What 25 cents Will Buy!

THE SCIENTIFIC AMERICAN REFERENCE BOOK.

PRICE TWENTY-FIVE CENTS.

This is a most useful little bound book of 150 pages,
comprising, probably, the most extensive variety of
standard, practical, condensed information ever furnished
to the public for so small a price. Contents:

1. The Last Census of the United States (1870).
by States, Territories and Counties, IN FULL, showing
also the area in square miles of each State and Terri-
tory.
2. Table of Occupations.—Showing the occupations
of the people of the United States, and the number of
persons engaged in each occupation. Compiled from
the last census.
3. Table of Cities having over 10,000 inhabitants.
Compiled from the last census.
4. Map of the United States. Miniature outline.
5. The United States Patent Laws (full text).—
Principal Official Rules for Procedure; Directions How
to Obtain Patents, Costs, etc.; Forms for Patents and
Caveats; How to Introduce and Sell Inventions; Forms
for Assignments; Licenses; State, Town, County, and
Shoe Rights; General Principles applicable to Infringe-
ments; Synopsis of the Patent Laws of Foreign Coun-
tries; Rights of Employers and Employees in respect to
inventions.
6. The Ornamental Design Patent Law (full
text).—Costs and Procedure for securing Design Patents
for Ornamental Productions such as Designs for Textile
Fabrics, Patterns for Wood and Metal Work, New
Shapes and Configurations of any article of Manufacture,
Prints, Pictures, and Ornaments, to be printed, woven,
stamped, cast, or otherwise applied upon machinery,
tools, goods, fabrics, manufactures.
7. The United States Trade-Mark Law (full
text).—With Directions, Proceedings and Expenses for
the Registration of Trade-Marks of every description.
8. The Label Copyright Law (full text).—With
Directions, Proceedings and Cost of Registering Labels
for Goods, Medicines, and Merchandise of all kinds.
9. The General Copyright Law of the United
States (full text).—With Directions and Costs for
securing Copyrights by Authors for Books, Pamphlets,
Charts, Photographs, Pictures, and Works of Art.
10. The Principal Mechanical Movements.—
Described and illustrated by 150 small diagrams, of great
value to Inventors and Designers of Mechanism.
11. The Steam Engine.—With engraving, showing
all the parts, names, etc., and a brief history of the in-
vention and Progress of Steam Power.
12. Geometry, as Applied to Practical Purposes.
With illustrations.
13. Horse Power.—Simple Rules for Calculating the
Horse-Power of Steam Engines and Streams of Water.
14. Knots.—Presenting engravings of 48 different
kinds of Knots, with explanations as to tying.
15. Tables of Weights and Measures.—Troy,
Apothecaries', Avoirdupois, French, Weights; U. S.
Standard; Dry Measure; Land Measure; Cubic Measure;
Liquid Measure; French Square Measure; French Cubic
Measure; or Solid Measure; Measuring Land by Weight; En-
graving of a section of English and French rule, of
equal length.
16. Valuable Tables: (1) Velocity and Force of the
Wind. (2) Specific Gravity and Weight, per Cubic foot
and Cubic Inch, of the principal substances used in the
Arts. (3) Heat-conducting Power of various Metals
and other Solids and Liquids. (4) Table of the Mineral
Constituents absorbed or removed from the Soil, per
acre, by different crops. (5) Table of Steam Pressures
and Temperatures. (6) Table of the Effects of heat
upon various bodies, melting-points, etc.
17. Medallion Portraits of Distinguished
American Inventors, with biography in brief and
engravings of their inventions, viz.: Franklin, Fulton,
Whitney, Wood, McCormick, Blanchard, Winans, Morse,
Goodyear, Howe, Lyle, Eads.
18. Engravings of Capital, Washington, with brief
history, dimensions, cost, etc.; United States Patent
Office, interior and exterior views; Dimensions, and
description; Scientific American Buildings, N. Y. and
Washington.
19. Miscellaneous Information.—Force of Expan-
sion by Heat; Small Steam-boats, proper dimensions of
Engines, Boilers, Propellers, Boats; Incubation, Tem-
perature of; To Make Tracing Paper; Constituents of
various substances; Friction, how produced, and Rules
for Calculation; Specific Heat Expanded; Specific
Gravity of Liquids, Solids, Air, and Gases; Gunpowder
—Pressure, Heat, and Horse-Power of; Copying Ink, to
Make; Heat, its mechanical equivalent explained; Mo-
leculars of Matter, size and motion explained; Light-
ning and Lightning Rods—valuable information; Value
of Drains; Explained; Amount of Power at present
yielded from Coal by best Engines; Sound—its velocity
and action; Liquid Glues, Recipes; Value of Brains;
Properties of Charcoal; Height of Waves; Speed of
Electric Spark, etc.; Plain Directions, with Engravings,
showing how any person can make Electro-Magnets
and Electric Batteries at a cost of a few cents; Valuable
Recipes.

The Scientific American Reference Book, price only 25
cents, may be had of News Agents in all parts of the
country, and of the undersigned, sent by mail on receipt
of the price.
Address MUNN & CO., 37 Park Row, New York.

PATENTS at AUCTION.

The third great Sale will take place Sept. 3d. Patents for this sale should reach us before August 21st. Send
for circular, terms, etc.
GEO. W. KEELER, Auction and Com'n Merchant, Salesrooms, 53 & 55 Liberty St., N. Y.

Pond's Tools

Engine Lathes, Planers, Drills, &c.
Send for Catalogue. DAVID W. POND, Successor to
LUCIUS W. POND, Worcester, Mass.

\$5 to \$20 per day at home. Samples worth \$5
free. STINSON & CO., Portland, Me.

Boul's Patent, Reverse Motion



Paneling, Vari-
ety Moulding &
Dovetailing Ma-
chine. Cuts
Panels of any
design or style
of mould in the
solid wood with
neatness and
dispatch.
Is a first-class
Shaper, Edge, &
Scroll Moulder.
Does general
Dovetailing
with thick or
thin stuffs. Simple, Durable and
Efficient. Send for Pamphlet
and Sample of work. Improved
Solid Steel Cutters for all kinds of
Variety Moulders made to order, and warranted by the

B. C. MACHINERY CO.,
Battle Creek, Mich.

PILES and FISTULA.

DR. O. PHELPS BROWN'S Herbal Ointment Supposito-
ries are guaranteed to cure any case of Piles or Fistula
that can be found in the United States. A sample box
of these Suppositories will be sent free by mail, to any
sufferer on the receipt of twenty cents, to prepay post-
age and packing. Regular price \$1.00. Address the
Doctor at 21 Grand St., Jersey City, N. J.

LEFFEL WATER WHEELS.

With recent improvements.
Prices Greatly Reduced.
7000 in successful operation.

FINE NEW PAMPHLET FOR 1877.

Sent free to those interested.

James Leffel & Co.,
Springfield, O.

109 Liberty St., N. Y. City.

DANBURY DRILL CHUCKS.

Perfect and Price reduced.
Manuf'd by the HULL & BELDEN CO., Danbury, Ct.



Lightest, Strongest and Best
Belt Pulley made. Secured
to Shaft without Keys, Set Screws,
Bolts or Pins; also, Adjustable
Dead Pulleys and Taper-
Sleeve Couplings. Send for
Catalogue.

TAPER-SLEEVE PULLEY WORKS,
ERIE, PA.

WATER SUPPLY ENGINEERING.

By J. T. FANNING, C.E. Complete Practical Treatise;
650 pages; 125 Tables; 180 Illustrations. Price \$5.00.
D. VAN NOSTRAND, Publisher, 23 Murray St., N. Y.

* Copies sent free by mail on receipt of price.

ON THE PROGRESS OF AERONAUTICS.

An essay read before the Aeronautical Society of Great
Britain, by Frederick W. Lanchester, Secretary of the As-
sociation. A useful and interesting paper. Containing
brief accounts of the most recent trials of balloons hav-
ing mechanical propelling attachments. The required
dimensions and best forms for balloons with propelling
machinery. Calculations of the power exerted by birds
in travelling through the air, and their methods of ac-
tion. Calculations of the mechanical requisites for suc-
cessful aerial navigation, as indicated by the flight of
birds. Report of balloon trials having vertical screw
propellers, made by the British War Office. Air naviga-
tion by "pushing" balloons. Experimental trials of the
Society's apparatus for testing the Lifting Power of
plane surfaces when exposed to wind currents. Descrip-
tion and dimensions of Moys' steam Aerial Locomotive,
with an account of its practical trial at the Crystal Palace
Description of Moys' remarkable self-lifting steam en-
gine and boiler, of one horse power, but weighing only
thirteen pounds, with dimensions, arrangement of the
lifting fans, etc. Contained in SCIENTIFIC AMERICAN
SUPPLEMENT No. 50. Price 10 cents. To be had at this
office and of News Dealers.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manu-
facturers of improved wrought iron Beams and
Girders (patented).

The great fall which has taken place in the prices of
iron, and especially in Beams used in the construction
of FIRE PROOF BUILDINGS, induces us to call the at-
tention of Engineers, Architects, and Builders to the
undoubted advantages of now erecting Fire Proof
structures; and by reference to pages 32 & 34 of our Book
of Sections—which will be sent on application to those
contemplating the erection of fire proof buildings—THE
COST CAN BE ACCURATELY CALCULATED, the
cost of insurance avoided, and the serious losses and in-
terruptions to business caused by fire; these and like con-
siderations fully justify any additional first cost. It is
believed, that were owners fully aware of the small
difference which now exists between the use of Wood
and Iron, that in many cases the latter would be adopted.
We shall be pleased to furnish estimates for all the Beams
complete, for any specific structure, so that the difference
in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

PIONEER IRON WORKS,



Nos. 149 to 153 Wil-
liam St., BROOK-
LYN, N. Y.
Manufacturers of the
A. LINCOLN
Patent Steam
ROAD ROLLER
and TRACTION EN-
GINE. All kinds of
Paving Machinery.
Machinery for
Sugar Houses and
Plantations a spe-
cialty.

Alexander Bass's Patent Portable Iron Railroad.

N. F. BURNHAM'S
1874
WATER WHEEL
Is declared the "standard turbine,"
by over 600 persons who bought and use
them with part and full gate open.
Pamphlets Free.
N. F. BURNHAM, York, Pa.

OTIS' SAFETY HOISTING Machinery.

OTIS BROS. & CO., No. 38 Broadway, New York.

\$55 & \$77 a week to Agents. \$10 Outfit Free.

WE ENAMEL
FINE JET BLACK every variety of turned wood work
parts of machinery, castings, tinware and other metal
work ENAMELED JET BLACK in wood or metal, made to order
AMERICAN ENAMEL CO. 11 WARREN ST. PROVIDENCE, R. I.

Lathes, Planers, Shapers, Drills,
Gear & Bolt Cutters, &c. E. GOULD, Newark, N. J.

SAVE OIL. USE TOMLINSON'S
Car Axle Box. Cars run for 3 cents for a thousand
miles. See Car Builder for June 1877. Address
J. B. TOMLINSON, 80 White St., N. Y.

SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood
Water. WM. D. ANDREWS & BRO., 414 Water St., N. Y.,
who control the patent for Green's American Driven Well

BIG PAY to sell our RUBBER PRINTING STAMPS.
Terms free. TAYLOR & CO., Cleveland, O.

Model Engines.

Complete sets of
CASTINGS
for making small
Model Steam Engines 1-2 in. bore, 3 in. stroke, price, \$4;
ditto 2 in. bore, 4 in. stroke, price, \$10, same style as cut.
Eureka Foot Lathes only 15 Dollars. Gear Wheels and
Parts of Models. All kinds of Small Tools and Materials
Illustrated Catalogue Free.
GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

50 MIXED CARDS, with name, 10c. and stamp.
Agent's Outfit, 10c. COLE & CO., Bristol, Ct.

PATENT SCROLL AND BAND SAW MACHINES A
specialty. CORDEMAN, EGAN & CO., Cincinnati, O.

THE NEW GERMAN PATENT LAW.
Being the Full Text of the New Law for Patents, passed
July 1st, 1877, covering all the States of the German
Empire. Contained in SCIENTIFIC AMERICAN SUPPLE-
MENT No. 50. Price 10 cents. To be had at this office
and of all newsdealers.

WOOD-WORKING MACHINERY,
Such as Woodworth Planing, Tongueing, and Grooving
Machines, Daniel's Planers, Richardson's Patent Im-
proved Trench Machines, Mortising, Moulding, and
Re-Saw Machines, and Wood-Working Machinery gene-
rally. Manufactured by
WITHERBY, RUGG & RICHARDSON,
25 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

BRADFORD MILL CO.
Successors to Jas. Bradford & Co.
MANUFACTURERS OF
French Burr Millstones,
Portable Corn & Flour Mills,
Smut Machines, etc.
Also, dealers in Bolting Cloths and
General Mill Furnishing.
Office & Factory, 168 W. 2d St.
CINCINNATI, O.
J. R. Stewart, Pres. W. R. Dunlap, Sec.
PRICE-LISTS SENT ON APPLICATION

ENGINES AND MACHINERY, ALL STYLES, NEW
and Second-hand. E. E. ROBERTS, 119 Liberty St., N. Y.

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.,
NEW YORK.

THE SUCCESS.

Why is the Success ahead? Be-
cause its great merits were attested
by the managers of the late Centen-
nial in causing the first award on
Turbines to be given to it, and in se-
lecting it as the Standard Wheel for
estimating the leakage of the wheels
of the world there represented.
Because it gives over 80 per cent. of
power under PART as well as FULL
GATE, send for descriptive Pam-
phlet and Price List to S. M. SMITH, York, Pa.

Best in use. Send for circular.

GLASS OILERS. CODY & RUTHVEN, Cincinnati.

The George Place Machinery Agency

Machinery of Every Description.
121 Chambers and 100 Reade Streets, New York.

THE "ROBERTS" PORTABLE HOISTING AND
Yacht Engines. Send for circular, 119 Liberty St., N. Y.

"IN ALL THINGS, BUT PROVERBIAL IN MECHANISM,
THE SUPREME EXCELLENCE IS SIMPLICITY."—Jas. Watt.

The Old Reliable Heald & Sisco Pump

Carries off the honors at the CENTEN-
NIAL. The award of the Judges is
based on its "SIMPLICITY, com-
pactness, and perfection of
WORKMANSHIP."

No higher praise could be given, but no award what-
ever was necessary to strengthen the confidence of
thousands already using them. Whenever subjected to
severe practical tests, they have always proved their
superiority over other centrifugal pumps, and always
will, as it is absolutely impossible to devise a pump
which can excel it for simplicity, tremendous ca-
pacity, and cheapness. Capacity of Pumps from one
hundred gallons to thirty-five thousand gallons per mi-
nute. For Paper Makers, Tanners, Contractors; for Irriga-
tion, or for any purpose where a large quantity of water
or other fluid is to be raised, the Heald & Sisco Pump
stands without a rival. More than three hundred paper
makers use them. More than three hundred tanners use
them. They are used in every State of the Union, and in
nearly every country in the world. Pumps alone, and
Pumps and Engines combined, adapted to nearly every
kind of work, on hand and built at short notice.

First premiums awarded at New Orleans in 1871, in
Cincinnati in 1872, and an award for Special Merit at
the American Institute in 1872. Send for Illustrated
pamphlet of 78 pages, with 18 pages of certificates and
references. Address
HEALD, SISCO & CO., Baldwinville, N. Y.

AIR COMPRESSORS

FOR ALL PURPOSES.
A SPECIALTY OF HEAVY PRESSURES.
THE NORWALK IRON WORKS CO.,
SOUTH NORWALK, CONN.

WESSELL METAL, A PERFECT IMITA-
tion of gold in color, surface, etc., for manufacturers of
imitation jewelry, and other workers in fine yellow
metal. WesSELL Manuf'g Co., No. 34 East 23d St., N. Y.



U.S. PIANO CO., 810 Broadway, N. Y.
Send satisfactory. Send for our Illustrated Circular, which con-
tains particulars, and contains the names of other 1000 Dealers, Mer-
chants and Families that are using our Pianos in every State of the
Union. Please state where you saw this notice. Address,
U. S. PIANO CO., 810 Broadway, N. Y.

\$12 a day at home. Agents wanted. Outfit and
terms free. TRUE & CO., Augusta, Maine.

WE CIGARS \$85
Want SALESMEN as a regular salary of
a month and expenses, to sell our
cigars. Send for circular. Samples FREE.
Send 10c. stamp to receive answer.
S. FOSTER & CO., Cincinnati, O.

EXTRAORDINARY, WONDERFUL, AND VALUABLE MEDICAL WORK.
With engravings; price, \$1.
Contains, also, fifty original
prescriptions for prevailing
diseases, each worth ten
times the price of the book.
Gold Medal has been award-
ed the author. Descriptive
circulars sent free. Address
Dr. W. H. PARKER, No.
4 Bulfinch Street, Boston.

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent. greater
strength, a finer finish, and is truer to gauge, than any
other in use, renders it undoubtedly the most economical.
We are also the sole manufacturers of the CELEBRATED
COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed on
application to
JONES & LAUGHLIN,
Try Street, 2d and 3d Avenues, Pittsburgh, Pa.
120 S. Canal Street, Chicago, Ill., and Milwaukee, Wis.
25" Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers St., N. Y.

IMPORTANT FOR ALL CORPORATIONS AND
MAN'G CONCERNS.—Buerk's Watch-
man's Time Detector, capable of accurately con-
trolling the motion of a watchman or patrolman at the
differing stations of his beat. Send for circular.
J. E. BUEBK, P.O. Box 979, Boston, Mass.
N. B.—The suit against Imhäuser & Co., of New York,
was decided in my favor, June 10, 1874. A fine was
assessed against them Nov. 11, 1874, for selling contri-
bution to the order of the court. Persons buying or using
clocks infringing on my patent will be dealt with ac-
cording to law.

SELF-ACTING SASH-LOCK for Meeting Rails

Burglar Proof.
Can not be forced or tampered with
in any way. Beautiful design;
practical; simple. United
States, State, or County Rights for
sale. Address
D. C. GOODRICH, Harrisburg, Pa.

THE PRACTICAL TREATISE ON LIGHTNING PROTECTION.

Recently issued by the undersigned, is the only com-
plete manual on the subject. It fully explains
the serious defects of the lightning conductors now
erected. Sent by mail, postpaid, on receipt of \$1.50.
H. W. SPANG, Reading, Penna.

LIGHT CASTINGS

to order promptly.
Plain, Bronzed, or
Galvanized.

We make a specialty of light work.
LIVINGSTON & CO., Iron Founders, Pittsburgh, Pa.

ALUMINIUM—ITS CHARACTER

Weight, Industrial Uses, Alloys, Method of Manufacture
and Cost in Market. A valuable paper. SCIENTIFIC
AMERICAN SUPPLEMENT No. 35. Price, 10 cents. To be
had at this office and of all newsdealers.

Steel Name Stamps.

N. Y. STENCIL WORKS, 57 Nassau St., N. Y.

65 LARGE MIXED CARDS, with name, 10c.
and 3 ct. stamp. 25 Styles Fun Cards, 10c.
Samples 6c. **M. Dowd & Co., Bristol, Conn.**

\$66 a Week in your own town. Terms and \$5 outfit
free. **H. HALLETT & CO., Portland Maine.**

GOLD, SILVER and NICKEL PLATING

made easy. The Electro Platers' Guide, a 72 page
Manual of instruction, sent free for 10 cents. All in-
formation relating to plating furnished free. Address
F. LOWEY, 142 Fulton St., N. Y.

AGENTS, MALE AND FEMALE, SEND

ten cents for new style package of the Eureka Button
Fasteners, containing two dozen (with punch) and
"Price Lists." Great profit to agents. Beware of
counterfeits; none genuine unless Eureka Button
Fastener, Patented January 25th, 1874, is on each pack-
age. W. L. Urann, Sole Manuf'r, 26 & 28 Broadway, N. Y.

TO ELECTRO-PLATERS, JEWELERS, AND

WATCHMAKERS.
BATTERIES, CHEMICALS, AND MATERIALS, in
sets or single, with Books of instruction for Nickel,
Gold, and Silver Plating. THOMAS HALL, Manu-
facturing Electrician, 19 Hume Street, Boston, Mass.
Illustrated Catalogue sent free.

WESTON DYNAMO-ELECTRIC MACHINE CO.

Machines for Electro-plating, Electrotyping, 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 MFG CO.;
REED & BARTON; HALL, ELLIS & CO.; RICHARDSON,
HOYT & CO.; W. H. JACKSON & CO.; STANLEY
WORKS; ROGERS CUTLERY CO.; CHAS. ROGERS BROS.;
EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NOR-
WALK LOCK CO.; HAYDEN, GIBB & CO.; DOMESTIC
SEWING MACHINE CO.; FRIEDRICH FABER JOH. DIXON
CHURCH CO.; MUMFORD & HANSON; FAGAN & SON,
and over 20 others. OUTFITS FOR NICKEL, SILVER,
BRONZE, Plating, etc. The two highest CENTENNIAL
AWARDS, and the CENTENNIAL GOLD MEDAL of American
Institute.

CONDIT, HANSON & VAN WINKLE

Sole Agents **NEWARK, N. J.**

Advertisements.

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

PUNCHING PRESSES. Drop Hammers and Dies, for working Metals, &c. THE STILES & PARKER PRESS CO., Middletown, Conn.

TAKE IT EASY.
Common-Sense Chairs and Rockers.
With or Without Reading Table.
For sale by the trade. Manufactured by F. A. SINCLAIR, Mottville, N. Y.
Send Stamp for Illustrated Price List.
Every Chair Stamped and Warranted.

1872, 1873, 1874, 1875, 1876, SCIENCE RECORD.

A few copies of these splendid books, copiously illustrated, are offered at the following very low prices. Persons desiring a condensed history of the most interesting Facts and Discoveries in the Arts, Sciences, and Inventions, for the years from 1872 to 1876, will find them recorded in the five volumes of the SCIENCE RECORD, now offered at half the original price.

Every Department of Science is treated in these volumes, and the important discoveries of the several years are not only faithfully described, but many of the subjects are illustrated with finely executed engravings, prepared expressly for these Annuals.

Among the subjects, the following are the most noteworthy, exhibiting in a condensed form a general account of the Progress of the World:

CHEMISTRY AND METALLURGY, MECHANICS AND ENGINEERING, ELECTRICITY, LIGHT, HEAT, SOUND, TECHNOLOGY, THE USEFUL ARTS, BOTANY AND HORTICULTURE, AGRICULTURE, RURAL AND HOUSEHOLD ECONOMY, MATERIA MEDICA, THERAPEUTICS, HYGIENE, NATURAL HISTORY AND ZOOLOGY, METEOROLOGY, TERRESTRIAL PHYSICS, GEOGRAPHY, GEOLOGY AND MINERALOGY, ASTRONOMY, BIOGRAPHY AND NECROLOGY.

Each yearly volume contains about 600 octavo pages, including a large number of handsome engravings. They are bound in substantial and handsome bindings, and will be mailed on receipt of \$1.25 each, or \$5 for the set of five volumes.

They were published and heretofore sold at \$2.50 each, or \$10 for the set.

State, in remitting for a single volume, which year, from 1872 to 1876, is desired, remembering that the date of the volume covers the events and discoveries of the previous year. Sent by mail on receipt of price. Address

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

EAGLE FOOT LATHES,

Improvement in style. Reduction in prices April 20th. Small Engine Lathes, Slide Rests, Tools, etc. Also Scroll and Circular Saw Attachments, Hand Planers, etc. Send for Catalogue of outfits for Amateurs or Artisans.

WM. L. CHASE & CO., 55 & 57 Liberty St., New York.

TURBINE WATER WHEELS.—A REPORT of the official Tests of Turbine Water Wheels made during the Centennial Exhibition of 1876. With thirty-one illustrations. Embracing Drawings and Descriptions of the Apparatus used for each test. The Instruments employed for determining the Power and revolutions of each wheel. Engravings and descriptions showing the Construction of the wheels that exhibited the Greatest Efficiency. Table showing the Names of the Exhibitors of the several wheels tested. Date of each test. Diameter of wheel. Fraction of gate. Weight on the scale in pounds. Revolutions per minute. Horse-power of wheel. Head on wheel in feet. Head on weir in feet. Flow over weir. Head on weir due to leakage. Horse-power of the water used. Percentage of efficiency realized by each wheel. Together with other valuable and interesting particulars. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS Nos. 59 and 61. 39 cts. each. To be had at this office and of all news-dealers.



PATENTS

CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

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 YEARS' EXPERIENCE, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Registrations, Copyrights for Books, Labels, Reliefs, Assignments, and Reports on Infringements of Patents. All business entrusted 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 Trade Marks, Copyrights, Designs, Patents, Appeals, Reliefs, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign Patent 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 patents—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 steam 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; Canadian, \$50. Address

MUNN & CO., 37 Park Row, New York city. Solicitors of Patents, and Publishers of the SCIENTIFIC AMERICAN.

GUARDIOLA'S COFFEE & SUGAR MACHINERY
Coffee, Malt, Corn, Cocoa, and Grain-Drying Machine, Coffee-Hulling and Polishing Machine, Coffee-Washing Machine, Helix Sugar Evaporator.

Messrs. C. ADOLPH LOW & CO., 42 Cedar Street, Messrs. MUNOZ & ESPRIELLA, 52 Pine Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Super-Heated Steam, Oil Stills, &c.

HENRY W. BULKLEY, Manufacturer, 10 Broadway, New York.

THE HOADLEY PORTABLE STEAM ENGINE.
WITH AUTOMATIC CUT-OFF REGULATOR AND BALANCED VALVE.
THE BEST & MOST ECONOMICAL ENGINE MADE SEND FOR CIRCULAR.
THE J.C. HOADLEY CO. LAWRENCE, MASS.
STATE WHERE YOU SAW THIS.

ESTABLISHED 1844.

JOSEPH C. TODD,
(Formerly of Todd & Rafferty), ENGINEER and MACHINIST. Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Also Agent for the celebrated and improved Lawson & Rittinger Hoisting Engine. I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address

J. C. TODD, 10 Barclay St., New York, or Paterson, N. J.

CONCRETE AS A BUILDING MATERIAL.—A lecture delivered before the Royal Institute of Architects, London, by A. Payne, with discussion of the subject by prominent architects. This lecture and the extended discussions of the subject are contained in SUPPLEMENT Nos. 26 and 34. Price, 10 cents each. They present a large amount of valuable information, upon Concrete building, in concise form.

\$50. 00 SCREW-CUTTING FOOT LATHES.
Foot Drill Presses. Send for Circular to R. L. SHEPARD, Cincinnati, O.

GUILD & GARRISON,
34 to 44 First St.,
Williamsburgh, N. Y.,
Manufacturers of
STEAM PUMPS
for all purposes.
Also Vacuum Pumps,
Vacuum Pans and
Air Compressors.

P. BLAISDELL & CO.,
Worcester, Mass.,
Manufacturers of the Blaisdell Patent Upright Drills and other first-class Machinists' Tools.

THE BIGELOW Steam Engine.

BOTH PORTABLE AND STATIONARY.
The CHEAPEST AND BEST in the market. Send for descriptive circular and price list.

H. B. BIGELOW & CO.,
New Haven, Conn.

Can I Obtain a Patent?

This is the first inquiry that naturally occurs to every author or discoverer of a new idea or improvement. The quickest and best way to obtain a satisfactory answer, without expense, is to write to us (Munn & Co.), describing the invention, with a small sketch. All we need is to get the idea. Do not use pale ink. Be brief. Send stamps for postage. We will immediately answer and inform you whether or not your improvement is probably patentable; and if so, give you the necessary instructions for further procedure. Our long experience enables us to decide quickly. For this advice we make no charge. All persons who desire to consult us in regard to obtaining patents are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us a careful consideration of their plans, an honest opinion, and a prompt reply.

What Security Have I that my communication to Munn & Co. will be faithfully guarded and remain confidential?

Answer.—You have none except our well-known integrity in this respect, based upon a most extensive practice of thirty years' standing. Our clients are numbered by hundreds of thousands. They are to be found in every town and city in the Union. Please to make inquiry about us. Such a thing as the betrayal of a client's interests, when committed to our professional care, never has occurred, and is not likely to occur. All business and communications entrusted to us are kept secret and confidential.

Address **MUNN & CO.,**
Publishers of the SCIENTIFIC AMERICAN,
37 Park Row, New York.

BENTEL, MARCEDANT & CO.
MANUFACTURERS OF SUPERIOR
UNIVERSAL WOOD WORKERS'
BAND SAWS, SCROLL SAWS,
PLANING & MATCHING MACHINES
UNIVERSAL HAND JOINTERS
MILLING, DOVING, BORING, FRIZING, SHAPING &
PLANING MACHINES, PLANE KNIVES & MILLING BITS
HAMILTON, OHIO.

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 and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 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.

Address **MUNN & CO.,**
Publishers SCIENTIFIC AMERICAN.

STEAM PUMPS

Wright's Pat. Bucket Plungers are the best. VALLEY MACHINE CO., Easthampton, Mass.

HAVING DISOBLIVED PARTNERSHIP, WE offer for sale a very large lot of Machinery for Wood and Iron Workers. Steptoe, McFarlan & Co., Cincinnati, O.

PERFUMERY.—BY W. SAUNDERS, Pharmacist.—A valuable and practical paper upon the preparation of Perfume Extracts. With Formulas for the preparation of the most prominent and popular Perfumes now on the market, directions for the preparation and compounding of the ingredients, etc. The Formulas here given embrace the preparation of the following Perfumes:—Jockey Club, Moss Rose, White Rose, Victoria, Ess. de Bouquet, Musk, Patchouly, Millefleur, Ylang Ylang, Spring Flowers, Wood Violets, West End, Tuberosa, Stephanotis, Rondeletia, New Mown Hay, Frangipanni, Clove Pink Violet, Mignonette. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 65. Price 10 cents. To be had at this Office, and of all News-dealers.

THE BEST AND MOST ECONOMICAL

Boiler Feeder

18

FRIEDMANN'S INJECTOR,

MANUFACTURED BY

NATHAN & DREYFUS, New York.

106 Liberty St.

Send for Circular.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.

Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.

NEW HAVEN MANUFACTURING CO.,

New Haven, Conn.

Blake's Patent Stone & Ore Crusher.

NEW PATTERNS, with important improvements, and abundant strength. This is the only machine used by the principal MUNICIPAL, RAILROAD and MINING CORPORATIONS and CONTRACTORS in the United States and foreign countries, for breaking hard and brittle substances to ANY SIZE. Send for circular. Address,

BLAKE CRUSHER CO., New Haven, Ct.

Steel Castings,

From 14 to 10,000 lbs. weight, true to pattern. An invaluable substitute for forgings, or for malleable iron castings requiring great strength. Send for circular and price list to CHESTER STEEL CASTING COMPANY, EVELINA STREET, PHILADELPHIA, PA.

HARTFORD

STEAM BOILER

Inspection & Insurance

COMPANY.

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

I. B. PIERCE, Sec'y

ROCK DRILLING MACHINES

AND

AIR COMPRESSORS.

MANUFACTURED BY BURLEIGH ROCK DRILL CO.

SEND FOR PAMPHLET. FITCHBURG, MASS.

FOR THE LATEST IMPROVED STAVE

Heading and Shingle Machinery, also the celebrated Bailey Gauge Lath, Second-hand Boilers and Engines, or Special Machinery, address T. R. BAILEY, Agt., Lockport, N. Y.

FOR SALE, AT GREAT BARGAINS.

One 18x26 Todd & Rafferty Engine, with 14 ft. band wheel, 25 in. face; built in sections; weight, 14,000 lbs.; 8 in. hammered iron shaft, 10 ft. long; Judson governor complete. One 14x18, heavy and strong, suitable for saw or grist mill; 8 ft. 4 in. band wheel, 19 in. face governor, and all complete. Also, one 10x24; one 8x20; one 7x16; one 6x16; and one 5x12, all new and first-class. Address J. C. TODD, 10 Barclay Street, New York, or at Works, Paterson, N. J.

Niagara

Steam Pump Works.

ESTABLISHED 1826.

CHARLES B. HARDICK,

No. 23 Adams Street,

BROOKLYN, N. Y.

LOCOMOTIVE ENGINEERING.—THE

most recent and best examples of Locomotive Construction, with scale drawings, tables of principal dimensions, general description, etc., are given in the SCIENTIFIC AMERICAN SUPPLEMENT. The following may be had at this Office, or ordered through any News-dealer. Sent by mail prepaid. Please order by the numbers here given.

Express Locomotives of the London, Chatham and Dover R.R. Tank Locomotives. With Specifications, Dimensions, Particulars and three Engravings. Supplement No. 23. 10 cents.

Locomotives at the Centennial. A series of Eighteen Outline Illustrations, showing the Principal Locomotives exhibited at the Centennial, with their measures, and a table of principal dimensions of each locomotive. Supplement No. 35. 10 cents.

Baldwin Locomotive.—Large engraving in sectional elevation, with measures, scale, and table of dimensions. Supplement No. 38. 10 cents.

Narrow Gauge Swedish Locomotive. with one page of engravings. Supplement 41. 10 cents.

Locomotives of the Eighteen Inch Railway at Crewe, Eng. Two engravings. Supplement 44. 10 cents.

Locomotive Passenger Engines of Midland Railway, with table of dimensions. Three engravings. Supplement No. 27. 10 cents. The same number contains report of valuable information given before the Master Mechanics' Association, concerning Locomotives and Locomotive improvements.

Narrow Gauge Locomotives. Indian State Railways, engraving and dimensions. Supplement No. 53. 10 cents.

New Railway Locomotive Crane. by Black, Hawthorne & Co. Four engravings to scale, dimensions, etc. Supplement No. 54. 10 cents.

New Road Locomotive. by Marshall Sons & Co. General description and one engraving. Supplement No. 56. 10 cents.

Express Passenger Locomotives. Great Western Railway. With five engravings, and tables of all the principal dimensions. Supplement No. 58. 10 cents.

Locomotive for Burning Petroleum.—Used on Russian Railways. With description and five illustrations. Supplement No. 63. 10 cents.

Steam Trolley or Chair.—Used on Oude Railway. Two engravings. Supplement No. 63. 10 cents.

THE TANITE CO., STROUDSBURG, PA. EMERY WHEELS AND GRINDERS. GEO. PLACE, 121 Chambers St., New York Agent.

\$3 PRINTING PRESS!
Prints cards, envelopes, etc., equal to any press. Larger sizes for large work. Do your own printing and advertising and save money. Excellent spare hour amusement for old or young. Or it can be made money making business anywhere. Send 3c. stamps for large catalogue to

KELSEY & CO., Manufacturers, Meriden, Conn.

H. W. JOHNS' PATENT. ASBESTOS MATERIALS.

Paints, Roofing, Steam Pipe and Boiler Coverings, Steam Packing, Sheathing, Fire, Acid, and Waterproof Coatings, Cements, etc. Send for Samples, Illustrated Catalogues, Price Lists, etc.

87 MAIDEN LANE, NEW YORK.

FOOT POWER TENONING MACHINES FOR SALE

By S. C. HILLS, 78 Chambers St., New York.

WANTED Small Machinery of any kind to Manufacture at a low figure

H. BICKFORD, Cincinnati, O.

Shaping Machines

Have novel device for changing length of stroke while in motion, also, automatic down feed, and quick return. Four sizes. Patented 1868, 1871, 1874.

Wood & Light Machine Co.

Worcester, Mass.

Manufacturers of all kinds of Iron Working Machinery

Shafting, Pulleys, &c.

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 & SON, Buffalo, N. Y.

THE

Scientific American.

The Most Popular Scientific Paper in the World.

THIRTY-SECOND YEAR.

Only \$3.20 a Year, including Postage. Weekly.

52 Numbers a Year.

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

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

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

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.

NOTICE TO FOREIGN SUBSCRIBERS.

The new Postal Union now offers special facilities for the regular and speedy transmission of the SCIENTIFIC AMERICAN direct from the office of publication in New York to subscribers in foreign countries. The subjoined table exhibits the yearly subscription prices of the SCIENTIFIC AMERICAN and SUPPLEMENT in the principal foreign currencies, payable in advance:

The prices are for one year's subscription, including the postage.

FOR SCIENTIFIC AMERICAN. FOR SUPPLEMENT. SCIENTIFIC AMERICAN AND SUPPLEMENT.

Austria..... 8. Fl. 9 13 20

Belgium..... 10. Fr. 10 15 25

Denmark..... 10. Kro. 15 20 30

France..... 10. Fr. 10 15 25

Germany..... 10. M. 16 24 36

Great Britain..... 10. Shillings 16 24 36

Holland..... 10. Fl. 10 15 25

Italy..... 10. Fr. 10 15 25

Norway..... 10. Kro. 15 20 30

Russia..... 10. Roub. 5 7 11

Sweden..... 10. Kro. 15 20 30

Switzerland..... 10. Fr. 10 15 25

The best way to remit is by Postal Order. Make the order payable to MUNN & CO., New York, United States, and forward the order to us with the name of the sender and the address to which the paper is to be mailed.

MUNN & CO.,

Publishers SCIENTIFIC AMERICAN.

New York.

THE "Scientific American" is printed with CHAS. TENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.

SCIENTIFIC AMERICAN

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

Vol. XXXVII.—No. 6.
[NEW SERIES.]

NEW YORK, AUGUST 11, 1877.

[\$3.20 per Annum.
[POSTAGE PREPAID.]]

Despaquis' Photo-Engraving Process.

M. Despaquis has observed, like all who have occupied themselves with this branch of study, that in an engraving it is necessary to have a grain inside the cavities, while the surface should be of a polished character in those portions destined to reproduce the whites of the image. He therefore set about to discover how such a result could be brought about. He applied to the metallic plate two films of gelatin, the first a thick one containing the grain, and the second thinner and absolutely free from grain. It is due to this second film that M. Despaquis is enabled to produce all the delicacy of half tone. His method of operation is as follows: In one thousand cubic centimetres of water are dissolved two hundred grammes of gelatin; to this are added twenty grammes of liquid Indian ink and four grammes of powdered pumice, the latter being finely ground and sifted through fine linen. Next, upon a plate of glass which has been waxed, he spreads a sheet of moistened paper, taking care to prevent the formation of air bubbles. The solution of gelatin, previously filtered and maintained at a slightly warmed temperature sufficient to keep it liquid, is then poured upon this sheet of paper. In this way a sheet is secured, covered with a thick film of gelatin having a very fine grain, uniformly spread throughout its body. When it is desired to make use of this prepared paper the second film is applied, and the sheet sensitized at the same time; to do this, it is immersed (prepared side uppermost) in a solution composed of:

Water.....	500 cub. cents.
Gelatin.....	1 to 15 grammes.
Bichromate of ammonia.....	15 "

After remaining in this liquid for some seconds the sheet is taken out, and by two of its corners (still prepared side uppermost) it is drawn over a gelatinized plate, previously prepared with ox-gall, so that later the paper may be easily detached. The sheet, dried in a locality where it is screened

from daylight, is cut a little larger than the cliché, and placed underneath the latter. The exposure of the prepared sheet to the light should be a third that necessary to give a carbon print. As in this latter process, as soon as the printing is finished, the impression is plunged into cold water, so as to transport the print, not to albumenized paper, but a plate of polished steel or copper; it is afterward put under pressure, and allowed to dry, and finally the image developed, as in the carbon process, with warm water. It is, indeed, treated as if it were a carbon print, rather more care being taken, however, because there is less adhesion between the gelatin and the polished steel. When the matrix plate has been secured in this way, a mould is made, either in the hydraulic press, as in the Woodburytype process, or in a rolling mill, covering the plate with a double sheet of very stout lead. The mill must be worked two or three times, so that every detail of the image is reproduced in the lead. Finally, you produce by the aid of the electrotype process a counter-mould, which is the plate from which the printed copies are produced.

An Illuminating Cannon Shot.

One of the most simple and ingenious contrivances, for the purpose of investing a fleet with a zone of light through which no enemy could pass without being observed, has been devised by M. Ferdinand Silas, of Vienna, whose experiments with lifebuoys at Portsmouth have been reported in these columns. M. Silas' inextinguishable lightning shell is similar to a common shell, can be made to fit any gun, and can, accordingly, be projected to any distance. The projectile consists of three parts, one within the other. Within the shell proper is a lining of wet sponge, and within this is a glass bottle, which fills the whole cavity; the bottom of the shell unscrewing to admit of its entrance. This bottle is filled with various charges of phosphide, none of which, however, is to be less than ten pounds. A small

channel is bored through the sharp point of the shell in order to allow the air to mix freely with the wet sponge, and there are a couple of apertures in the head which are plugged with wooden stoppers covered with leather. Through the movable bottom of the shell a steel striker is inserted, which is fitted with a spring, and communicates with the glass bottle within. When the light shell is fired, the spring striker is driven forward by the explosion like a gas check and so breaks the bottle; the water contained in the jacket of sponge then penetrates through the broken glass and saturates the phosphide; phosphuretted hydrogen is immediately generated in large quantities, by the pressure of which the stoppers are forced out and two streams of illuminating matter are poured upon the sea. The light burns with great brilliancy for a considerable time, and is claimed to be inextinguishable.—*London Times*.

CABLE FASTENINGS OF THE EAST RIVER BRIDGE.

In an article last week we followed the progress of making one of the strands that is to form the massive cables designed to support the roadway of the East River Bridge. These strands are a little over three inches in diameter, and the diameter of the cable when completed will be about fifteen and a half inches. We have seen the strand in place and resting in its permanent seat, the saddle, on top of the tower. We will now detail the manner in which the ends of these strands are secured and held in place at the anchorage at each end of the bridge. In the engraving, Fig. 1, which is taken from the Brooklyn anchorage, is shown the manner in which the wires are wrapped around the iron shoe as they are received at the anchorage. In the front of the engraving will be observed a massive iron bar, to one end of which this shoe, similar in form to a horseshoe magnet with armature in place, is attached. In folding the wires around it, as received from the carriers, the shoe lays horizontally, and the bight

[Continued on page 82.]



THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.—THE CABLE FASTENINGS.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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

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.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies 15 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.

[25] Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVII, No. 6. [NEW SERIES.] Thirty-second Year.

NEW YORK, SATURDAY, AUGUST 11, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

American Institute Exhibition.....	51	Labor, degradation of.....	89
Arrow, steam launch (18).....	91	Lead pipe, etc., manufacture of.....	81
Astrological notes.....	85	Lightning, casualty by.....	85
Aqueducts, ancient.....	88	Log turner.....	86
Axes, polishing (8).....	91	Mechanical industry, American.....	83
Bat, brown.....	89	Methylated spirit.....	85
Battery, bichromate of potash (39).....	92	Mississippi jetties, the.....	82
Bells, preserving (37).....	92	Mole and a nail.....	82
Bird line, recipe for making (9).....	91	Moles, exterminating.....	83
Blasting by electricity.....	92	Parchment paper (6).....	91
Book cover protector.....	92	Patents, selling by auction.....	81
Bronzing (41).....	92	Patents, American and foreign.....	90
Calliper, micrometer.....	79	Photo-engraving.....	79
Canon shot, an illuminating.....	86	Postage stamp, improved.....	89
Chess.....	84	Potato bug in Germany.....	83
Copper plating castings (5).....	92	Printers' rolls (31).....	82
Correspondence, Washington.....	84	Railway, a two foot.....	81
Daguerotypes, how to clean.....	82	Railway car construction.....	80
Doctors, dangers from.....	81	Rain tree, the.....	81
Donkey pump.....	79	Reducing flesh (10).....	91
East river bridge, cable fastening.....	73	Ribbon fish, the.....	88
Expansion by hardening.....	84	Rope, steel wire.....	88
Eye, visual purple of the.....	85	Rubber stamps, making (35).....	91
Fat, formations of.....	89	Saxton, Joseph (12).....	91
Fire cistern, a new.....	85	Sealing wax, making (34).....	91
Galvanometer (35).....	91	Shad in Iowa river.....	81
Hairs of the human head.....	82	Soap, sawdust.....	83
Hogwate Polar colony.....	81	Sparrows, about.....	89
Howe's cave, views of.....	83	Sticking paper, to make.....	83
Inventions patented in England.....	87	Telephone, a new.....	83
Inventions, returns for.....	87	Watch, invention and history.....	83
Iron, to magnetize (43).....	92	Well, deepest in the world.....	81
Iron trade, English.....	85	Wood engraving in Japan.....	87
Knives.....	88	Vinegar, home made.....	85

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 84,
For the Week ending August 11, 1877.

- I. ENGINEERING AND MECHANICS.—Collapsible Boats. By Rev. E. L. BETHUN, M. A. An interesting paper read before Society of Arts, London. With three engravings showing the system applied to ship's boats, artillery, and pleasure boats.—Clark and Standfield's Air Cushions for Boats. 2 figures.—Science and War; with descriptions of scientific implements used in warfare.—Pneumatic Clocks of Vienna. Designed by A. C. MAYRHOFER. 5 illustrations.
- Projected Pneumatic Railway, London. 1 figure. A Railway in the clouds; being a description of the great Peruvian Railway over the Alps.—New Locomotive Crane, with 1 engraving.
- Stank's Dynamometer. 4 figures.—How Matches are Made. By JOHN A. GARVEY, A. B. A valuable paper.—On the Manufacture of Portland Cement.
- Treating Oxides of Iron.—Bichromate's Improved Gas Furnaces.—The Monnier Process at the Providence Mine, California. With plan of the reduction works. Refractory Ores; Roasting; Lixivation; the Silver Room; the Copper; the Gold; Oxide of Iron; Advantages of Sulphatization.—New Alloy.
- II. ELECTRICITY, LIGHT, HEAT, ETC.—Spectrum of the Electric Spark in Compressed Gas. By M. A. CAZIN.—Second Successful Trials of the Jablockhoff Electric Candles, London.—Applications of Electricity in Warfare.
- III. CHEMISTRY AND MINERALOGY.—Deutsche Chemische Gesellschaft, Berlin.—Vielala Limbosa.—Oxygen at High Pressure.—Decomposition of Hydrochlorate of Trimethylamine by Heat. By M. CAMILLE VINCENT.—Manufacture of Sulphuric Acid.—Production of Aluminum.—How to Give a Harmless Green Color to Peas and other Canned Vegetables.
- IV. MEDICINE, PHYSIOLOGY, ETC.—On Catarrh. By DUDLEY S. REYNOLDS, M. D.—The Physiological Position of Copper.—On Milk Diet.—A Turpentine Bath in Rheumatism.—Removing Foreign Bodies from the Eye.—Is Consumption Incurable?
- V. LESSONS IN MECHANICAL DRAWING. By Professor C. W. MACCORD. Second Series.—No. XII.—The Screw Propeller, continued, 6 figures.
- VI. MISCELLANEOUS.—How to Draw a Straight Line. By A. B. KEMPE, B. A.—A lecture at South Kensington, London, 5 figures. A valuable paper.—The Hay Crop of the United States.
- VII. CHESS RECORD.—Conducted by SAMUEL LOYD. Introductory Remarks by the conductor.—Portrait of Dr. C. C. Moore, Treasurer of the American Chess and Problem Association, with sketch, and examples of some of his problems.—Formation of a new Chess Association.—Grand International Chess Match, between England and the United States; names of the Contestants on both sides.—International Chess Congress, French Exhibition of 1875.—Contest, Blackburne vs. Zukertort.—Origin of Chess.

Terms.—SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, five dollars. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, seven dollars. CLUBS.—One extra copy of the SUPPLEMENT will be supplied gratis for every club of five subscribers at \$5.00 each.

All the back numbers of the SUPPLEMENT, from the commencement, January 1, 1876, can be had. Price 15 cents each.

NOW READY.—The SCIENTIFIC AMERICAN SUPPLEMENT for 1876. Complete in two large volumes. Over 80 quarto pages; over 2,000 engravings. Embracing History of the Centennial Exhibition. New Illustrated Instructions in Mechanical Drawing. Many valuable papers, etc. Price five dollars for the two volumes, stitched in paper; or six dollars and fifty cents, handsomely bound in stiff covers.

Remit by postal order. Address

MUNN & CO., PUBLISHERS.

37 Park Row, New York.

[25] Single copies of any desired number of the SUPPLEMENT sent to any address on receipt of 15 cents.

THE DEGRADATION OF LABOR.

Labor is honorable, and the laborer worthy of honor in direct proportion to the personal integrity, independence and capacity that go with it. Abject servitude, even when voluntary, is neither honorable to the individual nor profitable to the mass.

This is the American idea: it is the independent laborer that honors labor. Unhappily of late years the majority of our working men have forgotten or failed to learn this basic principle of our social, industrial, and political system. Worse: they have hearkened to demagogues who have taught them contrary doctrines—doctrines subversive of all true manliness in working men, and calculated only to degrade labor by reducing the laborer to practical slavery.

Could there be a bitterer satire on the manliness of working men than the main plank in the platform of the "bread winner's league"—bread beggar's league, more properly—to the effect that the government—in other words their fellow citizens—should furnish them with employment and wages? Is government servitude the highest aim of the present generation of working men?

Time was when the American laboring man's boast was that he was, or was bound to be, his own master, asking odds of no one. He felt himself a free man, capable of self-support; a man whose strength and skill need not go a-begging for employment. While this was the rule labor could not be redundant. The laborer was not abjectly dependent on some one to hire him, for he was able and willing to to work for himself. However limited the scope of his productive industry, he was, or could be an independent producer; and his work was to be sought for if it was to be hired.

But all this, it would seem, has been changed. As a rule the laborer—tradesman, mechanic, artisan, or what not—is not and no longer aims to be first of all a free man. On the contrary he desires nothing and looks forward to nothing but to be dependent on some one for a job. He must be hired, or he can do nothing; and such employment failing he falls back, not on his own capacity for self support, not upon independent industry, but to the vain demand that government shall make work for him. Then having made himself utterly dependent on wages, he foolishly imagines that he can overturn the fundamental laws of work and wages, and dictate the terms at which he will be employed and the kind of work he will do.

The first lesson that the working men of the country need to learn is that they have no claim upon any one—individual, corporation, or government—for employment. They are not infants, but men: and they must be willing to act a man's part in the great industrial struggle, or go to the wall. Inability to find a master is no excuse for idleness; nor more is any lack of demand for the specific labor they prefer to do. The manliness of the working man is gone, the prosperity of the working class vanishes, the moment men give themselves up to individual helplessness—the first fruit of the fallacy that other men are in duty bound to provide them with the means of making a living. No part of the community, neither "capital" nor government, is in any way bound to furnish work for any one. And it matters little whether men demand or beg that employment be given them as their only resource against starvation, they ask only what would but seal their moral and industrial degradation. To persist in huddling together in increasing helplessness, is simply to rivet the chains of the slavery the working classes are doing most to bind upon their own limbs. The laws of Nature cannot be reversed to relieve men of the consequences of their folly.

Not until the old spirit of manly self respect and individual self-helpfulness is revived: not until the majority of the industrial classes seek first to become, sooner or later, their own employers, will prosperity return to them. Until then the labor market will be glutted; by their very numbers the mob of employment seekers will destroy the chances of all for steady employment; and by their hungry competition with each other they will dissipate the only hope of any for remunerative wages. It is not any absolute redundancy of laborers as much as the misdirection of their efforts that makes or largely helps to make the times so hard for laboring men.

IRON AND STEEL IN RAILWAY CAR CONSTRUCTION.

At the annual meeting of the Master Car Builders' Association, held in New York city, June, 1876, a committee was appointed to whom was referred the subject of iron and steel in railway car construction. The report of this committee, given in the late meeting in Cleveland, Ohio, was that the substitution of steel for iron in car construction was a subject of first-class importance, and merits more attention than it had yet received.

In answer to the question of iron or steel rods in car bodies, the majority preferred iron, but it must be iron of 60,000 pounds textile strength to the square inch. Open hearth steel was admitted to be tougher and denser, but was too expensive. It was thought that steel could be produced, that with less size and weight would give equal strength. Of bolts, all preferred iron, though none seemed to have tried steel bolts. Charcoal iron was specified in the report, and the suggestion was made that good iron was better than poor steel. Of steel nails, the majority admitted to not have used them, while in one instance they were preferred because they were lighter, and as cheap as iron. Another member had received some samples with request to try them, and he reports that he had no difficulty in driving every steel nail

to the head, while he found it impossible to drive a cut nail more than half way before it would break.

In order to further test the economy of steel nails, the returning board gave the following table of the weight of iron and steel nails as one of the results of their labor:

4d. Iron nails, 260 to lb.	Steel nails, 308 to lb.
6d. " 145 "	" 142 "
8d. " 90 "	" 80 "
10d. " 62 "	" 59 "
12d. " 47 "	" 38 "
20d. " 28 "	" 30 "
40d. " 13 "	" 12 "
6d. finish'g iron nails, 192 to lb.	" 188 "
8d. " 110 "	" 92 "
10d. " 84 "	" 70 "

The price of these nails was quoted as 50 cents per keg more than iron.

Steel screws were admitted by one or two persons to be fifty per cent stronger than iron, yet the majority preferred iron. Another recommendation of the steel screw was that there were no imperfect ones found; yet this must be admitted to be a recommendation for the manufacturer of said screws. The roughness of annealed steel screws was complained of, as well as their tendency to twist. It was admitted that where iron screw heads touched iron, they were better in that condition than steel screws.

It was thought that the carlines of passenger cars, if made of steel, would be more rigid than iron. It was suggested that body bolsters, if made of steel, would be lighter, and in the end might be as cheap as iron. It was thought that a sudden shock would be liable to break the steel bolster, yet the experiment had not been tried.

Of axles, the majority preferred steel, and open hearth steel was recommended as being more likely to be free from cracks. Some claimed that iron axles run with the coolest journals, while others advocated for steel the same advantage. It was admitted that the low price of iron axles hindered making them as good as they should be. The recommendation for the steel axle was that it could be lighter, and its stiffness prevented crystallization. Steel axles do not bend as iron, though they showed in some instances a tendency to crack in the inside of the wheel hub. Lubrication was more perfect upon steel surfaces than upon iron, and they worked with a much finer surface than iron axles, and would wear longer. One member had commenced a series of microscopic experiments to get at the cause of the iron axles heating, and found that the fibres of the iron stuck up, as he said, like knife blades.

The majority preferred cast iron wheels, though steel was thought to be safer. One fault of the steel wheel was that it would split in the tread. Brake shoes of steel showed less percentage of loss by wear than the iron, and no percentage of difference was found in the wheel to which they were applied. Upon a car that had run nearly ten thousand nine hundred miles, the wrought iron shoes weighed, when applied, thirty-four and a quarter pounds; when removed, weighed thirty one and a quarter. A pair of steel shoes weighed thirty pounds, and when removed weighed twenty-eight and a half pounds, having lost one half pound. Showing one and a half pound of loss in favor of steel.

A conservative character appeared in the reports upon the distinctive merits of steel over iron, and the majority did not seem inclined to make a change from iron to steel, unless convinced that decided advantages were to be gained. Indications seem to show that, with them, steel and strength were not synonymous.

ABOUT SPARROWS.

Any European conversant with the habits and color of the sparrow in his original home on the other side of the water, and who closely watches the sparrows in and around New York city, cannot fail to observe that the latter are undergoing a change of habit as well as color. Probably no part of England, if even of Europe, is more infested with this impertinent little fellow than is the county of Kent where the barnyards and fields abound with them. It is, however, necessary to draw a distinction, for there are two kinds of sparrows, the house sparrow and hedge sparrow. The former builds a ragged, clumsy-looking nest, notable for its size and external looseness; even the feathers with which it is lined are placed in no kind of order, but appear to be put together in a spirit of "that is good enough for me." The eggs are a dull white color, speckled with reddish brown spots, and number from four to six; rarely less than the former, and never exceeding the latter. The house sparrows rarely gather in large flocks, or indeed flock at all, save in winter. They build their nests in colonies if the conditions are favorable, otherwise they will build in nooks about cornices, under waterspouts, and sometimes in trees. Over the main entrance door to Trinity church in New York city are several house sparrow nests built in the ornamental stonework. In the ornamental cornice work of many brown stone front residences the same will be observed. The hedge sparrow is similar in appearance to his confrère save that he is a trifle smaller. He is much more tidy, however, in his household affairs. He builds a snug little nest, neat and compact outside, and carefully lined, with horsehair and feathers inside, made round and with a full open top. The fibers of which it is mainly composed neatly interwoven, and it is as cosy withal as a linnet's nest. They build separately and usually in small hedgerows, leaving the holes in trees and similar places to their city brethren, the house sparrows. They lay five small eggs of a beautifully clear blue color. The hedge sparrow it is against which the European farmer wages relentless warfare in the grain and seed fields; while the house sparrow is attacked in the barn-

yard about the stacks. The hedge sparrow, in reasonable numbers, is a valuable insect-destroying aid to the farmer, and so indeed, in a lesser degree, is the house sparrow; but the swarms of hedge sparrows to be seen in the southern counties of England are sometimes as relentless and exacting as the worst case of tax gatherer. Except in nest-building season, the hedge sparrow can be distinguished in the air by his flying in compact and well defined flocks, scolding the careless, disorderly, and irregular flight of the house sparrow. When a flock takes alarm, and two or three birds rise from the ground, the rest rise like a broad and somewhat circular sheet; and if they divide at all, it is done completely; one compact division going one way and one the other, no stragglers being seen. When they settle again, it is with one accord, whether it be in the field or upon the hedge rows. At times a flock will settle upon a tall bush as thick as bees, and chirp away with all their might and main, and at such times so intently are they engaged in their quarrel, confab, or whatever it may be, that one may get almost within arm's length of them, and watch them hop from twig to twig amid a very babel of chirps. When the nearest birds find sufficient time from their noisy conclave to look about them and discover an invader's presence, they rise with a short sharp chirp and fly off without another word, the rest of the flock either dispersing or hieing away to the fields in an irregular and disorderly manner. A dozen examinations of the bushes, in which these unruly conventions had been held, failed, with a single exception, to furnish any intelligible cause, and in that one case there was found a poor escaped and half frightened to death canary bird. The hedge sparrow is destitute of the impudence of the house sparrow, and this is no doubt largely due to the enterprise of that European institution, the crow boy, whose duty it is to perambulate the grain fields to scare away the birds, especially the crows and sparrows, whose earthly happiness appears to be measured by his capability to make unearthly yells produced at the back of the throat and audible a quarter of a mile distant; occasionally a "crow boy" will vary his occupation by inventing an alarm note of his own, the whole sound, however, rarely containing more than four notes.

The English farmer resorts to numerous strategic expedients to rid himself of his superfluous stock of sparrows, one of the most successful of which is to hold a bird net close to a stack of hay or wheat in the winter nights, and placing a lantern near the middle of the net, they beat the stack with sticks, whereupon the sparrows fly to the light and are caught, terminating their tangible existence in the sparrow pie which next day graces the farmer's table.

Returning, however, to the sparrows in the country. They are nearly all house sparrows, and while a sparrow with a white feather or feathers is quite a curiosity in England or France, they are quite common in and about New York city. They form at least five per cent of the whole, while about ten per cent of the female birds have their plumage interspersed with partly white feathers. In the City Hall Park may be seen at any time some sparrows with plumage lighter than others. At Bloomingdale some are seen unusually light. The European sparrow moves with a clean and distinct hop, rising from the ground, and making a perceptible pause between each hop, but the sparrows at Bloomingdale make a succession of quick hops with very little rise, amounting to a short run, and stopping very short, resembling somewhat the movement of the American robin. In fact the result of ten years of observation is that the habits of the American sparrow are undergoing a steady change, and he appears to be entertaining somewhat of disdain for the insectivorousness to which he owes his importation, forgetful that in no other way can he pay his passage money.

SELLING PATENTS BY AUCTION.

A correspondent writes as follows:

To the Editor of the Scientific American:

I notice a sale of patent rights took place in your city on July 16. Can you give me the names and address of the buyers? Or will your paper contain them? L. B. C.

ANSWER.—Our correspondent doubtless alludes to the novel attempt of an auctioneer in this city to establish a regular series of auction sales for patents, similar to the sales of coals and other realized commodities. As might have been expected the attempt has proved a failure, so far as concerns the bona fide sale of patents; but has been a success for the pocket of the auctioneer. The plan is as follows: The auctioneer by extensive advertising requests all who have patents to sell to send the same to him, together with the sum, in advance, of five, ten, or twenty dollars, as the case may be; for which amount the auctioneer promises on a given day, to offer the patent at public auction, and to return the proceeds of the sale to owner less certain additional commissions. Numbers of patent owners have nibbled at this pretty bait, have sent in their patents and money and enjoyed what they paid for—the satisfaction of having their parchments cried out for sale in the rear end of an auction shop; but in the majority of cases there were no genuine bidders. In fact we have not heard of a single example of a bona fide sale. If, however, there have been any real sales, we should be glad to be informed of the exact particulars, in order that we may give our readers the benefit of the facts.

Scattered about the country, there are quite a number of individuals who purport to make themselves useful in selling patents. But like the patent auctioneer, they thrive upon the advance money received from the patentees; the latter seldom or never get any money back from them. If

we are mistaken in this statement, if one in a hundred of those who have paid money to these pretended patent sellers have ever through such agency effected a satisfactory sale, or received back their money, we should be glad to learn the names and particulars. The truth is that, in order to sell a patent advantageously, something more must generally be done than to hold up a mere certificate on paper. The public must be very extensively informed about the merits of the new invention; the intending purchaser must have some sort of ocular and corroborative evidence that he can make money if he buys a right; he must see some actual examples of the device; understand how it is made, and at what cost; truthful information concerning the market for the goods must be furnished, etc. To do all this in a proper and effectual manner requires for each patent the undivided time and attention of one or more active persons for a considerable period; and hence, it appears to us to be almost an impossibility for any one individual or concern to make successful progress in the sale of a multitude of patents. The selling of a single patent frequently employs the time of many persons. If there is any one method or agency more effective than another, whereby a patentee, without going to much expense, can find customers, it is by the dissemination of a handsome picture of the invention. Good engravings representing the invention in its various forms and applications, accompanied by lucid descriptions, are almost equal to models or working machines, in conveying information to the public. Descriptive circulars are good in their way; but no matter how eloquent and strong their array of adjectives in praise of the invention, they have little power, and make little impression as compared with graphic delineations; which, if well executed, are pretty sure to command the attention and convince the judgment of the observer. The distribution of these engravings can be readily arranged for by the patentee himself; he has the satisfaction of knowing that every copy sent out is a good seed sown, a step made in the right direction, and all resulting business comes to him direct; but in nine cases out of ten all advance fees paid to the professional patent seller is so much money thrown away.

THE HOWGATE POLAR COLONY.

The schooner Florence, Captain George E. Tyson Commander, will soon sail from New London, Conn., for a voyage to Cumberland Island or some place near Cumberland Island, when the ship's company will form what is known to the scientific world as the Howgate Polar Colony. At the last session of the forty-fourth Congress an effort was made to procure an appropriation of \$50,000 for purposes of polar explorations; and though the House Committee upon Naval Affairs reported favorably upon the bill, it was impossible to secure favorable action, and the bill was not passed. Contributions have been obtained from private sources, and the expedition is being forwarded as rapidly as possible. Captain Tyson, it will be remembered, was assistant navigator of the ill-fated *Polaris*, and escaped on the ice floe. He is peculiarly fitted for the responsibility confided to him. He has been a seafaring man for over twenty years, and a large portion of his life has been passed in the Arctic regions. He is known as a skillful navigator, good executive officer, firm in purpose, cool in temper, and has a well balanced mind.

The object of the expedition is to collect data in reference to meteorology, geology, natural history, and cognate sciences of the polar regions by a system of observations, which will be favored by a permanent location, provided with necessary facilities. Magnetism, astronomy, atmospheric electricity, mineralogy, the question of ocean streams and currents, the phenomena attending the diurnal rise and fall of the tides, velocity and character of the winds, observations upon the vibrations of the pendulum, etc., will engage the attention of the colony when fully established.

Captain Howgate, the projector of the expedition, is an officer of the regular army and is connected with the Signal Bureau. He was selected as one of the committee of investigation on the loss of the *Polaris*, and during this investigation the present scheme of a polar colony impressed itself on his mind.

CHESS.

The lovers of this interesting and really scientific diversion will be glad to know that one of our valued correspondents, Mr. Samuel Loyd, of Elizabeth, N.J., has undertaken to supply them with a weekly record of chess information, which will be given regularly, until further notice, in the SCIENTIFIC AMERICAN SUPPLEMENT. The first contribution will be found in the current number of the SUPPLEMENT; for particulars, see the table of contents printed in another column.

It is a curious fact, that the most distinguished inventors, mechanics, scientists, lawyers, clergymen, musicians, and statesmen, find recreation in the practice of this superior amusement. There appears to be something about it that both delights the mind and sharpens the understanding. The ablest men are found among its devotees, and confess to its beneficial influences.

Mr. Loyd is well known all over the world as a chess player, and has probably met with as many successes and carried off as many prizes as any other individual. He probably has no superior in chess; a fact that will add interest to the student of the problems that will from time to time be given in our SUPPLEMENT. We may also add that, in addition to the above accomplishment, Mr. Loyd is an in-

ventor and mechanic of superior abilities, a musician of unusual excellence, an artist of peculiar skill, and an engraver of rare talents. The portrait of Dr. Moore is one of his productions. "When do you find time, Mr. Loyd, to execute these art works?" we asked, "I quit work at six o'clock," he said, "and after supper my wife reads, I listen, and at the same time make my drawings."

Manufacture of Lead Pipe, Sheet Lead, and Shot.

Our recent series of illustrated articles, in Nos. 3 and 4, present volume, have attracted much attention. Those who still desire to obtain copies may supply themselves at this office or at any of the news stores.

We are indebted to the Colwell Lead Company, No. 63 Centre street, New York city, John Hooper, President, Lewis Colwell, Treasurer, for attentions to our artists who made the sketches illustrating the making of shot, and for the particulars given, as published in our issue of July 28. The Colwell Lead Company is one of the largest and most enterprising establishments of its kind in the world.

American Institute Exhibition.

The managers have added three medals to the list of awards for the coming exhibition. They are "The Special Medal," "The Medal of Superiority," and "The Medal of Excellence," making in all six grades of medals, four grades of diplomas, and the usual money awards for "perishable products," as flowers, fruits, etc. "The Special Medal" will be offered for certain specified exhibits each year, and each year changed. For the Forty-sixth Exhibition, 1877, which opens September 12th, the following articles only can compete for this award: Pumping machinery, passenger elevators, sewing machines, fire escapes, an approved automatic fire detector, an approved method of preventing alterations of checks, bonds, drafts, and valuable documents, by the use of specially prepared papers or otherwise.

Dangers from Doctors.

Dr. Seaton, medical officer of health, remarks in a late lecture: There are many occasions where the clothes of the medical attendant require disinfection, as, for instance, after visiting a group of small pox or scarlet fever patients. Where the practitioner has been unfortunate enough to have a patient with puerperal fever under his care, the linen requires to be boiled, and the other things baked, before being worn again at a labor. But it is to the hands that he must pay special attention, and it is here that the disinfecting properties of chlorine are particularly useful. The hand should be well soaked three or four times daily in the chlorinated soda (P. B.). If this is done for a week, baths used at the same time frequently, and the clothes disinfected, practice may be resumed without danger. Length of absence will not compensate for a neglect of these precautions, as the practitioner may communicate the disease after many months.

The Rain Tree.

The Consul of the United States of Columbia in the department of Lereto, Peru, has written from Yurimagus to President Prado, informing him that in the woods adjacent to the city of Moyobamba exists a tree called by the natives Tamai-caspi (rain tree) which possesses some remarkable qualities. It is a tree of about fifty feet high when at maturity, and of about three feet in diameter at the base, and has the property of absorbing an immense quantity of humidity from the atmosphere, which it concentrates and subsequently pours forth from its leaves and branches in a shower, and in such abundance that in many cases the ground in its neighborhood is converted into a perfect bog. It possesses this curious property in its greatest degree in the summer, precisely when the rivers are at their lowest, and water most scarce; and the writer proposes that it should be planted in the more arid regions of Peru for the benefit of agriculturists.—*Panama Star and Herald*.

A Two Foot Cheap Railway.

The two feet gauge railroad between Billerica and Bedford is making good progress, and will be soon finished. The passenger cars, now building at Laconia, N. H., will be a decided novelty, as they will have a row of single seats on each side. The road is eight and one half miles long, and will cost about \$50,000, or less than \$6,000 per mile, being only one eighth the cost of the ordinary railways.

The Deepest Well in the World.

The Warren Farm Well, one of the deepest, if not the deepest, dug wells in the world, was commenced on the South Downs above Brighton in 1858, and after four years persistent digging the water was reached at a depth of 1,285 feet, the shaft being 6 feet in diameter down to 400 feet, and 4 feet for the remainder. The operation cost between £6,000 and £7,000, and was watched with the greatest interest by geologists.

Shad in the Iowa River.

Fly fishers on the Iowa river, at Iowa City, have recently taken several shad, weighing about one pound each. Shad were placed in the Mississippi by the United States Fish Commissioners several years ago, and this is believed to be the first catch in any of the tributaries.

MR. AARON VEEDER, the photographer, of Albany, N. Y., has made a series of interior photo views of Howe's Cave, by means of the calcium light. The stalactite and other formations are quite remarkable.

[Continued from first page.]

of the wire forming the strand lays in the same direction, and is received and held in a groove made around the circumferential surface of the shoe. As we have already stated the two divisions of the strand, being divided by the shoe, are gathered and retained by temporary binding wires. This is well illustrated in Fig. 2. Suppose a skein of thread to be wound upon the hands of a person, one half of the skein would be upon that portion of the hands in proximity to the thumbs, while the other half of the skein, as it passed around the hands, would contact near the little fingers. Gather the two divisions of the skein together, as shown, and bind them with thread, and we have the modus operandi of laying and binding the strands of the cables. The wires passing continuously around the shoes at each anchorage in the same manner as the skein of thread is wound around the hands.

The shoe is designed to permanently hold the strand, but its position on the iron bar, as shown, is only temporary and for convenience in laying it. When the strand is complete, two immense wrought iron bars are placed upon each side of the shoe and in juxtaposition with it, and are held firmly in place by means of clamps and bolts. Heavy and powerful tackle, with appropriate blocks and sheaves, is attached to the opposite ends of the iron bars, the wire ropes which pass around these sheaves are then conducted to the engine, and on a strain being taken, the shoe is lifted from the stud in the casting in which it has been held by its curved interior, is raised, turned so that its edges are vertical, is then let forward, thus lowering the strand, and depressed until it can be received between the ends of two of the massive eye-bolts, when the pin shown as standing on the eye bolt is inserted in one of the eyes passed through the shoe at the bend and is received in the eye of the bolt that is upon its opposite side. The heavy irons and clamps that assisted in raising it, together with the tackle and blocks, are removed and laid aside until another strand is laid upon its appropriate shoe, to be raised and deposited in like manner between the next pair of eye bolts. A portion of the strands are secured to the lower row of the eye bolts, when another and similar set of eye bolts are placed above this row and their services are

brought into requisition in like manner. We may add that these eye bolts are connected by means of a huge pin, upon which they are free to turn like a hinge, to another and similar set, and these in turn connected to others, until the series extends to the foundations of the anchorages, where they are securely held by appropriate fastenings.

In Fig. 3 we illustrate a view of the bridge as it will appear when completed and ready for traffic.

How to Clean Daguerreotypes.

To clean daguerreotypes perfect—so many ways have been published, so many daguerreotypes have been spoiled beyond redemption, by so many ways being tried, by so many who did not understand cleaning them. If the photographer, or even the old daguerreotypist, follows the following instructions closely he will never injure one, and will clean it perfectly, so that it will be as brilliant as the day it was taken, if it has not been defaced by rubbing the surface of

the daguerreotype plate or picture. The hot water is the whole secret of cleaning, with the other things mentioned. Cold water may do, and may not, as I have often found out, but hot certainly will. Next, pour the hot water off and pour on the cyanide solution, and it will immediately eat off all imperfections; then wash the picture, and it will become as brilliant as when it was first taken. As soon as the imperfections disappear, which will be in a few seconds, pour off the cyanide solution, and rinse the plate well with distilled water; lime water would spoil the picture—rain or soft water might do; then, with your spirit lamp in one hand and your pliers, holding the plate in the other hand, commence heating the plate from the upper corners, and blow gently with your breath on the plate till it is perfectly dry; do not stop blowing till it is so, for it is liable to leave a stain where you would stop off blowing and commence again. After this, seal up the picture well with sticking paper, leaving no breaks in it to let in air on to the picture, for that is what causes the defects on the plate, the action of the atmosphere on the gold surface that is over every good daguerreotype picture. Now, you will have as perfect a picture as the day it was taken.

For such jobs we get from one to five dollars, according to the condition and size of picture.—*St. Louis Practical Photographer.*

The Mississippi Jetties.

General Beauregard says concerning the Mississippi jetty system: There need be no fear of the jetty structures notwithstanding the ravages of the teredo, so fatal to all modern structures in the waters of the Gulf. So copious is the alluvial deposit upon the willow mattresses of which the jetties are composed that the wood is protected by a thick coat of mud, and the teredo, which requires free access of salt water to thrive, is balked of its opportunity.

DR. ERASMUS WILSON, an authority in England on cutaneous disorders, has been investigating the number of hairs in a square inch of the human head, and estimates that it contains on an average about 1,066. Taking the superficial area of the head at 120 square inches, this gives about 133,920 hairs for the entire head.

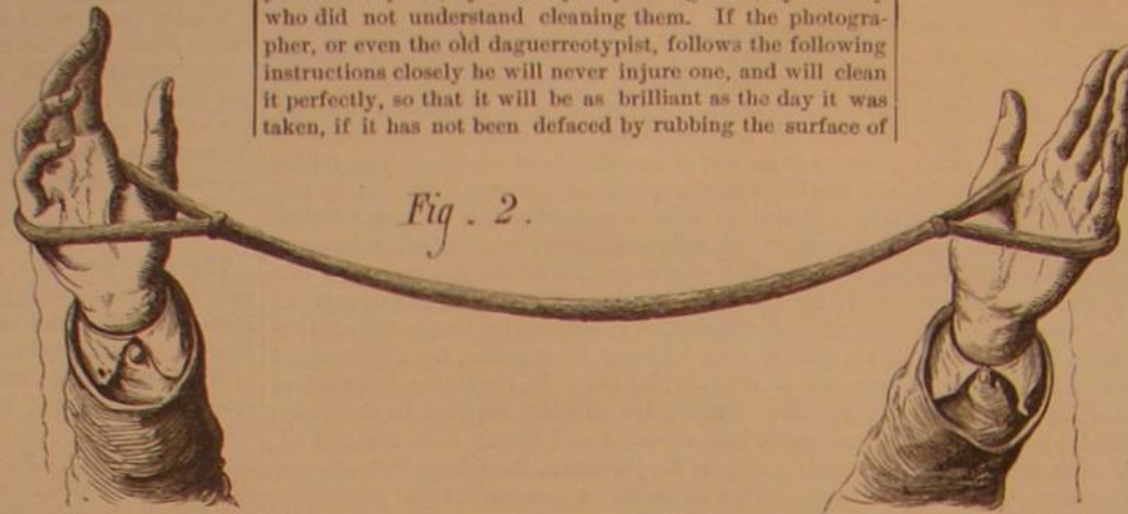


Fig. 2.

HOW THE STRANDS OF EAST RIVER BRIDGE ARE MADE.

it. First, all films, spots, and chemical action can be removed by the following method, and by no other that I have seen published or heard of. Now, bear in mind, the secret is hot water; where it should be used I will state. Second, when a party brings a daguerreotype to you to copy or restore, as they call it, if there are no defects on it, carefully take it apart, brush the surface, crossways the position of the picture, with a fine camel's hair brush, never up and down; then copy it. Third, if there is a film of some or all colors of the rainbow, spots or stains on it, have ready some hot water, cyanide, a pair of pliers, spirit lamp, and some distilled water.

Next, proceed as follows: First, see that the water is filtered and clean, the cyanide also; brush as directed above; then take hold of your plate with the pliers, pour on the hot water first, leaving it on the plate for about a minute, more or less, which softens the film of imperfections that is on



THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.—VIEW LOOKING FROM BROOKLYN.

A NEW TELEPHONE.

Mr. George B. Havens, of Lafayette, Ind., has invented a very simple form of telephone, which we illustrate in the annexed engraving. The instrument may be said to take the place of a telegraph key, being operated by the voice instead of the hand, and instead of a message being sent as in telegraph instruments, music is transmitted. It may be applied on any ordinary telegraph line.

The instrument may be said to consist of a metallic cylinder, resembling in size a quart pail, turned on its side, and attached to a block of wood.

By a reference to the engraving, A is the block or base in which the working portions of the instrument are placed. B is the metal sounding box, and may be made of brass, about the size of a quart measure, open at the end, C, and closed at the other end, which serves as a vibrator. In front of E is a metal standard, D, with a platinum-tipped regulating screw, which is in slight contact with the vibrator, E. The main wires, F, G, connect E and D.

The instrument is connected in the main telegraph line, the same as an ordinary relay, and tunes are hummed in the open end of the box, B, and heard from the armature of all the relays in the circuit. In this manner tunes have been sent, so Mr. Havens informs us, for over one hundred miles. In speaking of the instrument Mr. Havens says: "Only the armature of the relays in circuit vibrate. These vibrations are so rapid that the lever has no time to fly back and forth. Often, by holding the relay lever down, the vibrations are much louder, and to find out if the music goes we use the regular key and telegraph instrument. I have also been able to telegraph the Morse alphabet with my voice, by making a long sound for a dash and a short one for a dot. We sometimes throw the relay magnets closer to the armature to make the sound louder."

IMPROVED DONKEY PUMP.

We illustrate a donkey feed pump, from *The Engineer*, which is now being introduced in England. The engravings explain themselves. Fig. 1 is a perspective view, and Fig. 2 a sectional view. There is practically no novelty in the design that requires description, but nevertheless the pump deserves examination.

It has been especially designed for the use of owners of steam launches. It is made entirely of gun metal, and is so light that one quite competent to supply a powerful steam launch boiler can be carried under the arm. It requires little or no fitting on board as it can be bolted down at once and the connections made, and especial pains have been taken to make every portion simple, accessible, and not likely to get out of order. In these respects the little pump is meritorious, and we commend it to the attention of our readers.

Saw Dust Soap.

A manufacturer in Tilsit, instead of adding infusorial earth or ground quartz to the soap mass and thus producing a sapolio, introduces a considerable quantity of very fine sawdust, previously ground and sifted. The wood fiber acts mechanically as a detergent, and besides cleaning rapidly and thoroughly, occasions a saving of one third in the consumption of soap. The soap does not contain an excess of soda, and has no ill effect on the hands. An analysis of a specimen eight days old yielded, grease, 44 per cent; soda, 6 per cent; wood, glycerin, coloring matter, 10 per cent; water, 40 per cent. The price at the factory is about 5 cents a pound.

Progress of American Mechanical Industry.

Details accumulate on all hands in illustration of the fact that the Americans are endeavoring, with characteristic energy, to find world-wide outlets for the products of their mechanical industry. They are not satisfied with having driven our iron and machinery out of their markets by means of a prohibitory tariff, but they are also endeavoring to reduce the demand for our steam engines, our locomotives, and our general machinery in the leading markets of the world. This was to be anticipated as an inevitable result of

gravest attention on the part of both the capitalists and the workmen of the Old World. We have always fancied that Belgian competition was a bugbear rather than otherwise. It is true that iron has been produced at marvelously cheap rates upon the Belgian markets, and that some of it has found its way into this country, and has displaced a corresponding amount of English iron. But the competition of Belgian mechanical and metallurgical industry in this important particular—it is comparatively limited in extent, and consequently it does not do us the mischief which some writers

have supposed. The case seems wholly different with the American competition with which we are now threatened. The productive powers of the Americans, to whatever branch of human effort they may devote themselves, appear to be only limited by the demand which may spring up for their products. Their supplies of ironstone are practically boundless; their supplies of coal are practically boundless; their supplies of labor are practically boundless. They greatly excel the Belgians in the extent and importance of the mercantile marine, by means of which they are enabled to scatter their manufactures all over the world. They also share with us, apparently, the faculty of developing a world-wide commerce. Under these circumstances, we fancy that it is high time that both capitalists and our workers should be sufficiently impressed with the fact that in dealing with American competitors they have to confront competitors of first-rate ability, energy, and resources.—*London (England) Colliery Guardian.*

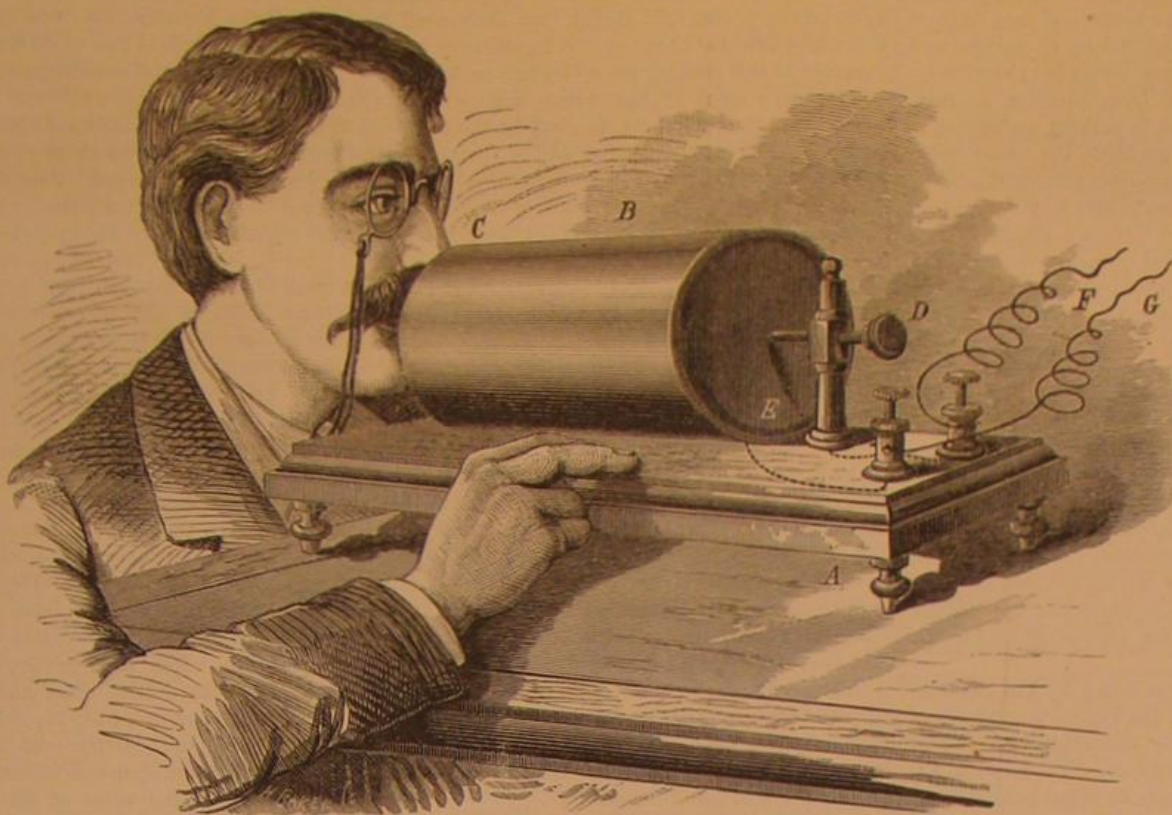
Motion and Heat.

M. Ollivier (in the *Journal des Débats*) gives the following experiment in illustration of the conversion of motion into heat: One end of a square bar of steel, in this instance 15 mm. x 70 or 80 cen., is held by one hand in the middle and pressed strongly against a rapidly revolving emery wheel, by which means the extremity so applied becomes considerably heated. The hand at the middle of the bar does not feel any change of temperature, but that at the other extremity is soon obliged to let go, the temperature rising to the point of burning the skin. M. Ollivier thus explains this effect, which appears paradoxical at the first glance. The heat that burns the hand is not generated at the other extremity of the bar and transmitted from thence, but is produced directly at the place. Movement and heat being synonymous, the movement destroyed by the hand at the outward extremity of the bar by the stoppage of the vibrations is converted into heat, while, there being an interval of repose at the middle of the bar, no heat is perceived. A curious feature of the experiment is that at the outer extremity the thermometer does not show any exceptional temperature, because the thermometer does not stop the vibration. To produce the burning effect, the hand should grasp the end of the bar with force enough to arrest the movement.

The Potato Bug in Germany.

The *Cologne Gazette* says that from careful observations and inquiries made since the burning of a potato field in the neighborhood of Cologne it is evident that the object of that destructive process has been completely attained. There is no further trace visible either of Colorado beetles or of larvae, neither above the soil nor below the surface. There is reason to believe that not one beetle has escaped.

TO MAKE STICKING PAPER.—Brush over your sheets a solution of dextrin, with sugar mixed.



HAVENS' NEW TELEPHONE.

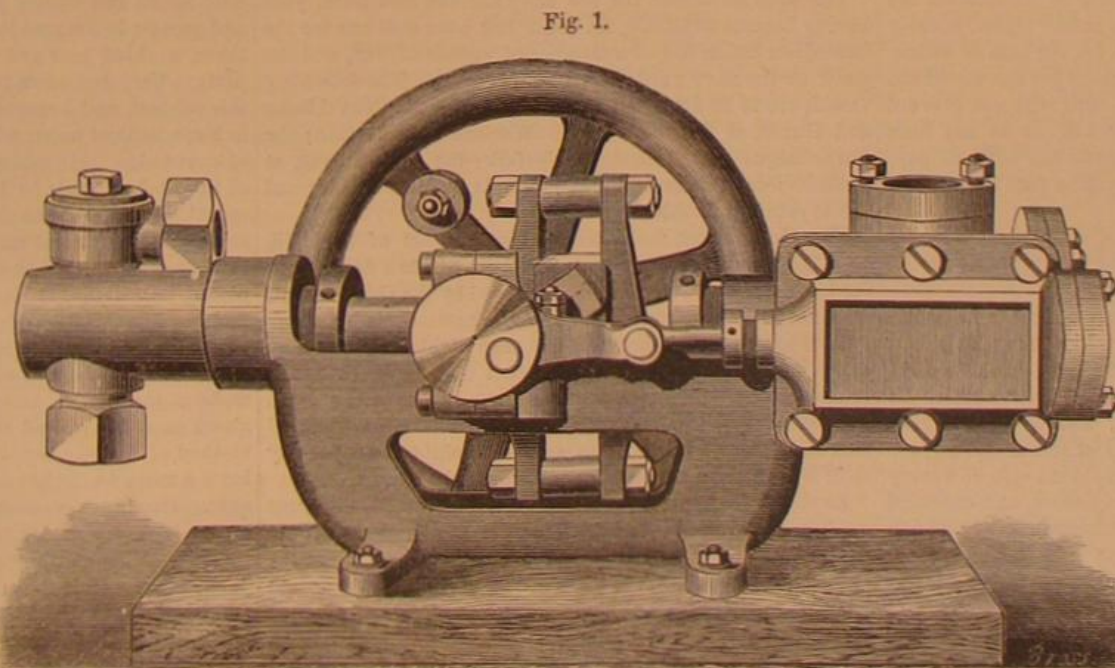
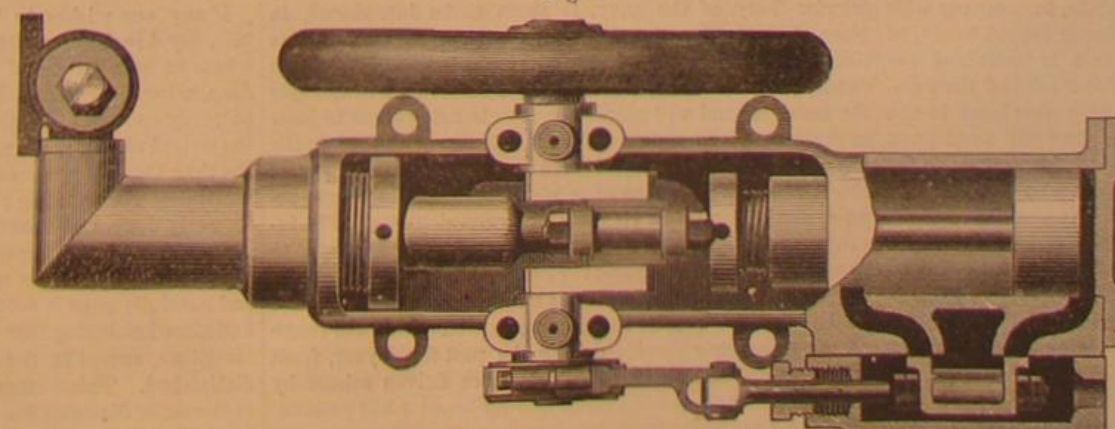


Fig. 2.



LEUPOLD'S IMPROVED DONKEY PUMP.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The Commissioner of Patents has rendered a decision in the interference between Messrs. Sargent and Little, awarding priority to Sargent. This is said to be one of the most important of all the various applications which the inventor has had before the Office, and he has had many, as it is believed to cover the use of a time lock with a combination lock on the same safe or vault door when each acts independent of the other on the "bolt-work." The application has been in litigation for over two years, and has been in interference with five different applications of various lock inventors, in all of which Mr. Sargent came out the victor.

Mr. Hunt, who was suspended from practice, as mentioned in a previous letter of mine, is making endeavors to have the Secretary of the Interior set aside the action of the Commissioner of Patents in suspending him, and also to compel the latter to allow the reissue patent to go out, about which the trouble originally arose. Hunt's attorneys were heard on Saturday last by Assistant Attorney-General Marble, but up to the time of this writing the decision has not been promulgated. It is understood, however, that he will recommend that the present order of suspension be withdrawn for irregularity, and that a temporary order shall be issued suspending Mr. Hunt until he has shown cause why the order should not be permanent.

I hear that Mr. Hunt takes exception to my statement that his papers were prepared by a brother of the assistant examiner, by saying that he prepared it himself. It is possible that I was wrong as to the actual preparation of the papers; but it is certain that the gentleman mentioned was the attorney in the case, as is shown by Mr. Hunt's own circular; and as the attorney most always prepares the application, my informant had good grounds for supposing that he did so in this case.

An important extension case was heard by the Commissioner on Saturday last, relating to the Voelter wood-pulping patent, which has already had one extension, and is now up for another by order of Congress. The decision has not yet been made, but will probably be given before this is printed.

The State Department has been officially advised that the French Government has reiterated its determination to open the Paris Exposition on the 1st of May next, and that detailed regulations for the information of exhibitors have been published. It is believed that our government will not be able to make any arrangement for American participation until Congress shall have met, there being no law authorizing the appointment of a permanent commission and no appropriation out of which the necessary expenses can be defrayed. I do not hear anything of the provisional commission proposed sometime since.

Secretary Thompson has written a letter to Captain Howgate of the Polar Expedition informing him that he cannot comply with his application that Captain Tyson, now in the service of the Navy Department, should be detailed for the expedition, and that he cannot, much to his regret, comply with Captain Howgate's other request for the loan of instruments belonging to the Navy Department for the use of the expedition. It is said, however, that this will not prevent Captain Tyson going into the expedition, as he has been granted leave of absence for that purpose but without pay. He will command the Florence, and will be paid by Captain Howgate.

The Woodward Expedition has been under discussion by the Cabinet, but I cannot learn that any assistance or official countenance is to be given to this party.

The War Department has issued a general order for facilitating the prosecution of the topographical surveys in the western military divisions and departments—including reconnaissance of routes, the astronomical determination of the positions of military posts, etc., and the drafting of maps—and holding in view uniformity of action and a systematic plan. The general plan of exploration and survey will be determined by the Chief of Engineers, and executed under the direction of the generals commanding by division and department engineers. The results of these surveys will be promptly transmitted to the chief engineers and also incorporated in the general maps of divisions and departments.

Dr. J. D. Hooker, President of the Royal Society of London, and Lieut.-Gen. Strachey, of the Royal Bengal Engineers, have also organized, through the assistance of friends in this city, an expedition for scientific research through the summer in Colorado, Utah, and California, in company with Dr. Asa Gray, of Cambridge, and Professor Joseph Seidy, of Philadelphia, the former celebrated as a botanist and the latter as a comparative anatomist. The results of their discoveries will be communicated to our government in the form of reports, and it is believed that they will be of great value, without involving any expense to the nation, as the costs will be defrayed by the gentlemen who compose the expedition.

Information has been received at the State Department that the International Geographical Conference, lately in session in Brussels, appointed an executive committee to sit in the interval between its adjournment and its future meeting, on which Mr. Henry Sanford was appointed to represent the United States and Sir Bartle Frere as the member for Great Britain.

Our Consul General at Berlin informs the same department that the collection of locks and tools of American

manufacture, on exhibition in that city in the building of the Berlin Association of Architects, under the auspices of that body, compare most favorably with other similar manufactures there exhibited, in quality and workmanship, or cheapness, and with proper efforts to introduce them they cannot fail to find an extensive and profitable market in Germany. A collection of American furniture was also on exhibition and received much commendation.

The same department has received a report from our Consul at Sonneburg, relative to the rinderpest. He says the poison of the disease is most difficult to destroy, attaches itself readily to all substances, and may be communicated for an indefinite period, but thinks that there need be no fear that either infected hides or other poisonous articles will be exported to this country from German ports.

The Department of Agriculture reports oats in superior condition in New England, in most of the Southern States, in those of the Missouri valley and in Oregon, and in fair to high condition in all the remainder, except California. The South is finding immunity from loss in their red rust-proof variety. The indications are favorable for a good yield of barley.

An investigation by the same department has been made regarding the loss of sheep, which shows that during the past year a total of nearly three millions of sheep and lambs have been destroyed by dogs, wolves, and disease, of an aggregate value of nearly \$8,000,000.

The new Commissioner of this Department (Agriculture) strongly endorses and will give all possible aid for a fair test of the proposed plan for giving, by telegraph and signal cannon, general and instant warning of coming storms, for the benefit of agriculturists during the hay and grain harvests, and also of shipping, and to give warning of sudden destructive floods on rapid rivers. The system has been pretty generally endorsed by prominent citizens, and it is now proposed to lay the matter before the Secretary of War, with the above mentioned recommendations and such others which may be sent by county and State agricultural societies, with the request that he will order a test to be made at all forts, arsenals, navy yards, barracks, etc., in the populous States, so that if successful it may be extended to all the principal towns and villages.

One of Professor Baird's assistants passed through this city on Saturday with 100,000 young shad that were hatched at the South Hadley Falls propagating gardens, to be deposited in the Cattauchee river, Ga., at Columbus and West Point.

The July returns of the condition of cotton, as stated by the department, cover the entire area of 361 counties, and these counties produce six tenths of the cotton grown in the United States. The average condition of these counties is 93.4 per cent, or less by 7 per cent than the average for 1876. The crop is from one to two weeks later, owing to cold in some sections and excess of rain in others. Insects have done but little damage. Labor is said to be becoming gradually more efficient, and an improvement both in morale and efficiency is reported from Louisiana.

The appropriations for the navy for the new fiscal year having become available, an order has been sent out for the immediate fitting out of a number of vessels of war, and the work at the navy yards has been resumed. The following vessels are to be fitted out at the places named: The Alaska and Guard, at New York; the Wachusett, at Boston; the Canandaigua and Galena, at Norfolk; the Quinnebaug, at Philadelphia; the Benicia and Troquois, at Mare Island; and the Wyoming, in this city.

The Government has decided that the act of June 18, 1868, declaring that eight hours shall constitute a day's work for all laborers and mechanics employed by the Government, does not prevent officers from making agreements by which a day's labor may be more or less than eight hours; and an order has therefore been issued that officers in charge of public work shall make their contracts and have the work performed upon the basis of ten hours to a day's work, and that all persons who desire to work only eight hours per day shall be paid for that number of hours and no more.

As stated in a previous letter, a number of Parrott guns are being converted into breech-loaders at the Parrott foundry, and the Ordnance Bureau has concluded to adopt the slotted screw—or what is known as the French system—in converting these guns. This system has also been adopted by several foreign governments who, after careful experiments, found it to be the most suitable for converted ordnance.

A new system of signals, the invention of Lieut. Commander Very, of the navy, is about to be introduced, in place of the Coston signal, which has been in use for some time past. These signals have the appearance of Roman candles, in two colors, which by time intervals will indicate the numerals and will enable the vessels using them to have as perfect understanding with each other as with flags in the day time. The Very signals will be projected to a height of about 250 feet by means of a pistol designed for that purpose, and will thus be visible at a great distance. The inventor of the system has given the Government the right to make and use the signals for five years.

The Treasury Department has made up a statement of the statistics of the wrecks that have occurred within the range of the life-saving service during the past fiscal year, from which it appears that 120 vessels were driven ashore by stress of weather, and that they had on board 1,253 persons, of which 1,214 were saved and 39 lost, or about three per cent of those imperilled. The estimated value of the vessels

wrecked is \$1,746,464, and of their cargoes \$1,348,876, making a total value of \$3,095,331, of which, so far as reported, \$1,554,505 was saved. Upon fifty of the wrecks the life-saving service apparatus was successfully used and 838 persons rescued through its instrumentality. Notwithstanding the gratifying success shown by the number saved by the apparatus, efforts are being made to improve it by Mr. Kimball, who has charge of the service, and Captain Merriam, the inspector, who has devoted much attention to the subject of extending the range of the shot line; and after a series of experiments at Cold Spring, N. Y., with a new gun and projectile invented by R. P. Parrott (the well-known gun founder), they find that with a gun, which with its carriage weighs less by 20 lbs. than the mortar now used at the stations, and some modification of the line, a range of more than 100 yards additional has been attained for the shot line. The department has ordered 24 of the new guns, which will be supplied to those points along the coast where a long range is required. Addition signals are also being prepared to facilitate communication between the vessels and shore, which will be incorporated into the national code of signals.

The first annual report on the internal commerce of the country has just been printed. It covers a wide range of subjects, that of railroads being treated at considerable length. It is noted that the entire amount of the contributions of the Government, to the close of last year, in aid of railroad construction, including land grants and subsidies to Pacific railways, is only three per cent of the total cost of the railroad system of the United States. The value of our internal commerce is stated to be twenty-five times the value of our foreign trade.

The Chief of the Bureau of Statistics has published a detailed statement of the value of and duties derived from imported commodities which were sold at the Philadelphia Exhibition in 1876, from which it appears that clocks and watches sold to the value of \$46,102, yielding \$13,208 in duties; china and earthenware sold for \$88,429, yielding \$40,325 duties; glass and manufactures thereof, \$43,706, duties on do., \$15,178; gold and silver manufactures, plated ware, and jewelry sold to the value of \$51,146, yielding \$29,212 in duties; iron and steel and manufactures thereof, sold to the value of \$83,615, yielding duties of \$29,212; painting and statuary sold for \$94,286, and yielded \$9,428 (10 per cent) in duties; and manufactures of wood sold to the value \$73,371, and yielded \$25,680 in duties. The total value sold was \$731,593, and the total amount of duties \$250,664.

Washington, D. C.

OCCASIONAL.

Expansion by Hardening.

To the Editor of the Scientific American:

It is claimed by some mechanics that steel always increases its dimensions in every direction from being hardened, and this I know to be sometimes the case. On the other hand it is contended that a piece of steel will get larger diametrically but shorter in length from being hardened, and this I have found to be sometimes so; but the increase diametrically, in both round and square pieces, is always out of proportion, and greater in amount than is the variation in length. I have taken working gear and refitted it by simply hardening the parts. Very few seem to have any precise knowledge upon this subject, and I recently noticed an article from a person in a mechanical paper who made a gross blunder from want of knowledge. He was speaking of threads and nuts lathed—of their being made to the one thousandth of an inch; he meant well enough, no doubt, but if he ever takes a piece of sheet iron and files at each end of it a V projection, to fit the threads of a tap, and then tries it along the tap in several places, he will divide his thousandths by about 20, for he will find his gage Vs too wide apart in one place and too close together in another portion of the same tap. Neither Whitworth nor the Morse Twist Drill Company will undertake to make a tap with a thread that will successfully stand the above named test, and the man that invents any practical method of making taps that will stand it successfully will leave a mark in the history of mechanism that will live for ages. Has it never occurred to you that it is strange that nuts which are under severe strain come loose upon the threads, although they are not supposed to move at all? Well, the reason is that the sides of the threads of the nut and tap don't fit the dies that cut them; the threads warped in hardening, and so did the tap. No two sets of dies are alike. No two taps are alike. Hence no bolt and nut can fit in the threads with the accuracy that other mechanical fits can be made.

If any one wishes to test this fact, let him take a screw bolt, say 4 inches long, then take a tap and tap a nut having a hole an inch deep, and also a nut having a hole 3 inches deep, using the same tap in each case. If the first nut fits the bolt easy enough to be just turned by hand, ten to one but the second nut will take very heavy pulling with a wrench by the time the bolt projects through the nut. Mechanics are hardening the working parts of machinery more than was formerly done, and nobody seems to take any interest in enlightening us by giving us the benefit of their experience.

Let us take a piece of steel, an untapped nut, for instance, and carefully gage it before and after hardening it; we will find after hardening that its dimensions have increased in all directions, except in the hole, and there the dimension has diminished. This seems an anomaly; for if the surface metal of the outer diameter has elongated, why should not the surface of the hole have increased also? The only explanation I can give is that the metal must expand in the direction in

which it has the most liberty. The center of the solid metal, between the hole and outside, is the strongest section; and taking that as a line, the outside metal is forced outwards in all directions, expanding the metal outside of that line, while inside of the line it is compressed. The diameter of the hole is reduced in order to make room for the expansion. There must, however, be two such sections or lines, one the center of the strength lengthwise of the metal, and the other the center of the strength diametrically of the piece. If our piece of work had no hole in it, all the expansion would take place externally.

In turning bolts in the lathe many workmen make an allowance for swelling in hardening, and they hit the mark remarkably successfully as a rule, though I never heard of any rule to go by, for it is different in different diameters. Care must be taken to allow little enough, because a hole too small may be lapped out, whereas one too large is a proportionately spoiled job. Small work swells by hardening more in proportion than larger work. What the proportion is, and whether it all increases uniformly, I have never kept any notes to indicate. Wrought iron work acts the same as steel, except that in small work I believe the enlargement to be greater than in large work. Here, however, I may say that by small work I mean work that is three inches and less in diameter, and about six inches long. By large work, say six inches in diameter by about ten inches long, or longer than this measurement.

MACHINIST.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

Positions of Planets for August, 1877.

Mercury.

On August 1, Mercury rises at 6h. 3m. A.M., and sets at 7h. 56m. P.M. On the 31st, Mercury rises at 7h. 52m. A.M., and sets at 7h. 20m. P.M. Mercury is small and will not be easily found, but should be looked for after sunset, and late in August, south of the point where the sun sets.

Venus.

Venus is so much brighter than Mercury that it can be seen all through the month of August for a short time after sunset.

On August 1, Venus rises at 6h. 57m. A.M., and sets at 8h. 23m. P.M. On August 31, Venus rises at 8h. 6m. A.M., and sets at 7h. 44m. P.M.

Mars.

On August 1, Mars rises at 9h. 19m. P.M., and sets at 8h. 09m. A.M. of the next day. On the 31st, Mars rises at 7h. 15m. P.M., and sets at 5h. 49m. A.M. of the next day.

Mars is coming into better and better position for evening observation, and will, by the latter part of August, be very conspicuous in the southern sky. Saturn and Mars rise and set nearly at the same time all through the month, Saturn being some degrees above Mars when on the meridian.

Jupiter.

On August 1, Jupiter rises at 4h. 22m. P.M., and sets at 1h. 23m. of the next morning. On the 31st, Jupiter rises at 2h. 23m. P.M., and sets at 11h. 23m. P.M. The best time to look at Jupiter during August will be from 7h. 0m. to 9h. P.M.

On August 1 the largest satellite (according to the *Nautical Almanac*) will make a transit across the disk of Jupiter during these hours, and will not be seen; Jupiter will seem to have but three moons. On the 4th the moon nearest to Jupiter will not be seen because it is behind the planet at the hour from 8 to 9 P.M. On August 9 the smallest of the moons will not be seen until 9 P.M., because it passes in front of the planet. On August 12 the largest moon will not be seen until near 8 P.M., having been in the planet's shadow, and the first or nearest to Jupiter will not be seen until after 9 P.M., having been passing across the face of Jupiter. This same moon is not seen on the 13th until near 8 P.M., because it is in the planet's shadow; again, on the 27th, it is not seen after 8 P.M., because it is behind the planet.

The smallest satellite disappears on the 16th a little after 8 P.M., by coming in front of the planet, and on the 25th it disappears by getting into Jupiter's shadow.

On August 19 the largest satellite will disappear by going into the shadow of Jupiter, and on the 26th it will not be seen between 8 and 9 P.M., being behind the planet.

Saturn.

On August 1, Saturn rises at 9h. 3m. P.M., and sets at 8h. 19m. the next morning. On the 31st, Saturn rises at 7h. 1m. P.M., and sets at 6h. 10m. the next morning.

Saturn and Mars rise at nearly the same time during the month. They are much higher in the southern sky, when they come to the meridian, than Jupiter. On the 2th, Saturn will be at meridian passage (12h. 57m.) directly above Mars, and have an altitude above the southern horizon of 41°. In the latter part of August, Venus, Mars, Saturn, and Jupiter can all be seen early in the evening.

Uranus.

Uranus can rarely be seen without a glass, but an ordinary telescope will show its disk—it is not at present well situated.

On August 1, Uranus rises at 6h. 13m. A.M., and sets at 7h. 57m. P.M. On August 31, Uranus rises at 4h. 21m. A.M., and sets at 5h. 59m. P.M.

At this time Uranus will be very near the star Regulus. It will not be easy to see it, as its diurnal passage is almost wholly made during the light part of the twenty-four hours.

Neptune.

Neptune rises on the 1st at 10h. 53m. P.M., and sets at 12h. 23m. P.M. of the next day. On the 31st, Neptune rises at 8h. 55m. P.M., and sets at 10h. 25m. of the next day.

The Visual Purple of the Eye.

We have several times alluded in these columns to the so-called visual purple, or *sch-purpur*, as the German physiologist, Boll, terms it. This visual purple is a colored sheet at the back of the retina of the eye, and becomes impressed by light in the same way as a photographic film. The light must, however, be very intense to make an impression, and it was only by exposing a rabbit's eye in a dark room to the action of a ray of light coming through a shutter for three minutes that any image could be produced.

It has been a question how long the visual purple remains after death. Boll found that a rabbit's eye immediately after death was in a position to receive an image quite as readily as when alive, and he asserted that he believed the visual purple to remain unbleached and photographic many hours after death. The German physiologist has been lately able to prove that in the human being such is the case for two hours and three quarters after death, at any rate. The subject in this case was a criminal who was executed in Vienna on the 5th of March last, at a quarter past seven in the morning. The execution occurred in a badly lighted yard, surrounded by high walls, and immediately after death the executioner, as is customary, closed the eyes of the body. Other means were then taken to keep light from the retina, and after an interval of a couple of hours an examination was made by Boll of the eye. A microscopic inspection at once showed the existence of the visual purple, so that the eye still possessed photographic properties, but no trace of an image was to be observed on the retina of the dead man. But even had a slight impression been bleached upon the purple film, say that of the prison wall, this would, nevertheless, have disappeared again, since the membrane behind the retina possesses all the properties of a re-sensitizer, and would have restored the purple color again in a very short time. That the visual purple does not lose its properties till some time after death may now be taken for granted.

So far as regards the possibility of an image existing on the retina after death, so as to be discovered some hours subsequently, we may safely decide in the negative, judging from what we know of the *sch-purpur*. It is only, as we have seen in the case of the rabbit, where the object is very bright, or it is steadily reflected upon the eye for some time, that an image appears; and then the latter must be immediately fixed in alum, as otherwise the mucous sensitizer does its work, and the purple color is restored. No doubt when the eye looks upon a very light object—the sun, for instance—and the vision remains persistent for some minutes, or seconds, afterwards, our eye has received photographic impression, but this not likely to occur just before death. Only under such circumstances would it appear possible to secure a photograph upon the *sch-purpur*, or visual purple of the eye. —*Photographic News*.

A New Fire Cistern.

A new fire cistern, by Mr. R. T. Scowden, City Engineer, was lately tested at the corner of Thirteenth and Magazine streets, Louisville, Ky., and proved to be entirely satisfactory. This cistern is entirely different from any fire cistern ever used before. It is constructed to hold three hundred barrels of water; the body of the cistern instead of being perpendicular is horizontal, lying parallel with the course of the street, cylindrical in form, the walls being of brick and cement, thirteen inches in thickness. The tank is sixteen feet long and ten feet in diameter, with the crown twenty-four inches below the surface of the street, the two outlets being near the ends. The idea of this plan of cistern is to obtain more than one outlet, which is impossible in those now in use, so that a great number of engines can be operated from one receptacle. Another advantage claimed for it is that the cistern, from the nature of its construction, cannot be crushed in from the street above. Every one who saw the test were much pleased, and were ready to acknowledge the superiority of this cistern over those now in use. It is likely that they will be extensively adopted in the future.

Methylated Spirit.

Methyl alcohol, wood spirit or wood naphtha, is one of the volatile products obtained by the destructive distillation of wood, sawdust, spent dyewoods, etc. It is used in a variety of chemical operations, and in the manufacture and preparation for use of certain artificial coloring matters. It having, fortunately, a very disagreeable taste, it is never used for drinking, and hence it may be manufactured, sold, and employed in the arts without any excise interference.

Methylated spirit, however, is a very different article. It consists of ordinary (so-called ethylic) alcohol mixed with about five to ten per cent of the true methylic alcohol just mentioned, and is, therefore, not a definite chemical compound, but a mere mixture. The origin and history of this "methylated spirit" may be briefly stated as follows: Methylic alcohol (wood spirit), though very useful to the chemical manufacturer and color maker, cannot be used as a substitute for common alcohol (spirit of wine), but produces different results. It was also found that many chemical operations which require spirit of wine could not be carried on as cheaply in England as on the Continent, where spirit is much cheaper on account of the smaller duty payable on its manufacture. Government was therefore petitioned to

grant some relief to manufacturers by remitting the duty payable upon alcohol used in the arts. The result was the concoction of the mixture known as "methylated spirit," which was supposed to be undrinkable, and which, under certain conditions, was to be sold duty free to dyers, etc. Unfortunately the mere addition of wood spirit to alcohol did not seem to the authorities a sufficient precaution. Except a manufacturer or dyer was able to give security in £1,000 not to use or allow to be used the "methylated spirit" for drinking purposes, further additions were insisted upon. One of these consists in dissolving in the spirit a small quantity of shellac. This addition was proposed in the interest of the varnish makers, who it was erroneously supposed would be the main consumers of methylated spirit, and to whom the presence of shellac would be no detriment. In this state the spirit is sold under the name of "finish." This addition, for the color maker and dyer, is one of the most unfortunate that could have been devised. It makes all colors come up flatter, and gives reds especially a dull bluish tone. To detect shellac in methylated spirit it is merely necessary to add a spoonful of the suspected sample to a large glass of pure water, say condensed steam water, and stir up well. If shellac is present it will be precipitated, and occasion a white turbidity or milkiness in the liquid. Sometimes instead of shellac a small quantity of some aniline color, blue or red, is added to the spirit. Whatever color is selected will, of course, in certain cases prove objectionable.

We should suggest that if any further addition to the methylated spirit is really needful—which we doubt—something of an intensely nauseous flavor would be much better than colors or resinous substances.

On the Continent ordinary alcohol is cheaper than wood spirit, and hence purchasers of the latter sometimes find it more or less adulterated with the former. To detect this fraud Riche and Bady heat the suspected sample with sulphuric acid, dilute with water, and distil. They then mix the distillate with peroxide of manganese and sulphuric acid, thus converting the ethylic alcohol into aldehyde, and add a solution of hyposulphite of soda, and finally some magenta. If common alcohol is present, even to the extent of one tenth per cent, the magenta takes a violet color. —*Chemical Review*.

Blasting by Electricity.

Blasting by electricity, one of the latest practical developments of science, is being generally utilized. The advantages are great saving of explosives, safety, and protection of life, economy of capital and time, and overcoming obstacles that nothing else will, such as firing under any quantity of water, sinking or driving in soft sandstone, granite splitting, rooting up trees, blasting slag, etc.

On Saturday, June 16, a gigantic explosion was arranged in the granite quarries of Messrs. Ellis and Evard, at Barddon Hill, near Leicester, by Messrs. Atkin and John Harris, of Nobel's Explosive Company; six holes being put in, averaging a depth of 20 feet, each hole being charged with 15 lbs. of dynamite, and exploded with Capt. Brain's electric fuses. The machine used to fire them was Capt. Brain's American Improved, a most compact and simple article, being only some 14 lbs. in weight, which may be used by the ordinary working men, giving an electric spark 2 inches in length. The firing of these six holes had a most marvelous effect, the whole quarry having the appearance of being rent as by an earthquake. Huge blocks of granite were tumbled out, and upon careful examination and measurement it was computed that 14,500 tons had been dislodged and thrown into the bottom of the quarry. This practical demonstration of the effect of simultaneous blasting with a powerful explosive in connection with quarry works was most satisfactory to the proprietors and other gentlemen present, it being generally acknowledged that such successful results had never been known in the district before.

The Electric Blasting Apparatus Company, Cinderford, Gloucestershire, have also just very successfully laid down a set of blasting apparatus at South Kirkby Colliery, near Pontefract, where shafts are being sunk to a depth of 700 yards. The advantages of the system are so apparent in collieries already using this apparatus in the district that its use is becoming more general. At the Houghton Main Colliery, near Barnsley, two 15 feet shafts are each firing 16 holes at once, and raising 70 tons of debris from a shot, an increase of 50 tons a blast on the old system—a practical demonstration of the great advantages of simultaneous blasting. —*Mining Journal*.

The English Iron Trade.

The statistics of the iron trade for last year show that out of 4,970,000 tons of pig iron produced in the Cleveland district, 2,828,000 were retained for home consumption, and 2,041,000 tons were exported; and in 1874, 3,543,000 tons of the 5,991,408 produced were retained for home consumption, whilst only 2,587,000 tons were exported. In 1863 the quantity of pig iron made in the North of England was 838,400 tons; last year it reached 2,075,000.

Casualty by Lightning.

The Salem (N.J.) *Standard* states that recently Mr. Henry White, a well-known resident of Lower Penn's Neck, was killed by lightning as he stood in his own doorway. He went to the door to look at the clouds, and as he looked out he placed his hand upon the water conductor, and was instantaneously struck by the electric fluid, which, it is supposed, was at that moment passing down the spout.

POSTAGE STAMP CANCELLER.

The improvement shown in the engraving consists of what might be called an enlarged non-adhesive postage stamp, printed on strips of paper like labels, gummed at one end and of convenient lengths to encompass the sides of letters or their envelopes, and of moderate width to cover a portion of the superscription and hold itself in position. In use it is folded around the middle of the letter or envelope, the gummed end dampened, and it then forms an encircling band around the letter. It is designed to be retained at the post office, where it is taken off in the act of cancellation. It might with propriety be called a postal notice to the postmaster that the writer had paid his postage. As a portion of the address of the letter is covered by the strip or band, the post office employé removes this band, and by retaining it, it becomes impossible to re-issue such coverings after the first redemption at the post office. If torn or otherwise mutilated, it will be impossible to reunite them, and thus the traffic in washed stamps will be at an end. By no cancelling stamps being employed, the contents of letters are not liable to injury from blows given in using these stamps for cancellation.



POTTS' METHOD OF ATTACHING AND CANCELLING POSTAGE STAMPS.

by an elastic band of thin rubber, which is sufficiently yielding to adapt it for the purpose designed.

This cover was patented through the Scientific American Patent Agency, July 17, 1877, by Charles B. Browne, of Camillus, Onondaga county, N. Y., who may be addressed at that place, or further inquiry may be made of George W. Keeler, 53 Liberty street, New York city.

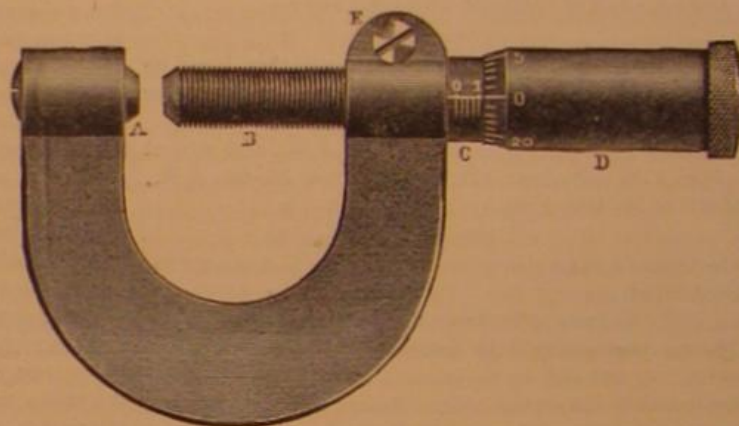
IMPROVED LOG TURNER.

Log turners, or "niggers," as they are sometimes called, having a reciprocating toothed bar to work in a perpendicular direction or nearly so, have been known and used for some years for turning logs or cants on the head blocks of sawmill carriages.

We illustrate herewith a reciprocating oscillating toothed bar that is claimed not only to turn the log on the head blocks, but also to grasp a log anywhere within its reach on the log deck, and turn or roll it forward on to the head block of a sawmill carriage. The advantages are in saving of the time of the man who was heretofore employed in rolling by hand, or by butt wheel and chain, the logs from the log deck upon the head blocks. As the reciprocating toothed bar will, we are informed, work successfully at great angles in either direction from a perpendicular, it will engage a log far away from the head blocks, and force it upon them.

This device is operated through the medium of an oscillating steam cylinder, A, into which the steam is conducted through the pipe, B, and flexible part, into the bottom of the cylinder, when it impinges upon a piston head within

the head blocks. In order to hold the log from rolling backward while the steam is cut off and the toothed bar has fallen down for a second action, another bar, G, is pivoted to hangings overhead having a cord, H, attached at the proper place, so that the sawyer can draw the holding bar down upon the log, the teeth engaging it and thus preventing the log from rolling back. A counterpoise is attached to the opposite end of the holding bar, so that when the bar is free the



MICROMETER CALIPER.

toothed end will rise up out of the way. The cylinder, A, is caused to oscillate by the attendant putting his foot upon the treadle lever, I, and forcing the weighted arm that is fixed to one of the trunnions of the steam cylinder down. This carries the cylinder over to the right, as seen in broken lines, or by raising the treadle bar, I, the cylinder will be forced over to the left, as seen, whereby is given a greater capacity to the log turner. The counterpoise, J, on arm, I, causes the cylinder to assume a perpendicular position when the arm is free from force in either direction.

This invention was patented by John Orm, of Paducah, Ky. Further information may be obtained on application to Langstaff, Orm & Co., same address.

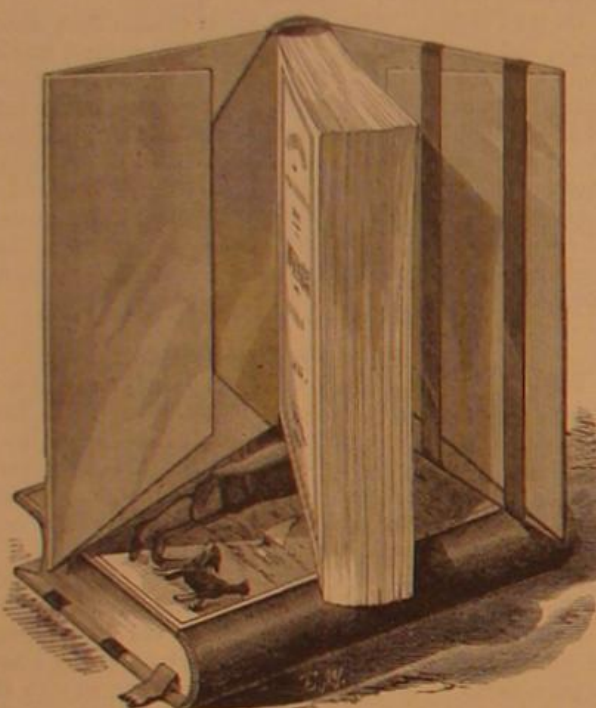
MICROMETER CALIPER.

The accompanying engraving represents a micrometer caliper manufactured by the Victor Sewing Machine Company, of Middletown, Conn. It consists of a U-shaped frame having in one of its arms a screw, A, for correcting the adjustment of the instrument, and in the other a screw, B. The internally threaded part of the frame is elongated, forming a sleeve, C, over which is fitted a sleeve, D, that is attached to the milled head of the screw, B. The sleeve, C, is graduated longitudinally, and the sleeve, D, circumferentially at its lower edge, it being beveled to bring the graduations near the surface of the sleeve, C, to insure accuracy in reading the scales.

Its capacity is one inch, and is graduated to one thousandths, but can readily be set one half and quarter thousandths; and is so constructed that any wear resulting from use can be readily adjusted.

Home-Made Vinegar.

A cheap and wholesome article of vinegar may be made of water, molasses, and yeast, say twenty-five gallons of water, four of molasses, and one of yeast. This, when it ferments, will yield very good vinegar. A fair imitation of white wine vinegar may be made of mashed raisins and water kept in a warm place for a month.



BOOK COVER PROTECTOR.

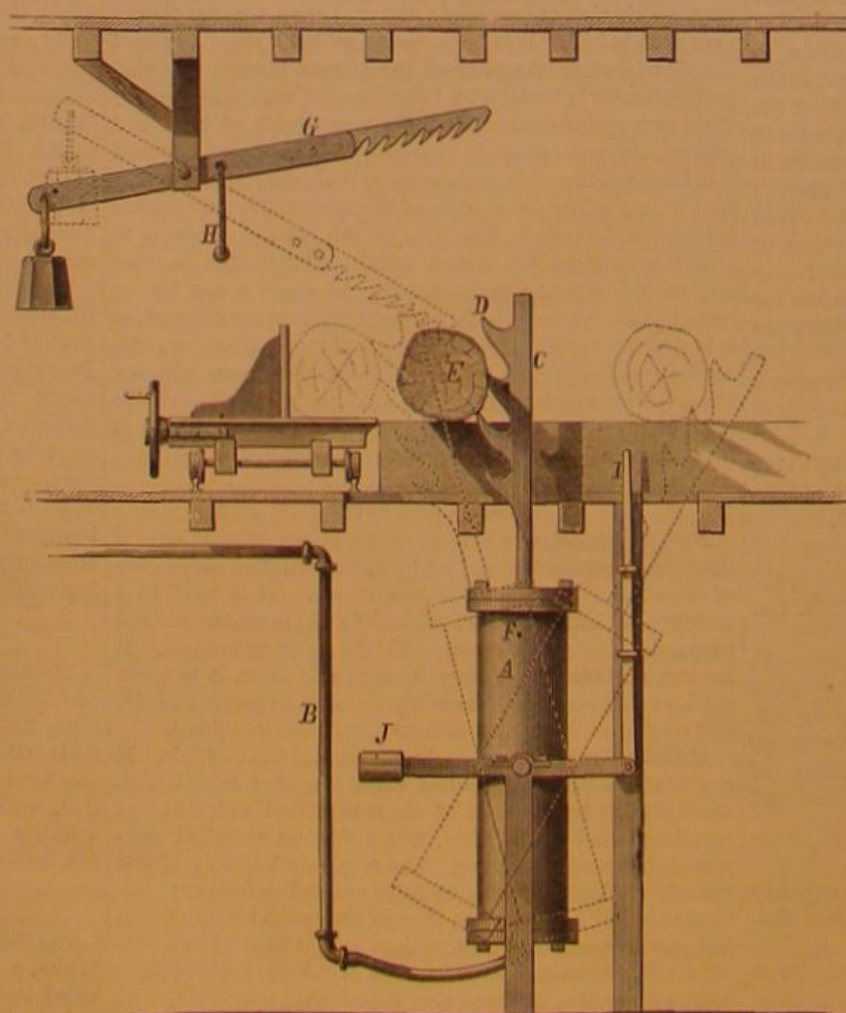
Another use may be made with this mode of stamping letters. At stated intervals the stamps, as removed from letters, could be forwarded to the accounting officer of the department to tally with the subordinate offices, in connection with mail lists or route manifests, and thus hold a check upon the auditing branch of the services, somewhat in the manner practised in the Treasury Department by means of duplicate invoices.

Application for a patent upon this method of attaching and cancelling stamps has been made through the Scientific American Patent Agency, by Albert Potts, 234 and 236 North Front street, Philadelphia, to whom communications may be addressed.

BROWNE'S BOOK COVER PROTECTOR.

The object of this invention is to provide a temporary cover for books, which may readily be applied to books of varying thickness, but having the same length and breadth. It is designed for children's school books, public and private libraries, to protect these books from the wear and tear of usage, and with ordinary care will last as long as the common book cover.

As shown in the engraving, this cover is made of paper of suitable quality and thickness, and is folded over the covers of the book in the manner in which covers are usually put on. One side of the folded part is pasted or otherwise fastened. The other half of the cover is similarly folded, and is retained in place by strips of thin elastic rubber extending from top to bottom of the cover. These strips enable the cover to be readily put on the book. Two of these bands are provided, one being sufficient to hold the folds of the cover in place, while the other may be slipped over a portion of the leaves of the book to "keep the place." To fit the cover to books of varying thickness, the two portions or sides of the cover are connected at the back



ORM'S IMPROVED LOG TURNER.

THE BROWN BAT.

BY C. F. W. KISS.

The brown bat (*scotophilus fuscus*, Beauvois) appears to be the most common vespertilion in the city of Philadelphia. It ceases to hibernate as soon as the first warm days of spring arrive, that is, about the latter part of March or the first of April, but I have, on two instances, observed it flying about at twilight as early as the middle of February. At one time, February 13, 1869, when the thermometer marked 60° in the shade.

This animal, unlike its near relations, the aves, has no need of a nest, and therefore does not construct one. The brown bat has one or two young at a birth, generally the former, and as with the other species, they are placed by the mother amid the fur upon her breast, as soon as they come into the world, where they remain clinging until they are able to fly and provide for themselves. When the mother bat is flying about in search of insect food, or during the day when she is sleeping in some unfrequented loft, clinging head downwards, to a rafter, she always has her baby bat with her.

We had a male bat of this species in captivity last spring; I was amused at his actions when placed in the revolving wheel of a white mouse cage, and was surprised to find him able to cause the wheel to revolve quite rapidly; though his gait was indeed ludicrous, being an awkward stumbling waddle. And to add more grace to his motions, he would fall every few minutes, and the momentum of the wheel would carry him completely around, before he could regain his footing. He was an irritable little brute. When any one would touch his cage he would squeak violently, at the same time showing in rage his sharp teeth. He refused to eat all the flies caught for him, and died of self-starvation and thirst combined, in three days after his capture. Therefore as "a cage bird" he was not a success.

Our bat, when on the floor of his cage, rested or moved upon all fours, as represented in the engraving; but seemed to prefer hanging by his feet from the side or top of the cage, head downwards, with his wings folded against his body. He, as with all living bats I ever experimented with, was

able to spring up and take wing from a level floor. I state this because it has been asserted that bats can only take wing by dropping from some elevated position, and never from a flat surface.

I once heard a gentleman, who had "gone through college," describe a bat to a lady as "only a mouse with wings."

pute the claim, that their artists during the reign of the renowned Emperor Wu Wang, who was contemporary with Samuel when he judged Israel, B.C. 1120, adorned the current literature of that day with their wood engravings. They have used pictures cut from wood to illustrate their books for many centuries, and have even during many ages practised printing in colors, which is a recent art in Europe. We say nothing now of the style either of these engravings or painting, for to our taste the drawing is rude, the perspective imperfect, and the coloring brilliant, not to say gaudy; we only give them the credit of having cultivated their artistic talents from an antiquity so remote that our modern art, of which we boast so much, dwarfs almost into nonage by its side.

In Japan, when a wood cut is to be made, the subject is first drawn on a thin piece of paper with Indian ink and a Japanese paint brush. The drawing is then reversed and pasted on the wood, which is not hard like our boxwood, but extremely soft. The paper is oiled and left on the wood till the engraving is finished. All the black lines in the drawing are thus left in relief. The block is then washed and covered with printing ink made of lamp-black and glue. The printing is performed by laying a clean sheet of paper on the

block and pressing the surface by hand, with a round tool covered with a dry leaf. In this way thousands of copies are printed.

An example of the large returns which a small invention may often bring in is found in the experience of Mr. Charles Cahoon, who recently died at Portland, Maine—a man of much inventive ability and persistent determination. It is said that he realized \$60,000 out of a little lamp-burner, which had an appliance for lifting the chimney so that the wick could be reached for lighting or the mouth of the lamp for filling. This saved the frequent removal of the chimney while hot, and so doubtless prevented many fingers from being burned, and many chimneys from being broken. Simple as was this device, Mr. Cahoon studied hard over it, and nearly lost his eyesight by persistent watching of the lamp flame under different conditions.



THE BROWN BAT.

If he had said a little hyena with wings, or better still, a flying mole, his description or comparison would have been nearer the truth. Look into a bat's mouth, and you will observe four sharp canine teeth as in the higher *carnivora*; not four long chisel-shaped incisors, and no canines, as in the *rodentia*.

The dental formula of the brown bat is—

Incisors, $\frac{2 \cdot 2}{3 \cdot 3}$; canines, $\frac{1 \cdot 1}{1 \cdot 1}$; molars, $\frac{4 \cdot 4}{5 \cdot 5} = 32$ teeth.

WOOD ENGRAVING IN JAPAN.

The art of wood engraving, which has been brought to such perfection in our day, is comparatively a modern art, at least in our Western civilization, where the earliest wood cut extant dates from 1423. The Chinese, however, have illustrated their printed books with engravings from wood blocks for ages. It is claimed, and we have no disposition to dis-



A JAPANESE WOOD ENGRAVER AT WORK.

KNIVES.

In forging table knives two workmen are usually engaged, one of them controlling the piece under treatment with his one hand while with the other he does all the light work, with the aid of a small hammer, his assistant dealing only the heavier blows. In this way the end of a red hot bar of steel rapidly assumes the form of a knife blade, and is separated from the rest of the bar, leaving, however, enough material to furnish the tang of the knife, the part which is secured in the handle, though this is sometimes forged from a piece of iron welded to the steel blade. The elevated portion of the knife between the blade and tang is formed at the same time by the use of the proper mould. A second heating and hammering completes the smith's share in the work. In France, where the knife manufacture has been carried to a high degree of perfection, a method of rolling the knife blanks has recently been introduced, producing excellent results.

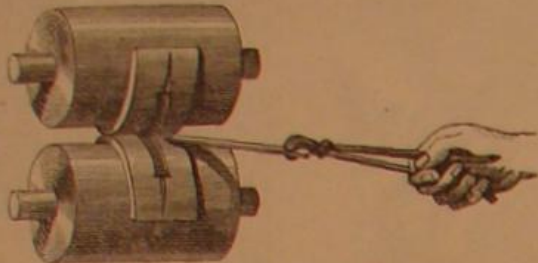


Fig. 1—ROLLING THE BLADES.

After having been properly hardened and tempered the knives pass finally into the hands of the grinders and polishers. The tangs of table knives are either flat or pyramidal in shape. The flat tangs are placed between the two halves of the handles, and are secured therein by means of several small rivets. The four-sided tapering tongues have a hole drilled for them in the hafts, and are firmly held in place by a cement composed of pitch and brick dust; in the case of knives with metal handles by pouring in molten lead.

Blades for pen and pocket knives are forged in a similar manner from small bars of steel. Their further elaboration—drilling the hole and cutting the notch along the back—is performed after a second heating. In tempering the blades after having first hardened them, they are placed upon an iron plate with their edges uppermost, and heated until they assume the right shade of color.

The accompanying illustration, Fig. 2, represents the more common form of table knife together with an ordinary clasp knife, and its separate parts. Pocket knives are composed of three principal pieces—the blade, the spring, and the haft. The haft is formed of two thin metallic plates, both covered on one side with small sheets of horn, ivory, bone, or other similar material. The blade turns about a small rivet in the upper part of the handle, and bears with its lower extremity against the spring, which is fastened at two places to the back of the handle, as shown in the engraving.

Razor making demands special care and attention on the part of the workman. A high grade of steel, a proper degree of hardness, and a very fine cutting edge are the essential requirements of such an instrument. The blades are forged from flat bars of cast steel as thick as the back of the razor, and the operation is usually carried on by two workmen upon a slightly curved anvil. They are never heated above a dull red heat, in order to prevent any deterioration in the quality of the steel, so that ten or twelve re-heatings often become necessary before they are ready for their next stage, their hardening. They are heated, as in the case of the pocket knives, on an iron plate to a bright cherry red heat, and are then thrown, back foremost, into a large vat full of water, in which they are stirred about until perfectly cold. In tempering, the blades are heated in an alcohol flame or in a bath of a molten mixture of tin and lead until they acquire the proper tint of yellow, which varies a good deal with the quality of the steel employed and is only to be learnt by experience. Grinding and polishing conclude the process.

An improved method of making razor blades has lately been patented in England, consisting in stamping them from thin sheet steel and riveting two strong narrow strips upon them, in order to form the back. This process greatly facilitates the manufacture of razors, and is advantageous in more than one respect.

Ancient Aqueducts.

Mr. J. H. Parker, in his book on the "Aqueducts of Rome," gives us some facts which may well put modern municipalities, not to speak of governments, to the blush. The exact quantity of water daily poured into Rome in Trajan's time is known from careful estimates of Frontinus, the head Government surveyor and engineer. It amounted to 24,805 *quinariae*, a section of which amount would be just upon 120 square feet; i.e., in Mr. Parker's words, "we can form some notion of the vast quantity, if we picture to ourselves a stream twenty feet wide by six deep constantly running in at a fall six times as rapid as that of the Thames." It is calculated that, when Trajan's and the Aurelian aqueducts were finished, the daily supply was quite 333½ millions

of gallons; i.e., at least 333 gallons per head, for the population of old Rome probably never exceeded a million. Nowadays forty gallons per head per day are thought ample, and by many excessive; these forty including, of course, all that is used in manufactures, in street cleansing, sewer flushing, etc. The site of old Rome was notably unhealthy, and there was much over-crowding; yet after the chief aqueducts were made, no city of antiquity was so free from epidemics. Another point to which Mr. Parker calls attention is the care with which the best water (such as the Marcian, now lately brought into use again) was kept wholly for drinking purposes, while the muddier and less pure (such as the Anio Vetus and Novus) was used for street and sewer flushing, for the baths, and for scenic representations.

Steel Wire Rope.

Some important trials of steel wire rope hawsers have been lately made at Portsmouth dockyard, the results being such as to astonish the operators as to the enormous tensile strength which had been imparted to the wire. Steel is not entering largely into the construction of our ships of war, but their standing rigging and hawsers are being gradually made of the same light and durable material, and in a short time we may fairly expect that the present unwieldy chain cables in use will be superseded by steel wire cables of moderate thickness and weight. The substitution of the one for the other has long been thought desirable, and after the tests at Portsmouth there can be no longer any doubt of the power of well-tempered wire strands to withstand enormous strains of ground gear. The advantages to be derived from the change are obvious and important. With a chain the safety of the ship depends upon the weakest welding, and when a single link parts, either from inherent defect or from a sudden jerk, everything parts, and the vessel drifts from her moorings. With a wire cable, however, the effect is different. Even when tested to the breaking point timely notice is given of the coming fracture. It does not snap suddenly like a chain, but first one strand, then another gives way, and it is possible for a wire rope to hold the ship even when one half the strands have exhibited signs of distress.

The recent tests at Portsmouth were of various samples of steel hawsers for towing purposes, it having been found from the experience of the Valorous and other ships that a wire hawser possesses equal flexibility to the best hempen rope, combined with less weight, superior handiness, and greater endurance, without any increase in the first cost. Official experiments at Portsmouth have also established the fact that the breaking strain of a steel hawser

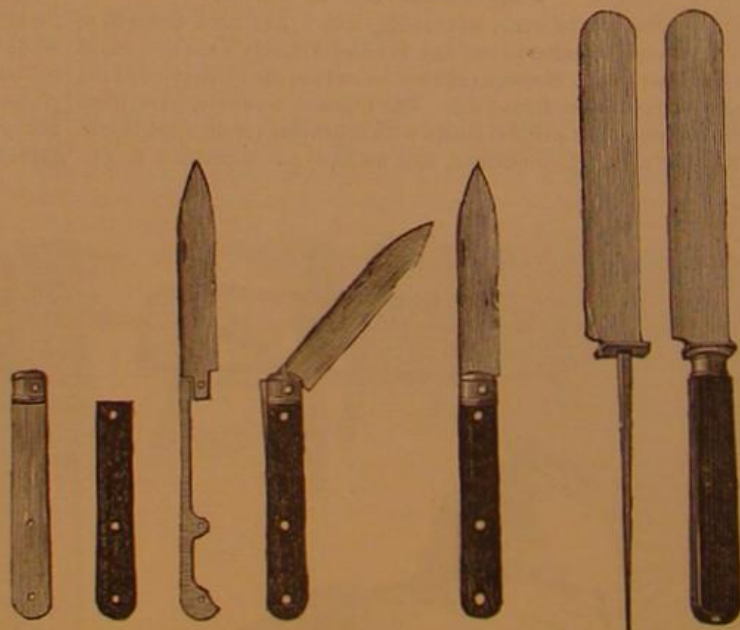


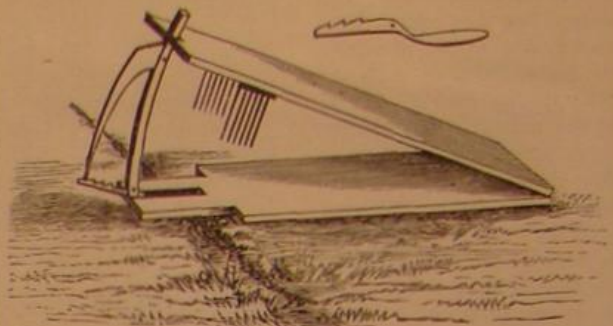
Fig. 2—TABLE AND POCKET KNIVES TAKEN APART.

is more than three times that of a rope hawser. Thus a 9 inch ordinary hawser will break under a strain of 16½ tons, and a 19 inch hawser under a strain of 72 tons, whereas Bullevant & Co.'s 3 inch steel hawser broke at 18 tons, and their 6 inch hawser at 80 tons. In the matter of weight the advantage is also clearly on the side of the steel, the 3 inch and 6 inch wire hawsers weighing 7 lbs. and 29 lbs. per fathom, while the 9 inch and 19 inch hempen hawsers weighed 19 lbs. and 84 lbs. per fathom. Up to the present time the navy has been wholly supplied with steel wire hawsers by Messrs. Bullevant & Co., of London, but the recent trials were made with four samples of steel hawsers submitted for test by Messrs. Scott Brothers, of Bishopsgate Street. Within the wire of which was made, drawn, and twisted into rope at their works at Nutsford Vale, West Gorton, Manchester. The samples operated upon were respectively of the circumference of 3, 4, 5, and 6 inch. The core of each was formed of tarred hemp, over which was twisted 6 strands, each strand being composed of 19 highly tempered steel galvanized wires. The 3 inch hawser, which was formed of 15 gauge wire, broke at 22½ tons; the 4 inch, 14 gauge, at 35½ tons; the 5 inch, 12 gauge, at 57½ tons; and the 6 inch, 10 gauge, at the enormous strain of 100½ tons. In every instance the strands parted at the splicing, which were the only parts displacing any appreciable elongation under the tests.—*London Times*.

EXTERMINATING MOLES.

Mr. Hand, of Sing Sing, N. Y., after trying numerous devices to catch the moles, planned the one represented in the annexed engraving, and finds it very effective. It is made of two boards, an inch in thickness, 7 inches in width, and 2 feet 6 inches long, attached to one end by a broad butt hinge. The bottom board is made with a central slit to admit the free play of the trigger, which is represented in the right hand corner of the engraving; it is of iron, 10 inches long; the lower part 5 inches long, 1½ inches wide, and the left end notched and ½ of an inch wide perpendicularly. The post, 16 inches high, is curved to the circular sweep of the top board on its hinge. The teeth, six in number, on each side, are riveted ¼ of an inch apart, in a plate 5½ inches long and 1 inch wide, which is fastened to the board by screws.

The trap is set, as shown in the illustration, across a mole



track, first digging a hole 8 inches square and 6 inches deep, and returning the soil, taking care to exclude all stones and large pebbles. Press the earth down pretty firmly, and set the trap so that the trigger touches the surface of the ground exactly over the line of the track. When the mole goes along his accustomed road, and finds it obstructed, his movement in re-opening the track inevitably heaves up the surface, so as to set off the trigger, and the teeth on one side or the other will catch him. Weight the trap with a heavy flat stone. In taking the mole out, dig down to him on the outside first; for if you simply raise the trap, and he is not dead, the teeth will be drawn out and he will escape, though mortally wounded.—*Country Gentleman*.

The Ribbon Fish.

Frank Buckland, in a recent letter to *Land and Water*, says: "I have received, through the kindness of a correspondent at Nice, a very interesting and remarkable specimen of a ribbon fish. I make him out to be a *regaliscus*. I have never before seen one of these most curious fish in the flesh. It measures five feet, is about a quarter of an inch thick, and is of a silvery hue, not unlike the color of the 'silver-hair tail.' Upon the top of the head there are filaments, which, when stretched to their full, are about eight inches long. The head is very remarkable; altogether it is not unlike the shortened head of a horse. The mouth is prehensile, and so peculiarly formed that it is quite worthy of a figure; the eyes are very large and circular; the iris of a lustrous silver color. Behind the head the body is two inches and a half deep, in the middle two inches, at the tail a quarter of an inch. When held up to the light it is almost transparent; the vertebrae can with difficulty be seen, but with the movement of the fingers each vertebrae will give a slight crack at the junction with its neighbor. The vertebrae are longest and thickest towards the tail end, at which there are sharp spines. It is covered everywhere with a fine silvery powder, which readily comes off in the hand. It has a crest of about an inch in height, which runs down the whole of the back. The rays forming the crest are united to double pillars of very slender bone. In substance it is very delicate, and begins to dry and harden almost immediately on exposure to the air.

"I cannot find much about this fish in any of my books. This family of ribbon-shape form consists of seven genera and twenty-six species. Mr. Swainson remarks of it as follows:

"It contains the most singular and extraordinary fishes in creation. The form of the body, when compared to fishes better known, is much like that of an eel, the length of the body being in the same proportion to the breadth; but then it is generally so much compressed that these creatures have acquired the popular name of ribbon fish, lath, or deal fish. The body, indeed, is often not thicker, except in the middle, than is a sword, and being covered with the richest silver, and of great length, the undulating motions of these fishes in the sea must be resplendent and beautiful beyond measure. But the wonders of the mighty deep are almost hidden from the eye of man. These meteoric silver-coated fishes appear to live in the greatest depths, and it is only at long intervals, and after a succession of tempests, that a solitary individual is cast upon the shore with its delicate body torn and mutilated by the elements on the rocks, so that with few exceptions they are scarcely to be regarded as edible fish."

"According to this authority, the Mediterranean has hitherto produced the largest proportion of the family, but it is distributed from the arctic regions to the sunny shores of India, so that probably a tithe have not yet been discovered."

THE WATCH—ITS INVENTION AND HISTORY.

We propose, in this and following articles on the same subject, to give a sketch of the origin of the watch, and to do so shall refer slightly to its elder brother, the clock; but as the early history of clocks has often been given, we do not propose to go over the whole ground of time-keeping instruments, and shall therefore only hint at the successive steps in clockmaking that have led to the invention and introduction of watches.

The first artificial means of noting time was probably a rude species of sundial, to which succeeded the clepsydra and hour-glass. The clepsydra in its simplest form was merely an upright cylindrical vessel that was filled at sunrise with water, which escaped through an aperture in the bottom, its decrease in the cylinder noting the lapse of time. The water was afterwards made to turn a wheel which carried an index round a dial, and many curious automata were thus operated. About the eleventh century it is believed that weights were substituted for the falling water, and a "fly" similar to that still used on the "strike part" of a clock is supposed to have been the usual means of regulating their motion, until the introduction of the balance and escapement, the exact date of which is not known. The earliest balance and escapement of which the actual construction has been preserved is one that was built by Henry de Vick, or De Wick, a German, and set up in Paris, for Charles V., in 1379. It is supposed by some that Vick was the inventor of the escapement there shown, but of this there is no evidence, and for aught we know it was invented and used long before his time. It consisted of a crown wheel, the teeth of which operated on pallets set in a vertical shaft, carrying at its top a cross bar having notches to receive hanging weights. The action of the crown wheel upon the pallets caused a vibrating motion to be given to the bars and weights, in a similar manner to what is known as the verge or vertical escapement, but it was without the hair spring, as this was not introduced until about 300 years afterwards. The rate of going was changed by hanging the weights in different notches in the horizontal bar; and this form of regulating was improved by subsequent makers, who cut threads on the end of the bar and tapped the weights, by which means the latter could be screwed nearer to or farther from the center, and very nice adjustment thus obtained.

The earliest clocks were large machines designed to be set up in monasteries, churches, etc., but succeeding generations saw them gradually made smaller and smaller, until sufficiently portable to be carried from room to room; and near the latter part of the fifteenth century were made so small as to be carried in the pocket, and hence were called by the Germans, who originated this form of timekeeper, "pocket clocks"—a name which they still retain in the German language. They were first made in the city of Nuremberg, and being of oval shape were sometimes called "Nuremberg Animated Eggs."

The first name that has come down to us in this connection is that of Peter Hele, who, it is claimed, some time between 1470 and 1490 (the authorities differ on this point), introduced the mainspring instead of the weight before used, without which it would seem impossible to make a watch, and he should therefore be considered as the first inventor of watches.

The early watches were made entirely of steel and iron. No glasses were used until about 1615, the cases being wholly of metal, and to admit of readily seeing the time, the cover of the face was sometimes perforated in elegant designs. Instead of the form now universally adopted, various styles of casing were employed, such as globular, octangular, cruciform, skull, coffin, acorn, pear, melon, tulip, bird, and, in fact, nearly every imaginable shape that ingenuity could invent, or caprice suggest; and, as a consequence of this and the fact that many of those watches were provided with striking movements, they were so bulky that it was inconvenient to carry them in the pocket, and they were hung at the girdle with swivels so that their faces could be readily turned for observation without being removed from their position. Most watches required winding twice a day, and from their very imperfect escapements could not be depended on as time-keepers—a fault from which it is believed that many modern watches are not wholly exempt. This irregularity of movement in the ancient watches did not depend entirely on the poor escapements, but was due partly to the varying power of the mainspring driving the balance at different speeds, owing to the absence of the hairspring and fusee. This last device was not introduced until about 1525, and was a very important improvement and a great necessity to the early watches before the invention of the balance or hairspring, about 1658. Instead of the chain used in modern watches as the medium between the spring and the fusee, catgut was employed, which was not superseded until about 1660, when the chain was introduced by Gunt, of Geneva.

Both clocks and watches were originally made without minute hands. Many such clocks may be seen in church towers and old houses in Europe, and some may yet be found in the possession of the descendants of the early settlers in this country. When the minute hand was first introduced, it was set on one side of the hour hand, as the second hand is now; and it was not until about 1687 that Quare placed the minute hand concentric with the other, in the manner now universally employed.

The first balance and escapement used in watches were substantially the same as that in Vick's clock, the only essential difference being that the weights were screwed on to the

straight bar, instead of swinging in notches. This device retained its position as the only regulator for a watch movement for a long time; but about 1695, the cylinder escapement, in an imperfect form, was invented by Tompion, and was finally perfected by Graham in 1700.

The lever escapement has several claimants, but the earliest style of this device appears to have been invented by the Abbe Hautefeuille, in 1722, and has since been improved by various inventors—Mudge, Litherland, Brequet, Roskell and Savage—until it assumed its present form.

The duplex escapement, in a crude state, is said to have originated with Dr. Hooke about 1658, but its present construction is believed to have been invented by Tyrer, or Dyrer, in 1767.

None of these escapements, however, would have been of much use as isochronous regulators without the balance spring, introduced in 1658, which is claimed as Dr. Hooke's invention. His priority in this matter is disputed by some who claim it for Huyghens, but the weight of authority appears to be in favor of Hooke, who first showed that the vibrations of such a spring are nearly isochronous, although their lengths may be varied with the power of the mainspring. The adoption of this spring marked an era in watchmaking equivalent to that of the introduction of the pendulum into clocks, for without it an accurate-going watch would seem to be an impossibility. It was first made nearly straight, but in 1660, it was improved by making it in the form of a coil.

Shortly after this, in 1676, repeating watches were introduced. This invention, like many others relating to watches, was claimed by two inventors and is interesting to patent attorneys, if not to others, as forming the basis of the interference case of Barlow vs. Quare, heard by King James II. in person, March 2, 1687, who decided in favor of Quare. It seems, however, as if Barlow was really the first inventor and that Quare was merely an improver who had succeeded in doing with one push-pin what Barlow had previously accomplished by two. As an example of the ornamental work of that period, the following description of the identical watch made by Quare for the king, furnished by its present owner to the *London Chronicle*, December 11, 1833, may be interesting:

"The outer case, which is of very pure gold, is embossed with the king's head in a medallion, under which on the right is Fame, in the clouds, with a trumpet at her mouth, which is held in her left hand; in her right is a wreath she is raising, as if to crown him. On the left are winged boys supporting the royal crown; under them a tower and fortifications on which a flag is flying; under all is the sea running close up to a fort, and on the sea is a ship under full sail. This case is also beautifully engraved and pierced with scroll work, ornamented with cannon, mortars, shot, flags, etc. The face is of gold, with Roman letters for the hours and figures for the minutes. In the center is a piece of pierced work in gold upon blue steel, showing the letters J. R. R. J., combined so as to form an ornamental scroll, above which is the royal crown. The box is exquisitely pierced with scroll work intermixed with birds and flowers; about the hinge is engraved a landscape with a shepherd sitting under a tree, playing upon a pipe, with a dog at his feet, and houses, trees, etc., in the distance. On the back of the box is the following inscription: 'James II. Gloria Deo in excelsis sine pretio redimi mini mala lege ablatus bno. Regi restituitur.' Within the inner circle is engraved a figure of Justice in the clouds, having in one hand scales and in the other a scepter with which she points to three bishops with an altar before them. On one side of the alter is the tower of London with a group of twenty-six men carrying bags (presumed to represent money); on the other side is a view of the city of London in perspective and a group of twenty-seven men carrying similar bags, of which there are several more lying in the foreground; under all a lion and a lamb lying together.

"The watch is considerably thicker than, but otherwise not much above the common size, and every part of the engraving is beautiful and distinct. It goes accurately, and is in a perfect state of preservation."

In this connection we may state that in 1764 Mr. John Arnold presented to George III. what is believed to be the smallest repeating watch ever made. It is said to have been smaller than an English silver two-penny piece (rather smaller than our silver half dime) and only weighed 5 dwts. 7½ grains, case and all—the movement itself only weighing 2 dwts. 2½ grains. It was necessary to make a set of minute tools on purpose for its construction. For this watch he received a present from the king of 500 guineas (about \$2,500), and it is reported that he was afterwards offered a thousand guineas to duplicate it for the Emperor of Russia, but he refused it, so that his gift to the king might remain unique. A smaller watch than this, however, formed a part of the Swiss exhibit in the World's Fair of 1851, but this was not a repeater. It was only ⅓ of an inch in diameter and was set in the end of a pencil case. It not only gave the hours, minutes, and seconds, but the days of the month also.

The next great improvement in the watch, after the invention of the hair or balance spring, was the compensation feature, and this is believed to have been first applied to watches by F. Berthoud, of Paris, who sold one with this improvement in 1776 through Pinchbeck the London watchmaker, to George III.; but the compensation effected by means of the combinations of bars of metals of different rates of expansion, as applied to timekeepers, was without doubt invented by John Harrison, of Foulby, England, who

devoted himself for a long series of years—from 1728 to 1761—to the discovery of a mode of overcoming the change of rate due to the varying temperature changing the proportions of the pendulum in clocks, and the balance wheel, springs, etc., in chronometers.

The compensation pendulum requires but one adjustment to maintain the center of gravity at an equal distance at all times from the axis of oscillation, but the compensation balance is subject to two variations—one owing to the expansion and contraction of the balance itself, and the other due to the varying length of the balance spring, both caused by the changes of temperature. To overcome the change in the length of the ordinary pendulum rod, Harrison invented the gridiron pendulum, but a second invention was necessary to overcome the variation in the hair spring and balance of chronometers, and this he accomplished by combining with the curb which governs the acting length of the spring a compound bar, composed of two metals of varying degrees of expansion, so that the curving of the bar by heat would move the curb and so shorten the spring sufficient to compensate for its own increased length and the expansion of the balance. For these improvements Harrison received the award of £20,000, (nearly \$100,000) offered by the British government.

The earliest compensation devices, of which there were several, were applied to increasing or diminishing the active length of the hair spring, but Arnold and Earnshaw invented compensation balance wheels about 1790, and the latter improved them to substantially their present form in 1802.

Jewelling of watches was patented in England May 11, 1704, by N. Facio, of Geneva, who invented a machine for drilling jewels, but it is claimed that Ignatius Huggerford of London had used jewels in one movement only as far back as 1660.

The above is believed to be as correct an account as can be given of the principal inventions that have brought watches to their present state of perfection, but it should be stated that the authorities differ as to the names of the inventors—the same invention being claimed for different men in several instances. We have not attempted to give any of the minor improvements, because a synopsis of these, however condensed, would fill a volume, as there are not less than 450 United States patents relating to watches, to say nothing of foreign inventions in the same line.

The introduction and manufacture of watches, with a description of some remarkable specimens, will form an interesting article, which we shall reserve for our next number.

The Formation of Fat.

It was pointed out by Liebig that the view, once generally held, that the fat of the herbivora was derived exclusively from ready formed fat in their vegetable food, was untenable; he attributed much of the fat of the animal body to the carbo-hydrates of the food. His explanation was combated by Dumas, Boussingault and others, but subsequently adopted by them; and the very numerous feeding experiments of Lawes and Gilbert, commenced about thirty years ago, have afforded strong confirmation of the accuracy of Liebig's conclusions. Voit, in 1865, and still more recently in 1869, and conjointly with Pettenkofer, have maintained that fat is the result of the transformation of nitrogenous substances. They state that they never found fat to be formed from starch or sugar, nor was the carbon stored up more than that in the fat of the food, plus that which could be derived from the breaking-up of the albumen. Their experiments, made on the body of the dog, led them to believe that the same must occur with the herbivora; and they contend that, to establish the formation of fat from carbo-hydrates, experiments must be brought forward in which the fat deposited is in excess of that supplied by the food, plus that which could be derived from the transformed albumen. Lawes and Gilbert, in a recent paper, refer to the results of feeding experiments with pigs which they published eleven years ago, which experiments clearly show such to be the case. Voit, however, cannot allow himself to consider a transformation of carbo-hydrates into fat to have been conclusively proved by the English experimenters, and suggests several possible sources of error, his reference to some of which, as these gentlemen have found, showing that he has in fact misunderstood them. A careful review, instituted by Lawes and Gilbert, of their feeding experiments with oxen, sheep, and pigs, in order to satisfy themselves whether any doubt could be entertained of the views they had previously advocated, has shown that, as regards the ruminant animals, no absolute proof of the derivation of fat from carbo-hydrates can be obtained; it was quite otherwise, however, in the case of their experiments with pigs, in many of which much more fat was produced than could possibly have been derived from transformed albumen of the food. Instead, therefore, of experimenting further in this field, they have decided, says the *Academy*, to again direct attention to the results given in the paper on the subject, which appeared in the *Philosophical Magazine* in 1866. In the cases to which they refer, where the nitrogenous substance was not so very excessive, but still more than is the most appropriate, there was a considerable proportion of the total fat produced which could not possibly have been derived from the nitrogenous substance of the food. When the proportion of the nitrogenous to the non-nitrogenous substance in the food was the most appropriate for fattening, there was a much larger proportion (about 40 per cent) of the total fat produced which could not possibly have had its source in the nitrogenous substance consumed.

Inventions Patented in England by Americans.

June 22 to July 6, 1877, inclusive.

ARCHITECTURAL COLUMNS.—W. H. Drake et al., Chicago, Ill.
 BARRELS, ETC.—G. W. Zaraway, Hartford, Conn.
 BOOT CHIMNEY.—J. Smith et al., Boston, Mass.
 BOTTLE STOPPERS.—N. Thompson (of Brooklyn, N. Y.), London, England.
 BOX DRAWERS.—C. C. Chamberlain, New York city.
 BRUSHES AND CURRYCOMBS.—U. E. Holmes et al., New York city.
 CAKE MACHINERY.—D. J. Holmes (of New York city), London, England.
 ENGRAVING MACHINERY.—H. K. Floger, Boston, Mass.
 FIRE ARMS.—H. C. Bull et al., New York city.
 FIRE ARMS.—D. C. Holloway, Washington, D. C.
 FURNACE.—J. J. Storey (of New York city), London, England.
 HARVESTERS.—D. M. Osborn, Auburn, N. Y.
 HARVESTERS.—W. A. Wood, Hoosier Falls, N. Y.
 LAMP SHADES.—J. J. West, Chicago, Ill.
 LETTER FILES.—B. Brower et al., Irvington, N. Y.
 MATCH.—W. H. Bracy, Boston, Mass.
 MATCH SPLITS.—E. B. Beecher, Westville, Conn.
 METALLIC CANS.—A. S. Lyman, New York city.
 PENCILS.—R. Duncan, New York city.
 PRINTING.—H. D. Dupel, Boston, Mass.
 PROPELLING STREET CARS.—J. Amboderg, Richmond, Va.
 PUMPS.—J. Robertson, New York city.
 RAILWAY RAILS.—J. E. Atwood, Stonington, Conn.
 RAILROAD BRAKE.—H. J. Hadden, Mt. Stevens, New York city.
 STEAM CARS, ETC.—L. Ransom, Stratford, N. Y.
 TELEGRAPH APPARATUS.—E. Gray, Chicago, Ill.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED CARBURETER.

Oliver P. Drake, Boston, Mass.—The object of this invention is to produce a more equal and reliable density of rich illuminating gas when manufactured by the admixture of common atmospheric air and the vapor of hydrocarbons. The invention consists in an improved construction of valve case and valve, and in the arrangement of the valve directly above the float in the partition separating the reservoir and carbureting chamber; also in a device located in the reservoir and resting on its bottom partition, for separating any excess of hydrocarbon vapor from the air passing through the carbureter; also in arranging two or more carbureting chambers, one above the other, in the same case in such a manner that each chamber shall be automatically supplied by means of a float and feed valve.

IMPROVED ICE CREAM FREEZER.

Oliver Dexter, Jr., Troy, N. Y.—This invention consists in means which will forcibly inject currents of air into the freezing can during the process of agitating the contents thereof by dasher blades.

IMPROVED SHOW CASE.

William Shockley, Allerton, Iowa.—This is a case or box for storing screws, screw eyes, or other articles of hardware, of different sizes, for the purpose of preventing any intermixing of different sizes of screws, which forms a source of annoyance in the present open boxes. The invention consists of a case having a number of boxes for the different sizes of screws, each box, except one, being covered by a separate sliding lid, that is guided by slide grooves along T rails of one set of partitions. The T rails extend over the greater part of the partitions, with the exception of one end tier of boxes, along which the lids slide laterally, so as to remove the lid from any one of the boxes by sliding first the lateral lids, and then those at right angles to the open box.

IMPROVED POCKETBOOK.

Daniel M. Read, New York, N. Y.—In the construction of this pocket-book the coins are put one at a time upon disks until as many as desired have been put in, or until spring nuts with which it is provided have been fully compressed. The coins are slipped out one at a time, as they are required for use. To the lower part of the case is attached a cover of leather or other material, which is provided with pockets in the manner of an ordinary pocketbook. The cover folds together around the case, and its overlapped ends are secured by a fastener.

IMPROVED BUNG EXTRACTOR.

William J. Wademan, Bay City, Mich.—This invention consists in an extracting rod having a flat arrow-head formed on one end for penetrating and giving a hold on a bung. In combination with a tubular hammer stock for driving the arrow-head of the extractor through a bung. When the head has passed through the bung, it is turned one quarter round, taking a firm hold and allowing the bung to be extracted.

IMPROVED STABLE SCUTTLE AND TRAP.

William M. Watkins, Worcester, Mass.—The scuttle lid rests on sides and ends, so that the whole forms a box. Hinged to the side is the bottom or trapdoor, having the catch that receives a pivoted and right-angled latch. To the latch is pivoted the lower end of a rod, which passes through keepers attached to the side and is used to trip the latch, which is held forward to engage with a catch when the trapdoor is raised into place. A spring is attached to the side and bears against the latch, which is covered by a dust case. The trapdoor is raised by a cord passing over the pulleys pivoted to the forward corners of the free edge of the trapdoor, a lever cam being employed to hold the free end of cord detachably.

IMPROVED TOY BOOTBLACK.

Adolph Gartner, New York city, assignor to himself and Louis Gompfer, of same place.—This invention is a toy in which figures perform certain movements by the action of a clock train. The figures are worked by the train, so that the arm of one is operated by a horizontally reciprocating slide piece, and the head of the other by a vertically reciprocating slide piece, forming contact with the pivoted and spring-acted portion of the figure.

IMPROVED SELF-RAISING LARD.

Thomas H. Rosser, Selma, Ala.—This invention relates to an improved compound used for culinary purposes; and it consists in a composition formed by mixing lard, tartaric acid, bicarbonate of soda, alum, and starch.

IMPROVED VENTILATING BUNG.

Simon H. Lesser, New York city.—This invention consists of a hinged and spring-acted bung that is fitted tightly into a seat of the cask and locked by a spring catch or bolt, the bung being provided with a ventilating device for admitting or shutting off the air. It is intended to furnish a bung for the water casks of sea-going vessels, for beer kegs, and other purposes, by which a hermetical sealing of the bunghole is obtained, and air admitted for giving vent at any moment without opening the bunghole.

IMPROVED PROCESS FOR ORNAMENTING GLASS.

Chas. J. Cartisser, New York city.—This invention consists mainly in dispensing with the frosting of the glass by mechanical means, as emery, sand, etc., and producing, first, a prepared surface or ground in clear or whitish color by etching the surface with hydrofluoric acid alone, or by a mixture of carbonate of ammonia and hydrofluoric acid, and laying then on this ground any desired ornamentation by means of a varnished transfer pattern or sheet of lace, or other perforated or cut material, and finally etching this and larger ornaments by one or more baths of carbonate of ammonia and hydrofluoric acid.

IMPROVED CLASP FOR HOLDING NECKTIES.

Alvin H. Dodd, New York city.—This necktie or bow fastener consists of a spring clasp formed from a single piece of wire, bent into loop shape, to receive an attaching plate, having an eye for the reception of the collar button, and provided with outwardly branching ends, to facilitate the entrance and removal of said button.

IMPROVED SADRON HEATER.

William H. Haylock, Jonesville, New York city.—This invention relates to improvement in sad iron heaters, so that the same may be used at will for heating sadirons, a tailor's goose, or for boiling starch in a convenient manner; and the invention consists of a sad iron heater having a chimney of inverted conical shape, supporting on an angular seat a top for sadirons, or a box top, or a flat pan top, the escape of heat being arranged at the seat and the top parts.

IMPROVED BRUSH.

John Waddell, Elora, Ontario, Canada.—In this invention the brush handle is connected by means of bevel dovetail tenons at the ends of the handle to the brush head, said tenons running in one direction, so as to enter simultaneously corresponding mortises of the bevel dovetail shape of the brush head, into which the tenons are secured by glue.

IMPROVED TOBACCO PIPE.

Samuel H. Thurston, Whitestone, N. Y.—This invention relates to improvements in pipes for smoking tobacco; and it consists in making the entire pipe or portions thereof, or a cigar holder or portions thereof, of pumicestone.

IMPROVED LABELS FOR PLUG TOBACCO AND CIGARS.

George W. Yerby, New York city.—In this invention a plug of tobacco has a portion of a leaf of tobacco, of lighter color than the plug, in which apertures, having the form of letters or characters, are cut, which, when the label is attached to the plug, permit the darker covering of the plug to show, thus making the letters or characters prominent and easily distinguished. Where the label is applied to a light-colored plug it is made from a dark leaf.

NEW HOUSEHOLD INVENTIONS.

IMPROVED VENTILATOR.

Thomas M. Foster, of Union City, Penn.—This invention consists of a number of apertures arranged in the wall and opened or closed by single and double covers, that fit snugly over the apertures, and are operated by a pivoted lever and cords and pulleys. The apertures are provided with thimbles and other weather caps.

IMPROVED SASH BALANCE.

William Cashner, Pleasant Hill, Mo.—This invention consists of the sashes of a window hung by cords to double spring pulleys, turning in opposite directions, and being retained in any position by sliding spring bolts and pins acting on recesses of the sashes. It dispenses with boxes, weights, cords, and pulleys, and is easily adjusted for the weight of the sash.

IMPROVED WINDOW BRACKET.

John F. Zimmerman, Crestline, O.—This invention is designed to furnish a shelf for attachment to window frames to receive flower pots, and is supported by means of arms or bars, which are so connected with it as to admit of adjustment according to the width of different window casings.

IMPROVED BROOM.

James Roney, Scotland, Mo., and Thomas Roney, Hyde Park, Ill.—This invention consists in the combination of a seamless stock, ribbed upon its inner surface, and provided with a screw collar and movable clamps ribbed upon their outer surfaces, and a handle made with a conical forward end, having a screw thread formed upon it. When the handle is screwed down it enters between plates and presses them apart, clamping the filling between their ribbed outer surfaces and the ribbed inner surface of the stock, holding the filling securely.

IMPROVED DEVICE FOR COATING CAKES WITH COCOANUT, ETC.

Daniel M. Holmes, New York city.—The object of this invention is to furnish an improved device for coating cakes made of soft dough, such as jumbles, etc., with grated cocoanut, sugar, currents, and other substances, which will enable all the cakes to be coated evenly, and will prevent any of the cakes from being flattened. The invention consists in the watertight box provided with a flexible waterproof sheet, a water pipe, and air passages, to adapt it to be used for coating soft cakes with cocoanut, sugar, etc.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED AXLE BOX.

Isaac Newton Camp, Deerfield, Mich.—The axle is inclosed at the hub-section with a revolving box provided with outer spiral grooves or channels, and, if desired, an inner returning groove for oil. The groove or grooves are provided at suitable distances with perforations through which the oil passes to the axle to lubricate the bearing of box and axle.

IMPROVED COMBINED CUT-OFF AND FILTER.

John Hoover, Crawfordville, Ind.—This invention relates to a cut-off and filter combined, which may be used so as to conduct first the dirty water from the roof out through the waste pipe, and passing then the water through the filtering chamber, in which the filtering material can be readily replaced, as required. The invention consists of a cut-off combined with a filtering device, the partition between the cut-off having vent holes to pass any surplus water.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CORN PLANTER.

Charles McGee, Elwood, Kan.—This improvement is in that class of cultivators which are constructed in duplicate form with shovels upon separate beams arranged to cultivate upon both sides of a row at once, which beams are connected by a loosely jointed elevated coupling high enough to permit one set of shovels to be advanced or retracted independently of the others. The improvement consists in arranging upon each beam a nicked shovel combined with centrally arranged cutting blade, which arrangement more perfectly cuts the grass and clears the shovel.

IMPROVED ROCKING DEVICE FOR HARVESTERS.

Edward Cheney, Geneva Lake, Wis.—This invention relates to means for tilting the cutting apparatus of reaping and mowing machines; and

consists in combining, with the drawbar and slotted shoe of the finger bar, an adjustable cam or slotted wedge and a hand lever, whereby the attendant can tilt the cutting apparatus, and give it any desired angle of inclination.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SPIRAL CAR SPRING.

James Ludlum, Pompton, N. J.—This invention is a spiral spring made from a metallic bar, whose cross section in its exterior surface is convex, and the two interior ones more or less concave, while the upper and lower edges of each spiral are rounded off. The spring thus formed is capable of resisting a great amount of pressure, while it is also capable of yielding laterally, and as the coils overlap each other they are mutually supported.

IMPROVED FEED REGULATOR FOR MILLSTONES.

James W. Moir and James H. Ellis, Halifax, Nova Scotia.—This invention consists in the combination of a valve connected with the end of the grain conduit, a spring for holding the valve open, and a hopper that is suspended from the valve, through which the grain passes to the hopper of the millstone. The grain, by weighing down the hopper, moves the valve so as to control the amount of grain passing through it.

IMPROVED SPINDLE FOR LOOM SHUTTLE.

James Hamilton, Salmon Falls, N. H.—This invention consists in a spindle which is made of two parts, and applied in the shuttle by means of independent pivots, arranged in such manner that when these parts are raised to introduce the cop they will be contracted, and when they are adjusted in position for weaving they will expand and firmly hold the cop.

IMPROVED ROAD SCRAPER.

Ahira Thompson, Harmony, Ill.—This invention consists in the combination of bar, perforated plates, and draft bars, with scrapers and running gearing of a wagon; and in the combination of loops or keepers, chains, levers, crossbar, and the standards, provided with hooks, with scrapers, and with bars, attached to the running gearing of a wagon. It is so constructed that it may be attached to an ordinary wagon, which will work upon even or uneven ground, and can be adjusted to scrape wide or narrow, light or heavy, light upon one side and heavy upon the other, and light or heavy upon the inside, and heavy or light upon the outside.

IMPROVED ROPE OR LINE CARRYING PROJECTILE.

Thomas C. Backus, Brooklyn, N. Y.—The object of this invention is to furnish, for the purpose of establishing connection with the upper stories of burning buildings, an improved line or rope projectile or conveying device, that is shot, in the nature of the line-carrying balls or rockets in coast wrecking apparatus, from a gun or other implement, to carry a line to the endangered persons, and admit the hoisting of a hose, rope ladder, or other fire-escape. The device may also be employed as a safety device on board of vessels to convey the line ashore.

IMPROVED WINDMILL.

William G. Alexander, Winnemucca, Nev.—This invention consists in a windwheel in which the fans are divided longitudinally into two equal parts or sections, hinged to each other at their adjacent edges, and having one section rigidly attached to the arms of a wheel; in the combination of spiral springs with the hinged parts or sections of the fans; and in the combination of rods, a small sliding wheel, a sliding rod, and a cord with the hinged sections of the fans, and with a wheel shaft and turn table.

IMPROVED SAW GUIDE.

William Collins, Perham, Minn.—This saw guide is extended to the end of its frame, and is provided with a screw at the long end of a lever, whereby the sawyer need not let go his feed lever, and may adjust with more facility.

IMPROVED CAR MOVER.

Daniel Pierce, Brownington, Vt.—This invention is a device for moving freight and street cars on railroad tracks, and may be also used for hoisting and other purposes. It consists of two cogwheels, arranged in fixed position, but with teeth at opposite direction to each other, on the car axle or shaft, the cogwheels having circumferentially grooved side disks for a detachable yoke frame carrying lever sockets and pawl. The cogwheels are intended to be attached to the axles of each car, forming a stationary fixture of the same.

IMPROVED SCROLL SAWING MACHINE.

Franz Eisendick, New York city.—This invention consists of a lateral saw frame that is guided on top and bottom rails, and made adjustable to different lengths of stroke by a radially slotted and adjustably weighted crank disk. The upper saw clamp is raised or lowered by a screw rod and set nut for the length of the saw, and the tension adjusted by a sliding wedge key. A pan below the saw serves as receiver for the sawdust.

IMPROVED MACHINE FOR MAKING PICKER TEETH.

Robert Aldrich, Millville, Mass.—This invention produces shoddy picker teeth from metal rods by a process of swaging; and the nature of the invention consists in rotating swaging dies adapted to give the desired shape to the picker teeth in combination with a punch which is applied to a horizontal reciprocating stock.

IMPROVED RAILROAD GATE.

Elias W. Moyer, Bernville, Pa.—This invention is to furnish railroad gates which shall be so constructed that they will be opened by the wheels of the approaching train, and will close automatically as soon as the train has passed. The gate is formed by attaching parallel bars to a shaft, which rocks in bearings in bars attached to the ties. The wheel of the advancing car strikes either end of a spring, and the effect is to push the spring and bar before it, bringing the levers and gate into an inclined position, so that as the wheels advance upon the spring and bar they force them downward, bringing the levers and gate into a horizontal position. As the wheels pass off the spring and bar, other springs draw the levers into a vertical position, raising the gates.

IMPROVED SPINDLE.

Gilbert P. Whitman, Rockport, Mass.—This spindle is intended to steady the bobbin without driving the same, so that high speed without vibration is obtained. The invention consists of a fixed standard supporting a small spindle loosely at the top, revolved by a combined cup, whir, and sleeve, and lubricated by an oil cup at the base of the post, provided with a dished cap or drip cup. A bulging collar is fastened to the post above the whir to prevent raising of oil, facilitating seating of bobbin, and prevent whir from rising.

IMPROVED RAILWAY AXLE BOX LID.

Francis C. L. G. Susenihl and Herbert H. Hewitt, Detroit, Mich.—This invention relates to the covers of journal oil boxes for railway cars; and it consists in a cover or lid having projections formed on its edges that are received by grooves formed in flanges that project from the sides of oil box. The cover cannot be lost, as it can only be removed from the box by removing the box from the truck; and it cannot easily be broken or disarranged.

IMPROVED COMPOUND STEAM BOILER.

Robert R. Hine, Kohala, Hawaii, Hawaiian Islands.—This invention is a compound boiler, designed to use cane trash or other light fuel. It consists in the combination of a single flue boiler and a many flue boiler, placed end to end, with a space between them, and connected together by a steam drum and circulating pipe, with each other and with the furnace and chimney.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

For Sale—A valuable patent; will make a large business; no competition. Address G. W. Baker, Wilmington, Del.

Wanted—A Manufacturer for a Staple Article of Hardware or Tools. Patterns and special tools complete for one half their cost, secured by two patents. Address Geo. Everett, P. O. Box 1021, Providence, R. I.

Ground Mica—H. Lawrence, 148 Manger st., Wilkesburg, N. Y.

Boiler Incrustations.—Wanted a first-rate house to introduce a new Anti-Incrustator, solving completely the question. Address, Wirth & Co., Frankfort on Maine, Germany.

Wanted—A chemist by a western chemical factory. Must be well posted in volumetric analysis. Address, with references, H. W. H., P. O. Box 75, New York city.

The Best Ice Machine ever made was recently patented by Major D. L. Holden, and will shortly be illustrated in the SCIENTIFIC AMERICAN. Address, D. L. Holden & Bro., Beach & Palmer Sts., Philadelphia, Pa.

For Sale—Entire interest in Patent Self-Measuring Fluid Can. Satisfactory reasons for selling. Address, Box 143, Geddes, N. Y.

Wanted—Brown & Sharpe's Universal Milling Machine. Must be in good order, and cheap for cash. Address, A. V., 129 William St., Newark, N. J.

Wanted—To purchase a second-hand Disintegrating Mill. Please address, stating size and price, J. O. & E. Smith, So. Canterbury, Conn.

Good Second-hand Steam Engine, cylinder 12 x 24 in.; flue boiler 43 in. x 25 ft.; smoke stack and connections complete; for sale cheap. C. S. Green, Roaring Branch, Lyeomg Co., Pa.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsyth & Co., Machine Dealers, Manchester, N. H.

Reliable Oak Leather and Rubber Belting. A specialty of Belting for high speed and hard work. Charles W. Army, Manufacturer, Phila., Pa. Send for price lists.

Shaw's Noise-Quelling Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quells all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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

"Abbe" Bolt, Forging Machines, and "Palmer" Power Hammers; best produced. Prices greatly reduced. Also sole builders Village and Town Combined Hand Fire Engines and Hose Carriages, \$350. Send for circulars. Forsyth & Co., Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Removal.—Fitch & Meserole, Manufacturers of Electrical Apparatus, and Bradley's Patent Naked Wire Helices, have removed to 40 Cortlandt St., N. Y. Experimental work.

Power & Foot Presses, Ferracite Co., Bridgeton, N. J.

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

Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., 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.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Help for the weak, nervous, and debilitated. Chronic and painful diseases cured without medicine. Pulvermacher's Electric Belts are the desideratum. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Silver Solder and small Tinning. John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

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

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Best Glass Oilers. Cody & Ruthven, Cincinnati, O.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 94.

For Boulton's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B. C. Machinery Co., Battle Creek, Mich.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M. E., Providence, R. I.

Notes & Queries

E. W. E. is informed if you will send some more particulars, to make your meaning plainer, we will endeavor to answer the question concerning forging crank axles.—S. L. N. F. is informed that we have already published so much on the "snake" question that we feared to bore our readers. We have received many letters on the subject, and every week adds to the number.—C. B. R., W. D. Z., W. E. D., and others.—For directions for making rubber stamps, see No. 13, vol. 25, p. 393 (26).—C. R. is informed that Mr. Rose has not yet published such a work. The information you desire

can be gained by reading the Nos. of the SCIENTIFIC AMERICAN containing the articles you are interested in.—J. W. W.—Apply to a physician.—W. E. D. asks for a recipe to make eggs of Pharaoh's serpents, and is referred to vol. 34, No. 14, p. 218 (2).—E. L. R. is informed that we are not very favorably impressed with the design of his engine.—R. C. of Canada is informed that he should use gearing in his machine in place of the lever.—S. E.'s inquiries have already been answered.—To inquiry of J. D. about balloons we refer him to p. 64, vol. 32.—W. L. is informed that his calculation of his hay press is correct. But he will not realize all the pressure, in practice, as some will be required to overcome friction of moving parts.—K. Bros. are informed that the question of grate bars can only be answered by themselves. Measure the water and coal used by each boiler in a given time.

(1) M. M. C. says: I wish to make a number of wheels of sheet brass about 3 inches in diameter with a flange $\frac{1}{4}$ inch wide turned over so as to be at right angles to the web of the wheel. On one edge of this flange is to be ratchet teeth about $\frac{1}{8}$ inch apart, and on the face are to be figures stamped into the brass. Can I stamp out the teeth and figures and then turn the flange over with rollers without impairing the uniformity of the teeth? A. It would be better to turn the flange and then cut the teeth with a wheel-cutting engine or some fixture adapted to that purpose. If the figures are marked before the teeth are cut, there is no danger of injuring by spreading of the metal with figure dies. 2. Can light brass articles be cast in iron chills successfully? A. Use sand for casting small articles.

(2) W. M. asks: Is there anything that will insure or give to steam-heated tar (gas tar) drying qualities? We find it necessary to return our small chain, after tarring, into a steam chest in order to make it, when cold, sufficiently dry to handle. This is objectionable in view of cost, also detrimental to the appearance of chain. A. We know of nothing. Perhaps some of our correspondents can give the desired information.

(3) J. T. asks: 1. What kind of metal is best for what is called a buzz, such as is used for cutting the twisted part of augers? What is the speed required for such a wheel? A. If you have reference to what is called the "tit" or tip of the auger, it is done on a steel wheel running at high velocity, say from two to four thousand per minute, dependent on the size of the wheel. 2. Have case-hardened journal boxes ever been used for a high speed with advantage? A. Yes.

(4) C. J. M. asks: 1. Is there a rule for figuring cone pulleys? Is it necessary to know the distance from center to center? If so, why? A. C. J. M. will find his pulley question fully explained in "Wrinkles and Recipes." 2. I am building an engine, and I have two narrow rings with break joints on the piston head. Should they be turned the same size as the cylinder? A. Turn the rings rather larger than the cylinder bore and spring them in. 3. What kind of metal is best for engines and pump rings? How should the joints be made? A. For piston rings cast iron. For pump rings brass.

(5) C. Y. & Co. ask how to copper plate iron castings. A. A cheap method of covering articles of iron with a film of copper without the use of a battery is to clean them and immerse them in an acidulated solution of sulphate of copper, and clean by washing in water. The solution may consist of 3 lbs. sulphate of copper dissolved, and add 2 fluid ozs. of sulphuric acid.

(6) J. E. B. asks for a recipe for the manufacture of parchment paper? A. Dip white unsized paper for half a minute in strong sulphuric acid, and afterward in water containing a little ammonia. Another process is to plunge unsized paper for a few seconds into sulphuric acid diluted with half to a quarter its bulk of water and wash with weak ammonia.

(7) W. H. asks: What is the best fertilizer for celery? A. Apply to some gardener in your vicinity. By what process could I extract gelatin from buffalo hide or cow's hide? A. See "gelatin" in Appleton's "Cyclopaedia."

(8) W. T. W. & Co. ask for information about polishing axes? A. The polishing of axes differs immaterially from other kinds of work that is finished on emery wheels. After the axes are ground, a piece of wood is inserted in the eye to conveniently hold it, and then it is held upon a common emery wheel (made of wood covered with leather and coated with glue and emery). A similar wheel covered with a finer grade of emery is used, and the finishing done on a still finer wheel covered with flour of emery being used. Some axe makers use but one grade of wheel, and varnish the work to prevent rust.

(9) R. S. R. says: I wish a recipe for making bird lime? A. The middle bark of the holly is gathered in June and July and boiled for 6 or 8 hours in water until it becomes soft. It is then put in a heap underground for 2 or 3 weeks, being watered if necessary, and left to ferment until it assumes a mucilaginous state. It is then pounded and kneaded until all refuse matter is worked out. To preserve it, it is kept in an earthen vessel and covered with water.

(10) J. G. asks: What is the Banting system of reducing flesh? A. Mr. Banting reduced his weight by leaving off eating plain bread, potatoes, fat meats, pastry, sweets, salmon, pork, and veal, and restricting his diet to fish, corn beef and mutton, toasted bread or crackers, and fruit. He drank nothing with milk or sugar in it, no wine but claret, and no beer.

Will the cistern water from houses on which pigeons light, after being passed through sand and charcoal, retain any disagreeable odor, or be injured in any way? A. No.

(11) P. B. asks: Will the water rise in a tube or vacuum 4 or 6 inches in diameter as well as 2 inches? A. Yes.

(12) F. L. asks: Who is Mr. Joseph Saxton whose name appears as one of "Our Men of Progress"? A. Joseph Saxton was born at Huntington, Pa., March 22, 1779, died in Washington, D. C., October 20, 1873. In his youth he constructed a printing press and issued

a small newspaper. At the age of 18 he went to Philadelphia, where he found employment with a watchmaker and afterwards with an engraver. His first invention was a machine for cutting the teeth of chronometer wheels. Afterward he constructed the astronomical clock, with compensating pendulum, now in the State House. He constructed many other machines and appliances, but these mentioned were considered sufficient to give his name a place among "Men of Progress."

(13) I. L. B. asks: Can you tell me how to clean postage stamps for a collection? A. We must decline to publish recipes for cleaning—removing postmarks, etc.—postage stamps, as it will be obvious that information of this would be taken advantage of by unprincipled persons to defraud the Government. The gum may be removed by soaking in a large quantity of water, and pressing between pieces of filter paper—this will also remove most of the grease and other stains and tend to brighten the colors.

(14) D. F. H. asks: 1. What kind of steel is used for making shoe knives? A. Good cast steel. 2. What oil is used for hardening? A. Any animal oil. Lard oil is generally used. 3. How is the temper drawn, and how low? A. Till the bright surface assumes a red or copper color.

(15) E. H. asks: What ought to be the size of a blower fastened on a 4 inches axle making 85 revolutions a minute, to produce 40 lbs. of pressure, the diameter not exceeding 18"? A. We think it will be necessary to use a positive blower, and the size will depend on the quantity of air you wish to use.

(16) D. B. K. asks if the bearing surface of two hardened globes of 25 feet diameter is greater than two globes of 1 inch diameter? A. If the globes are perfectly hard they will only have a point in contact, whatever their size. In practice, however, if one globe was resting on the other, we think the bearing surface would be greatest for the large globe.

(17) J. P. L. says: How can I compute the thickness of iron or brass in a hollow sphere necessary to stand a given pressure per square inch, the pressure to be applied within? A. Multiply the tenacity of the material in lbs. per square inch, and divide the product by the diameter of the sphere in inches.

(18) H. S. M. says: 1. The steam launch Arrow has wagon top boiler with large flat surfaces, which are stayed with $\frac{3}{4}$ inch iron bolts 3 inches between centers; they are riveted into the shell in the usual manner. What is a safe load to use on stay bolts thus placed and fastened, and what pressure is safe on such a boiler? A. The data sent are rather incomplete, but we think the pressure should not exceed 60 lbs. 2. It has a screw 24 inches in diameter and 38 inches pitch. It makes 300 turns per minute. The hull is 28 feet long, with a beam of six feet. She has a moderately "fine run." What is her probable speed? A. From 5 to 6 miles an hour.

(19) C. P. F. says: A. Claims that by using foot valves, 1st 28 feet, 2d 14 feet, 3d 7 feet, 4th 3½ feet, 5th 1½ feet from pump, that water can be pumped by suction atmospheric pressure 54½ feet, while B. claims 33 feet is the theoretical, 32 feet the practical limit of pumping water by suction. A. We think B. has about the right idea.

(20) A. D. H. says: I am running an engine of an English make, the bore is 10 inches, stroke 27 inches. What is the horse power? A. You do not give sufficient data.

(21) J. S. B. & Co. ask: Is there any way that air could be purified after being once inhaled, or could oxygen be confined and admitted into a small cell at will, so as to sustain life? A. We think the difficulties to be overcome in realizing your plan, as we understand it, would be very great.

(22) P. J. K. asks for a formula to make rubber adhere to iron or steel? A. There are a number of good cements for this purpose in the market, and we think it will be more satisfactory for you to try some of them.

(23) S. G. F. says, for the best way to construct a penstock and the most suitable size for furnishing water to a 20 inch turbine wheel, the head being 36 feet. A. We think this may answer very well; but as we know nothing of the situation, we advise you to consult an engineer.

(24) To B. E. T. we say that every connection between motor and machine requires some power to drive it. The amount of loss in your case will depend upon the fitting up of the gears, and any guess we could make from the data sent would be of little value.

(25) H. E. E. says: We are using an engine 9 x 20 that has been running from one to three days in the week since 1861, with no repairs on the piston till last March, when the piston rings were so much worn that we had new ones put in. When first put in the saving of steam was one half, but lately we find the exhaust showing considerable leakage, so in taking out the piston I find the rings worn out again. A. We could not answer definitely without knowing more particulars. It was probable that the cylinder needs reboresing. Allowing it to rust is very bad practice, and assists the wear of the rings. You should use sufficient oil to prevent this action, moving the piston slightly if the engine is not used for several days.

(26) H. E. H. asks: Will you inform me of a correct rule for finding the proper sizes of boilers for different sizes of steam engines? A. You will find some notes relating to the subject on p. 235, vol. 32.

(27) J. R. P. says: In a work entitled the "Electrical Theory of the Universe," I find the following: Immerse the prime conductor of a galvanic battery in a pint of water, and it will be converted into two thousand pints of its constituent gases, oxygen and hydrogen; now insert the same conductor into these gases, and it will be contracted back to one pint of water. Now if this change could be done quick enough, and not cost too much, would it not be a good motor for locomotives and other machines? A. Certainly, if.

(28) W. H. M. asks: 1. What is the longest span of suspension bridge in the world? A. We believe

the largest suspension bridge that is completed has a clear span of 1,067 feet. 2. How much is the estimated cost of Brooklyn bridge? A. Between ten and twelve million dollars. 3. What is considered the greatest engineering work (as completed) at the present day? A. It would probably be impossible to name any single work which could be called the greatest in the opinion of everybody. 4. Is cold water pressure harder on a boiler than an equal steam pressure? If so, why? A. Cold water pressure is often more injurious than steam pressure, because with the former the boiler is not in the condition which occurs in actual practice, so that, when it is heated, it may be better able to resist the strain.

(29) I. T. W. says: I am making a steam engine cylinder $1\frac{1}{2}$ inch bore and $2\frac{1}{2}$ inches stroke. What size boiler will it require? A. See pp. 33 and 235, vol. 33.

(30) W. F. says: Will you inform me of the mode of casting iron on to steel so as to form a solid weld? A. Perhaps some of our readers who have experience can aid the correspondent.

(31) J. N. asks: How many feet of pipe heating surface will an upright boiler of the following dimensions furnish economically with an average of 5 lbs. steam? Boiler 5 feet diameter, 151 $\frac{3}{4}$ flues 7 feet long, 3 feet 4 inches diameter of grate surface. Good draught. A. Such a boiler should evaporate 9 or 10 cubic feet of water an hour. The arrangement of flues mentioned is sometimes advantageous, but not always. You could only determine the question, in your case, by experiment. There is no standard for rating the power of boilers that is generally accepted by engineers.

(32) J. L. K. asks: 1. Is the Thomas steam wheel applicable to marine propulsion, and is it cheaper in construction than an ordinary engine? A. We do not discuss the merits of special manufactures in these columns. 2. What power can I expect from a windmill whose sails (4) are 5 feet x 2 feet in what is generally described as a stiff breeze? I cannot give you the pitch of sails, but presume that part is all right; it was made in London, England, and purchased from a ship wrecked on this coast. A. See p. 241, vol. 32.

(33) J. L. says: Will you give me the process for making rubber stamps? A. The rubber used for stamps may be either the pure gum (caoutchouc) or the sheet rubber, containing about 3 per cent of uncombined sulphur (not vulcanized rubber). In preparing the stamp the form is first set up in clean type well oiled, a retaining rim is set up about the face of the form, and a little thin cream of fine plaster of Paris worked in with a fine camel's hair brush. When all air bubbles have thus been excluded, the thicker plaster is run in to the depth of about three quarters of an inch, and the mould allowed a sufficient length of time in which to harden. The use of strong alum water in place of the clean water used in mixing the plaster will give a much harder mould, but the plaster then is longer in hardening. After thoroughly drying and baking, the mould is placed in a frame of suitable size, the sheet of rubber (about $\frac{1}{2}$ inch thick) adjusted on its face, and the whole put in a small screw clamp and heated slowly until the rubber becomes sufficiently softened to admit of being easily forced into the mould by tightening the screw. The subsequent vulcanization of the rubber may be effected by immersing it for a short time in a mixture of 30 parts bisulphide of carbon and 1 chloride of sulphur, and then exposing in a room heated to 70° Fah. until all the sulphide of carbon has volatilized. Immersion in a boiling solution of 9 ounces of caustic potassa in a gallon of water for a few minutes, and subsequent washing in clean water completes the process, and the form is then ready for mounting. If the rubber is sufficiently softened, a very little pressure will cause it to copy the mould perfectly without breaking it. This also answers several other correspondents.

(34) H. C. asks for a recipe for making sealing wax. A. For red wax take shellac 4 ozs., melt and add $1\frac{1}{4}$ ozs. Venice turpentine. Mix and add 3 ozs. vermilion. It can be poured into moulds while melted, or rolled into sticks after it has cooled a little.

(35) N. A. B. says: 1. In the description of a magneto-electric engine on p. 8, vol. 33, I read: "By a suitable commutator, the currents circulating through the coils on the stationary magnet can be sent through those on the armature." Is reference had to the battery current, or the induced ones? A. The battery current. 2. Please tell me how to use the tangent galvanometer? A. The tangent galvanometer of most recent construction is composed of a compass dial five or six inches in diameter, having a fine steel point in the center. Underneath the dial are placed coils, of insulated copper wire of several capacities, designed to measure various currents, from those of great intensity with but little quantity, to those of great quantity with but little intensity. The magnetic needle which is supported on the fine steel point alluded to is composed of a number of thin, oblong steel plates, riveted upon a flat ring of aluminum and so trimmed as to form a perfectly circular disk. The average weight of the needle does not exceed 30 grains. The coils are placed so that the current runs parallel with the meridian of the needle. They are half an inch or more wider than the diameter of the disk. The intensity of currents, as measured by the tangent galvanometer, is proportional to the tangents of the angles of deflection—thus: let an electric current be sent through the galvanometer coil, whose directive force is precisely equal to that manifested by the terrestrial magnetism, and the needle, before at rest upon the meridian, will be deflected 45°; double the current passing through the coil and the needle will cut 63° 30'; with threefold the intensity of current the deflection will be 71° 34'; with fourfold, 76°, etc., according to the law of natural tangents. For measuring resistance, etc., of lines, a set of resistance coils is used in connection with the instrument. 3. As the Camacho electromagnet develops so much power with a comparatively weak current, will it not produce proportionally powerful induced currents? A. Yes, under some circumstances. 4. I purpose making the positive pole for sesquioxide of iron battery in the form of a carbon cell, made as described on p. 129 SCIENTIFIC RECORD for 1875, containing a quantity of the sesquioxide; or in the form of a cylinder composed of coarsely pulverized coke and sesquioxide made similarly to the coke-manganese pole

described on p. 221, *SCIENTIFIC RECORD* for 1876. Will both arrangements work, and which will be the better? A. The latter will have the least internal resistance, but will not be a very constant form. 5. Is there any alloy that expands when cooled, and contracts when heated? A. No; but a few of the metals or alloys, as those of antimony and bismuth, have the property of expanding considerably at the moment of solidification from fusion, owing to their tendency to crystallize.

(36) W. A., of Montreal, asks for the recipe for starch polish, or "concentrated starch," so-called? A. We do not know its exact composition, but think it is simply starch with a little grape sugar and paraffin.

(37) L. W. H. says: I want some method of preserving belts. I was told by an engineer to paint them with printer's black ink. Please let me know if this will damage belts that are in motion daily? A. A very little pure lard oil or neat's foot oil will preserve belts and prevent them from cracking. Castor oil is also used, but too much is worse than none. Daubing with printing ink is not recommended.

(38) R. B. G. says: I have a 12 x 24 inch engine, nearly new, runs 80 revolutions per minute, with which I wish to drive 2 pair 42 inch and 1 pair 30 inch burrs. My boiler is 42 inch x 28 feet, with two 16 inch flues. Is this boiler capacity sufficient? Give me the best plan to construct the furnace to give good draught and to economize fuel. How much of the boiler shell should be exposed to the flames? What should be the size of an iron chimney, and how high? A. The boiler will be large enough in all probability. As to mode of setting, see p. 339, vol. 33.

(39) C. M. asks how to make a bichromate of potash battery? A. The carbon battery usually consists of a glass jar having within it a cup of porous, unglazed porcelain. The annular space between the sides of the vessel is filled with water slightly acidulated with oil of vitriol, and contains a sheet of zinc shaped so as to conform to the curve of the inner cup, which it nearly surrounds. A stick or prism of gas carbon is placed in the porous cup, and surrounded with a fluid made by adding strong sulphuric acid to a saturated solution of potassium dichromate until the red chromic acid just begins to separate in flakes, and then just enough water to redissolve the precipitate. The proportions of the several ingredients in this mixture should be about as follows: To 10 ozs. of potassium dichromate in a gallon of water, add 1 pint of strong oil of vitriol.

Please give me a recipe for polishing shells? A. See answer to H. C., p. 43, vol. 37.

(40) W. M. asks how to magnetize iron? A. Soft iron will not retain magnetism so as to become permanently magnetic. When a box of iron is surrounded by a coil of insulated wire (wrapped tight about it) through which a battery current is passing, the iron becomes a strong magnet. As soon, however, as the electric current is interrupted, the iron loses its magnetism and resumes its passive condition. You should consult some elementary treatise on electricity and magnetism or natural philosophy (physics). The best of these works may be consulted at the Astor Library.

(41) W. M. U., of Cork, Ireland, asks: 1. How is brown bronze on gas chandeliers and fittings done? A. Vinegar half a pint, copper sulphate 3 ozs.; hydrochloric acid 3 ozs., ammonium chloride 2 ozs., alum 1/2 oz. Dissolve the salts, reduced to a fine powder, in the vinegar and acids with the aid of heat, and apply to the brass warm. 2. Make a paste of 2 ozs. each of verdigris and vermilion, 5 ozs. each of alum and sal ammoniac (all in fine powder), and vinegar. Heat the paste, and spread it on the cleaned work previously warmed. The addition of a little sulphate of copper inclines the color to chestnut brown, and borax to yellowish brown. 3. Use the following bronze powder with an oil size: Copper filings 100 parts, carbonate of soda 60 parts; fuse, cool, powder, add 15 parts of copper filings, mix, heat to whiteness for 20 minutes, cool, powder, wash and dry. 2. How is black bronze done? A. Dip the work bright in nitric acid, quickly rinse with plenty of water, and place in the following mixture until it turns black: Hydrochloric acid 12 lbs., sulphate of iron 1 lb., pure white arsenic (arsenious acid) 1 lb. It is then taken out, rinsed with clean water, and dried in sawdust, and polished with black lead, and lacquered with a green lacquer made as follows: 1 gallon of wood naphtha (methyl spirit), 5 ozs. shellac, 4 ozs. gum sandarac, 1 oz. gum ellmi; place in a tin flask and expose to a gentle heat for a day or two. Then strain off, add a half gallon of spirit, and treat as before. Finally dissolve in the liquor 6 ozs. of turmeric and 1 of gum gamboge. 3. Can brass before pouring be colored by placing anything on it so as to give it when turned in the lathe a rich color like straw? A. If we understand you, no. Yellow brass contains a larger proportion of zinc.

(42) I. H. P. asks: What will remove the stain of sugar of lead from lime? A. Try a little soda water (carbonic acid water). If this does not answer use oil of vitriol diluted with about 50 parts of water.

Should imitation black walnut paper wainscot be sized before being varnished? If so, what is the preparation for sizing, and what is the best varnish? A. Yes; use a thin glue water, and when perfectly dried varnish with copal.

What can be done to cleanse for domestic use iron vessels in which sulphur has been melted? The sulphur seems to have combined with the iron by incrustation. A. Boil in the vessels for some time strong aqueous solutions of caustic soda or potash; then wash with plenty of clean water and scour with sand.

(43) S. S. T. asks how to make the lightest gas possible from coal, such as would be most suitable to inflate a balloon? A. Use a hard coal and work the charge at a high temperature and longer than usual. The gas should be well washed and purified. Peat gives a lighter gas than coal.

(44) M. M. says, in answer to C. R., if he will so arrange his flue that the smoke from his boiler will pass vertically downward into a small chamber of 3 or 4 times the sectional area of his smoke flue, and from that chamber pass into the smoke flue, very few sparks will ever rise. If he will keep the floor of this receiving chamber flooded with water, neither sparks nor dirt

can possibly pass up the smokestack. I have seen this tested and know it to be a perfect cure.

(45) B. R. T. asks how to make printer's rollers, and moulds for the same. A. The roller mould may be a brass, zinc, or tin tube of the size required. Oil it on the inside before pouring the composition into it. This is to prevent sticking. For the roller composition to use in summer take good glue, prepare as for gluing wood work, and add about twice the quantity of good molasses, and boil together for a short time, say an hour or two, then pour in the mould. If too soft when it gets cold, remelt and add more glue.

(46) J. E. asks for a recipe to make black ink, and is referred to reply to T. C. (34) p. 70, No. 5, present volume.

(47) J. A. H. is informed that we know nothing of the opportunities for his business in Japan. We doubt if employment could be secured there that would pay better than here.

(48) W. J. asks: Have any detailed drawings of the Brayton gas engine been published? A. In No. 30, vol. 34, and No. 2, vol. 35 of the *SCIENTIFIC AMERICAN*, and in Nos. 24 and 58 of the *SCIENTIFIC AMERICAN SUPPLEMENT*, you will find cuts and descriptions that will give you the information.

(49) H. K. asks: What is the best solution for tempering coalpicks? What is used for tempering dies and knives, and how is it done? Which is the best method to straighten a horse's hoof? A. Vol. 31 of the *SCIENTIFIC AMERICAN* contains about a dozen good articles on hardening and tempering to which reference is made. No two experts in hardening and tempering use precisely the same solutions or manipulate the tools to be tempered in the same manner. Each one would probably claim their process as the best. Conditions are such, as regards quality of steel, hardening, etc., that it is impossible to give the best solutions or the best methods. In reply to the last question our correspondent had better consult a farrier.

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

S. M. S.—The scale consists principally of carbonate and sulphate of lime, some carbonate of iron, and a little alumina and silica. There is nothing in it of a poisonous nature. The mineral matter forming the scale is most readily precipitated from the water by boiling. Allow the water to settle and siphon off from the sediment.—W. P. C.—It is flint.—M. C.—It is an earth or soil containing a large quantity of carbonaceous matter apparently of animal origin. Earth of a similar nature is often found in the caves of guano districts. The percentage of ammoniacal salts is very small, but it contains enough of the phosphates to be of some value as a fertilizer.—T. W.—It is not plumbago, but a shale of little value. It may pay you to look deeper.—B. F. G.—Nos. 1 and 4 are not trap rock, but a limestone containing garnets and idocrase—a compound of lime, iron, alumina, and silica. Nos. 2 and 3 contain copper.—H. W. K.—We cannot find your box of minerals.

COMMUNICATIONS RECEIVED.

The Editor of the *SCIENTIFIC AMERICAN* acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Darwin and Others on Creation. By Dr. H. D. T. On Determining the Proportions of Gear Teeth. By O. E. M.

On Hydraulic Cements, Stone, etc. By —. On Geometrical Problem and Instrument. By W. G. B.

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

HINTS TO CORRESPONDENTS.

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

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

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

Hundreds of inquiries analogous to the following are sent: "Who publishes books on steam boilers? Who publishes a book on construction and running of steam engines?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

July 3, 1877.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adhesive substance, Long & Drake 192,773
Advertising seal, etc., Lacomme, Marville, & Girou 192,770
Animal stocks, Bowman & Irving 192,672
Animal trap, F. Cowan 192,509

Aquarium, Paen & Sexton	192,595	Lifting jack, J. P. McGrew	192,631
Axle box covers, G. S. Winslow	192,667	Lightning rod, C. H. Smith	192,638, 192,718
Bag holder, M. P. Moule	192,652	Lock, E. Wike	192,734
Bale tie, F. M. Blake	192,730	Lock, L. H. Sholder	192,661
Baling cotton press, P. C. Ingersoll	192,762	Lock, F. J. Kimball	192,707, 192,768
Band machine, M. Blake	192,615	Locomotive, J. E. Wooten	192,725
Barrel head, M. L. Thompson	192,664	Loom, L. J. Knowles (r)	7,794, 7,795
Bath apparatus, H. J. Bailey	192,728	Loom, J. Rothwell	192,659
Bed bottom, S. H. Reeves	192,790	Loom shuttles, J. Hamilton	192,692
Bed, cabinet, Green & Williamson	192,621	Loom, shuttle box, Hickey & Miles	192,580
Bedstead, C. Pabst	192,711	Lumber, W. E. Brock	192,673
Bee hive, D. Thompson	192,695	Millstones, Moir & Ellis	192,707
Blinder, W. H. Russell	192,791	Mower, A. R. Reese	192,637
Blowers, C. Hammelmann	192,623	Nut lock, Collins & Grant	192,636
Bobbin holder, etc., Nealon & Higgins	192,655	Nut lock, J. W. Eaton	192,630
Boiler and superheater, S. N. Carvalho	192,678	Nut lock, J. Hollingsworth	192,635
Boiler cleaner, T. Craney	192,741	Oil can, G. T. Hunsaker	192,581
Boiler flue scraper, G. H. Noyes	192,736	Oil well tubing, J. C. Dickey	192,619
Boiler, R. C. Duchesne	192,685	Ore mill, H. K. Drake	192,747
Book, parcel handle, G. Havell (r)	7,773	Ore stamp, T. A. Cochrane	192,567
Boot, J. Miner	192,730	Organ, reed, Koerber & Sheridan	192,593
Boot-burnishing machine, J. W. Dodge	192,578	Ornamenting wood, O. Barwolf	192,558
Boot machine, J. Kimball	192,582	Packing, J. R. Cross (r)	7,772
Boot sole edges, A. Bolling	192,616	Packing, A. J. Stevens (r)	7,781
Boot-trimming machine, R. F. Leon	192,585	Pen holder tip, E. W. Giles	192,754
Box for collars, Green & Tift	192,756	Pen, stencil, H. M. Paine	192,630
Brick kiln, W. T. Christy	192,634	Pencil sharpener, E. W. Frost	192,732
Brick machine, T. James	192,763	Pianos, music retainer, J. P. Molitor	192,591
Brush machine, J. L. Whiting	192,802	Picker teeth, R. Aldrich	192,609
Buggy top, J. H. & E. M. Keller	192,650	Piston, L. Richner	192,715
Bung extractor, W. J. Wademan	192,721	Plow, etc., Wertemberger & Ahlms	192,800
Burglar alarm, J. K. Johnston	192,698	Plow brightener, Minor & Woolverton	192,738
Button, S. W. Young	192,613	Plow clevis, W. S. Wier	192,608
Canal boats, N. M. Tobey	191,606	Pocket book, D. M. Read	192,714
Candle, P. R. Gottstein (r)	7,777	Pocket, W. M. Blume	192,732
Canning fruits, W. A. Wicks	192,803	Printing presses, T. J. Mayall (r)	7,796
Capstan, etc., Churchill & Champlain	192,738	Projectile, T. C. Backus	192,670
Car brake, J. Tarr	192,719	Propeller, W. J. Carroll	192,563
Car bumper, S. M. Cummings	192,579	Pulley, band, C. R. Bushnell	192,562
Car coupling, G. M. McMahon	192,776	Pump reel, D. C. Brawley	192,567
Car coupling, C. D. Norman	192,710	Pump rod, Gifford & Abell	192,600
Car fare box, L. Wood	192,806	Pump valve, N. S. Bean	192,633
Car mover, D. Pierce	192,713	Punching machine, M. Gluck	192,640
Carspring, J. Ludlum	192,703	Railway gate, E. W. Moyer	192,706
Car, A. A. Young	192,808	Refining liquors, G. Clark	192,635
Cars, J. B. Slawson (r)	7,780	Refrigerator, L. B. Woolfolk	192,706
Cars, G. E. Noyes	192,785	Register, A. Sheddock	192,792
Carpet stretcher, L. W. Rivers	192,599	Revenue guard, etc., F. I. Howe	192,640
Carriage curtain fastener, H. P. Elston	192,748	Road scraper, A. Thompson	192,730
Cartridge, D. E. Williams (r)	7,783	Rock-boring machine, H. N. Penrice	192,788
Cartridge, J. H. Bullard	192,676	Sash balance, W. Cashner	192,680
Chain coupling, J. C. Dillon	192,639	Sash fastener, H. P. Andrews	192,614
Chair, J. R. Brumby	192,674	Saw guide, W. Collins	192,683
Churn, L. Budahl	192,675	Saw mill dog, H. Snyder	192,795
Coal breakers, S. Broadbent	192,733, 192,734	Saw mills, H. Gawley	192,576
Coal elevator, J. A. Woodward	192,610	Saw, pulley, J. H. Hobson	192,686
Cock and valve, J. Powell	192,638	Sawing machine, F. Millward	192,810
Coffee pot, R. L. Nelson	192,593	Sawing machine, F. Eisendick	192,896
Coloring fluids, Lecourt & Guillemare	192,771	Sawing machine, J. W. Penney	192,567
Core box, Aikin & Drummond	192,536	Scales, R. Ehmer	192,574
Core box, J. Powell	192,637	Screw machine, Stiff & Bowen	192,796
Corn planter, Christrup & Schneider	192,737	Seal, E. J. Brooks	192,735
Corn planter, M. Gregg	192,757	Sewing machine, J. Blasius	192,731
Corn planter, F. A. & J. W. Hartnagel	192,694	Sewing machine, Corbett & Hadlow	192,568
Corn planter, C. Woods	192,612	Sheep wash, W. Little	192,597
Corset, Bale & Goldberg	192,729	Sheet metal vessel handle, F. G. Niedringhaus et al	192,794
Corset, L. C. Warner (r)	7,782	Shirt, M. Simon	192,794
Crucibles, R. Taylor	192,634	Show case, W. Shockley	192,717
Cut-off and filter, J. Hoover	192,636	Skate, O. Edwards	192,643
Dental plugger, R. B. Donaldson	192,746	Skiving machine, W. S. Fitzgerald	192,645
Dentist's chair, E. Burritt	192,809	Soldering tool, L. Cutting	192,743
Desk, Durant & Kane	192,641	Spoke socket, J. P. Parkhurst	192,596
Digger, etc., M. Johnson	192,697	Stable scuttle, W. M. Watkins	192,722
Dish rack, Bowden & Stewart	192,560	Steam and water cock, Guild & Lewis	192,622
Door spring, L. P. Sherman	192,602	Steam radiator, R. S. Gillespie	192,755
Drawing frames, J. B. Clarke	192,682	Stopecock, etc., J. G. Murdock	192,654
Electrode, G. M. Schweig	192,601	Stopecock, R. Lapham	192,884
Engines, W. R. Comings	192,637	Stove, F. A. & A. B. Lyman	192,589
Fabrics, M. Jonasson	192,766	Stove, E. L. Matteson	192,774
Fan, C. Krauss	192,700	Stove, J. D. Murray	192,783
Faucet, A. Luhrs	192,583	Stoves, O. F. Stedman	192,629
Feathers, C. W. Nichols	192,594	Stove, grate, J. H. Mearns	192,777
Fence, A. A. McAllister	192,709	Telegraph signal, L. B. Firman	192,644
Fence barb, W. Burrows	192,736	Ticket machine, H. Van Geasen	192,798
Fence, blood, W. H. Johnson	192,765	Tobacco label, G. W. Yerby	192,736
Fence, iron, M. G. Freeman (r)	7,775	Tobacco cutter, C. F. Harlow	192,579
Fence post, S. Miller	192,779	Tobacco safe, L. C. Parker	192,712
Fences, post, Morgan & Landers	192,532	Toilet screen, E. S. Lathrop	192,701
Filter, J. Foley	192,750	Tonsorial compound, W. Clark	192,565
Fire arm, G. F. Evans	192,749	Toy, A. Gartner	192,689
Fire escape, W. Guthrie	192,758	Turbine wheel, A. R. Guilder	192,691
Fire escape, S. H. Harrington	192,683	Turbine wheel, E. M. Hale	192,648
Fire escape, Michie & Williams	192,778	Umbrella tip, E. Croft	192,638
Fire irons, B. H. Connor	192,618	Vase holder, C. Heckert	192,761
Fire places, G. W. Moore	192,782	Vehicle axle box, I. N. Camp	192,677
Fish scrap, L. R. Cornell	192,740	Vehicle hub, C. J. Valentine	192,799
Fluting machines, H. Albrecht	192,632	Ventilating bung, L. H. Lesser	192,702
Fly trap, J. T. Guthrie	192,578	Ventilator, A. Barnum	192,537
Forks, L. S. White	192,561	Ventilator, T. M. Foster	192,688
Gate, L. Dickerson	192,745	Volute motor spring, D. Carter	192,564
Gearing, E. Parker	192,656	Wagon bed, W. J. Kinsey	192,699
Glass, ornamenting, C. J. Cartisser	192,673	Wagon end gate rod, J. Genzly	192,733
Glassware, C. L. Knecht	192,769	Wagon seat spring, T. Thompson	192,797
Globe, E. G. Durant	192,646	Wagon spring, A. W. McKown	192,775
Grain, band, F. Peteler	192,789	Wash basin, C. E. Yvelin	192,807
Grain binder, Gammon, Dixon, & Steward	192,575	Washing machine, S. Needles	192,705
Grain binder, J. F. Steward	192,603	Water closet valve, S. Eckert	192,642
Grain elevator, J. A. Woodward	192,611	Water wheel, J. J. Bourgeois	192,671
Grate bar, A. O. Denio	192,744	Weaving shuttle, W. L. Gilbert, (re-issue)	7,776
Grate bar, H. W. Adams	192,630	Whiffletree, C. D. Smith	192,662
Grindstone, A. O. Morgan	192,781	Whip, O. Breckenridge	192,517
Gun, spring, J. L. Follett	192,751	Windmill, W. G. Alexander	192,688
Harrow, A. J. Upham	192,607	Windmill, W. Peck	192,787
Harrow, etc., J. L. Curry	192,742	Windmill, Rhoades, et al	192,598
Harvesters, E. Cheney	192,681	Window bracket, J. F. Zimmerman	192,727
Hats, N. A. Baldwin (r)	7,771	Window shade roller, J. R. Smyth	192,663
Hay rack, C. Williams	192,804	Window washer, G. G. Clark	192,560
Heating apparatus, W. Bliss	192,559	Wire stretcher, W. Z. Dafeo	192,573
Hoe, M. Johnson	192,764	Wood boring machine, J. D. Shooks	192,793
Hog cholera compound, R. E. & T. M. Madison	192,590	Wringer roll, J. Greenen, Jr.	192,577
Hog elevator, G. Wheeler	192,723	Yarn machine, J. Cunnock	192,571

Advertisements.

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

TWO LARGE IRON PLANERS FOR SALE VERY cheap. E. E. ROBERTS, 119 Liberty St., N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 52 & 54 of our Book of Sections—which will be sent on application to those contemplating the erection of fire proof buildings—THE COST CAN BE ACCURATELY CALCULATED, the cost of insurance avoided, and the serious losses and interruption to business caused by fire these and like considerations fully justify any additional first cost. It is believed, that where owners are fully aware of the small difference which now exists between the use of Wood and iron, that in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARRIGIE, BROS. & CO., Pittsburgh, Pa.

Can I Obtain a Patent?

This is the first inquiry that naturally occurs to every author or discoverer of a new idea or improvement. The quickest and best way to obtain a satisfactory answer, without expense, is to write to us (Munn & Co.), describing the invention, with a small sketch. All we need is to get the idea. Do not use pale ink. Be brief. Send stamps for postage. We will immediately answer and inform you whether or not your improvement is probably patentable; and if so, give you the necessary instructions for further procedure. Our long experience enables us to decide quickly. For this advice we make no charge. All persons who desire to consult us in regard to obtaining patents are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us a careful consideration of their plans, an honest opinion, and a prompt reply.
What Security Have I that my communication to Munn & Co. will be faithfully guarded and remain confidential?

Answer.—You have none except our well-known integrity in this respect, based upon a most extensive practice of thirty years' standing. Our clients are numbered by hundreds of thousands. They are to be found in every town and city in the Union. Please to make inquiry about us. Such a thing as the betrayal of a client's interests, when committed to our professional care, never has occurred, and is not likely to occur. All business and communications intrusted to us are kept secret and confidential.

Address **MUNN & CO.,**
Publishers of the SCIENTIFIC AMERICAN,
37 Park Row, New York.

Wood-Working Machinery,

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

Engines and Machinery, ALL STYLES, NEW and Second-hand. E. E. ROBERTS, 119 Liberty St., N. Y.

WESTON DYNAMO-ELECTRIC MACHINE CO.

Machines for Electro-plating, Electrotyping, Electric Light, etc., in addition to testimonials in our Catalogue of Jan. 1. We beg to refer to the following houses: MERIDEN BRASS CO.; RUSSELL & ERWIN MFG. CO.; REED & BARTON; HALL, ELTON & CO.; RICHARDSON, HOYTSON & CO.; W. H. JACKSON & CO.; STANLEY WORKS; ROGERS CUTLERY CO.; CHAS. ROGERS BROS.; EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NORWALK LOCK CO.; HAYDEN, GERE & CO.; DOMESTIC SEWING MACHINE CO.; EBERHARD FABER; J. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 200 others. Outfits for NICKEL, SILVER, BRONZE, Plating, etc. The two highest CENTENNIAL AWARDS, and the CENTENNIAL GOLD MEDAL of American Institute.

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

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.,
NEW YORK.

The George Place Machinery Agency

Machinery of Every Description,
121 Chambers and 100 Reade Streets, New York.

THE "ROBERTS" PORTABLE, HOISTING AND Yacht Engines. Send for circular. 119 Liberty St., N. Y.

WE ENAMEL
FINE JET BLACK every variety of turned wood work parts of machinery, castings, tinware and other metal work ENAMELED IN COLORED, in wood or metal, made in our AMERICAN ENAMEL CO. at Warren St. Providence, R. I.

Lathes, Planers, Shapers, Drills,
Gear & Bolt Cutters, &c. E. GOULD, Newark, N.J.

SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 414 Water St., N. Y. who control the patent for Green's American Driven Well

65 MIXED CARDS, with name, 10c. and stamp. Agent's Outfit, 30c. L. C. COE & CO., Bristol, Ct.

THE NEW GERMAN PATENT LAW.
Being the Full Text of the New Law for Patents, passed July 1st, 1877, covering all the States of the German Empire. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 80. Price 10 cents. To be had at this office and of all newdealers.

PATENTS at AUCTION.

The third great Sale will take place Sept. 3d. Patents for this sale should reach us before August 21st. Send for circular, terms, etc.

GEO. W. KEELER, Auction and Com'n Merchant, Salesrooms, 53 & 55 Liberty St., N. Y.

NOW READY.

ILLUSTRATED HISTORY OF THE CENTENNIAL EXHIBITION OF 1876.

The full History and Progress of the Exhibition, Maps of the Grounds, Engravings of the Buildings, and accounts of all the most notable Scientific and Mechanical objects, profusely illustrated with engravings, are given in the SCIENTIFIC AMERICAN SUPPLEMENT for the year 1876. This work consists of Two Large Volumes, comprising over 80 quarto pages, equal in quantity of reading matter to over Seven Thousand ordinary book pages. The space devoted to the great INTERNATIONAL EXHIBITION is very extensive, and probably forms the most complete and full history of the affair that can be obtained. The illustrations pertaining to the Exhibition are more than 450 in number. A copious Special Index of all matters relating to the Exhibition is given. Those who desire to possess a complete and splendid illustrated Record of the Centennial Exposition should have the SCIENTIFIC AMERICAN SUPPLEMENT for 1876.

In addition to this splendid History of the Centennial Exhibition, the SCIENTIFIC AMERICAN SUPPLEMENT for 1876 contains a vast amount of other matter of great value for reference and preservation. It presents to the reader, in attractive form, full accounts of the Advances made during the year in all the chief departments of Science and Useful Arts, covering the progress in Chemistry and Metallurgy, Mechanics and Engineering, Electricity, Light, Sound, and Heat, Agriculture, Botany, Horticulture, Rural and Household Economy, Materia Medica, Hygiene, Natural History, Zoology, Microscopy, Meteorology, Terrestrial Physics, Geography, Geology, Mineralogy, Astronomy. The whole illustrated by over Two Thousand Six Hundred Engravings. The wide scope of this splendid work, its surprising variety of contents, its wealth of illustration, render it the most valuable contribution to scientific literature extant, while in price it is probably the most economical. The SCIENTIFIC AMERICAN SUPPLEMENT for 1876, complete, is supplied, stitched in paper covers, at the low price of \$5. Strongly bound, both volumes in one book, cloth, ornamented with gilt, \$6.50. Bound in two separate books, \$4 each, or \$8 for the two. Sold at the leading Bookstores and News Offices, and by

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



Shaping Machines

Have novel device for changing length of stroke while in motion, also, automatic down feed, and quick return. Four sizes. Patented 1868, 1871, 1874.
Wood & Light Machine Co.,
Worcester, Mass.
Manufacturers of all kinds of Iron Working Machinery, Shafting, Pulleys, &c.

Notice to Machinery Jobbers.

A lot of New Cotton Machinery, English make, packed in the original cases, consisting of 2 pickers, 6 carders, 6 looms, 2 spinning-jacks, shafting, hangers, &c., at less than one-quarter of their original cost.
W. H. H. BLACKMAN, New Haven, Conn.

BUSINESS OPPORTUNITY — STEAM PUMPS.—An experienced Salesman can secure an active interest in an old and successful establishment upon liberal terms. Address, with references, etc.,
STEAM PUMPS,
P. O. Box 1430, Cincinnati, O.

N. F. BURNHAM'S 1874 WATER WHEEL
Is declared the "standard turbine," by over 600 persons who bought and use them with part and full gate open. Pamphlets Free.
N. F. BURNHAM, York, Pa.

WANTED—A SCREW-CUTTING FOOT LATHE, hollow mandrel, first-class. Send description and price to M. ROBINSON, 50 William Street, N. Y.

Pond's Tools

Engine Lathes, Planers, Drills, &c.
Send for Catalogue. **DAVID W. POND, Successor to LUCIUS W. POND, Worcester, Mass.**

FOR SALE—STOCK, GOOD WILL, AND Fixtures of a "Card and Printers' Materials" Business. Good chance for a practical printer. Whole building on lease at low rent. Price \$1500 cash. For information, address S. C. COLLIS, 162 N. 4th St., Phila.

OTIS' SAFETY HOISTING Machinery.
OTIS BROS. & CO., No. 348 Broadway, New York.

\$55 & \$77 a week to Agents. \$10 Outfit Free. P. O. VICKERY, Augusta, Maine.

MEN OF PROGRESS.

Persons desiring to secure a copy of this magnificent Engraving can do so at the following greatly reduced rates:

Engraving, single copies, \$5 00
Engraving and SCIENTIFIC AMERICAN, one Year, 7 00
Engraving, with SCIENTIFIC AMERICAN and SUPPLEMENT, one year, 10 00

This large, rare, and splendid STEEL-PLATE ENGRAVING, entitled "Men of Progress," is one of the finest art-works of the day, possessing a rare and peculiar value over ordinary pictures, by reason of the life-like accuracy of the personages it represents. The scene of the picture is laid in the great hall of the Patent Office at Washington. The grouping is spirited and artistic. Among the persons represented are the following eminent inventors:

S. F. MORSE.....Electric Telegraph.
CYRUS H. MCCORMICK.....Reaper.
THOS. BLANCHARD.....Lathe for irregular forms.
WILLIAM T. G. MORTON.....Chloroform.
SAMUEL COIT.....Brewing Fire-Arms.
CHARLES GOODYEAR.....Rubber Fabrics.
FREDERICK E. SICKLES.....Steam Cut-Off.
HENRY BURDEN.....Horse Shoe Machine.
JOHN ERICSSON.....First Monitor.
JAMES HOGARDS.....Iron Buildings.
JOSEPH SAXTON.....Watch Machinery.
PETER COOPER.....Iron-Rolling Machinery.
JOSEPH HENRY.....Electro-Magnetic Machines.
ISAIAH JENNINGS.....Friction Matches.
RICHARD M. HOE.....Fast Printing Presses.

The picture, which is three feet long and two feet high, forms an enduring and desirable object for the adornment of the parlor and library. It was engraved by the celebrated JOHN NAYLOR, from a large painting by SCHUSSELE, and all the portraits were taken from life. Put up in stiff rolled paper cases, and sent by mail, postage free, to all parts of the country. The Engraving formerly sold for \$9. Address

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

STEAM PUMPS.

FIRST PRIZES, CENTENNIAL, PHILA., VIENNA, PARIS, NEW YORK, BALTIMORE, BOSTON. Send for circular of recent patented improvements. THE NORWALK IRON WORKS CO., South Norwalk, Conn. Prices Reduced.

JOHN HOLLAND'S GOLD PENS

Received the Centennial Medal from the Judges on Awards, for "superior elasticity and general excellence." If not sold by your Stationer, send for Illustrated Price-List to the Manufacturer, 19 W. 4th St., Cincinnati.

TORPEDO VESSELS. By Mr. DONALD-SON. A valuable paper, lately read before the United Service Institute. Being a full exposition of the torpedo-boat system, from the earliest efforts to the present time. Giving dimensions and performances of the several sizes built by Thornycroft Bros. for the various governments, highly interesting trials of these boats, and experiences in war, and a description of the torpedoes used. 1 illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 79. Price 10 cents. To be had at this office and of all newdealers.

PATENT COLD ROLLED SHAFTING.

Price list mailed on application to JONES & LAUGHLINS, Try Street, 2d and 3rd Avenues, Pittsburgh, Pa. 120 S. Canal Street, Chicago, Ill., and Milwaukee, Wis. Stocks of this shafting in store and for sale by FULLER, DANA, & FITZ, Boston, Mass. GEO. PLACE & CO. 121 Chambers St., N. Y.

SECOND-HAND MACHINERY.

For Sale.
The Machinery in the works of the UTICA STEAM ENGINE CO., comprising Large Face Plate Lathe, Engine Lathes, large and small, 20 ft. x 4 ft. Planer, Slotter, Shaper, Lauback Universal Drills, Bolt Cutter, Fans, Upright Drills, Cranes, Dugdown Steam Hammer, Steam Fire Pump, Hose, Platform Scales, Pulleys, one 40 H. P. Locomotive Boiler, two 50 H. P., and one 25 H. P. Tubular Boilers, one 35 in. by 15 ft. Cylinder Boiler, etc., etc.
For Catalogue and Price List, address
JAMES F. MANN, UTICA, N. Y.

\$100.00 REWARD. This MOUNTAIN OF a smooth face by the use of BYRKS BEARD ELIXIR, without injury, or will fetch \$100.00. Price by mail in sealed package 25 cents, 3 packages only 50 cents. A. L. SWEET & CO., Palatine, Ill., Sole Agents. We caution the public against imitations.

CUTTING OUT KEYS. By JOSHUA ROSE. An excellent practical description of the several methods employed, with 11 illustrations. The qualities of the various drills; square files and safe-edges, roughing out, etc. The best tools described and illustrated. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 79. Price 10 cents. To be had at this office and of all newdealers.

Dayton Cam Pump.

THE ONLY PUMP IN THE MARKET DESIGNED AND CONSTRUCTED ESPECIALLY FOR BOILER FEEDING. Are Pumping water at 200° F. No Dead Centers. The Steam Valve is a plain Slide Valve, identical to the slide valve of a Steam Engine, but derives its motion from a cam. Speed can be regulated to suit evaporation. Pumping Returns from Steam Heating Apparatus a specialty.
Send for Circular.

Smith, Vaile & Co.,
DAYTON, OHIO.

STUDIES OF MATTER AND LIFE.—By Prof. Henry J. Black, F.R.S. A most interesting and valuable paper, explaining the latest scientific theories, researches and calculations, concerning the various Modes of Motion, the Ether of Space, the Transmission of Wave Forces, the Limits of Vision, the Size of Atoms, Motion and Force of Atoms, Grouping of Atoms, Phenomena of Reproduction, Mental Phenomena. SCIENTIFIC AMERICAN SUPPLEMENT No. 37. Price, 10 cents. To be had at this office and of all newdealers.

EUREKA SAFETY POWER!

Practically impossible to explode. Tested to 30 lbs. pressure per square inch. 3-Horse Power, \$150, 5 to 4 H. P., \$250. Also, Stationary Engines and boilers, and Spark Arresting Portable Engines for plantation use. Send for our circular. Discount to the trade.

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

ON THE PROGRESS OF AERONAUTICS.

An essay read before the Aeronautical Society of Great Britain. By Frederick W. Brearey, Secretary of the Association. A useful and interesting paper. Containing brief accounts of the most recent trials of balloons having mechanical propelling attachments. The required dimensions and best forms for balloons with propelling machinery. Calculations of the power exerted by birds in travelling through the air, and their methods of action. Calculations of the mechanical requisites for successful aerial navigation, as indicated by the flight of birds. Report of balloon trials having vertical screw propellers, made by the British War Office. Air navigation by "pushing" balloons. Experimental trials of the Society's apparatus for testing the Lifting Power of plane surfaces when exposed to wind currents. Description and dimensions of Moys' steam Aerial Locomotive, with an account of its practical trial at the Crystal Palace. Description of Moys' remarkable self-lifting steam engine and boiler, of one horse power, but weighing only thirteen pounds, with dimensions, arrangement of the lifting fans, etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 50. Price 10 cents. To be had at this office and of News Dealers.

CONCRETE AS A BUILDING MATERIAL.—A lecture delivered before the Royal Institute of Architects, London, by A. Payne, with discussion of the subject by prominent architects. This lecture and the extended discussions of the subject are contained in SUPPLEMENT Nos. 26 and 34. Price, 10 cents each. They present a large amount of valuable information, upon Concrete building, in concise form.

FOR SALE—LOCATED IN RICHMOND, Va., a small Brass and Iron Foundry, in complete working order, under house rent of \$200 per annum, with two Brass Furnaces and all appurtenances, and 300 Patterns: 5-Horse Power Engine; Steam-driven Blower; one ton capacity Cupola; good assortment of Flask and Patterns for Moulds; Frames and Grates, and so on, with room and capacity of \$4000 per annum. Price \$2000. Address
W. L. COX, 512 Cary St., Richmond, Va.

WESSELL METAL, A PERFECT IMITATION of gold in color, surface, etc., for manufacturers of imitation jewelry, and other workers in fine yellow metal. Wessell Manuf'g Co., No. 204 East 23d St., N. Y.



U.S. PIANO CO., 810 Broadway, N. Y.

\$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

Want SALESMEN on a regular salary of a month and expenses, to sell our **WE CIGARS** to DEALERS. Samples FREE. Send 5c. stamp to locate answer. H. FOSTER & CO., Cincinnati, O.

EXTRAORDINARY, WONDERFUL, AND VALUABLE MEDICAL WORK. With engravings; price, \$1. Contains, also, fifty original prescriptions for prevailing diseases, each worth ten times the price of the book. Gold Medal has been awarded the author. Descriptive circulars sent free. Address Dr. W. H. PARKER, No. 4 Bulfinch Street, Boston.

STRONG AND CHEAP SPAR BRIDGES.

General description, dimensions, and particulars, with 2 pages of drawings, covering illustrations of all the details, for a bridge of 100 feet span or less; specially useful for crossing of creeks, small rivers, gullies, or wherever a costly structure is not desirable. The drawings are from the Spar Bridge exhibited at the Centennial, in the U. S. Department of Military Engineering. These bridges are wholly composed of unressed stuff. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 71. Price 10 cents. To be had at this office and of all newdealers.

BIBB'S Best Original Baltimore-Made **Fire Place Heaters** Mantels and Registers. **B. C. BIBB & SON,** Baltimore, Md. Best workmanship. Lowest prices guaranteed. Send for circulars.

IMPORTANT FOR ALL CORPORATIONS AND MAN'S CONCERNS.—Buerk's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular. **J. E. BUEBK, P. O. Box 979, Boston, Mass.** N. B.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 10, 1874. A fine was assessed against them Nov. 11, 1876, for selling contrary to the order of the court. Persons buying or using clocks infringing on my patent will be dealt with according to law.

LIGHT CASTINGS to order promptly. Plain, Bronzed, or Galvanized. We make a specialty of light work. **LIVINGSTON & CO., Iron Founders, Pittsburgh, Pa.**

FIFTY SYRUP RECIPES, FOR HOUSEHOLD purposes, Mineral Waters, etc., to wit: Simple Syrup, (2) Lemon Syrup, Mulberry Syrup, Vanilla Syrup, Vanilla Cream Syrup, (2) Cream Syrup, Ginger Syrup, Orange Syrup, (2) Pineapple Syrup, Redstart Syrup, Sherbet Syrup, Grape Syrup, Banana Syrup, (2) Coffee Syrup, Wild Cherry Syrup, Wintergreen Syrup, (2) Sarsaparilla Syrup, Maple Syrup, (2) Chocolate Syrup, Coffee Cream Syrup, Ambrosia Syrup, Hock and Claret Syrup, Sotiferino Syrup, Capsicum Syrup, Cherry Syrup, Strawberry Syrup, (2) Raspberry Syrup, Peach Syrup, Blackberry Syrup, Oregon Syrup, Catawba Syrup, Milk Punch Syrup, Champagne Syrup, Cherry Cobbler Syrup, Elderberry Syrup, Fancy Syrup, Currant Syrup, Framboise Syrup, Maidenhair Syrup, Orange Flower Syrup, Cinnamon Syrup. How to make syrups Frothy. Colognes for the Sick Room, by GEO. LEIS. With recipes for the production of preparations that serve as pleasing perfumes, deodorizers, and cosmetic lotions. All the above are contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 77. Price 10 cents. To be had at this office and of all newdealers.

Steel Name Stamps.

N. Y. STENCIL WORKS, 87 Nassau St., N. Y.

65 LARGE MIXED CARDS, with name, 10c. and 3 ct. stamp. 25 Styles Fun Cards, 10c. Samples 6c. M. Dowd & Co., Bristol, Conn.

\$66 a Week in your own town. Terms and \$5 outfit free. **H. HALLETT & CO., Portland, Maine.**

GOLD, SILVER and NICKEL PLATING

made easy. The Electro Platers' Guide, a 72 page Manual of instruction, sent free for 10 cents. All information relating to plating furnished free. Address F. LOWEY, 142 Fulton St., N. Y.

\$5 to \$20 per day at home. Samples worth \$5 free. **STINSON & CO., Portland, Me.**

HOW TO BUILD BOATS CHEAPLY.

A series of plain, practical articles, showing how any intelligent person, by following the directions, may build a boat with economy. Each article is accompanied by drawings, diagrams, directions, dimensions, etc.
The Three-Dollar Skiff.—Directions for construction, seven illustrations. SUPPLEMENT No. 23. 10 cents.
The Five-Dollar Rowing Skiff.—With full directions for construction. Thirteen illustrations. SUPPLEMENT No. 24. Price, 10 cents.
The Fourteen-Dollar Sailing Skiff.—With fourteen illustrations. Full directions for construction of boat, centre board, rudder, mast, sail, etc. Contained in SUPPLEMENT No. 25. Price, 10 cents.
The Twelve-Dollar Row Boat.—Twenty-five illustrations. Illustrates the construction of a graceful ribbed boat, light weight. Shows the method of securing good lines, how to bend and arrange the ribs, dimensions of all the parts, and directions for construction in full. Contained in SUPPLEMENT Nos. 30 and 32. Price, 10 cents each—20 cents for the two.
The Sixteen-Dollar Family Boat.—With seven illustrations. Tables of measures and full directions for construction. A handsome and commodious boat. Contained in SUPPLEMENT No. 34. Price, 10 cents.
The Fifteen-Dollar Row Boat.—With three illustrations. Tables of measures and full directions for construction. Contained in SUPPLEMENT No. 37. Price, 10 cents. This number also contains fourteen excellent practical rules for the management of sail boats, by an experienced sailor.
The Fifteen-Dollar Sailing and Rowing Canoe.—With eight illustrations, including perspective of double sail rig. Tables of dimensions and directions in full for construction. SUPPLEMENT No. 39. Price, 10 cents.
A Thirty-Dollar Yacht.—With eight illustrations, including perspective of sail rig. Tables of dimensions and full directions for construction. Contained in SUPPLEMENT No. 42. Price, 10 cents.
A Two Hundred Dollar Yacht.—A thirty-three-foot sloop yacht. With eight illustrations. A very cheap and simple method of construction is shown, which nevertheless possesses sailing qualities equal to a full-masted boat. Directions in full. Contained in SUPPLEMENT No. 67. Price, 10 cents.
The whole or any desired single number of above SUPPLEMENTS, containing the best papers to be had at this office and of all newdealers. Price, 10 cents per copy or one dollar for the entire series of ten numbers.

Advertisements.

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

PORTABLE FIRE ESCAPE.



Will let you down 100 feet with perfect safety, occupies but little room in a traveling bag; made of Brass and Ligum Vitæ, Braided Linen Rope, which will suspend 80 pounds, and Webbing Sling of equal strength, 2 weight, with 50 feet of rope, 2 pounds. Price \$2.00. Weight, with 100 feet of rope, 3 pounds. Price \$3.00. Sent by mail, prepaid, on receipt of the price. Warranted to give perfect satisfaction. To use this Escape throw the free or lower end of the rope to the ground, and tie the upper end to something in the room. Then put the sling around your waist and get out of the window. A slight pull on the rope will unlock it, and you run down at any desirable speed by letting the rope pass through your hand tightly or loosely.

MILLERS FALLS CO.,

No. 74 Chambers St.,

NEW YORK.

1872, 1873, 1874, 1875,

SCIENCE RECORD.

A few copies of these splendid books, copiously illustrated, are offered at the following very low prices. Persons desiring a condensed history of the most interesting Facts and Discoveries in the Arts, Sciences, and Inventions, for the years from 1872 to 1875, will find them recorded in the four volumes of the SCIENCE RECORD, now offered at half the original price.

Every Department of Science is treated in these volumes, and the important discoveries of the several years are not only faithfully described, but many of the subjects are illustrated with finely executed engravings, prepared expressly for these Annuals.

Among the subjects, the following are the most noteworthy, exhibiting in a condensed form a general account of the Progress of the World:

CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE,
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE,
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NEOLOGY.

Each yearly volume contains about 600 octavo pages, including a large number of handsome engravings. They are bound in substantial and handsome bindings, and will be mailed on receipt of \$1.25 each, or \$4 for the set of four volumes.

State, in remitting for a single volume, which year, from 1872 to 1875, is desired, remembering that the date of the volume covers the events and discoveries of the previous year. Sent by mail on receipt of price. Address

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

EAGLE FOOT LATHES,



Improvement in style. Reduction in prices April 25th. Small Engine Lathes, Slide Rests, Tools, etc. Also Scroll and Circular Saw Attachments, Hand Planes, etc. Send for Catalogue of outfits for Amateurs or Artisans.

WM. L. CHASE & CO.,
95 & 97 Liberty St., New York.

DROP FORGINGS and SPECIAL MACHINERY.

THE HULL & BELDEN CO.,
Danbury, Conn.

PATENTS

CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

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 YEARS' EXPERIENCE, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Registrations, Copyrights for Books, Labels, Reliefs, 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 Trade Marks, Copyrights, Designs, Patents, Appeals, Reliefs, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign Patent 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 patents—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 steam 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, \$130; Belgian, \$160; Canadian, \$70. Address

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

Solicitors of Patents, and Publishers of the SCIENTIFIC AMERICAN.

GUARDIOLA'S COFFEE & SUGAR MACHINERY

Coffee, Malt, Corn, Cocoa, and Grain-Drying Machine, Coffee-Rolling and Polishing Machines, Coffee-Washing Machine, Helix Sugar Evaporator.

Messrs. C. ADOLPHE LOW & CO., 3 Cedar Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.

ESTABLISHED 1844.
JOSEPH C. TODD,
(Formerly of Todd & Hafferty), ENGINEER AND MACHINIST. Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Also Agent for the celebrated and Improved Hawson & Rittinger Hoisting Engine. I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address

J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

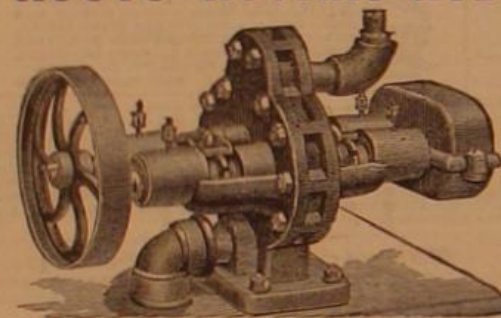
GUILD & GARRISON,
34 to 44 First St.,
Williamsburgh, N. Y.,
Manufacturers of
STEAM PUMPS
for all purposes.
Also Vacuum Pumps,
Vacuum Pans and
Air Compressors.

THE BIGELOW Steam Engine.

BOTH PORTABLE AND STATIONARY.
The CHEAPEST AND BEST in the market.
Send for descriptive circular and price list.

H. B. BIGELOW & CO.,
New Haven, Conn.

ROOTS' ROTARY HYDRAULIC ENGINE.



FOR BLOWING ORGANS AND RUNNING

LIGHT MACHINERY

OPERATED BY

HYDRANT PRESSURE.

GIVES GREATEST USEFUL EFFECT OF WATER.

IS A POSITIVE PRESSURE ENGINE.

P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.

S. S. TOWNSEND, Gen'l Ag't, 6 Cortlandt St., NEW YORK.

Machines AND Wheels Guaranteed.
LEHIGH VALLEY EMERY WHEEL CO.
PA.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Super-Heated Steam, Oil Stills, &c.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, New York.

PUNCHING PRESSES. Drop Hammers and Dies, for working Metals, &c. THE STILES & PARKER PRESS CO., Middletown, Conn.

TAKE IT EASY.
Common-Sense Chairs and Rockers.
With or Without Reading Table.
For sale by the trade. Manufactured by F. A. SINCLAIR,
Mottville, N. Y.
Send Stamp for Illustrated Price List.
Every Chair Stamped and Warranted.

LOOTT LATHES, for Broom, Rake and Hoe Handles.
S. C. HILLS, 78 Chambers St., N. Y.

LeCOUT'S PATENT Machinists' Tools.

REDUCED PRICES.
Set Iron Dogs, 3 to 2 in., \$4.50
" Steel " 3 to 4 in., 12.00
" " 3 to 2 in., 6.30
" " 3 to 4 in., 13.00
Iron & Steel Clamps, Die Dogs, Clamp Dogs, Vice Clamps, Expanding Mandrels, &c. Send for latest Price List to C. W. LE COUT, South Norwalk, Conn.

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 and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 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.

TAYLOR'S MFG CO., WESTMINSTER, MD., PORTABLE and Stationary Engine Builders, etc. Send for Catalogue.

STEAMPUMPS

Wright's Pat. Bucket Plungers are the best. VALLEY MACHINE CO., Easthampton, Mass.
PERFUMERY. — BY W. SAUNDERS, Pharmacist. — A valuable and practical paper upon the preparation of Perfume Extracts, with Formulas for the preparation of the most prominent and popular Perfumes now on the market, directions for the preparation and compounding of the ingredients, etc. The Formulae here given embrace the preparation of the following Perfumes: Jockey Club, Moss Rose, White Rose, Victoria, Bee, Bouquet, Musk, Patchouly, Millefleur, Ylang Ylang, Spring Flowers, Wood Violets, West End, Tuberosa, Stephanotis, Rondeletia, New Mown Hay, Frangipani, Clove Pink Violet, Mignonette. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 65, Price 10 cents. To be had at this Office, and of all Newsdealers.

MACHINISTS' TOOLS.

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

Steel Castings,

From 14 to 10,000 lbs. weight, true to pattern. An invaluable substitute for forgings, or for malleable iron castings requiring great strength. Send for circular and price list to CHESTER STEEL CASTING COMPANY, EVELINA STREET, PHILADELPHIA, PA.

HARTFORD STEAM BOILER

Inspection & Insurance COMPANY.

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

Working Models

And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 82 Center St., N. Y.

THE TANITE CO., STROUDSBURG, PA. EMERY WHEELS AND GRINDERS. GEO. PLACE, 121 Chambers St., New York Agent.

\$3 PRINTING PRESS!
Prints cards, envelopes, etc., equal to any press. Larger sizes for large work. Do your own printing and advertising and save money. Excellent spare hour amusement for old or young. Or it can be made money making business anywhere. Send for stamps for large catalogue to KELSEY & CO., Manufacturers, Meriden, Conn.

H. W. JOHNS' PATENT ASBESTOS MATERIALS.

Paints, Roofing, Steam Pipe and Boiler Coverings, Steam Packing, Sheetings, Fire, Acid, and Waterproof Coatings, Cements, etc. Send for samples, illustrated Catalogues, Price Lists, etc.

WANTED. Small Machinery of any kind to Manufacture at a low figure. H. BICKFORD, Cincinnati, O.

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

LEHIGH UNIVERSITY.—TUITION FREE. Civil, Mechanical, and Mining Engineering; Chemistry and Metallurgy; Full Classical Instruction; French and German; English Literature; International and Constitutional Law; Psychology and Christian Evidence. For Registers, address the Rev. JOHN M. LEAVITT, D.D., President, Bethlehem, Penna.

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 & SON, Buffalo, N. Y.

THE Scientific American.

The Most Popular Scientific Paper in the World.
THIRTY-SECOND YEAR.

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

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

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

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

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.

NOTICE TO FOREIGN SUBSCRIBERS.

The new Postal Union now offers special facilities for the regular and speedy transmission of the SCIENTIFIC AMERICAN direct from the office of publication in New York to subscribers in foreign countries. The subjoined table exhibits the yearly subscription prices in the principal foreign currencies, payable in advance:

The prices are for one year's subscription, including the postage.	FOR SCIENTIFIC AMERICAN.	FOR SUPPLEMENT.	SCIENTIFIC AMERICAN AND SUPPLEMENT.
Austria.....	S. Fl. 9	13	20
Belgium.....	Francs 20	30	45
Denmark.....	Kro 15	23	35
France.....	Francs 20	30	45
German Empire.....	R. M. 16	25	35
Great Britain.....	Shillings 16	25	35
Holland.....	H. Fl. 14	21	31
Italy.....	Francs 20	30	45
Norway.....	Kro 15	23	35
Russia.....	Roubles 5	8	11
Sweden.....	Kro 15	23	35
Switzerland.....	Francs 20	30	45

The best way to remit is by Postal Order. Make the order payable to MUNN & CO., New York, United States, and forward the order to us with the name of the sender and the address to which the paper is to be mailed.

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
New York.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.

SCIENTIFIC AMERICAN

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

Vol. XXXVII.—No. 7.
[NEW SERIES.]

NEW YORK, AUGUST 18, 1877.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

IMPROVED ICE MACHINE.

This ice machine is constructed upon the general principle of the employment of a non-congealable liquid as a vehicle for conveying the cold product to a receptacle where the temperature of the cooled liquid is transmitted to atmospheric air, which is then later directed into a congealing receptacle, where the freezing effect is produced.

A perspective view of the apparatus is shown in Fig. 1. In Fig. 2 is shown the refrigerating cylinder in section, a perspective view of the same being seen at the right of the view, Fig. 1. This refrigerator cylinder may be made of any suitable material and covered with felt or some non-conducting material. It is journaled on a longitudinal shaft, A, which is provided with radial arms, B, which carry upon their outer ends longitudinally arranged ribs, C. Around these ribs, and near the inner periphery of the cylinder, is wound a continuous coiled pipe, D, in which circulates strongly saturated brine or other non-congealable liquid, which is received from a convenient cistern or tank. A coil of pipe extends the entire length of the cylinder, and at each end communicates with the hollow ends of the shaft, A, and through this hollow with the supply pipe, E, and the exit pipe, F, so that a continuous circulation of the non-congealable liquid may be kept up in the coil. Inside of this cylinder a volatile liquid is placed, which may be ether, gasoline, ammonia, bisulphide of carbon, or other easily evaporated liquid, which is introduced through a pipe, G, and is maintained at such level as to immerse the bottom portion of the coil of pipes, which level may be regulated by means

of a glass gauge upon the outside. As the coil of pipes is revolved by any suitable mechanism, the coil passes to the upper portion of the cylinder with its surface moistened by the volatile liquid, which it carries up from adhesive attraction; and as the cylinder is exhausted of its gaseous contents through the pipe, H, by means of the pumps seen at the left of the cut, Fig. 1, the evaporation of the liquid

which are filled with the non-congealable liquid, and these, together with the stuffing boxes, effectually seal the bearings against all leakage of air in the interior.

As the gas is exhausted from the cylinder, it passes to the pumps previously referred to, from thence to a condenser, seen in the center of Fig. 1, and thence through a pipe as liquid to a receiver which is shown underneath the condenser. The cooled non-congealable liquid passes into the case, M, Fig. 4, through the pipe, F, and from thence back to the coil in the cylinder through the pipe, E. The circulating of liquid is effected through a circulating pump, shown at the foot and just at the right of the pump previously spoken of, which is operated by the engine at the right of the pumps, which also works the large pumps, refrigerator coil, and a rotary blower for circulating air in the congealing case.

The large pumps, of which there are two (for detail see Fig. 3), form an important part of the apparatus. They communicate with pipe, H, from the cylinder through inwardly opening check valves, I, located in the branches of the pipe. These pumps are also provided with a gravity cup-shaped valve, J, which is of greater diameter than the piston cylinder, and plays between the cylinder head and the flange of the body of the cylinder, upon which it is seated, being guided in its movement by ribs in the enlarged cavity of the cylinder-head. In operation, upon the descent of the piston the gas is drawn through the pipe, H, the check valves, I, are opened, and the pump cylinder filled. But when piston rises the check valves are closed, and the compressed gases above the pis-

[Continued on page 98.]

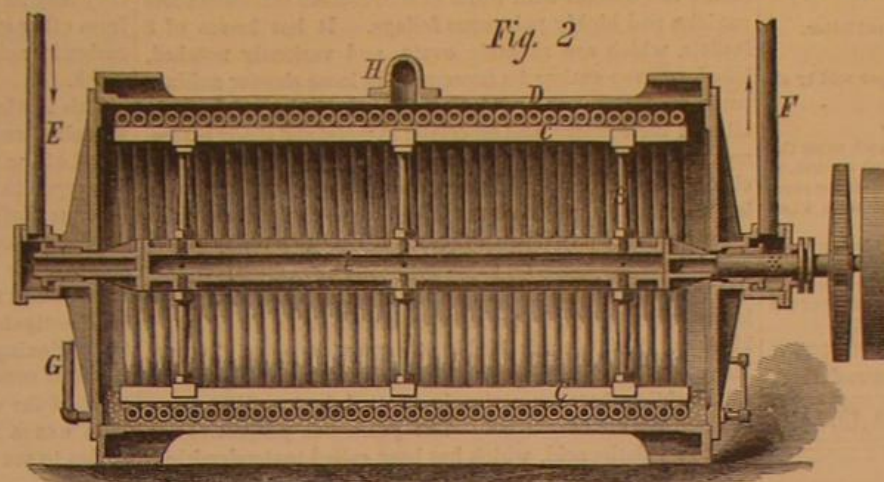
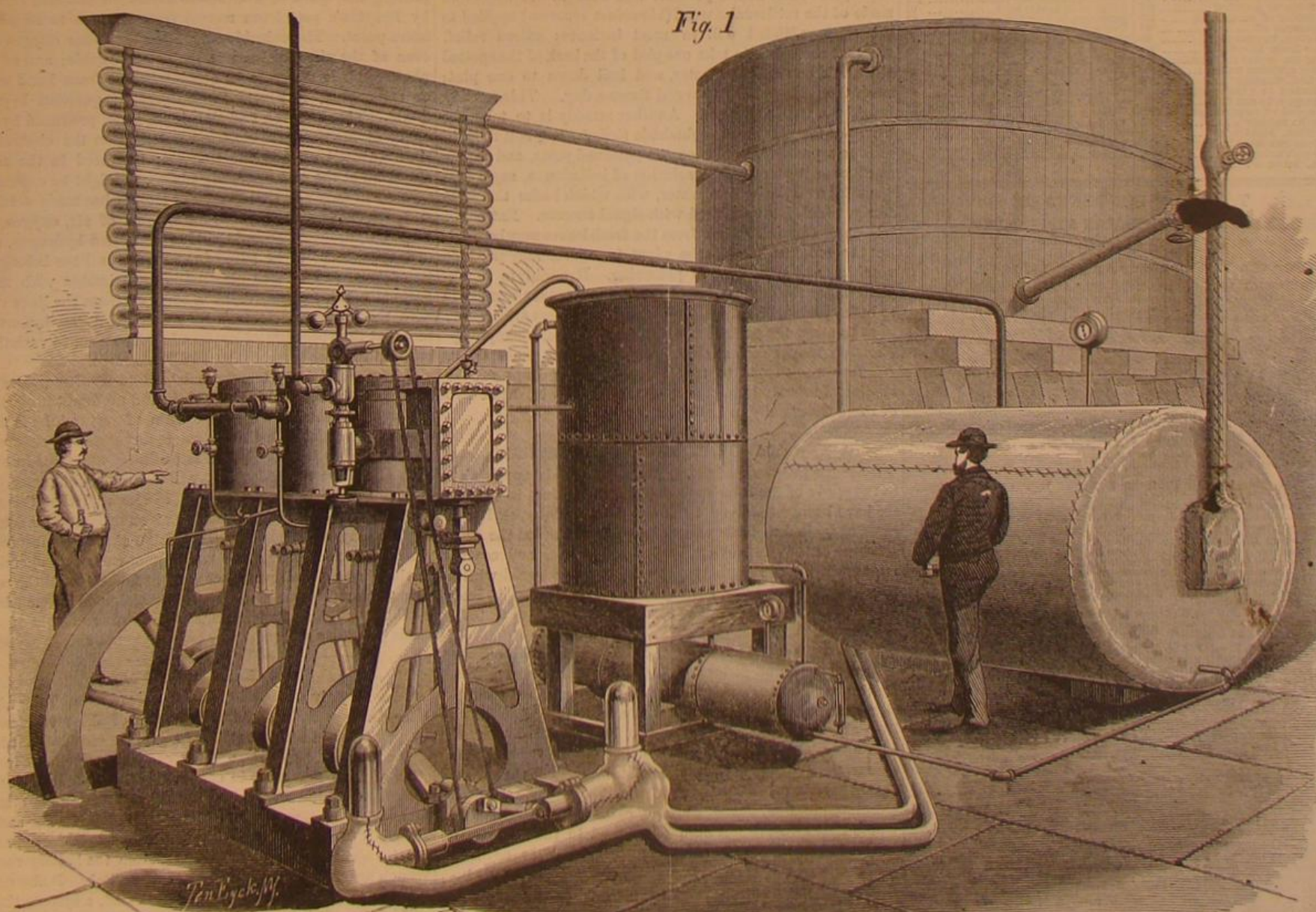


Fig. 1



HOLDEN'S IMPROVED ICE MACHINE.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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

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.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, 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.

Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVII., No. 7. [NEW SERIES.] Thirty-second Year.

NEW YORK, SATURDAY, AUGUST 18, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

American Institute Exhibition.....	57	Kid gloves*.....	104
Aniline colors and varnish (11).....	107	Kid gloves, to clean (20).....	107
Antelope, the curly haired*.....	108	Manganese (4).....	107
Bad water, to detect.....	57	Marble, ink stains removed (5).....	107
Base ball, curving*.....	100	Mars and Saturn, conjunction of.....	98
Blacking, boot (31).....	107	Measures, standard (34).....	108
Carbolic soap (18).....	107	Mercury, pressure of (35).....	108
Carpet loom, the Gates*.....	102	New books and publications.....	105
Cement for parchment paper (10).....	107	Oxygen in the sun.....	96
Cement for belts (7).....	107	Patents, American and foreign.....	106
Citric acid, to make (37).....	107	Patents, official list of.....	108
Cleopatra's needle.....	97	Peroxide of hydrogen (19).....	107
Coal fields of Ohio.....	98	Pigeon vs. locomotive.....	97
Compass, good ship's.....	103	Poison ivy and its remedies.....	105
Concrete masonry walls.....	99	Railway strike, H. W. Beecher on.....	105
Correspondence, Washington.....	100	Rotation in motion.....	100
Davium.....	97	Shellac varnish (27).....	107
Dead bodies, preserving.....	103	Shower, artificial.....	100
Diphtheria, hyposulphite in.....	104	Silver first coined.....	97
Dustpan, improved*.....	98	Solar spectrum, new theory of.....	96
Electric fire.....	103	Starch, laundry (9).....	107
Electrical lamp.....	103	Stamps, to destroy (12).....	107
Ether, freezing point of.....	104	Sulphur in acetic acid.....	97
Expenditure of metals (49).....	108	Sunshine in London and N. Y.....	97
Eyes, dimness of.....	97	Telluric odors.....	104
Feed cutter, improved*.....	98	Tin from copper, to remove.....	98
Fertilizer from blood.....	104	Tobacco, to flavor (53).....	108
Filtering sea water (1).....	107	Tooth paste (37).....	107
Fish from artesian wells.....	100	Vestibular apparatus.....	97
Flower bed, floating*.....	104	Vinegar, sulphuric acid in.....	101
Fruit canned in Cincinnati.....	98	Wash boiler, improved*.....	98
Glass gauges, to cut (31).....	107	Watch, invention and history.....	101
Horse, speed of, pressure, etc (36).....	108	Water snake*.....	103
Hose, India rubber.....	100	Wheel, revolution of (51).....	107
Ice machine, Holden*.....	95	Wood, metal (15).....	107
Inventions patented in England.....	105	Woods, gravity of.....	101
Iron, to galvanize (16).....	107	Zinc dust, combustion of.....	97
Jackson, Isaac W.....	97		

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 85,
For the Week ending August 18, 1877.

I. ENGINEERING AND MECHANICS.—Eight Horse Traction Engine. With 4 illustrations.—The Disconnecting Compound Screw Engines of Steamship "Otter." With one page of engravings.—The New Fast Irish Mail Steamers.—Analysis of Boiler Incrustations. By EDWARD FRANKS.—Improved Tug Steamers, with bow and stern screws.—The Theoretical Steam Engine. By CHARLES E. EMERY.—The Boettling Gas Furnace. With 4 illustrations.—Radial Drilling Machine. With 1 engraving.—General Description of the New Water Works, Detroit, Mich.—Iron Railroad Ties as used on the Central Pacific Railway.—The Highest Railway Level in the United States.—The Chelsea Swimming Baths, London. With an engraving of the three baths.—The New Post Office and Custom House, Albany, N. Y. With an engraving.
On Ice and Ice-Making Machines; by W. N. HARTLEY, F.R.S.E. Being a concise description of the best methods for the artificial production of ice.—On the Manufacture of Chinese Gongs; showing the method of production, the alloys used, etc.—How to Draw a Straight Line. By A. B. KEMPE, A.B. With 12 illustrations.
On Vortex Motion. By Professor OSBORNE REYNOLDS. An interesting and valuable paper.
Results of the Chronometer Trials at Geneva, 1876-77.
Discussion on the Parallelogram of Forces. By D. P. BLACKSTONE.
II. ELECTRICITY, LIGHT, HEAT, ETC.—The Story of the Prism. A concise and interesting history of the Analysis of Light, and its marvelous results.—Action of Light upon Iodide of Potassium. Santeaux and Ekman's Oil.—New Method of Producing Light by the aid of Electricity.—New Experiment for showing the Composition of White Light.—On the Repair of Submarine Telegraph Cables.—Influence of Light on the Electrical Resistance of Metals.—Diathermancy of Rock Salt.—Suspension of Boiling Water on a Muslin Net.—Experimental Determination of the Thickness of Soap Films.—The World of Matter.—Temperature and Organic Remains in Tahoe and Echo Lakes.
III. TECHNOLOGY.—On the Principles of Tanning.—On Arlonine Blacks.—On Garnets; selection of the woods and manipulation; Garnet Paper; Dye Book; Brazil Garnet; Garnet with Sanders and Orichal; second Bath; third Bath.
New harmless method of giving permanent Green Color to Peas and other Canned Vegetables.—New Lichen Acid.—Cremation of Street Refuse.
IV. AGRICULTURE, HORTICULTURE.—On the Home Manufacture of Superphosphates.—Value and best methods of Curing and Using Clover.—On the best methods of Potato Culture.—Economic Plants in the Island of Jamaica. An interesting paper showing the success of efforts to introduce and acclimatize many useful and valuable plants; most of which may be grown in the United States.
V. ASTRONOMY.—Dr. Debergs recent Catalogue of thirteen Double revolving Stars.—Physical Observations of the planet Mars.—Mars in the Autumn of 1877. By RICHARD A. PROCTOR, F.R.S. With Chart of her lands and waters of the planet and 6 illustrations of her telescopic appearance in opposition.
VI. SCIENTIFIC AMERICAN CHESS RECORD.—Constitution of the American Chess and Problem Association.—Portrait of Samuel Loyd, notices of some of his successes as a Chess Player; with selections of his original problems from the recent Centennial Problem Tournament.—Game selected from the celebrated match played in London between Steinitz and Blackburn, 1876, prize \$250; with notes thereon by Mr. Steinitz.

Remit by postal order. Address

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

Single copies of any desired number of the SUPPLEMENT sent to any address on receipt of 10 cents.

POISON IVY AND ITS REMEDIES.

A correspondent asks: "Can you inform me by what characteristics I can determine the poisonous species of dogwood and ivy, and what simple remedy there is for their effect on the skin?"

Poisonous dogwood is a name improperly given in some parts of the United States to the *rhus venenata*, a species of poisonous sumach. It is sometimes called poison elder. It is a neat, graceful shrub growing from 6 to 18 feet high, and is found in swamps from Canada to Louisiana. The young shoots are purple or green clouded with purple, and marked by orange-colored dots which turn grayish; the leaves have 7 to 13 leaflets, which are dark green, pointed and entire on the margins; the greenish yellow flowers are in loose axillary panicles, and the greenish white fruit hangs in loose clusters on stems 6 to 8 inches long, and remains after the leaves have fallen; the juice is milky, and dries to a black varnish. This has poisonous qualities which are virulent. Its effect is an acute eczematous inflammation of the skin, often accompanied with much swelling.

The poison ivy or poison oak, in some places called mercury vine, the toxicodendron group of the botanists, includes two species with white or dun-colored berries in loose panicles and highly poisonous foliage. It has leaves of 3 leaflets, which are rhombic ovate, and variously notched, lobed, or even entire; its flowers are in loose slender axillary panicles; the smooth fruit is pale brown. It is found nearly all over the country, and especially in moist and shady places, and presents two forms, one erect and the other climbing. It clammers over rocks and fences, and by means of aerial rootlets ascends the trunks of the tallest trees, and adheres with great pertinacity. When wounded it exudes a milky juice, which becomes black on exposure to the air, and upon fabrics makes a stain indelible by all ordinary solvents. The leaves taken internally promote the secretions of the skin and kidneys. This plant is highly poisonous to some persons. Many can handle these plants without any unpleasant results, while others are seriously affected by touching them or even passing near them. The poisonous properties are due to a volatile acid, which has been called toxicodendric.

Many remedies are employed for poisoning by these plants, some of which will have beneficial effect on some persons, while on others have no effect at all. Water saturated with salt will often prove a cure, and at other times have no effect. The same may be said of sweet oil. There has been a remedy employed in some of the New England States that has been claimed to be effectual. It was this, the fat of the common black snake (*bascanion constrictor*) rendered into oil and applied to the parts affected. A strong lye made from wood ashes has been beneficially used, and so has an application of iodide of potassium. Another remedy is to take the fresh bark of the witchhazel (*Virginian hamamelis*), boil and apply the liquor as hot as the patients can bear it. A decoction made of the rattlesnake weed (*hieracium venosum*) applied to the parts afflicted will in most instances afford relief. Another remedy is to take one pint of the bark of the spotted alder, add one quart of water, and boil down to one pint; wash the parts poisoned several times a day. This remedy is said not to be injurious. Another remedy is to take the leaves of the poisonous nightshade (*belladonna*), boil them in milk to a poultice, bind it on the poisoned parts, and renew as often as it gets dry. A solution of belladonna, say a teaspoonful to a tumbler of water, with which bathe the parts freely. This has been used with signal success. Extract of lobelia or a poultice made from the fresh leaves may be used, but the external use of the plant in excess may produce vomiting and symptoms of poisoning. It ought to be applied under the advice of a physician. Another remedy is to bathe parts with spirits of niter. If the blisters are broken, so as to allow the niter to penetrate the cuticle, a simple application may effect a cure. Apply several times daily. Another remedy is to take three or four drops of the medicinal remedy known as *rhus toxicodendron*, drink two or three times daily in half a glass of water.

A NEW THEORY OF THE SOLAR SPECTRUM.

Since the invention of the spectroscope, and its application to the study of the solar spectrum, the dark lines in the latter have been considered as absorption bands, caused by a layer of ignited metallic vapors, which surrounded the photosphere of the sun and changed the luminous and continuous spectrum of the photosphere into one covered with a multitude of dark lines, corresponding with the bright lines which we can produce by the combustion of various metallic substances.

Professor Henry Draper now comes forward with a series of experiments and deductions from the same, and proves that we must change this theory and form another conception, namely, that the solar spectrum consists also of bright lines and bands superposed on a less luminous background of continuous spectrum. Such a conception, combined with observations in regard to these bright lines, opens the way to the discovery of metalloids, sulphur, phosphorus, selenium, chlorine, bromine, iodine, fluorine, carbon, etc., the lines of which thus far have not been discovered in the solar spectrum. At the same time many of the dark lines, not thus far accounted for, may be due to being merely intervals between very bright lines.

That an incandescent gas in the solar atmosphere should not always be subject to the law, that it absorbs rays of the same refrangibility as it emits, may, at first sight, be difficult to understand. But the fact is, the substances thus far investigated in the sun have been metallic vapors, to which,

according to our present knowledge of chemistry, hydrogen also belongs. The metalloids may, and probably do, behave differently; the intensity of the light, from a great thickness of incandescent hydrogen, overpowers the effect of the photosphere; and instead of throwing a shadow of the rays of the same refrangibility, it increases the luminosity. It is as if a person looked through a yard thickness of ignited sodium vapor to a candle flame; he would see no dark sodium light, but a bright one; while looking at a very bright flame, he would see the comparatively dark sodium lines.

This would necessitate the supposition that some incandescent gases could give out more light than other substances in the sun, and why not? Has not Huggins shown that, in the outburst of the star *Corona Borealis*, hydrogen could give bright lines on a bright background of a similar nature to the background of the solar spectrum?

It is evident that bright lines on a less bright background make to ocular observations not so much impression upon the mind as the dark lines, and this is the simple reason that thus far they have been overlooked. If, however, the solar spectrum is photographed, such lines become very prominent; and the photograph being a permanent record, they may be easily compared with bright lines photographed from other spectra, such as those of air, oxygen, nitrogen, carbonic acid, etc., illuminated by means of the electric spark.

This is what Professor Henry Draper has been doing, and we call attention to the following article containing an account of the manner in which he demonstrated the presence of oxygen in the solar photosphere.

Fraunhofer who, about one century ago, first discovered the dark lines of the spectrum, which at the present day are named after him, also discovered that these lines are different when the light of some of the prominent fixed stars is investigated; and Berzelius, in remarking this, said in the beginning of this century that the study of these lines would at some future day lead us to the knowledge of the cause of the development of light in the heavenly bodies. This was a genuine prophecy, of which the world now begins to see the realization.

DISCOVERY OF OXYGEN IN THE SUN BY PHOTOGRAPHY.

Professor Henry Draper has announced the discovery of a series of bright lines or bands in the photograph of the solar spectrum, which correspond exactly with the principal bright lines or bands seen in photographs obtained by means of electric illumination in the spectrum of oxygen.

He has, in the *American Journal of Science and Arts*, published a paper and illustrated it with a photograph, in which he shows the perfect coincidence of certain bright lines. The photograph contains in its upper half the solar spectrum, and in its lower half the spectrum of air obtained by passing the spark of a Gramme induction machine (driven by Brayton's petroleum motor) from an iron to an aluminum point. The coincidence of the luminous oxygen and even of the nitrogen lines is really remarkable; and as the photograph is stated to be absolutely free from hand work or retouching, it places the subject in question beyond doubt. Thus the iron and aluminum lines, produced by the effect of the powerful electric current upon the electrodes, show themselves, and the first may be traced in the solar spectrum at the corresponding places, as might be expected.

We will only add that Professor Draper has made detailed comparison of these lines in the spectra of air, oxygen, nitrogen, hydrogen, carbonic acid, carburetted hydrogen, and cyanogen, so as to be sure of the luminous lines belonging to oxygen, and he has also made experiments with these gases at various pressures, as in some of them the lines vary with the pressure. It may be remarked as an important fact that the spectrum of oxygen is not subject to variation, but that its lines are constant at all pressures.

Science is already largely indebted to Professor Draper for the originality of his researches, and no doubt important results may be expected in the train of research he is now following. It is useless to speculate as yet on the nature of the sun, and it is better left to later times, when our knowledge of this remarkable body will be more complete; but one thing is certain, that the idea of Herschel that the sun may be an inhabited globe must be given up. It is undoubtedly a body at a temperature so high that the substances present there are dissociated and cannot enter into chemical combinations. However, that we will find there all the elements present on our globe may be anticipated if we adopt the theory of Kant and Laplace of a common origin of our whole planetary system out of one single nebula.

AN ELECTRIC FIRE.

A fire recently occurred at the Western Union Telegraph Office, in New York city, that was one of those incidental circumstances in the operation of a great enterprise that imparts a lesson of experience. The cause was defective insulation of wires that came in contact, in what is known as the "grand switch." This switch is situated in an upper story, and consists of a mahogany table about 25 feet long and 5 broad. It is of elegant cabinet work, placed vertically, and contains about 400 wires, which pass from the battery room through apertures in the ceiling into the switch. It also controls about 10,000 connections. It is, in fact, a systematized combination of all the wires issuing from the chief office to every part of the country.

These wires as they enter the switch are separated and insulated. By some means two of the wires, not sufficiently insulated, came in contact with each other. Electrical heat

was generated, which soon set the wood of the switch on fire. When discovered the conflagration could not have been continued over ten minutes, yet the time was sufficient to seriously damage the elegant woodwork, warp and twist the multitude of wires into every conceivable shape, and render them inoperative and worthless for future use.

The actual loss to the building will not exceed \$700, but the fire caused a temporary cessation of business of the department, which, together with the loss of wires, switch, and the extra labor entailed, it is claimed, will make the loss to the company about \$20,000.

SUNSHINE IN LONDON AND NEW YORK.

At the Royal Observatory, Greenwich, Eng., a self-registering sun dial is used to indicate and record the daily duration of sunshine. The instrument consists of a lens made in the form of a ball, of glass, 4 inches in diameter, supported concentrically with a metallic bowl. The focus of the ball lens falls on the concave surface of the bowl, in which is placed a strip of suitable combustible material; the arrangement being such that, when the sun shines, the material is charred and a burned line is made, the length and position of which indicates the time and the duration of the solar radiance. Some very curious results are given, which illustrate in a striking manner the difference between the atmospheric conditions of London and New York, especially in the fall and winter months.

During the entire year ending April, 1877, there were, according to this register, only 1,200 hours of sunshine at Greenwich, or an average of a trifle over 3½ hours per diem. The monthly record was as follows:

May.....	152.3	Sept.....	106.1	Jan.....	18.7
June.....	184.5	Oct.....	47.3	Feb.....	36.4
July.....	214.3	Nov.....	35.9	Mar.....	99.3
Aug.....	216.9	Dec.....	6.5	Apr.....	71.8

We have not at hand any reliable register of sunshine in New York like the above; but it is within the experience of every one living here that our periods of sunshine far surpass those of London. For example, London makes the beggarly show of only six and a half hours of sun during the entire month of December. In New York, we have in December many days of solar brilliancy, any one of which would register more hours of sunshine than the Londoners get during the whole month.

We hope that some one will introduce the globe lens here and ascertain the exact sunny records for this latitude. The instrument would form a useful addition to the meteorological observatory of the Central Park.

DIMNESS OF THE EYES.

Dr. George C. Harlan, of Philadelphia, Pa., has lately communicated to the Medical Society, of that city, some very interesting observations concerning that insidious and often incurable disease, albuminuria. The presence of the disease, in cases previously unsuspected, he has discovered by examination of the patient's eyes by means of the ophthalmoscope. In one instance, a gentleman, 35 years of age, a picture of health, with appetite and digestion good, complained of a dimness in the sight of the left eye, which rapidly increased, and then the right eye became similarly affected. Examination of the eyes with the instrument showed well marked *retinitis albuminurica*. Further medical examinations revealed the presence of the hyaline casts, and the fact that the patient had reached the last stages of albuminuric disease. Two and a half months later he died. Dr. Harlan cites quite a number of other cases of persons who considered themselves in perfect health, but in whose eyes the impress of the terrible disease was discovered, and who quickly succumbed to its power. It remains for the students of medical science to discover some means whereby the early approach of the disease can be detected and proper remedies applied in time to effect a cure.

Professor Isaac W. Jackson.

Professor Isaac W. Jackson died on the 28th ult. in Schenectady, N. Y., in the 73d year of his age. For 51 years he was a professor in Union College. He was born at Cornwall, Orange county, N. Y., in 1805. In 1824 he was graduated at the Albany Academy with the highest honors. Two years later he was graduated at Union College, where he has ever since remained as tutor and professor. As a student, an author, and an instructor in mathematics, he gave evidence of the singleness of purpose with which he took up his life work. His works and text books on conic sections, optics, mechanics and trigonometry, have received the cordial appreciation of competent critics, and have stood the severest test of use in the class room both at home and in foreign lands. In the development of the art of landscape gardening and the improvement of horticulture, he was peculiarly fortunate. The College garden owed its existence to his wise forethought and prudent management. Through his famous garden he contributed largely during many years to the introduction and distribution of the choicest fruits and flowers. Professor Jackson's life was a noble, self-sacrificing one. He devoted himself earnestly to the education and improvement of the youths under his charge.

CLEOPATRA'S NEEDLE.—In preparing to move the obelisk at Alexandria, two inscriptions have been found upon it—one in Latin, the other in Greek. They fix as the year of its erection at Alexandria, by Barbarus, prefect of Egypt, the eighth year of Augustus Caesar's reign; or about 32 years before the birth of Christ. Fontius, the engineer, did it.

Odors of the Human Body.

At a recent meeting of the American Neurological Association, Dr. Hammond called attention to some facts in regard to the natural odor of the body in the human species, and of the faculty which some of the lower animals possessed,—that of differentiating between the odors of different individuals. Besides the inherent odor of the body, there was reason for believing that an entirely different one may be given off, not only as a consequence of disease, but as a result of emotional disturbance. During the middle ages, manifestations of the kind in question were not uncommon in the persons of both sexes, and were attributed to miraculous power. That such cases existed was probable, not, however, as a special gift of God, but as a neurosis similar to other instances which had come under the doctor's own observation. Cases were then cited, of a number of the more important instances among the saints, who were considered highly odoriferous. So far as the author of the paper was aware, there had been no attention given to the subject in the relations now under notice. The cases cited by Dr. Hammond as bearing upon this point were briefly as follows:

A young married lady of strong hysterical tendencies, from whom, during a paroxysm, an agreeable odor, similar to that of violets, was exhaled only from the left lateral half of the anterior wall of the chest. At such times the perspiration was remarkably increased in this region, as compared with the corresponding part opposite. The odor was perceptible at a distance of several feet, but was entirely absent during the intervals of the paroxysms. From an examination of an alcoholic extract of the odoriferous perspiration exhaled by this patient, it was presumed that the odor was due to the presence of butyric ether. The local application of several remedies to the parts, among which were preparations of carbolic acid, soap and water, and other alkaline substances, gave the patient only temporary relief from the odor; but the internal administration of the salicylate of soda, in doses of five grains, entirely cured this lady of her violaceous odor, and the perspiration of the region was reduced to the normal character.

A second case was that of a young lady in whom the first exhibition of the odor (in this case that of pine apple) occurred contemporaneously with an attack of chorea.

In a third case a pine-apple odor was emitted from the skin of the head, neck, and chest of a woman whenever she was angry.

A fourth case was that of a man who, during frequent hypochondriacal periods, emitted a violaceous odor. Occasionally cases were met with from whom a disagreeable odor was exhaled during sexual excitement. No opinion as to the actual and immediate cause of these odorous emanations was expressed, further than that they were due to a nervous disturbance.

Dr. Hammond passed around a small vial containing an alcoholic extract of the odoriferous perspiration of his first patient, which had a distinct violet smell; also a second vial of the same extract, with the addition of bicarbonate of soda, smelling strongly of pine-apple.

The paper was discussed by Drs. Jewell, Beard, Hammond, Seguin, Hamilton, and Spitzka, cases of a similar nature to those mentioned in Dr. Hammond's paper being cited.

Combination Wood and Iron Pavement.

By permission of the Commissioners of Sewers of the City of London, a portion of the new wood paving in Beech street has been charged with iron (3 cwt. to the square yard) by way of experiment. The object is to increase the durability of wood and preserve and protect it from heavy racking traffic, and to test the practicability of securing small blocks of iron without framework, and so as to deaden the noise and counteract the other disadvantage of metal, as hitherto applied. The ordinary wood paving blocks are beveled by machinery on the upper and lower edges, and between each row is laid a row of cast iron blocks of double wedged section, thicker at the upper and lower surfaces than in the center, so as to fit mechanically between the bevelled wood blocks, which on section are thicker in the center than at the upper and lower surfaces. The iron blocks weigh 16 lbs. each, are rounded and serrated on surface for foothold, and perforated for grouting material, and are bedded in sand on the ordinary concrete bed.

Hints for Home Builders.

First, let your cellars be large, well ventilated, and lined with stone or cemented above the level of the ground. The breath of life in furnace-heated houses depends literally on the air of the cellar, unless there be a flue for fresh air extending from the furnace out-of-doors (never the case in cheap, showy houses). The air of the whole house is sucked through this narrow and often unclean apartment, the care of which is usually intrusted to ignorant servants. We have spoken in a previous number of the malaria engendered by massing quantities of vegetables in the cellars, as is the practice in farmhouses during the winter. The lining of stone or cement not only prevents dampness, but is absolutely necessary in streets through which the sewers pass, as a protection from rats. Terriers, ferrets, traps, or poison are feeble defences against the legions which swarm in nightly from a neighboring culvert. Next to the cellars comes the kitchen, which should be large, airy, and sunny. To take no higher ground, conveniences in this department are a politic investment which pay a full interest of capital, especially to the housekeeper who does not live in a large city.

Stationary tubs, closets beneath the dressers for flour, dry groceries, spices, etc., will be likely to tempt into her household a better class of servants, and, when she is forced to turn cook and baker herself, will take half the burden from her weary hands. An addition to comfort, much neglected by builders, is the lighting of stairways, closets, pantries. We have in our mind's eye a modest little house, in a closely built neighborhood of dark buildings, which gives you a sunny, cheerful welcome in every corner: a result produced not only by windows wherever a window is practicable, but by a sky-light of plate glass which sends down sunshine through three floors of closets, halls, and pantries. A mistake made also, which resolves itself into a question of humanity, is the placing the servants' chambers on the top of the house, be that three or seven stories above the kitchen. Passing along a city street at night one cannot look up at the dim lights burning in these far skyey attics without a groan of compassion for the wearied wretches dragging themselves to their beds up yonder after the day's hard labor.—*Scribner.*

To Detect Bad Water.

For detection of animal decomposition products in water, a watery extract of gall nuts was used by M. Fauré. It has also been recommended to use tannic acid for improvement of bad drinking water. M. Kämmerer has recently advised the use of tannin for discovering putrefying animal products in water. He considers that the presence of gelatin in ground water can no longer be doubted, and it is often found in comparatively large quantities. The presence of salt and other compounds in water may delay the precipitation by tannin; hence the purity of water should not be affirmed, as regards tannin reaction, till after 24 hours of this. Every water which becomes troubled in a considerable degree through tannin must be held dangerous as drinking water. For this judgment it is all the same whether a precipitate occurs at once or only after a long time; for the time depends less on the nature of the precipitated body than on the dissolved substances which retard precipitation.

American Institute Exhibition.

Applications for space should be forwarded at once to the General Superintendent, room 22, Cooper Union building, New York, and all details arranged through him with as little delay as possible. Persons familiar with the exhibitions annually given by this Institute are aware that one of the great troubles with which the exhibitor has to contend is that of sufficient space; as all applications which comply with the rules are considered in the order of their coming, it is therefore evident that better location is secured by the early than by the late applicant. The Exhibition will open on the 13th day of September.

Pigeon vs. Locomotive.

A race between a carrier pigeon and a mail train recently took place from Dover to London. The pigeon was of the Belgian breed, and was "homed" to a house in Cannon street. On the train leaving Dover it was thrown from a carriage, and was observed to circle round for a few moments, when it took its flight in a line between Sittingbourne and Maidstone, which would, of course, be the nearest route to London. Although the railway people were confident in the powers of their locomotive (the Continental express) the bird arrived twenty minutes before the train. The times are not given, but the pigeon must have flown at the rate of fifty miles an hour.

Spontaneous Combustion of Zinc Dust.

Zinc dust, so called, is a fine, grayish powder, used extensively in dye works, and consists of 40 per cent zinc, 2½ per cent lead, 4 per cent cadmium, 50 per cent oxide of zinc, 3½ per cent carbonate of zinc, and some non-metallic dust. Such zinc dust becomes spontaneously incandescent at the presence of moisture, and has been known, says *Dingler's Journal*, to cause conflagration on shipboard.

Davyum—A New Metal.

Another new metal has been discovered. M. Sergius Kern, of St. Petersburg, has found in platinum "ores" a new metal which appears to occupy a place midway between molybdenum and ruthenium. He is studying its physical and chemical properties, and proposes to call it Davyum, in honor of Sir Humphrey Davy. Platinum is found in the metallic state in alluvial deposits; but is rarely, if ever, pure, being generally alloyed with iron, palladium, osmium, iridium, and copper.

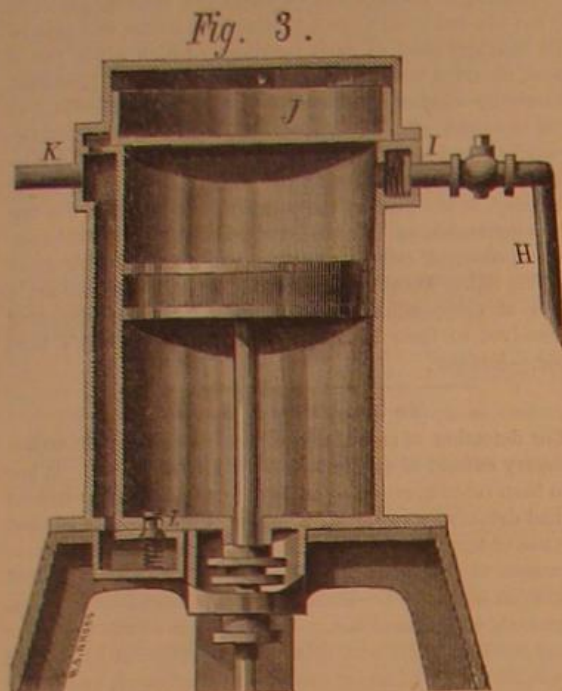
Solubility of Sulphur in Acetic Acid.

Liebermann draws attention to the fact that sulphur is soluble to a not inconsiderable degree in warm concentrated acetic acid, while a trace is taken up even by the dilute acid. If the concentrated solvent be diluted with water, much of the sulphur separates as "milk of sulphur;" if it be concentrated with the Bunsen pump, fine long prisms of sulphur separate; when cooled, the liquid deposits sulphur in a crystalline form. All modifications of this element appear to be taken up by acetic acid. The author points to cases in analysis where these changes occur, and are apt to mislead the operator.—*Wiener Anz.*

SILVER was first coined by Phidon, King of Argos, about about 860 B. C., the epoch of the building of Carthage, and about 140 years after the construction of Solomon's Temple.

[Continued from first page.]

ton lift the valve, J, and allow the gas to pass out into the pipe and from thence to the condenser through K. As, however, the gases contained in the portion of the pipe between the pump cylinder and the check are compressed, but not forced out, if the piston should descend with this pressure

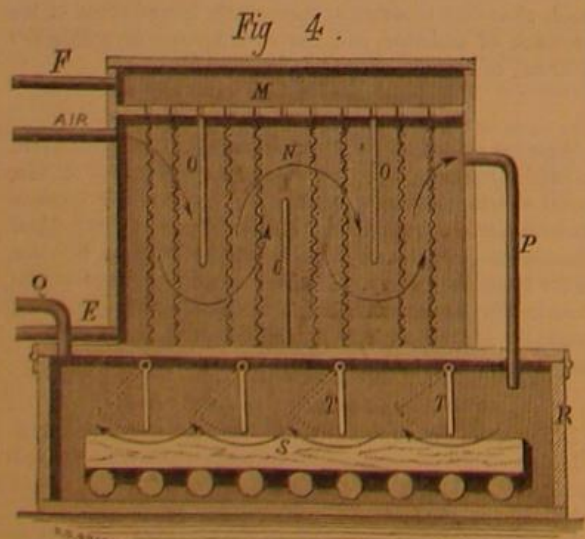


ure of gas retained here, it is obvious that the gas would expand, and, by partially filling the chamber, prevent the perfect exhaustion of the gas cylinder. To provide for this, the piston in its upward stroke passes the orifices of pipe, H, so that the compressed charge of gas is held in the confined space and is liberated beneath the piston, and upon its descent is driven out through the valve, L, at the bottom into a pipe that communicates with K. It will be observed that the face of the piston, in rising, strikes against the bottom of the cup valve and lifts it, and upon the reverse stroke the valve seats itself upon the flange of the cylinder, while the plain ground face of the piston departs from the plain ground bottom of the valve it produces as nearly a perfect vacuum as possible to attain in a pump, there being practically no cushion of gas left between the valve and piston.

As the gas is delivered to the condenser it is made to traverse coils and is cooled by the circulation of water of the normal temperature which passes through the condenser. As the gas is liquefied it passes into the receiver, where it accumulates and is fed from time to time back into the refrigerator cylinder.

As the non-congealable liquid in the coil of the refrigerator circulates, it passes out through the pipe, F, to the distributing pan, M, Fig. 4, where its temperature is to be transferred to the air circulating in the subjacent case, N. The upper case is provided with a distributing pan, into which the cooled liquid is admitted. The bottom of the pan has perforations which are arranged in rows immediately above a series of vertical partitions of wire gauze, between which are arranged the vertical baffle plates.

As the cooled liquid drops through the perforations in the pan, it falls upon the wire partitions, and being retarded in its descent, trickles slowly down, while the current of air driven through the case by the blower is made to pass through and penetrate all parts by reason of the baffle plates, and in so doing takes on the temperature of the non-congealable liquid, which is below the freezing point of water,



and passes into the congealing case at and through pipe, P, and then traverses the pans in the congealing case to freeze the water therein contained, and after having done its duty passes up through the blower and pipe, Q, to be reduced in temperature again.

The congealing case has doors, RR, at each end, and is provided with supporting rollers upon which the pans, S, are fed in at one end and removed at the other.

The apparatus may be made applicable to cooling liquids, as beer, etc. When applied to such purpose, the liquid is allowed to trickle down over the coiled pipes seen at the left of Fig. 1. In a large brewery, where a contract required 560 barrels of water to be cooled from 60° to 38° Fah. in 24 hours, which is equal to the production of 8½ tons of ice from water at 80°, the actual yield of this machine consisted in the cooling of 1,010 barrels of water, which is equal to the production of 16 tons of ice per diem. For this yield the machine required an average of 24 horse power. The apparatus, as shown in Fig. 1, was taken from one in actual use in a large brewery in Philadelphia. It requires but the attention of a single attendant.

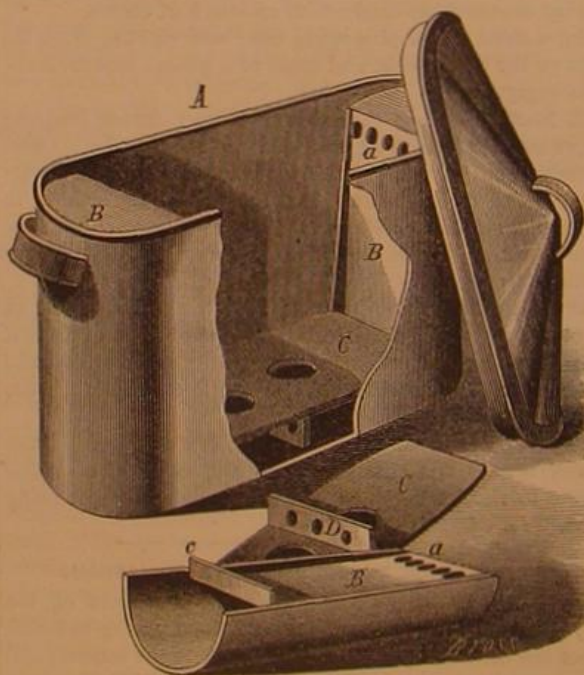
This improved ice machine was patented through the Scientific American Patent Agency, January 31, 1877, by Major D. L. Holden. The pump was patented March 6, 1877. For further information, address D. L. Holden & Bro., Penn. Iron Works, Beach and Palmer Sts., Philadelphia, Pa.

Conjunction of Mars and Saturn.

At the last meeting of the London Astronomical Society, Professor Marth exhibited some diagrams of the triple conjunction of Mars and Saturn, between July and November of this year. The dates of the three conjunctions are: July 27, 5:15 P.M.; August 26, 4:19 A.M., and November 4, 12:8 A.M., all New York time. The last of these occurrences will be the most interesting, from the remarkably close approach of the two planets, the distance between them being only eleven minutes of arc, or about one third the diameter of the moon. Saturn, the greater Infortune, and Mars, the lesser Infortune, of the old astrological systems, may now be found in the southeast before midnight. Mars is daily increasing in brightness, and in the last days of August and the opening days of September will be much more brilliant than he has been since 1845, or will be again till 1924.

IMPROVED WASHBOILER.

This invention relates to that class of washboilers which are constructed with a false bottom, and have passages or conduits leading to the top of the boiler, through which the water, when heated, escapes from below the false bottom.



The form of the boiler, as shown in the cut, is of the usual construction. The two conduits, B B, are made with a straight front piece and with a rounded back piece, which fits into the curvature of the boiler. These conduits are provided with holes, a, at the top, and are made with a projecting shoulder or bracket, c, at the bottom. A false bottom, C, has a perforated brace or cross piece, D, at its inner side, and is provided with openings for the ingress of the water under the false bottom. The ends of this button, C, are cut off straight, so as to rest on the brackets, c.

When it is desired to use the boiler for washing purposes, the conduits are inserted, after which the false bottom is put in position. Upon this bottom the clothes are placed, after being soaped, in layers, abutting against the conduits at each side, and a quantity of water is put in the boiler, which is then placed over the fire. The heated water and steam will be forced up through the conduits, and, escaping through the openings in a continuous stream, is poured with considerable force down upon the clothes, where it mingles with the soap. This flow is constant and uninterrupted as long as the boiler is kept upon the fire.

This improved washboiler was patented June 5, 1877, by Thomas Gunsalus, West Troy, N. Y., to whom apply for further particulars.

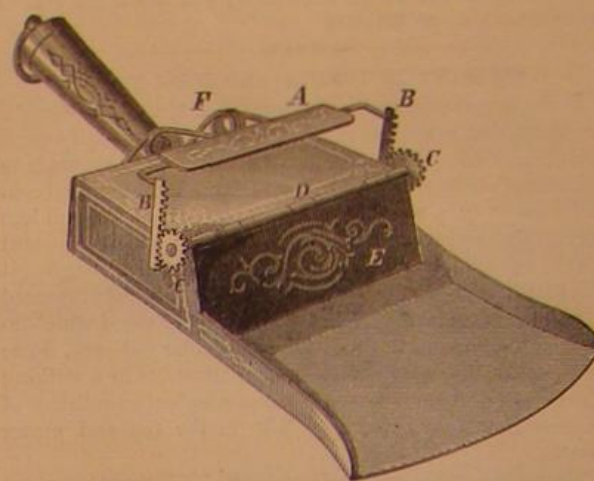
To Remove Tin from Tinned Copper.

Professor Boettger has recently described an easy and practical method of removing the tin from tinned copper vessels or utensils. The vessel to be cleaned is filled with, or immersed in, a solution of sesquichloride of iron. In a few minutes, according to the thickness of the tin, it will be entirely removed, and it is only necessary to polish the copper with sand slightly moistened with very dilute hydrochloric acid.

IMPROVED DUSTPAN.

This dustpan is provided with a recess or box, of convenient size, to hold sweepings, dust, etc. A door is connected in front of the recess or box, and can be opened and shut by means of a lever constructed for that purpose.

The operation is as follows: Pressure on the thumbpiece, A, depresses the vertical ratchet bars, B B, which revolve the cogs, C, with their axle, D, and raises the door, E, when the dust or sweepings can be swept in the box or recess; then,



relaxing the pressure on thumbpiece, A, the spiral spring, F, forces the door in its proper place, and prevents the dust or sweepings from spilling.

Patented May 24, 1875, by Walter J. Parker, of San José, Cal.

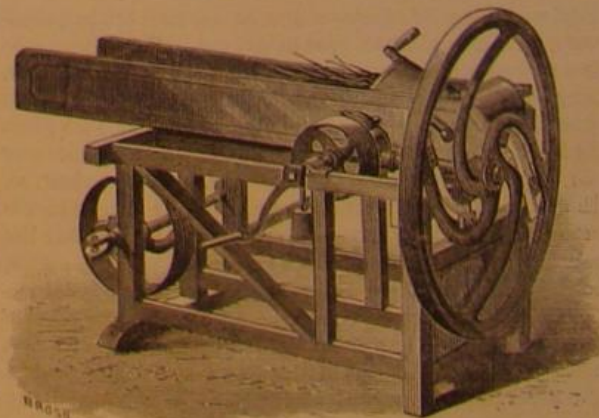
The Great Coal Fields of Ohio.

A district of one hundred miles square, including the counties of Athens, Perry, and Hocking, is the future coal field of this nation. It is to be the "Black Country" of the United States, as the noted district in Staffordshire is the "Black Country" of Great Britain. In fifty years it will probably equal Staffordshire or any district in the world. This district has twenty-two feet of solid coal in five seams. The great vein (properly "bed") is in places twelve feet thick, and nowhere less than six feet. Mingled among the coal beds are inexhaustible beds of iron. The thickest is five feet deep at the outcrop; the thinnest, in places, sinks to six inches. But the thickness of neither seam is quite persistent; there are "waves" from time to time, which narrow the seam. The coal, on the contrary, may be said to run from hill to hill with perfect uniformity. Limestone is also present in any desired quantity.—Nelsonville (O.) Gazette.

IMPROVED FEED CUTTER.

A feed cutter is deemed an indispensable adjunct to the farm and stable. Many forms are used, some of simple while others are of more complicated structure. In nearly all of the cutters, as used, the length of the material as cut is arbitrary, there being no means provided to readily change the mechanism so as to produce cut feed of varying lengths.

The machine which we illustrate in the annexed engraving is intended to obviate some of these difficulties, and can be set so as to cut feed from one quarter inch to one inch. As will be seen in the engraving, the knives are arranged upon and attached to the curved spokes of the fly wheel, and can be set, by means of set and binding screws, to cut the length of feed desired. When operated by hand, the power is applied to cranks, of which there are two, one on each side of the machine, and their rotation, by means of miter gears, causes the revolution of the fly wheel with knives attached. Upon the shaft, to which the cranks are attached, is seen a pulley, which may receive motion from the pulley shown under the rear portion of the cutting box, which pulley,



in turn, may be rotated by a shaft attached to a horse or steam power.

Patented through the Scientific American Patent Agency, July 17, 1877, by Charles Silberzahn and Herman Heyssen, of Sheboygan, Wis., to whom reference is made for further particulars.

DURING 1876 the quantity of fruit canned in Cincinnati was as follows: Tomatoes, 1,200,000 cans; blackberries, 60,000 cans; raspberries, 120,000 cans; cherries, 60,000 cans; damson plums, 72,000 cans; string beans, 36,000 cans; pickles, 6,000 packages; tomato catsup, 500 barrels.

IMPROVED CONCRETE MIXER.

We are indebted to *Iron* for the engravings and description of this mixer, the advantages of which are its portability, compact shape, and self-contained arrangements, which permit of its being easily moved from place to place, and used in different parts of a work, thus dispensing with a mixing platform and measures. Another point is that nothing is left to the judgment of the workman. The proportion of materials is predetermined, as well as the number of revolutions necessary; so that, with but little supervision, a concrete of uniform quality is produced.

The mixing chamber may be said to be of trapezoidal form, with its two longest planes at right angles to each other, rotating on a horizontal axis; this arrangement is adopted in order that the stuff falling from a contracted into an enlarged space or capacity may be thoroughly rolled over, and therefore intimately incorporated. When the chamber is half filled with the materials for making concrete, the whole contents are turned over sideways, as well as endways, four times in each revolution of the chamber, so that in from six to twelve revolutions—the number necessary being varied according to the weight and nature of the materials—a more perfect mixture is effected than can be produced by hand. Fig. 2 shows a vertical section through the mixing chamber, the dotted lines representing the altered view of the mixer after a quarter revolution. Fig. 1 shows the mixer mounted on a stout timber frame supported on four flanged wheels for running on rails, though plain wheels may be substituted for ordinary ground. In this arrangement it is driven by four men by means of gear, which can be adjusted to move the truck along, or can be thrown out when the truck is propelled by other means. The truck also carries, at one end, a tank holding the proper quantity of water for a charge of concrete, and at the other end a davit, from which is suspended a hopper for holding the materials, the cement being supplied in bags, ready for being run into the mixer. This arrangement is adopted for filling concrete into a trench or the heating of a pier, the mixer being supported over the opening on two balks of timber, and a wagon containing the materials following on the same line.

To receive a charge, the door of a mixer is brought uppermost, a catch in the cogs of one of the wheels holding it in that position. The door is allowed to rest on a stay provided for that purpose, as shown by dotted lines in Fig. 2. The hopper containing the materials in proper proportion is swung round on the davit to the position shown in dotted lines; and while the materials fall into the mixer, the water contained in the tank is allowed to run in by a flexible hose. The hopper is then swung clear of the mixer, the door closed, and the requisite number of turns given. To save the necessity of counting or guessing, a simple tell-tale is added for giving notice when a sufficient number of revolutions (as determined by the weight and nature of the materials) has been given. A screw thread is cut on the projecting end of the mixer shaft, and an iron plate with a hole in it is hung on the screw. The rotation of the shaft causes the plate to move towards the end until it drops off, and thus indicates that the determined number of revolutions has been accomplished. For a less number of revolutions, a nut or distance piece of the required thickness is put on the end of the shaft.

When the proper number of turns has been given, the mixer is stopped with the door downwards, the door fastening is released, and the charge of concrete falls in a mass into its place, the discharge being instantaneous. The mixer is then turned, so that the door comes upward again, and refilled as

before. While the mixer is being turned, two men fill the hopper from a wagon with raised sides.

Fig. 3 shows the arrangement of the machine for making concrete blocks for pier and harbor works. The mixer is mounted on a light traveling frame, capable of being moved from one mould to another; and the materials, filled into a large tray, holding from 10 to 15 tons, are lifted on to a raised portion of the traveling frame by the steam traveling crane, which removes the concrete blocks when formed.

It is stated that, with this mixer turned by hand, a gang of six men, with a boy for attending to the water cistern, can make from 30 to 40 cubic yards of concrete blocks, or a much larger quantity of concrete in bulk, in a day, of better quality and at a cheaper rate than can be done by shovel mixing; and that when the mixers are turned by steam, twice these quantities are produced.

Venus' Slippers.

Mr. F. Buckland, in *Land and Water*, says "These slippers are far more beautiful

than anything ever yet turned out in the workshop of a London or Parisian ladies' bootmaker. They are found floating far out at sea in the Mediterranean, on the French coast. Each slipper is about an inch and a half in length, and half an inch in the widest part. They are of a lovely glass-like consistence, and in certain light resplendent like jelly fish. They are the shape of a handsome shoe: the edge of the shoe projects in a very ornamental dentated margin, and the toe part is highly ornamental, as if with embroidery insertion. Mr. M. Latham says: 'It is a kind of jelly fish; I have had considerable difficulty in finding out its real nature. At last I ascertained that it is one of the *pteropoda*, or wing-footed molluscs.' The Rev. J. Wood writes: 'These are so-called from the fin-like lobes that project from the sides, and are evidently analogous to the similar organs in some of the sea snails. These appendages are used almost like wings, the creature flapping its way vigorously through the water, just as a butterfly urges its devious course through the air. They are found in the hotter seas, swimming boldly in vast multitudes amid the wide waters, and one species (*Clio borealis*) has long been celebrated as furnishing the huge Greenland whale with the greater part of its subsistence. The scientific name of it is *cymbulia*, so

called on account of its being so like a boat.' We read: 'Cuvier describes the *cymbulia* as having a cartilaginous or gelatinous envelope in the form of a boat or slipper, beset with points in longitudinal rows; and the animal as possessing two great wings, which are at once branchiae and fins, and between them, on the open side, a third smaller lobe, which is three-pointed. The mouth, provided with two small tentacula, is placed between the wings towards the shut side of the cell, and above are two small eyes. The transparency of the texture permits the internal organs to be distinguished with great facility. The shell is cartilaginous, translucent, oblong in the form of a slipper, and entirely covered with a delicate and scarcely visible membrane.'

"These slippers of the Marine Venus are so beautiful in form and structure that I propose, if possible, to have a model of them cut in crystal. In the form of ear rings they would make very pretty ornaments, as showing the *chausure* of Cinderella of the Ocean."

Fig. 1.

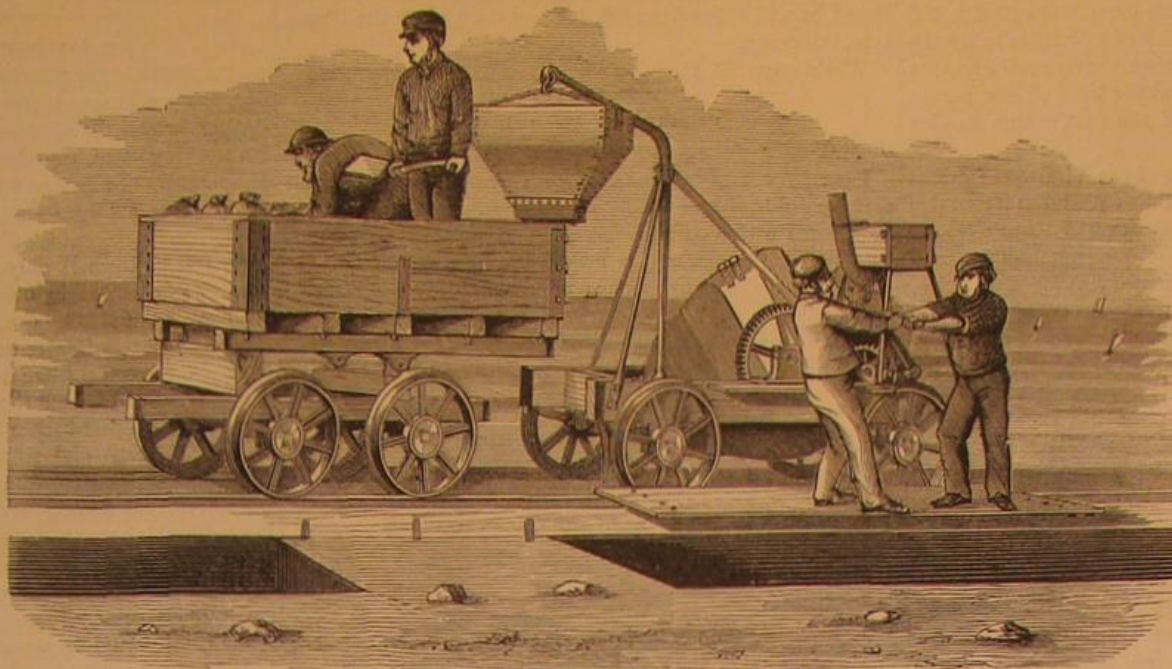


Fig. 2.

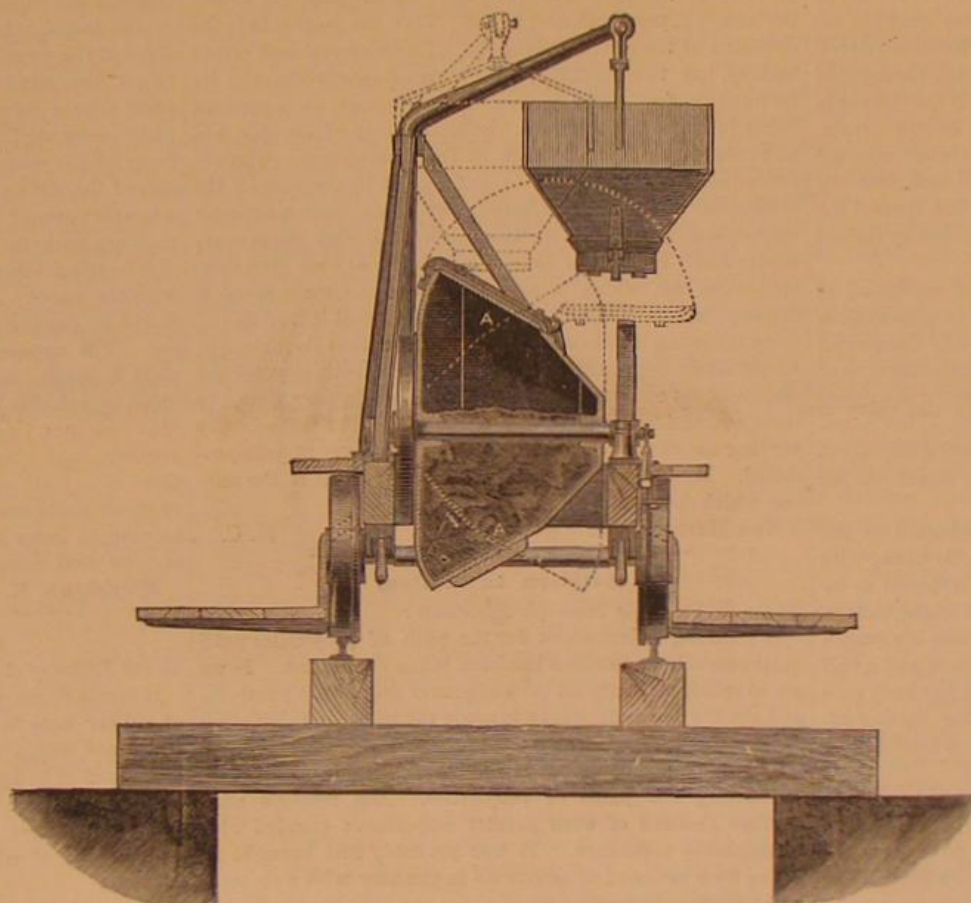
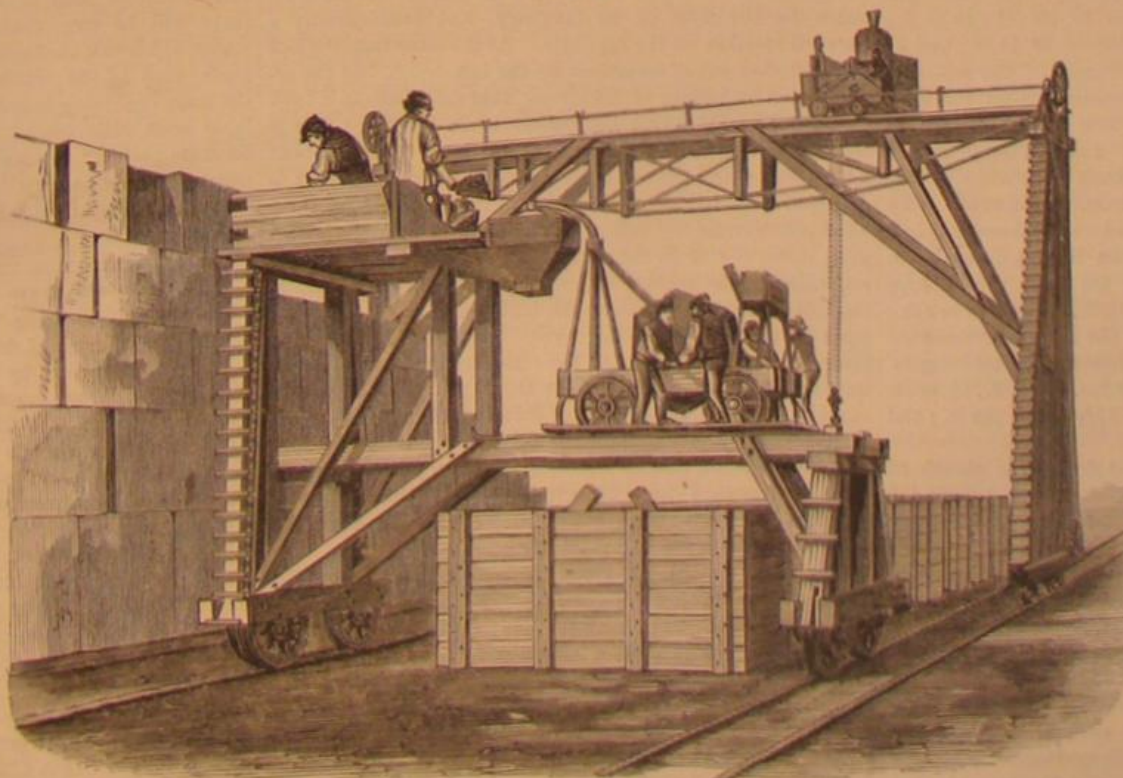


Fig. 3.



MESSENT'S IMPROVED CONCRETE MIXER.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

In a previous letter I mentioned a decision of the Commissioner of Patents in the matter of Mr. Sargent's application for a patent on combined time and combination locks, awarding priority to Sargent. Since that decision the attorneys for the Yale Lock Co., the opposing party, have filed a bill in the Supreme Court of the District of Columbia to try the title to the invention *de novo*, and subsequently made a motion before the Commissioner to suspend the issue of the patent to Sargent until the termination of the suit, which motion has been granted.

For two or three years past some of the Virginian farmers have been complaining of what they called the "root disease" in their wheat, and this season some of them wrote to the Commissioner of Agriculture requesting him to send some one down to investigate the matter. Professor Taylor, the microscopist of the department, was accordingly sent to examine into the matter, and after spending some days there returned and reported that no such disease as was reported existed. From his investigation it appears that the soil in the locality said to be infected with the disease was simply worn out, and that the report of the disease is said to have arisen from the fact that one of the farmers, observing barren spots in his wheat fields, examined the roots of his wheat at such points and discovered what seemed to him a peculiar web-like appearance, which he supposed to be of fungoid character; and this explanation of the presence of such barren spots appears to have been accepted without question by so many others that the "root disease" came to be considered as an established fact; and in some places farmers had abandoned wheat growing on account of it. Professor Taylor examined this supposed fungoid matter with the microscope, and found it to consist only of the minute rootlets of the plant itself. An examination of the wheat growing on the barren spots and that on more favored localities developed the fact that, the more vigorous the plants, the more of these rootlets there were, showing conclusively that this supposed "root disease" was no cause for the barren places. Mr. Taylor is convinced that the barren spots referred to are due solely to the lack of nutriment in the soil, and that the failure of wheat in such places, which really has formed the only ground of complaint, may easily be remedied by the use of fertilizers and proper treatment of the soil.

The monitor Wyandotte, just manned and equipped at our Navy Yard, was on the verge of going into commission and about to put off to sea, when it was suddenly discovered that she was leaking badly along one of the seams from near her bow to aft of the turret. A board of survey was at once formed, which, after due examination, condemned her as unseaworthy. It seems rather curious how a leak of the extent reported should fail to be discovered until the vessel was all ready for sea.

Several experiments have recently been conducted on the United States steamer Hartford by Captain S. B. Luce, with a patent magneto-electric lamp, which it is proposed to introduce into the navy for distant signalling at night, detecting the approach of boats or torpedoes, picking up buoys, etc. The lamp produces a steady light for three and a half hours, which is visible for fifteen miles. One has been purchased for the Hartford, which will be used for further experiments to determine as to the advisability of introducing these lamps into general use in the navy.

Some time since the Treasury appointed several commissions to examine the question of the rates of drawback on the exportations of sugars and syrups refined from imported raw sugars, and the following are the recommendations of the Baltimore, Boston, and New York commissions:

The majority of the Baltimore Commission recommend that the existing rates of drawback, namely, $3\frac{1}{10}\%$ cents per lb. on refined hard sugar; 3 cents per lb. on soft, 20 D. S., in color; $2\frac{1}{2}$ cents per lb. on soft, below 20 D. S.; and $6\frac{1}{2}$ cents per gallon on syrup, be left unchanged. The minority report of the same commission recommends that for hard sugars produced by refiners using raw sugars known as "Centrifugals" and "Vacuum Pan," a reduction of $\frac{1}{10}\%$ of a cent be made from the present for each per centum of raw sugars of that description operated upon. This would make the drawback on hard sugars produced wholly from this class of raw sugars $3\frac{1}{10}\%$ cents per lb. The Boston Commission recommended the following rates: On hard sugars, $4\frac{1}{10}\%$ cents per lb.; on soft, above No. 20 D. S., $2\frac{1}{10}\%$ cents per lb.; and on syrup, $6\frac{1}{2}$ cents per gallon. The rates recommended by the New York Commission are as follows: On hard sugars, 3 cents per lb.; on soft sugars, above No. 20 D. S., $2\frac{1}{2}$ cents per lb.; on soft, No. 20 and below, $2\frac{1}{10}\%$ cents per lb.; and on syrup, $5\frac{1}{2}$ cents per gallon.

The Bureau of Statistics report that during the month of June there were exported from the United States 2,832,116 yards of colored and 7,855,300 yards of uncolored cotton cloths, which with other cotton goods exported are valued at \$939,831. During the past fiscal year, the total value of cotton goods exported was \$10,180,984. During the preceding year the total amounted only to \$7,722,978.

A short time since the Treasury advertised for bids for printing bank checks at so much per thousand, and there was so much rivalry between the American Phototype Company and the Graphic Company that each of them determined to get it if possible. The Phototype Company bid for the job at $\frac{1}{100}$ of a mill per thousand; and the Graphic, not

to be beaten, offered to do it for nothing, and the contract was awarded to the latter as the lowest bidder. The Phototype Company now appear by counsel before Assistant Secretary French and ask that the contract made with the Graphic Company be set aside, on the ground that the bid of the latter was not in accordance with the terms of the advertisement, which called for bids "at so much per thousand," and that "nothing" was not so much per thousand. The Secretary has not given his decision yet, but it is believed he will differ from the learned counsel of the Phototype Company.

Washington, D. C.

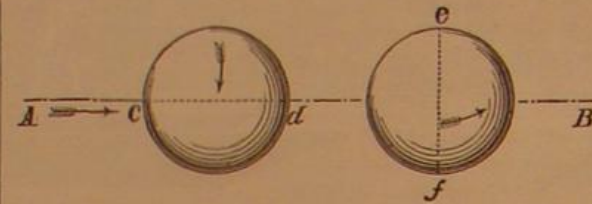
OCCASIONAL.

Curving a Base Ball.

To the Editor of the Scientific American:

I see by a reply to one of your correspondents that you seem to doubt the possibility of this feat. That a ball may be thrown with a curve seems to be an undisputed proposition among players, and it may, I think, be accounted for on the principle of unequal momenta of different parts of the ball.

Let us suppose that the ball is thrown in the direction A B, as shown in the cut, with no attempt at a curve. It will



probably leave the pitcher's hand spinning on an axis, *c d*, in the direction of the arrow. Assuming this axis to be perfectly horizontal, the ball will move in a straight line to B, or rather in a parabola in a vertical plane. Now suppose the pitcher, on letting go the ball, to bring the axis, *c d*, to the position, *e f*, perpendicular to *c d*. Then the motion is in the direction of the arrow around *e f*. The posterior half of the ball, *e f*, has two motions, its motion of revolution and its forward motion. The forces which produce these motions being in opposite directions, the momentum of the side will be produced by the difference of their resultants. The anterior half, however, must be influenced by the sum of the resultants of its similar forces, and hence have a superior momentum. And also the side having the least momentum would affect the ball so as to draw it in its own direction. Hence the ball, which is supposed to be thrown toward B directly, would curve off and strike at a point left of B.

By throwing the ball in such a manner that the axis, *c d*, would attain the position, *e f*, at a point a little beyond the middle of its course, the first half of its trajectory would be nearly straight, and it would curve off on the second. By varying the direction of revolution other curves may be produced. My theory is perhaps not correct, but it is the only one which appears at all satisfactory to me.

New Haven, Conn.

H. C.

Rotation in Motion.

To the Editor of the Scientific American:

In making calculations for the path of projectiles until quite recently no account has been taken of rotation. If we are to speak correctly no projectile ever describes a parabola, and yet the parabolic curve is made the basis of calculation for all practice in gunnery.

The resistance of the air is no inconsiderable element in calculating the paths of projectiles. But rotation adds another element of even greater importance coupled with atmospheric resistance. It was probably first brought to notice by a series of experiments in gunnery with a smooth-bored piece. In leaving room about the ball for windage it was noticed that the ball balloted from side to side in passing out the piece. The last ballot gave the ball a backward rotation on the side of its tangency, and consequently a forward rotation on the free side. At the same time the ball was deflected out of its course by the last touch, but the accumulated resistance of the air on that side deflects it back again. Thus if a ball last ballots upon the right side it receives a right hand rotation (looking down upon it) about a perpendicular axis. At the same time by touching it is deflected from its course to the left. But owing to its right hand rotation the left side of the ball comes in contact with more molecules of air than the right, and encounters greater resistance. The compression of the air on that side deflects the ball to the right. Hence the ball describes a curve aside from the so-called parabolic curve. If the ball had balloted last on the left side it would have received a left hand rotation and first been deflected to the right and afterwards curved to the left, on account of greater resistance of the air on its left. By balloting on the bottom last it would first rise and then fall, and by balloting on the top last it would fall and afterward rise. Thus it is possible with a smooth-bored gun to shoot round a near object and hit a remote object when both are in a right line.

A ball may be thrown from the hand so as to show the same remarkable effect of rotation. By throwing the ball so as to retard the motion on the left side as the ball leaves the hand, the ball receives a left hand rotation; if the angular velocity is as great as the velocity of translation, the left side meets almost no resistance, while the right meets a double resistance equal to both angular and forward. The air is compressed ahead and to the right of the ball, and it is deflected toward the left. Sometimes this deflection amounts

to five or six feet in a course of fifty feet. If the ball is thrown with a right hand rotation it comes round to the right. If a forward rotation (like that of a ball rolled along the floor) the ball will curve down much sooner than it would acted upon by gravity alone. If the rotation be backward, the ball will curve upward until gravity overcomes its initial velocity, and it does not begin to fall as soon as when acted on by gravity alone.

J. G. McMurphy.

Racine, Wis.

An Artificial Summer Shower.

To the Editor of the Scientific American:

A few weeks ago, while thinking with some anxiety of the dangers which the approaching hot weather might bring to his teething child, the idea occurred to the writer that the temperature of a heated room might be lowered by keeping the window awnings saturated with water or any volatile fluid.

By this means not only would the air which entered the windows be cooled by contact with the cool wet surface of the canvas but also by evaporation of the moisture from the awnings. Accordingly, on the following day, a brass tube having an internal diameter of $\frac{1}{4}$ of an inch was so placed that it would lie across the outside surface of the awning at a distance of a few inches from the upper edge, which is attached by hooks and rings to the house. The ends of the tube, being bent at right angles to the tube, hung down by the sides of the awning about 6 inches. All along the side of the tube which touched the awning were drilled, at intervals of 3 inches, holes about the size of a pin. One end of the brass tube was closed and over the other end was slipped a small india rubber tube. This tube was carried in at the open window and connected by an ordinary screw coupling to the nearest cold water faucet. The awnings of three windows of the nursery having been supplied with this simple apparatus, the water was turned on, and, after passing through the rubber tubing, escaped through the perforations in the metal tubes and, flowing evenly over the front and sides of the awnings, dripped upon the tin roof of the porch below the windows—a miniature summer shower. In a short time a refreshing coolness and moisture of the atmosphere reminded one of breezes blowing into the windows from off the surface of a lake. A thermometer hung outside of the window under the awning, while still dry, showed a temperature of $97\frac{1}{2}^{\circ}$ Fah. Upon turning the water on, the mercury sank in 15 minutes to 90° Fah., the thermometer still hanging below the awning, but protected from contact with the water. A still more marked effect might be produced by passing the rubber tube through a pail of broken ice. The apparatus is inexpensive; the amount of water used is small, while the comfort it might bring to a sick child or a feeble invalid might be very great. The apparatus does not interfere with the raising or lowering of the awning; and should the dripping be objectionable where there is no roof below to receive it, a small gutter of canvas or metal could readily be attached to the lower edge of the awning to carry off the water; or a smaller flow of water may be used, enough only to keep the canvas moist.

Morristown, N. J.

HENRY N. DODGE, M.D.

India Rubber Hose.

To the Editor of the Scientific American:

It seems to me that a little more care in the manufacture of rubber hose would double, treble, quadruple its value. It is lined with a thin coat of rubber, which is supposed to be so perfect in its continuity as to protect the cotton body of the hose from water, but it is not so. There are many points in it where water finds its way through, so that the cotton duck, of which the body of the hose is made, soon decays.

I have a large quantity of inch and a quarter garden hose, two or three years old, that has become quite troublesome. Each piece of hose is fifty feet long, and in each length there will be two, three, four, or more spots where the water will break through, although the bad parts are not a tenth part of the whole, that is, of the entire length of the hose; the lining membrane of rubber seems to be perfect in at least nine tenths of it. Why cannot the other tenth be made perfect? It seems to me the additional cost of manufacture would be very little more, but the value of the hose would be at least doubled.

Portland, Me.

N. D.

Fish from an Artesian Well.

At a recent meeting of the San Francisco Academy of Sciences, specimens of fish, supposed to be trout, were presented, accompanied by a letter from Thomas R. Bard, of Hueneme, Ventura county, Cal. They were thrown up from an artesian well 141 feet deep near that place. The well, which is nearly 300 feet deep from high water mark, was bored in 1871, and ever since has thrown out immense quantities of freshly spawned fish in April and May. The first fish this year were observed in March. The well is capped, having three two-inch apertures, from one of which people were in the habit of filling barrels of water for household uses. In that way the presence of fish was discovered in 1872. The cap was removed and fish were ejected in incredible quantities, until the cap was replaced. The fish are said to be of various sizes, the largest about an inch in length. The nearest stream where fish are found is Santa Paula Creek, twenty-five miles from the well, but it empties in the Santa Clara river, at a point twenty miles distant.

THE WATCH—ITS INVENTION AND HISTORY.

In our last issue we gave an account of the history of the invention of the watch; and this week we resume the subject, but confining ourselves more to its introduction into society and describing some of the more remarkable specimens now in existence.

In the early days of watchmaking, from their comparatively high price, watches were great rarities, and were found only in the hands of the very wealthy, but it soon became the rage among those who could indulge in such a luxury to make collections of them, and among others Charles V., who, it is said, after retiring from his throne to a monastery, spent much time in trying to make a lot of watches all keep time alike, which he could not do, from which he sagely drew the conclusion that he must have been a great fool to spend so much blood and treasure as he had done to make men all think the same way, when he could not even make a few watches agree. The story further states that one of the monks entering the king's cell accidentally upset the table on which the watches were placed, upon which the king remarked that the monk had easily accomplished what he himself had vainly tried to do—to make the watches all go together.

Diana of Poitiers, the mistress of Henry II., being a widow, the courtiers of the period, to ingratiate themselves in her favor, used to present her with watches in such shapes as coffins, skulls, etc., and it became the fashion to have them made in this lugubrious style. Mary, Queen of Scots, is said to have had several such, and she gave one to Mary Letoun in 1587, which is still in existence. It was made by Moysse, of Blois, France, and has been thus described: The watch has a silver casing in the form of a skull, which separated at the jaws so as to expose the dial, which is also of silver, occupying about the position of the palate, and is fixed in a golden circle with the hours in Roman letters. The movement appropriately occupies the place of the brains, but is enclosed in a bell, filling the hollow of the skull, which bell is struck by the hammer to sound the hours. The case is highly ornamented with fine engravings, showing on the front of the skull Death standing between a cottage and a palace; in the rear is Time devouring all things; on one side of the upper part of the skull are Adam and Eve in the Garden of Eden with the serpent tempting Eve; on the opposite side is the crucifixion. Inside on the plate or lid is the Holy Family in the stable, with the infant Jesus in the manger and angels ministering to him. In the distance are the shepherds with their flocks, etc. The works are said to be in good order and to perform astonishingly well.

Many of the watches of this period, besides being made of the peculiar shapes before mentioned, were set in crystal cases, so that their works might be seen in motion; others were set in perfume and snuff boxes, saddle pommels, canes, and at a later period in finger-rings, shirt studs, bracelets, and other articles of personal wear; and it is said that a striking watch, small enough to be mounted in a ring, was made by an Italian goldsmith as long ago as 1542.

Queen Elizabeth had a large number of watches, many of which were presented to her by her favorites, or those who wished to become so. There is a list extant of over a score of these articles which she owned. Many of these are mentioned as "clocks," but it is evident from the context that most of them were watches.

Lady Fitzgerald, an English lady who has several remarkable watches of different periods, has one of Elizabeth's time which is in the form of a silver duck, with the feathers in chased work. The lower part opens to expose the dial plate, which is of silver encircled with a gilt design of floriated scrolls and angels' heads. At the back of the neck is a ring to which a chain is attached. The same lady has one representing Jupiter and Ganymede, with the movement contained in the body of the bird. It is so made that, when not suspended to the girdle by a ring in the bird's beak, it will stand on its claws. She has also a cruciform watch of about 1700, covered with elaborate engravings of a delicate character. The center of the dial plate has a representation of Christ's agony in the garden, the outer compartments being occupied by the emblems of the passion and the lowermost by a figure of Faith.

A watch said to have been made by Hans John, of Königsberg, about the 17th century, is stated to have the earliest known instance of a chain on the fusee, and it is peculiar in other respects, as it has a small wheel-lock pistol to serve as an alarm.

Watches were such a rarity in 1630 that it is said a Dr. Allan, who had the reputation of being a wizard, happening to leave his watch in a bedroom in a house where he was visiting in the country, came near losing it because the chambermaid who found it thought it was the doctor's "familiar spirit." She therefore took it up with a pair of tongs and threw it out of the window into the moat "to drown the devil," but as "one who is born to be hanged cannot be drowned," the watch, when search was made for it, was found hanging on a bush growing on the bank of the moat, on which it had accidentally caught in its flight through the air. This failure in her attempt only the more confirmed the girl in her idea, and she could not be prevailed upon to touch the watch. Thirty-five years after this Poppe, in his diary (December 22, 1665), made the following entry, which shows that even then the sight of the internal mechanism of a watch was so much of a curiosity that he was "mightily pleased and satisfied with it." "I to my Lord Brouncker's and there spent the evening, by my

desire, in seeing his lordship open to pieces and make up again his watch, thereby being taught what I never knew before, and it is a thing very well worth my having seen and am mightily pleased and satisfied with it."

Watches after this period and during the eighteenth century came gradually into use among the wealthier people, but they were still of great cost, which was further increased by excessive ornamentation and by many of them being made as repeaters, which were then the fashionable watches. Another style of watch was also then in vogue, called "touch watches," with which the time could be felt in the dark. These watches were made of different styles, one of the best of which had projections on the back corresponding to the different hours on the face, and a movable or independent hand which could be turned round with the finger until it was opposite the hour hand, when it could be moved no further.

In 1769 George II. had a watch presented to him of which one hand took a year to make a revolution, and was used to point out the month and day of the month. It also had a brilliant to represent the sun, set on a plate which regularly revolved to perform its apparent diurnal revolution. On the plate was a movable horizon to show the variation of the days according to the season of the year.

In the same year Ranzonet, a Lorraine watchmaker, made a watch of the common size containing a musical instrument that played an *air en duo*, and none of the parts of the musical mechanism interfered with the time works.

In the Museum of Dover, England, is a watch of about the same date as above, of an oval shape, like the Nuremberg eggs, having two movable dials, one having the numerals of the month, etc., and near the center are the signs of the zodiac; the fixed part around which it revolves has the abbreviated names of the months. The outer dial has merely the hours upon it. There is also a revolving plate below the surface bearing upon it the days of the week. Other apertures show the month and the day of the month, and another the moon's position. The hands move in the opposite direction to those of the watches of the present day.

During the reign of Catherine II. of Russia, Kalutin, a peasant, made a musical repeating watch about the size of an egg, which had within it a representation of Christ's tomb with sentinels on watch. On pressing a spring the stone would be rolled from the tomb, the sentinels fall down, the angels appear, the holy women enter the sepulchre, and the same chant which is sung in the Greek church on Easter eve accurately performed. It is now in the Academy of Sciences at St. Petersburg.

About 1770 it became the fashion to wear two watches. In a rhyming receipt of this date, "To Make a Modern Fop," appear the lines:

"A lofty cane, a sword with silver hilt,
A ring, two watches, and a snuff-box gilt."

The ladies soon adopted this fashion, but as watches were still very expensive, mock watches were often substituted, some being of costly materials while others were cheap imitations. The Chinese of the present day wear two watches when they wear any at all, for the reason "spose one make sick and die" the other one "still lives." Chinese time-keepers have twenty-four hours shown on the dial.

Keyless watches now so much worn have long been known but have not been used much until of late years. Napoleon I. possessed one that at every step he took caused a weight to act on the end of a lever having a weak spring under it, which was attached to a click working into a ratchet wheel on the barrel arbor and so wound up the main spring. In the Kensington Museum in London there is a pedometer, operated in a similar manner, combined with a watch, so that the same instrument tells the time and also the distance walked by the wearer during the day. A watch in the United States Patent Office is wound up by closing the case after looking at the face to see the time. It has an attachment to throw the winding device out of gear when the spring is wound up.

Among the remarkable watches may be cited one on exhibition in New Haven, Conn., which is thus described by Mark Twain:

"I have examined the wonderful watch made by M. Matile, and it comes nearer to being a human being than any piece of mechanism I ever saw before. It knows considerable more than the average voter. It knows the movements of the moon and tells the day of the week, the month, and will do this perpetually; it tells the hour of the day, the minute, and the second, and splits the seconds into fifths, and marks the divisions by stop hands; having two stop hands, it can take care of two race horses that start one after the other; it is a repeater, wherein the voter is suggested again; musically chimes the hour, the quarter, the half, the three-quarter hour, and also the minutes that have passed of an incomplete quarter hour—so that a blind man can tell the time of day by it to the exact minute. Such is this extraordinary watch. It cyphers to admiration. I should think one could add another wheel and make it read and write; still another and make it talk; and I think one might take out several of the wheels that are already in it, and it would still be a more intelligent citizen than some that help to govern the country. On the whole I think it is entitled to vote—that is, if its sex is of the right kind."

When speaking of curious watches we should not forget that the commonest watch made would, if it were the only one in existence, be considered a marvellous piece of workmanship, hardly second to any of man's creation, but as every one now carries a watch, it barely excites more

curiosity than a pocket-knife. Independent of the completed watch as an automatic machine, let us consider some of the curiosities of its manufacture. Take, for instance, the small screws, some of which are so small that they look like grains of fine sand, and will require 150,000 to weigh a pound, yet all of these when examined under a microscope look like finely finished little bolts, each having a perfect thread, although so fine as to take 250 turns to measure one inch. These screws are now made by the American Watch Company by an automatic machine, which only requires to be supplied with the necessary quantity of wire and power to keep it in motion, to turn out these infinitesimal screws all complete, except tempering. If we examine the chain used in most English watches we find it to be only about six inches long, and yet it has 630 pieces in it. The hair-spring may also be considered as one of its curiosities. To the naked eye it looks like a hair, but under a glass it is shown to be a flat steel ribbon, which a suitable gage will show to be only $\frac{1}{16}$ of an inch thick, or about one half the thickness of a hair; and although from six to eight inches long, yet it is said that it takes about 25,000 to weigh a pound. It has been frequently cited as an instance of the value given to raw materials by manufacturing into finished articles, as a pound of finest hair springs, selling for thousands of dollars, may be made from metal which in its crude state cost but a few cents.

Leaving the component parts of the watch and considering the number of ticks the completed article will make, we arrive at some extraordinary figures. Many watches make five ticks per second, 300 each minute, 18,000 in every hour, and 432,000 per day. Thus we see that by a half dozen turns of the key once a day, occupying a few seconds, we store up a modicum of power in the spring that is cut up into near a half million of beats which are spread over the whole day, any successive two of which are precisely the same distance of time apart as any other succeeding two at any time of the day or night. If, now, we multiply the daily beats by 365, we shall obtain the number of beats in a year, which are 157,788,000—a number of which we can have but a slight conception, except from some calculation of this kind, although it may help to give us some idea of our national debt. If our worthy Secretary of the Treasury should engage to pay off this debt and should detail a sufficient number of clerks to put down a dollar for every tick of a watch, night and day, it would be over thirteen years before they would get through with their job of paying off the principal—to say nothing of the interest. This, however, is a digression, and we had better return, as the French say, "to our moutons"—or rather, our *montres*.

Many of our elderly readers no doubt remember the printed "watch papers" that used to be put by the watchmakers, as business cards, into the bulky watches used by our grandfathers. These were sometimes enlivened with a couplet or verse, some of which seem worth preserving, for instance, this one, which hath a flavor of worldly wisdom:

"He that wears a watch, two things must do:
Pocket his watch and watch his pocket too!"

Or this one, which savors more of heavenly things:

"I labor here with all my might
To tell the hours of day and night;
Therefore example take by me,
And serve the Lord as I serve thee."

As one of the "Curiosities of Literature" connected with watches, we may cite the following, which can be seen in the churchyard at Lydford, Devonshire, England, and is something in the style of Benjamin Franklin's celebrated epitaph:

"Here lies in a horizontal position
The outside case of
George Routledge, Watchmaker,
Integrity was the main spring and prudence the regulator of
all the actions of his life;
Humane, generous, and liberal,
His hand never stopped till he had relieved distress;
So nicely regulated were his movements that he never went
wrong,
Except when set agoing by people who did not know his key;
Even then he was easily set right again.
He had the art of disposing of his time so well
That his hours glided away in one continued round of
pleasure,
Till in an unlucky moment his pulse stopped beating.
He ran down Nov. 14, 1802, aged 57,
In hopes of being taken in hand by his Maker,
Thoroughly cleaned, repaired, wound up, and set agoing
In the world to come when time shall be no more."

Test for Free Sulphuric Acid in Vinegar.

The impression popularly prevails that vinegar is frequently strengthened by the addition of sulphuric acid, hence numerous tests for this acid have been proposed. Natural vinegar contains sulphates, hence chloride of barium always forms a precipitate, whether sulphuric acid has been added or not. The simplest test for free acid is that proposed by G. Witz, namely, methyl-aniline violet. Acetic acid has no effect upon this dye, but the smallest trace of free mineral acid, hydrochloric, sulphuric, or nitric, changes it to green or bluish green. To make the test he dissolves 1 part of methyl-aniline violet in 2,000 parts of water (5 centigrams to 100 c. c.) and adds a single drop of this solution to about 25 c. c. ($\frac{1}{4}$ ounce) of the vinegar to be tested. If the slightest amount of sulphuric acid has been added to the vinegar the above mentioned change of color is noticed.

IMPROVED CARPET LOOM.

The loom herewith illustrated is the invention of Mr. Josiah Gates, and has a considerable number of practical improvements embodied in its construction, which mark it as a distinct step in advance of our present looms. One prominent feature is the use of a combined set of reciprocating and revolving shuttle boxes, thus allowing an exceptionally large number of different colors or shades to be used when desired, namely, as many as sixteen. The use of shaded colors in producing a graduated succession of tints in lighter and darker shades is certainly a most artistic improvement over the vividly contrasted colors so largely in use in our present carpet and general woven fabrics.

The use of the combined set of revolving reciprocating shuttle boxes permits the use of a few shuttles only when a small number of colors are all that are required. That is to say, the three upper shuttle boxes and the uppermost box of the revolving set make a set of four reciprocating shuttle boxes without the use of the revolving gear at all, which may then be thrown out of action, and all the wear and tear of its working parts thus be saved. The reciprocating and revolving action of the shuttle boxes are obtained in the ordinary way by the use of fingers upon the usual perforated cardboard pattern, and which, upon dropping through the pattern, cause the corresponding shuttle box to be brought into the requisite position for delivery across the material.

The loom is fitted with a peculiar double-beat lay, and combined positive motion of the shuttle, which is of great value in the weaving of heavy fibrous material, such as rattan, matting, and other long coarse fibrous substances. The double-beat lay is obtained by means of grooved cams upon the main shaft, and acting upon connecting rods or levers slotted on the shaft and connected with the lay, the cams being constructed with two eccentric operating or pressing points and a depression between them. At each revolution of the shaft and the cams the two eccentric points of each cam successively act upon the roll of the slotted lever, and thus produce the double beat or repeating action of the lay. Either of the eccentric or operating points of the cams may be varied, and one may extend beyond the other to produce one full beat and one partial beat, which in some cases may be preferable, as the repeating action is intended for clearing the sheds and for more thoroughly beating up the filling. By giving the second beat a greater amount of force a firmer and closer texture of fabric may be produced, since the second beat of the lay takes place on the cross shade or as the new shade is formed.

A double-beat action of the lay has already been used in England in many looms; but to the best of our knowledge, it has hitherto been produced by the duplex action of a toggle joint, which can only give two successive blows of equal travel and intensity. By the use of the double-throw cams in the Gates loom the two beats may be timed at any suitable interval after each other, and the blows may be varied in intensity to suit any requirements.

This loom is also provided with an improved take-up apparatus, in which the tension is very ingeniously exactly

suited to the draught of the material so as at no time to injuriously strain the fabric. This improvement we illustrate in detail, Fig. 2. A* represents the cloth roll, and it has a ratchet wheel, B, on one end, a little inside the sword, C, rising from the rocker shaft, E, and arranged to work in the usual way. The cloth roll is shorter than the loom, and it is supported in bearings on an open bracket, D, project-

or part of the frame. The backward and forward motions of the sword impart the same motions to the lever and the pawl, *g**, causing the latter to engage with the teeth of the wheel, and when the cloth is slackened by the introduction of filling in the web, and by the action of the let-off mechanism, the motion and power of the oscillating sword causes the connected pawl, *g**, to turn the wheel and the roll,

and to wind up the cloth as fast as it is woven. The introduction of the tension spring, K, is here most valuable. At some occasions during the weaving of the cloth and the winding, the rate of let-off may not exactly correspond to that of the winding on, and at the same time there is always a certain tension most suitable for taking up the cloth. When the forward motion of the sword brings the pawl into contact with the tooth of the wheel, the wheel may be either driven forward, or, if the resistance be great, the spring, K, will yield and allow the end of the lever, H, to depress under the action of the rock of the sword, instead of the ratchet wheel being driven by the pawl. The tension with which the cloth is wound up will thus depend upon the tension of the spring, and thus will remain tolerably regular, and may be adjusted to any required winding-up tension.

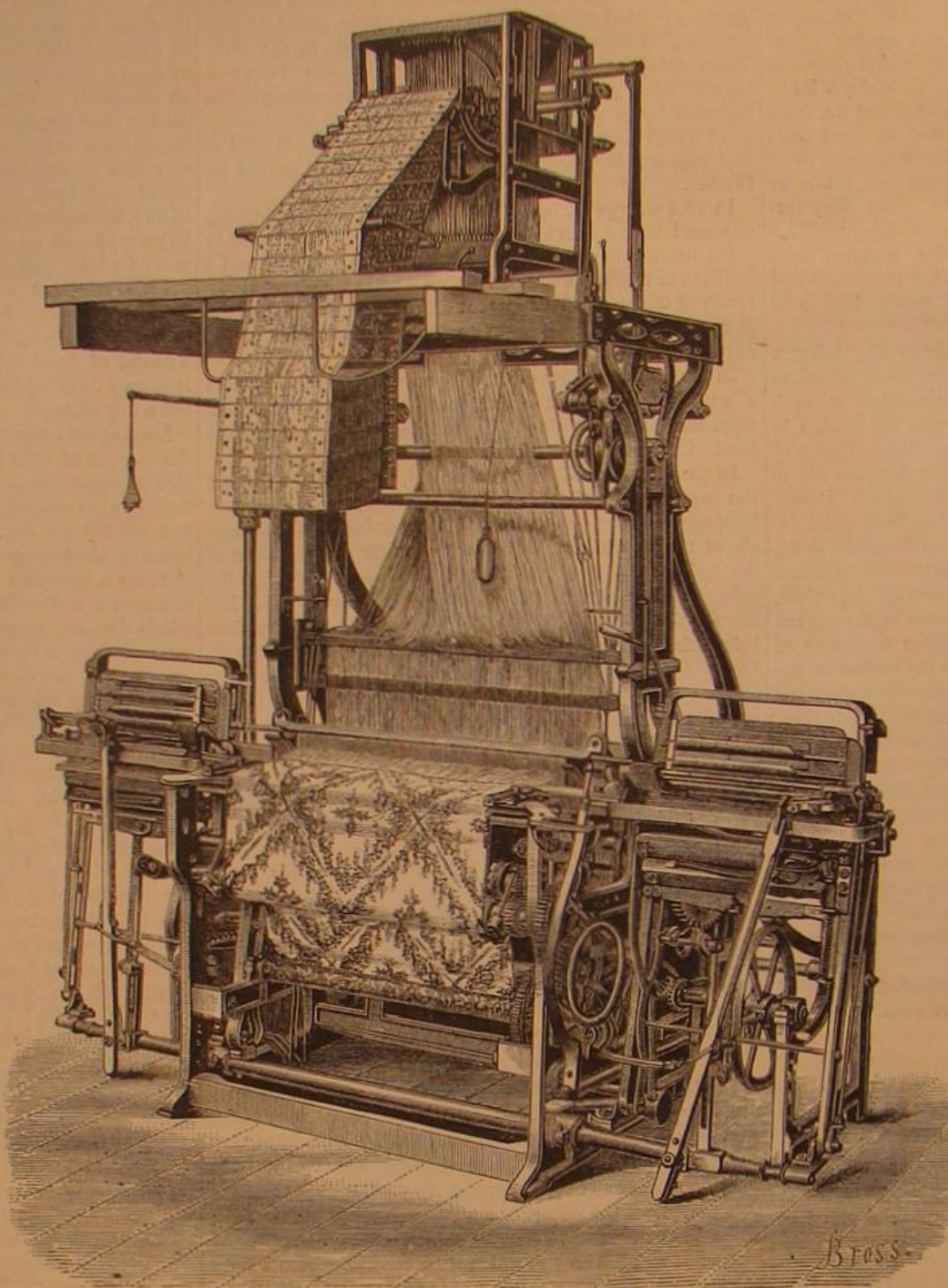
The other detail we illustrate is an improved bobbin catch, by means of which the momentum of the bobbin is allowed to be gradually taken up by the action of a longitudinal spring. When the shuttle is set in sudden motion by a blow, the bobbin in this case first compresses the spring, and thus more gradually acquires its velocity, thereby saving a considerable portion of the filling, which, in an ordinary bobbin, is either separated or loosened. The same gradual stoppage of the bobbin by a spring cushion takes place when the shuttle is driven home, and many filling bobbins are thereby saved, which, in an ordinary shuttle, are split by the sudden stoppage of the shuttle.

Fig. 3 is an underside view, and Fig. 4 a longitudinal section of the rear end of a weaver's shuttle, with the spring recoil above referred to. A is the bobbin catch, constructed with a longitudinal slot, *b*, and a rising rear end, *d**, and furnished with a spiral spring, E, and a retaining pin, *f**, while the shuttle is supplied, near the forward end of the bobbin-catch mortise, with a stop or bar, *c**, as a bearing for the forward end of the spring.

The usual fulcrum pin, *e**, passes through the slot, *b*, and this allows the bobbin catch and the bobbin to move forward, or to yield to the action of the blow of the shuttle when its forward end strikes. The spring, E, instantly returns the bobbin and catch, or draws them back after each blow of the forward end of the shuttle. The spring acts between the bar, *c**, secured to the substance of the shuttle, and the ear, *d**, rising from rear end of the bobbin catch plate, while the pin, *f**, projecting forward from the ear, holds this end of the spring in position, not only when in action but also when the rear end of the bobbin catch is passed upward to release the catch end from the groove, *g**, in the bobbin.

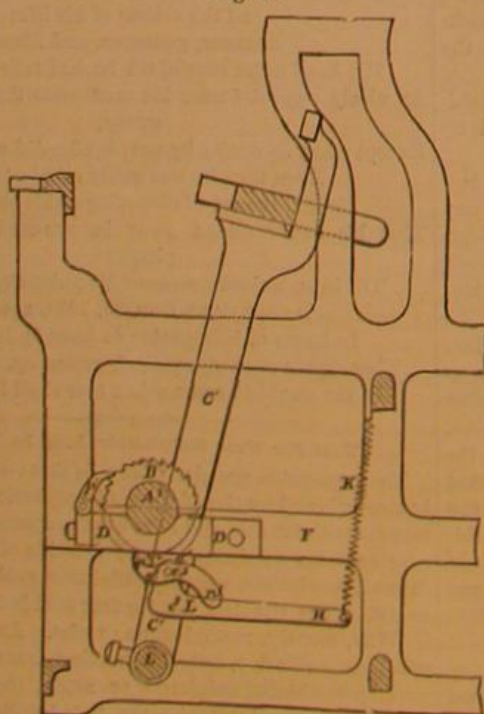
The Gates machine is supplied with a most perfect automatic gear by means of which the action of the filling beat is at once checked and thrown out of action if the shuttle has not been fully returned home after its last traverse across the warp. In this way, should a shuttle be caught and not reach its box, the action of the lay is instantly suspended, and the shuttle replaced without any injury having been done to the warp.

This loom is being introduced into England, and as many



THE GATES POWER CARPET LOOM.—Fig. 1.

Fig. 2.



ing inward from the end frame, F, leaving room between the frame and the bracket for the oscillating sword and the ratchet wheel.

At the forward side of the loom, and hung to the bracket or other support, is a pawl, P, to hold the wheel against the draught or unwinding action of the cloth upon the roll. In practice the pawl, P, is in two parts, that is, a long and a short pawl to catch and hold on the distance of half a tooth, one pawl catching ahead of

Fig. 3.

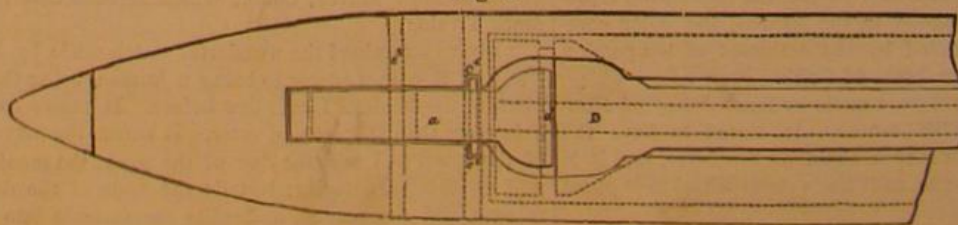
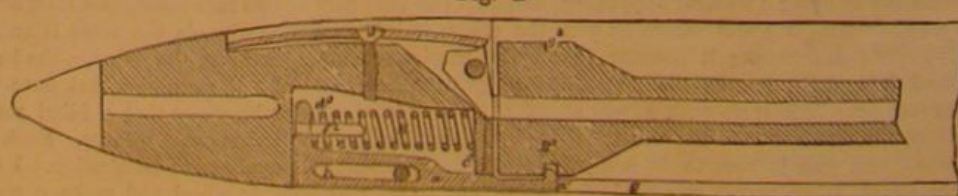


Fig. 4.



the other, and vice versa. To the lower portion of the sword, C, a lever of a peculiar construction is pivoted at C*, and a lug or arm, *d**, rises at right angles to the lever, and to this ear a counterbalance pawl, *g**, is hung near its center by any easy working joint or a pivot, *e**. The outer end, *n**, being most weighty, holds the catch end, S*, in contact with the teeth of the wheel, B*. The arm, H, of the lever extends rearward, as shown, and a spring, K, is attached to its end and to some fixed object

as 225 of them are running in this country. The speed at which the looms may be run seems also to be exceptionally high—so much so as to give a maximum production, with skilled labor, of 35 yards of carpet per day. The general all-round average production per day, amongst a variety of labor, is about 25 yards per day, which certainly speaks well for the construction and easy working of the loom.

THE WATER SNAKE—HOW IT EATS.

BY C. F. W. SKINN.

If we wish to keep serpents alive and healthy in captivity they must of course be fed. They must, with few exceptions, have living food. I have endeavored in various ways to entice them to eat raw beef, without, however, any success. In only one instance, I believe, did I ever succeed in making a serpent devour a lifeless object. This was a water snake which I enticed to seize and swallow a dead minnow by moving it rapidly about in the snake's bath tub, with a piece of slight wire. But even after the fish was seized, I was obliged to move the minnow's tail from side to side, to imitate life, for fear the snake should perceive his mistake and relinquish his hold.

Garter snakes must be fed upon toads and frogs, and water snakes upon frogs, tadpoles, and fishes.

I cannot say I enjoy seeing a snake swallow a frog. The last time I witnessed our water snake (*tropidonotus sipedon*, Linn.) devour a frog, I must confess a feeling of pity for the little frog came upon me. The snake first, by a sudden dart through the water, caught the frog by one of its hind legs. The frog struggled in terror, and madly endeavored to free itself from its ferocious captor. It struggled in vain, for the snake slowly drew the frog into the dark vale from whence no frog ever returns. From the instant the frog was seized, until it was entirely swallowed, and the snake's mouth closed, it cried most piteously, first loudly, but by degrees growing fainter and fainter, until entirely hushed in the gullet of the snake. I imagine I can yet hear that young frog's death cry. It was repeated at intervals, and sounded something like the words "quaak! uck! uck! quaak! uck! uck!" uttered in a plaintive tone.

While the frog was passing through the œsophagus of the snake, and even after it had arrived in the ophidian's stomach, I observed by the external agitation of the snake's body how violently the frog kicked and writhed to extricate itself from its untimely tomb.

It may be said of most serpents that rather than eat, in the general sense of the word, they drag their jaws over and around their prey, previous to swallowing it.

Supposing the object to be made food of by a water snake is a frog. After seizing it, the snake unhooks from the frog the teeth of one side of its upper jaw, and forces them further forward upon the frog, where it rehooks them, and draws them backward; then the teeth of the opposite side of the jaw performs the same action, and thus they move alternately and regularly, the inferior jaw going through much the same action, until the head of the snake is drawn completely over the frog. The snake then forces the frog through its œsophagus to its stomach by violently contracting the muscles of its neck and body, at the same time its neck is contorted in a horizontal waving manner.

When the object swallowed is passing through the œso-



THE WATER SNAKE.

phagus, and into the stomach of the serpent, that is if the prey be of any considerable size, the ribs expand, widely distending the skin of the neck and body, leaving spaces between the scales, which, being generally light in color, cause the serpent, especially if it be a dark one, to have the appearance of being prettily speckled with white.

Fig. 1 represents a *tropidonotus sipedon* in the act of devouring a frog. The movable quadrate bones are forced outward, thus widely distending the head and neck of the serpent. The dotted line indicates the size of expansion while the frog is passing through the œsophagus of the serpent. Fig. 2 represents the same serpent in a state of quiet. The occipital plates of this specimen are somewhat smaller than they generally are in this species.

SUGAR of lead ground in linseed oil is a good paint dryer.

Reynier's New Electric Lamp.

The author's object in this invention has been to produce an electric lamp capable of acting for 24 hours. He has succeeded in almost completely suppressing the occultations hitherto supposed inherent in the use of discs. M. Cance submitted to the Academy of Paris a novel system of electro-magnets with a multiple nucleus, analogous to that of M. Camacho, but in which the tubular nuclei are replaced by series of small rods of soft iron in juxtaposition and enveloping in pairs the different layers of spirals.

Requirements for a Good Ship's Compass.

In order that a compass may be good, the needle should be very hard and well magnetized so as to retain its power, the cap should be of ruby or agate, carefully hollowed so as to be even and smooth, and the point should be hard, fine, and sharp.

No dirt or dust should be permitted to get into the cap, as it will make the needle sluggish, and enable the point to grind into the cap. The point should be examined from time to time and kept sharp. It is important also that the point should be exactly in the intersection of the two diameters passing through the gimbals, and that it should be exactly at the same height as the centers of the gimbals, a matter frequently neglected by the maker. It has been shown that a compass is more steady, and that the quadrantal correction is more perfect when the card has two parallel needles, the ends of which intersect the circumference of the card at points 60° apart. The admiralty compass has four needles.

If the bowl is of copper, or better if a stout copper ring surrounds the card, the vibrations of the needle will be calmed, that is their amplitude will be reduced, while the time of vibration will remain the same, owing to an action being set up which appears to be due to currents generated by the relative motion of the needle and the copper.

It may be suggested that no means of cutting off the action of the ship's iron from the compass can be effectual, since anything which will do that will also cut off the action of the earth's magnetism also, and render the compass useless.—From Fairman Rogers' work on "The Magnetism of Iron Vessels."

THE CURLY-HAIRED ANTELOPE.

Very little is known of this antelope in its wild state. Siebold, in his "Fauna Japonica," calls it *antelope crissue*, and mentions that it is known to the Japanese by the name of "Nik," but that it is rarely found, and only then in the highest mountains of the Island of Nippon and Sikok. The appearance of the animal would indicate that it is a hardy inhabitant of a mountainous country.



THE CURLY-HAIRED ANTELOPE.—(JAPANESE CHAMOIS).

The illustration that we give was drawn from life and gives a good representation of the animal. It is about the size of a goat. Seen from the front, it has a wolf-like appearance, on account of its strong neck, encircling mane, and peculiar color of the head. The coarse long hair of the body is of a light slate color, the points of which are united so as to form tufts or curls. The back, neck, ears, and goat-like tail are of a dark black color. The hair from the eyes towards the forehead, the cheeks, and along the throat is of a dirty grayish white. The short spirally-twisted and backward-bent horns are grooved at their base and are nearly hidden by the long hair of the forehead. The insides of the ears are covered with long and thick hair. The eyes are dark brown. The hoofs are grooved on the inside and terminate in dull points.

A full grown female of this rare species was exhibited at the Zoological Gardens, at Cologne, in the winter of 1876. It was unfortunately killed by the inundation of last spring, which overflowed a part of the garden.

KID GLOVES.

The manufacture of kid gloves is an old French industry. Grenoble is the principal seat of the trade, over a third of its inhabitants being engaged in it, and it was from this city that the manufacture was introduced, some three hundred years ago, by wandering craftsmen, into other European cities, especially those of Germany. Paris not long ago grew to be the rival of Grenoble in the trade, mainly through the exertions of Jouvin, who brought the manufacture into prominent notice, and laid the foundation of that world-wide fame which the Parisian kid gloves have ever since enjoyed.

He introduced several important improvements, and was among the first to recognize the great superiority of machine work in his special department.

The French kid glove manufacture gives employment to over 70,000 hands, including those who attend to preparation of the leather. The yearly production amounts to something like 24,000,000 of pairs, representing a value of 80,000,000 francs.

Kid gloves are made of the skins of goats, kids, sheep, and lambs, which are supplied by all European countries, Sax-

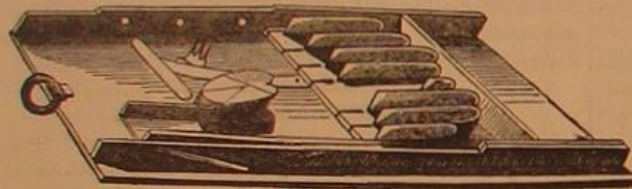


Fig. 1.—FORM FOR CUTTING GLOVE BLANKS.

ony, however, furnishing the best. Great care is exercised in tanning in order to obtain leather of the required degree of softness and pliability. The dyeing of the leather is carried on in special establishments, for the convenience of glove makers who do not, like larger firms, attend to their own dyeing. The soft gloss of kid gloves is not, as some have been led to suppose, due to any peculiar treatment, but depends upon the quality of the leather and the care expended in its tanning.

The hides, after coming from the dyer, are spread out separately upon a marble table with the smooth side down, the other or flesh side being submitted to a scraping process in order to reduce the existing inequalities and to render the skin as smooth and as uniformly thick as possible.



Fig. 2.—FORM FOR CUTTING THE THUMB PIECES.

The leather is now cut into strips of a little over twice the breadth of a hand, and these *établions*, as the French call them, are then stretched for some time in the direction of their length. The cutting, which now follows, was formerly

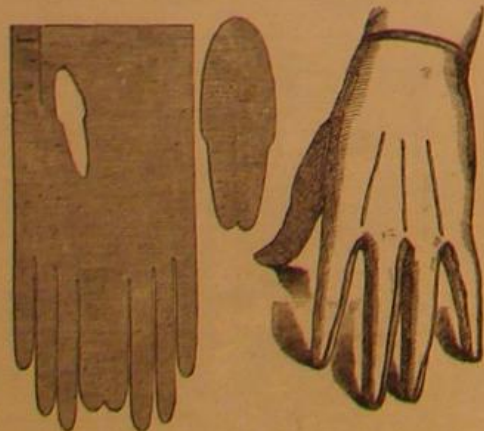


Fig. 3.—GLOVE BLANK.—POSITIONS OF THE SEAMS ON A GLOVE.

accomplished by first tracing the outline of the glove upon the piece and then using the handshears. Next came sheet iron patterns, which had merely to be pressed upon the soft

leather in order to leave an impression of the outline, when the shears as before completed the work. This method is still employed to some extent. The mode of cutting at present almost universally adopted is to stamp the gloves out by means of the contrivance shown in Fig. 1. Steel knives are so arranged upon a board, with their edge uppermost, as to form the outline of a double glove, including the opening for the thumb piece. Four to six pieces of kid of the proper

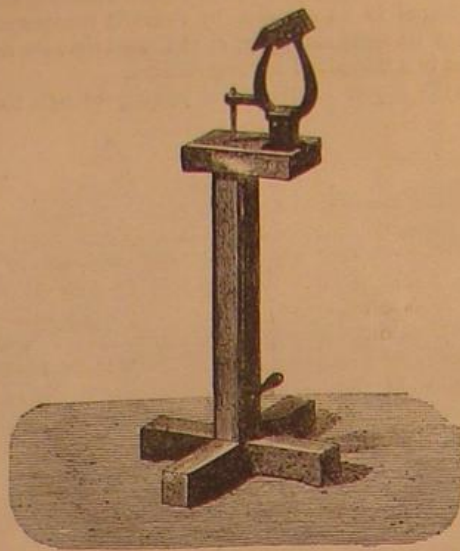


Fig. 4.—MACHINE TO ASSIST IN SEWING.—FRONT VIEW.

size are placed upon these knives, a board is laid over both, and the whole is then submitted to pressure, after which the gloves, neatly and cleanly cut, are ready to be passed to the seamstress.

A separate apparatus, as shown in Fig. 2, is provided for cutting the thumb pieces. The knives used are made of the very best steel, and demand special accuracy in their manufacture.

In some Parisian factories they have a more complicated form of cutting tool, in which the glove, besides being cut, is provided at the same time with the holes through which the sewing thread is to pass. Such an apparatus has, however, from its complexity, been found to be too uneconomical to warrant its extended introduction.

In sewing the gloves, silk is ordinarily used. A small contrivance is employed for this purpose, which, besides serving to hold the glove while being sewed, furnishes also a guide in making the stitches. As shown in Figs. 4 and 5, it bears some resemblance to a vise, and is ordinarily kept closed by the pressure of a spring, but can be opened at pleasure by means of a treadle. The jaws of this vise are furnished with a pair of brass plates, changeable at will, which have their upper edges provided with a row of teeth, the latter being placed at varying distances apart on different plates.

In sewing, the two portions of the glove are allowed to project slightly above the comb, sufficiently to permit the seam being made with the necessary freedom. The needle is made to pass through the glove in the spaces between each two teeth, and the seam thus acquires its uniform and pleasing appearance. This machine has been in use ever since its invention, in 1807, by James Winter, of England, and is still extensively employed, despite the fact that special sewing machines have been brought to the notice of the trade, capable of sewing within the same time three times as many pairs as the most skillful seamstress.

After sewing, the gloves undergo various minor operations, such as straightening those portions that may have become distorted, flattening the seams, pressing, etc., and are then ready for the market.

Hyposulphite in Diphtheria.

A very large number of diphtheria cases are cited by a Boston physician as having been successfully treated, in his own practice, by the use of hyposulphite of soda, in doses of from five to fifteen grains or more in syrup every two or three hours, according to age and circumstances; as much as the patient can bear without physicking being a good rule in the severer cases. The tincture can be used in doses of five drops to half a drachm, in milk, the amount for thorough stimulation being greater than can be taken in water, and, in the treatment of children, the milk thus used answers for food. As, however, the hyposulphite prevents the digestion of milk, it should not be given in less than an hour from it, though they may be used alternately, in frequent doses.

GRAVITY OF WOODS.—The woods which are heavier than water are Dutch box, Indian cedar, ebony, lignum-vitæ, mahogany, heart of oak, pomegranate, vine. Lignum-vitæ is one third heavier, pomegranate rather more. On the other hand, cork, having a specific gravity of .24, and poplar, .383, are the lightest woody products.

Freezing Point of Ether.

Our common ethylic ether, improperly called sulphuric ether, because made by the action of sulphuric acid upon alcohol, is known to be a substance which does not freeze very readily. Its freezing point has been variously stated by different investigators, but Franchimont thinks that pure ether cannot be frozen. He has cooled it to -80°C . (-112°Fah.) and it remained a thin liquid showing no signs of crystallization. In ether containing any water, white crystalline flakes form at a very low temperature, but the less water there is present the lower the temperature required will be, and the smaller the quantity of crystals. Franchimont thinks that these flakes are not crystals of ether, but ice crystals. The question seems to be one not easily settled, for few experimenters care to work at such extremely low temperatures, obtainable only by the expenditure of so much time, labor, and expense.

A FLOATING FLOWER BED.

G. F. Wilson in *The Garden* gives his experience of a float which he has successfully used in the cultivation of bog and water plants, and says: The raft is 8 feet square and consists of nine planks, connected underneath by crosspieces, and having about 2 inches open spaces between; this was sunk by the weight of the pots, pans, and pieces of rock to 2 or 3 inches under the surface. On the raft bog plants in pots and water plants in pans were placed, with the result that, with no attention, they flourish as well as in their natural homes. After a time, when the wood has become saturated with water, and its floating power thus lessened, we nailed large pieces of cork underneath the raft; this enabled it to carry a heavy load. The plants now growing on the raft number twenty, and were chosen as representative plants. There are the North American pitcher plant (*sarracenia purpurea*), *saxifraga palmata*, buck beans, bog violets (*plinguicula vulgaris*), grass of Parnassus, several sorts of mimulus—the spotted mimulus overgrows its pan, and with floating roots in the water is most beautiful—*lobelia cardinalis*, bog myrtle, a large variety of yellow iris, and North American lady's slipper (*cypripedium spectabile*). It is obvious that, while the raft floats between 2 inches and 3 inches under water, each



pan or pot may be adjusted according to the requirement of its inhabitant; thus a water plant is sunk to the full depth, while a plant requiring only moist soil is raised up by a piece of wood placed under its pot. Probably a still more ornamental form would be a round raft of wood with cork or wood fastened with copper nails to form sides, the bottom to have only small holes all over to admit the water; there might be cross divisions for different mixtures of soil suitable for the various plants, made not deep enough to show above the surface; in this case the whole raft would be covered with soil, and all woodwork, except the sides, hidden.

A Fertilizer from Blood.

A Frenchman named Lissagaray has taken out a Bavarian patent for making a fertilizer from blood. High pressure steam is first passed into the blood so as to cause it to boil and coagulate the albumen. The coagulated blood, while still hot, is pumped up on a linen filter stretched across a frame, and the greater part of the liquid drained off from the coagulum, which is packed in bags made of stronger linen, piled one upon the other, and squeezed between the plates of a hydraulic press, then dried in a wheel divided into four compartments, into which is passed hot air. In this way the nitrogenous portion of the blood is all retained in a form in which it is not liable to immediate decomposition, rendering it less offensive to handle and transport. If the blood be subjected to this treatment while fresh, the operation should not be particularly disagreeable.

Telluric Odors.

Some salts of bismuth, more especially the nitrate and carbonate, have recently come into favor, and been prescribed by medical men for certain disorders of the system (*Ann. Pharm.*) It has been remarked in several cases in England that persons to whom either of these preparations had been administered were affected in an unaccountable way, the breath and skin acquiring an intolerable odor. It appeared at first sight probable that the cause lay in the presence of arsenic in the bismuth, but analysis of the salts has shown them to be contaminated with tellurium. Tetradytite, a compound of bismuth and tellurium, is a mineral which has been met with in many localities, and may easily have caused the contamination of the crude metal.

We may add that among workers in ores containing tellurium in Colorado, it is well known that, if they inhale the vapors of that metal, or take it into the system, they soon begin to emit from every pore an odor, compared with which the smell of rotten eggs, sulphuretted hydrogen, or bisulphide of carbon are savory substances. Tellurium is a metal resembling tin in color, but it has many of the characteristics of sulphur.

Henry Ward Beecher on the Railway Strike.

There is no class of men who deserve the gratitude of the community more than those who operate our great railroads. I shall not satisfy myself if I do not express the gratitude which I feel, and which I think every man should feel, for that most honorable class of laboring men in our midst. Considering the vast extent of these roads; considering how they have changed the forms even of industry and civilization; considering how the industrial interests and the very happiness of society are dependent on them; considering what an instrumentality the railroad system has become in the civilization of our land and in our time—considering these things, the men who conduct this system and make it successful are certainly worthy of consideration. Civilization would be obstructed and in many respects destroyed but for these workers upon this multiplex and universal machine. The faithful men who operate it are responsible for an incalculable trust; and in general they execute that trust so as to demand recognition and gratitude on every hand. In all weather, by night and by day, they toil, carrying their lives in their hands. No man more than the engineer sows without reaping. No man carries such responsibility with so little remuneration. Millions of men by his care and fidelity are sped upon their errands safe from disaster who give him never a second thought.

The general sobriety of all the operatives on our great roads, and their usual carefulness, are unquestionable. Myriads of men daily are indebted to them. Their heroism often breaks forth in most illustrious acts. It is seldom that in any great catastrophe we do not hear of some among the engineers and their faithful assistants who heroically risk their lives. The stationary men who care for the depot, the switchmen and the brakemen, all of them, though humble in position, are indispensable parts of a machine whose workings are a marvel of modern civilization.

These men, hundreds and thousands and thousands of thousands in number, are, as a class, men that are seeking to become more and more self-respecting men. They organize themselves into "unions" for mutual insurance, for fellowship in life, for succor in sickness, and for an honorable burial when they die. For the exclusion of evil men from their ranks, they organize themselves. There is a moral purpose that animates them. They seek for intelligence, sobriety, and fidelity among themselves, and for mutual protection against the natural selfishness of employers and capital.

Thus far their organizations are eminently wise; but there is a foreign element which has come into these "unions" in America. It is a poisonous element. It is a usurpation of authority over one's fellow workmen. It is an assumption of right by the exercise of force to compass their ends—an assumption which surpasses the most bitter tyranny of Europe, and which would not be tolerated a day in a crowned head. What right has any association of men to say to the master mason, "You shall not work as a laboring man on your own contracts?" What right have they to say to an employer, "You shall never have more than five or six apprentices to learn this trade?" What right have they to say to him, "You shall employ nobody but 'union' men?" What right have they to dictate to free men as to how they shall carry on their business? They have a right to say, "If your business is carried on in a way that is prejudicial to our interest we will not work for you." The continent is large; the door to enterprise is open for all; and let no man be compelled to work where it is not for his interest to work; but who clothed any of these "unions" with authority to say, "Such men shall work, and only such men shall work; so many shall work, and only so many shall work; they shall work under such conditions, and they shall work only under such conditions?" It is a denial of freedom, it is a blow at personal independence and popular liberty; and if there were any considerable danger of its spreading, if it did not carry in itself the elements of its sure defeat, it would be time to raise the banner and lift the voice like a trumpet, against this clandestine industrial tyranny.

It is the virus that has vitiated the course of these disaffected railroad laborers; and it is a subject of profound regret to all who sympathize with them that they have put themselves in an attitude in which their friends cannot defend them, and in which the public peace and safety require that they should be resisted and subdued.

The reduction of their wages is the solitary grievance which is alleged as an excuse for their misconduct. But men whose pay is not sufficient have a right to refuse to work for the pay. They are not bound to work for less than they deserve. But they have forbidden those men who are willing to work for that pay to avail themselves of it. It is not enough for them to say, each man for himself, "I will not work for one dollar a day," but they turn to their neighbor and say, "Neither shall you." They say, "I have a family to support, and a dollar and a half never can feed my children;" and when a man who is without a family says, "It will feed me," the response is, "It shall not feed you; for if I will not work for that, neither shall you work for it." They have seized the property of companies, and domineered it. They have taken the law into their own hands—or, rather, they have trodden it under their own feet. They have disturbed the public peace by riot and violence against the State laws, and against the laws of the whole of these United States. They have thrown the vast business interests of this country into confusion. And, that every element of blame may rest upon them, they have shed

the blood of those who have the authority of their State in their hands. And this has been done, evidently, by a combination running through the whole country, from ocean to ocean. It exhibits the tendency of a class interest to seek its ends, not by open, reasonable methods, but by an organized conspiracy which has in it every element both of opprobrium and of peril.

The strike went to show that labor had not received its full remuneration; that working men were subjected to a great many petty injustices, and that the way of acquiring prosperity was not the way of the grog shop. It was by the way of more work, better work, more refinement, nobler ambitions and larger manhood. Discontentment and strikes did no good, neither did the attempt to make men work eight hours with wages of fifteen. It is an American doctrine that every man must stand upon his own level. It is said that the world owes every man a living. That is so when a man earns it. Again, that the world should take care of all men. Man was born to take care of himself, but sometimes he is cared for by his mother, and afterward by his wife. Man should be valued according to his achievements. If he achieved as much as a fly he is entitled to an equal reward for what he did. If he is an eagle, he has a right to the whole air. No man has a right to go high by artificial merits; it must be through merit. Men may go into a rebellion, and learn that two pounds weigh more than one. The law of nature is on the side of two pounds. A man who drinks beer and grumbles, and works one tenth of the day, says that he is as good as the next man. That depends on who is the next man.

The test of all governments and combinations was, "How much individual liberty did they secure to each one?" To restrict the individuality of a single man was pernicious and poisonous. The tyranny of combinations was just as much a tyranny as that of the despot upon the throne. Human nature was the same all the world over. He said it would be the glory of his life if he might see the majority of the working men happy in houses of their own. In speaking of the adversity that overtakes many, he said that when a man has hard times he should not grumble or complain. He ought to be manly enough to be manly when he is poor as well as when he is rich. When he comes down to a single dollar a day, must he throw up his hands in despair? Is that the manly course for a man? If you are being reduced, go down boldly to poverty. Bankruptcy never hurts a man until it takes his manhood. Working man, work more and grumble less. Mr. Beecher said that he did not say that a dollar a day was enough for a working man, but it would give a man bread. Man ought to be superior to his circumstances. He should not suffer the outside world to shake him. He should stand, not crawl. Don't sneak, but bear adversity as well as prosperity.

A NEW method of preserving the bodies of the dead has just been exhibited in Berlin. It is the invention of a Mr. Tominetti of Hamburg, and consists in a thorough drying of the tissues by means of an injected gas, which absorbs the moisture and drives it out through the pores. Prepared in this way, an animal preserves its form and color in perfection. Mr. Tominetti exhibited a bear which had thus been treated after his death four months previously. Slices were cut from the body to show that the tissues were not destroyed but, except for their desiccation, were preserved in excellent condition.

Inventions Patented in England by Americans.

July 10 to July 17, 1877, inclusive.

BALE TIE.—S. N. Drake et al., New Orleans, La.
BLIND BOLTER.—Henry Hughes (of San Francisco, Cal.), London, Eng.
BOOT AND SHOE MACHINE.—G. W. Copeland et al., Malden, Mass.
BUTTER TRAY, ETC.—C. Ingersoll, Beloit, Wis.
DOOR AND WINDOW SASH.—H. E. Russell, New Britain, Conn.
GAS APPARATUS.—E. T. Thomas, New York city.
GAS LIGHTER.—K. Vogel, Chelsea, Mass.
HERMETICALLY SEALED PACKAGES.—C. Lewis, Boston, Mass.
LOCK.—H. E. Russell, New Britain, Conn.
LUBRICATOR.—R. Haworth, New York city.
MOULDING MACHINERY.—A. K. Rider, Walden, N. Y.
OZONE PURIFYING.—F. W. Bartlett, Buffalo, N. Y.
PLATING MACHINE.—H. Albrecht, Philadelphia, Pa.
SAW BLADES, MANUFACTURING.—J. A. House, Bridgeport, Conn.
SHEET METAL PIPE.—H. K. Flager, Boston, Mass.
STEAM PACKING.—H. Greenough, Boston, Mass.
TOY.—L. Seasongood, Cincinnati, O.
WATER MEASUR.—H. B. Hayes, Woburn, Mass.
WOODEN SOLED SHOES.—T. R. Hyde, Westerly, R. I.

NEW BOOKS AND PUBLICATIONS.

A POPULAR TREATISE ON WATER SUPPLY ENGINEERING: relating to the Hydrology, Hydromatics, and Practical Construction of Water Works in North America. With numerous Tables and Illustrations. By J. T. Fanning, C.E. New York: D. Van Nostrand, Publisher, 23 Murray street. 1877.

The author says in his preface that this work is intended more for those who have already had a task assigned for them, and who, as commissioner, engineer, or assistant, are to proceed at once upon their reconnaissance and surveys, and the preparation of plans for a public water supply. Its aim is to develop the bases and principles of construction, rather than to trace the origin of or to describe individual works. The book is divided into three sections, the first treating upon the collection and storage of water in its impurities; the second upon flow of water through sluices, pipes, and channels; the third, practical construction of water works. In the introductory chapter of the first section the influences of a liberal water supply are pointed out, and then follow statistics and tables of water supplied to various American and foreign cities, the ratios of consumption during the different seasons, and the reserve capacity necessary to provide water for the use of a fire department. To those who have to estimate large quantities of water the statistics and diagrams will prove of great value. The hydrology of the United States is discussed in chapters relating to rainfall, flow of streams, storage and evaporation of water, supplying capacity of water sheds and supplies from wells and streams. The second section opens with special characteristics of water, its weight, pressure and motion, and is followed with chapters on the flow of water through orifices, apertures, pipes under pressure, upon channels, and to measuring weirs and

weir gauging. The third section includes about one half the entire book and embraces the practical construction of water works. The first subjects discussed are reservoirs, embankments and channels, and canal banks. The proportions of waste ways and the safety valves of embankments are fully discussed. Waste weirs and dams of masonry and timber cribwork are exemplified and described. Following this are chapters on proportions, construction, and laying of conduits of masonry and mains and distribution pipes of metal, and the valves, hydrants, and appendages of the distribution systems. The clarification of water is fully discussed and sediments and impurities are duly considered, the processes of treatment by infiltrations, precipitations, and filtrations are described. The management and maintenance of filter beds and basins are illustrated and described. The concluding chapter is a brief discussion of the several systems of water supply, and includes a review of the methods of gathering and delivering water, choice of water, systems of pumping, etc. An appendix is added, giving tables, equivalents and formulas, of value to hydraulic and mechanical engineers.

THE ANTELOPE AND DEER OF AMERICA. A comprehensive scientific treatise upon the natural history, including the characteristics, habits, affinities, and capacity for domestication, of the Antilocapra and Cervidae of North America. By John Dean Caton, LL.D. New York: Published by Hurd & Houghton, Boston: H. O. Houghton and Company. Cambridge: The Riverside Press. 1877.

The author says that the natural history of these animals, the pursuit of which has been his favorite recreation, has occupied his leisure for many years, during which time he has kept in domestication all of the American deer of which he treats, except the moose and the two species of caribou. This has given him opportunities of making observations of them, which in the wild state he could not do. The habit of noting these observations accumulated a vast amount of facts, which those competent to judge deemed of scientific value, and so he was induced to put them in a form that would be available to others. He makes no attempt to exhaust the natural history of the few animals of which he treats, but contents himself with a mere monograph of them, leaving their osteology and anatomy almost entirely for other hands, invading their province only so far as is necessary to give completeness to the external of the animals studied. His aim has been to carefully observe facts and to accurately state them, and to truly exhibit nature and her workings. In the illustrations he has tried to make them true to nature regardless of the question whether they were ornamental pictures or not. The full figures, as far as possible, are drawn from photographs, taken while the animals were standing at ease, believing in this way he could give a truer idea of them than when they were made to assume striking and unusual attitudes, although these attitudes might be more attractive to the eye. The book is written in a free and easy style, interspersed with anecdotes enough to make it interesting, even to those who care but little for the subject which the author has chosen for his discourse.

AN ELEMENTARY COURSE OF CIVIL ENGINEERING FOR THE USE OF CADETS OF THE UNITED STATES MILITARY ACADEMY. By I. B. Wheeler, Professor of Civil and Military Engineering in the United States Military Academy, at West Point, N. Y., and Brevet-Colonel, U. S. Army. New York: John Wiley & Sons, 15 Astor Place. 1877. Price \$4.

This treatise has been compiled and arranged especially for the use of cadets of the United States Military Academy and with regard to the limited time allowed them for instruction in this branch of their studies. The author defines civil engineering as the designing and building of all works intended for the comfort of man, or to improve the country by beautifying it or increasing its prosperity, and gives in regular order the elementary principles, common to all branches of engineering, which are essential for the student to learn, that he may understand the nature of the engineer's profession, and know how to apply the principles that he has already acquired. In the first part, building materials are taken up; and under the head of wood, all kinds of timber are treated upon, their kinds, classes, defects, durability, and preservation, noticed. Stones, bricks, concretes, and glass follow. The metals used in engineering constructions are then taken up; uniting materials as glue, lime, cements, and mortars follow, and preservatives as paint, japanning, oiling, varnishes, coal tar, asphaltum, metal covering, etc., close this part of the work. Part second treats upon the strength of materials, as strains, tension, compression, shearing, flexure, torsion and strength of bearing. Part third treats of framing. Part fourth of masonry and masonry construction. Part fifth of foundations on land and in water. Part sixth of bridges, as trussed, tabular or iron plate, arched, suspension, movable and aqueduct, and of bridge construction in general. Part seventh treats of roofs, and part eighth of roads, their location and construction, closing with a chapter on railroads and one upon canals.

THEORY OF TRANSVERSE STRAINS, AND ITS APPLICATION TO THE CONSTRUCTION OF BUILDINGS. By R. G. Hatfield, Architect, Fellow of Am. Inst. Architects; Mem. Am. Soc. Civil Engineers; Author of the American House Carpenter. John Wiley & Sons. Price \$6.

This book is intended especially for architects and for students in architecture and contains much that should be useful to civil engineers. Those who can command the time to read the work carefully through will here find the subject of construction so far as it applies to floors, girders and roofs, carefully elaborated and thoroughly elucidated, algebraically, graphically, and arithmetically. Those who have not the leisure for studying the work in detail may still derive assistance from its many useful results; which are classified in a directory, showing at a glance the particular rule needed in any given case, whether it be of a lever, a beam, a tier of beams, a header, a carriage beam with one, two, or three headers, a girder, solid, framed, or tubular, or a roof truss; and for those who are very limited in time, there are tables containing the dimensions required for floor beams and headers, of four several kinds of wood and of rolled iron; and all these are for dwellings, office buildings, halls of assembly, and first class stores. There is a table showing the thickness of floors made of timber, solid. In many other tables are recorded the results of experiments upon several of our American woods, made by the author expressly for this work, to test their resistance to flexure, rupture, tension, compression and sliding. Other tables give the values of constants which are derived from these experiments and which are used in the rules given in the body of the work. This feature gives to the work its great practical value, as well as the manner in which the principles of the science have been so carefully and lucidly developed. This work ought to become popular with students; the steps by which access is gained to the more intricate portions of the subjects treated are so easy and gradual that those even whose knowledge of algebra is quite limited will, by ordinary attention, be able to progress satisfactorily, and in a reasonable time become familiar with the more important of the subjects treated. To secure a knowledge of the useful results to the student unversed in even the simpler processes of algebra, a practical example is given to elucidate every rule, in which the practical application of the rule is shown by arithmetical processes worked out in detail. For the purpose of fixing in the mind of the student the subject matter of each chapter, there are appended questions of a practical nature, and at the end of the work the answers to these questions are given. An extended index, as well as a table of contents, will facilitate the labors of those who have occasion to consult its pages upon any particular subject.

REPORT OF THE DIRECTORS OF CENTRAL PARK MENAGERIE; Department of Public Parks, City of New York, for the year 1876.

The additions to the menagerie of the Park during the year are: mammals, 107, birds 145, and reptiles 51. The number of animals was 983. As compared with previous years, the donations have gradually decreased, which is attributable to the establishment of zoological gardens in other cities or where the owners of animals find markets for their specimens. The number of specimens during the year have diminished from the effect of a reduction of appropriation of funds and an order not to receive animals unless the owners agreed to furnish necessary food for them. There was an increase of visitors to the menagerie, which is accounted for by the great influx of strangers passing through the city, to and from Philadelphia, to visit the Centennial. The amount expended for the year was \$15,418.10, against \$15,089.92 of the previous year, being a reduction of \$3,271.82.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SMELTING FURNACE.

John L. Sturdy and John A. May, Goderich, Ontario, Canada.—This invention relates to the combination and arrangement of a cupola, two furnaces, and two steam boilers, discharging jets of steam into the combustion passages of the cupola for creating draft in a smelting furnace, whereby efficiency in operation is secured.

IMPROVED SHOE FOR SCAFFOLDINGS.

Henry Batt, Kentish Town, London, Eng., assignor to Leonard G. Tabraham, Boston, Mass.—In this invention a shoe or box is provided with hooks on the upper corners of its sides, and teeth forming an extension of the bottom, whereby the device is adapted for attachment to a joist or vertical timber, and to receive and support the end of a horizontal timber.

IMPROVED TRACTION WHEEL FOR LOCOMOTIVES.

Jean Larmanjat, Paris, France.—This invention relates to an improvement upon that form of traction wheel in which spring seated teeth are arranged to project radially from the wheel, which teeth secure a better hold, and at the same time yield to any obstruction that may present itself; and the improvement consists in the means for controlling the teeth, whereby they may be allowed to project to engage with a rock bar to increase the traction, or be withdrawn into the periphery of the wheel, as may be desired.

IMPROVED APPARATUS FOR PROPELLING CARS.

John B. Tibbitts, Hoosick, N. Y.—This invention relates to apparatus for propelling street and railway cars by means of steam engines or other similar motors; and it consists of a frame suspended centrally from the car frame, and carrying two shafts, upon which friction wheels are secured. The supports for the said shafts are capable of both vertical and lateral motion.

IMPROVED CAR COUPLING.

Floyd Heavener, Laramie City, W. T.—This invention relates to an improved car coupling, adapted to couple automatically with cars of different heights of drawbars, and with cars having the ordinary form of link and pin coupling. The drawbar is enlarged at its front end, and provided with horizontal partitions which form a tier of vertical series of throats with tapering mouths, which are made of such depth and width as to receive the coupling link.

IMPROVED WINDWHEEL.

James P. Preston, Gold Run, Cal.—The advantages claimed for this windwheel are that it may be readily adjusted while running, it is acted upon by wind blowing from any direction, and as the vanes are curved so that their inner edges are nearly at right angles with the course of the wind, the action of the wind is positive, and the greatest amount of the power of the wind is realized; also that the wind has free and unobstructed discharge from the wheels.

IMPROVED COOLING APPARATUS FOR STAND PIPES OF GAS RETORTS.

David R. Shiras, Sharon, Pa.—This invention is to prevent the stand pipes of gas retorts from reaching a sufficiently high temperature to cause an accumulation of carbon or baked tarry matter in the stand pipes to enable the manufacturer to heat the retorts to the maximum temperature without causing a stoppage in the stand pipes, and thereby increase the production of gas, as well as improving its quality and greatly diminishing the time occupied distilling the charge. To the ordinary stand pipe, which conducts the gas from the mouth of the retort to the hydraulic main, is a curved pipe surrounding the same, which is perforated from the under side, so as to direct the number of jets of water against the stand pipe.

IMPROVED SCREWDRIVER.

Andrew J. Curtis, Monroe, Me., assignor to himself and Edmond H. Neally, of same place.—This invention consists of a screwdriver having a sliding sleeve, with spring jaws or tweezers extending over the end of the screwdriver, and being spread by a conical collar of the same back of the driving edge. When the pressure on the sleeve is removed the tweezers slide back and clamp the screw, so as to admit the ready insertion of screws into soft wood without requiring holes, or the taking hold of the same, and removing them when turning loosely in the worked-out screw holes.

IMPROVED STEAM BOILER AND SUPERHEATER.

Solomon N. Carvalho, New York city, assignor to himself and James M. Pattee, of same place.—The object of this invention is to economize fuel in the generation of steam, and to superheat the steam from the boiler in a separate and independent steam dome, so as to prevent priming, and permit pure dry steam only to go to the cylinder of the engine. It is intended to provide in the lower part of the boiler an enlarged heating surface that assists in and accelerates the generation of steam and the more perfect utilization of the fuel. A hollow water back or loose reservoir is placed in the combustion chamber of a boiler, and a water-conducting pipe that leaves the highest point of the water back at the side of the boiler, enters from the outside of the boiler into a separate steam dome, that is connected by a pipe and check valve with the main steam dome. A heating water pipe is arranged in the shape of a serpentine coil in a separate steam dome, and conducted then through the shell of the boiler. The steam in the steam dome is superheated and made drier, being brought by the pipe to greater pressure and elasticity than the steam in boiler, so as to be used with greater effect in the cylinders of the engine, to which the steam dome is connected by suitable pipes. From the superheater the pipe runs longitudinally through the boiler to the back of the same, then down along the boiler, and enters at the bottom or lowermost part, which is usually the coldest on account of the insufficient passage of the fire gases through the lower flues.

IMPROVED RELIEF APPARATUS FOR ROLLING MILLS.

Edward C. Hegeler and Frederick W. Matthiessen, La Salle, Ill.—The object of this invention is to prevent the breakage of rolls and roll gear by connecting the screws that regulate the distance between the rolls with rubber cushions, which permit the rolls to separate under extraordinary pressure, but do not yield under the usual working pressure.

IMPROVED DEVICE FOR TRANSMITTING MOTION.

Peter Derkum, Richmond, Ind.—This invention consists of a revolving shaft with double driving wheels, which are connected by a straight and cross belt with pulleys of separate shafts, transmitting the power from the same by friction disks with beveled edges to a conical pulley of a vertical revolving shaft, to which the moulding knives or other working devices are attached. The object is to provide a device for transmitting motion from a horizontal crank shaft to a vertical shaft, to be used for working moulding and other machines in which a steady and continuous motion is required.

IMPROVED FURNACE.

Henry C. Richmond, Allegheny City, Pa.—This invention is an improvement upon that form of furnace in which steam jets are employed to inject or carry in by induction atmospheric air to the combustion chamber to consume the smoke; and it consists mainly in the particular construction of an air and steam pipes having concentric nozzles arranged within the front part of the furnace, and combined with a fire tile for the pipes to protect them from excessive heat.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED SCHOOL DESK.

William Walgrain, Charles F. Buscall, and Kate Buscall, New York city.—This invention consists in a box for the reception of books, constructed so that the front shall be made to answer the purpose of a rest or easel when the box is placed in a vertical position.

IMPROVED STIRRUP.

Charles E. Wallin, Salt Lake City, Utah Territory.—This invention is designed to prevent the noise and chafing produced by the stirrup strap, to provide a degree of elasticity for the rider's foot, and to straighten and reinforce the stirrup against splitting. The improvements consist, first, in interposing between the upper ends of the stirrup a metal and a rubber roller, both of which encompass the pivot bolt to form a bearing for the strap; and secondly, in reinforcing the body of the stirrup by a peculiar arrangement of metallic straps or bands.

IMPROVED GRAIN STEAMER.

Edward C. Jones, Independence, Mo.—This invention relates to an improved device for steaming grain just before it is ground for the purpose of softening the cuticle, and thereby facilitating the removal of the bran. The improvements consist principally in the construction and arrangement of a deflector located in the casing, and adapted to scatter or spread the descending grain, and at the same time to spread and divert the steam through the grain in its descent. The invention also consists in the combination of said deflector with the steam and drain pipes and their valves, and with the chutes and their cut-off slides.

IMPROVED GROUND SQUIRREL EXTERMINATOR.

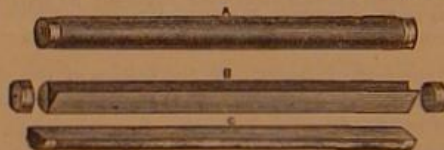
Henry Dreyer, Oakland, Texas.—In this apparatus a coal fire is started in a furnace and the end of a pipe is inserted in the hole leading to the nest of the gophers or ground squirrels, and the soil is packed around it. After the coal is fully kindled, sulphur is put in and a slide closed, so that the action of a fan blower will force the fumes through all the branch passages of the nest, and the whole colony of gophers will be destroyed in a few minutes.

IMPROVED POSTAGE OR REVENUE STAMP.

David G. Beaumont, Austin, Texas.—These stamps are made of two thicknesses of paper, the lower one, to which the mucilage is applied, and the upper one, upon which the stamps are printed. The upper paper has incisions cut in and across it, parallel with each other, and at suitable distances apart. This paper is then laid smoothly upon the lower paper, and the two are secured together with mucilage. The stamps are printed upon the paper thus prepared, and the paper is thus punctured between and around the stamps in the usual way. The upper paper may also have incisions formed in it through the body of the stamps, and at right angles with the main incisions.

IMPROVED COMBINED BLOTTER AND RULER.

Mark P. McElhinney, Montreal, Quebec, Canada, assignor to Robert W. Simpson, of same place.—This invention consists in an improved blotting



ruler formed of two semi-cylindrical strips with blotting paper B and C, wrapped around them. The flat surfaces of the two parts are then brought together, as at A, and rings or caps are slipped upon their ends, the slight elasticity of the blotting paper being sufficient to keep said caps securely in place.

IMPROVED HOG HANGER AND CARRIER.

Jacob Meyer, Hollowayville, Ill.—This invention is intended to furnish an improved device for carrying and hanging hogs in convenient manner; and it consists of a carrying frame with hinged braces, fixed legs, and a top round or crossbar, with suspension hook for the hogs.

IMPROVED SPOOL CASE.

Benjamin R. Hamilton, South Deerfield, Mass.—This invention has reference to a case for holding different sizes of spool cotton or silk thread, and paying it out as used without the inconvenience of the threads becoming entangled or being drawn back into the case by the rolling of the spools; and the invention consists of a spool case of any desired form or size, with hinged partitions between the spools and exit holes for the threads, provided with rubber, felt, or other binding substance that retains the thread.

IMPROVED PEN AND PENCIL CASE.

Richard M. Collard, New York city.—This invention consists in a pen and pencil case having both ends extensible, and both pen and pencil applied at one end, in combination with a double spirally grooved tube for moving the pencil stock, and an inclosing tube therefor, when this tube is fixed rigidly to the outer short case, and a short distance beyond one end.

IMPROVED BEER CASK.

John Hoffman, Toledo, O.—This improvement relates particularly to closing the ends of a metal tube extending from end to end of the cask, and fastened to the heads, for the purpose of facilitating cooling or warming the contents, by means of adjustable caps, pivoted to rings or boxes which are attached to the heads of the cask, and inclose the ends of the tube.

IMPROVED TOY PISTOL.

James Barry, New York city.—This invention is a toy to be used for exploding fulminate paper; and it consists of a tube having in it a side opening, and an anvil upon which the paper is laid, and a spring-acted plunger for striking the fulminate paper.

NEW HOUSEHOLD INVENTIONS.

IMPROVED COFFEETOP.

Willis H. Sherwood, St. Joseph, Mo.—This invention consists essentially in the combination, with a water pot or receptacle, of a perforated steam pipe with detachable screw cap, for the purpose of using the coffeetop with steam; and secondly, of a funnel-shaped mouth of the filling tube closed by a cap with safety valve that may be opened at will to interrupt boiling by the thumb screw.

IMPROVED SASH FASTENER.

Frederick J. Hoyt, New York city.—This invention consists in the combination of a base plate, bent lever pawl, a rack plate, rod, and spiral spring with each other to adapt them to be applied to the sashes of a window; in the combination of a base plate, bent lever pawl, rack plate, screw rod, and nut for locking the pawl in place when engaged with the rack plate; and in the combination of a base plate, bent pawl, rack plate,

screw rod, and nut for locking the pawl in place when withdrawn from the rack plate.

IMPROVED DISH WARMER.

James H. Wright, New York city.—This invention consists in a papier-maché block recessed upon the upper side, and lined with sheet metal to adapt it to receive and hold a heating iron. The case is divided into two compartments by a horizontal partition, with the papier-maché block or receiver that receives and holds the iron. The object of this invention is to furnish an improved device for keeping platters and other dishes warm when placed upon the table, and which shall be so constructed as to prevent the heat from injuring the table.

IMPROVED SAD IRON.

Thomas H. McCaffrey, Providence, R. I., assignor to himself, Henry J. Gorman, and William J. Armstrong, of same place.—This is a reversible sad iron, that is heated by gas, and used continuously by reversing the heated side from time to time.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED SASH FASTENER.

David T. Gerrish, Lewiston, Me.—This invention consists of a sash with countersunk recesses or sockets made square at the upper and rounded off at the lower side, so as to be supported on a spring-acted catch operated by a thumb piece projecting through a face plate of the window casing. The catch to work the upper sash is applied to a bolt that passes through a tubular bolt of the catch of the lower sash, the end of the inner bolt having also an operating thumb piece.

IMPROVED SASH BALANCE.

Adam Kolb and Charles Osberghaus, Sandusky, O.—This invention consists in a casing containing a serrated cam or pawl for clamping the cord and a lever for moving the cam for releasing the cord. When the cord is drawn downward through the casing the serrated cam binds it firmly at any desired point. When it is desired to release the cord it is drawn outward, so as to move the lever and by this means throw the cam upward out of engagement with the cord.

IMPROVED VEHICLE WHEEL.

Martin J. Racer, La Grange, Texas.—The object of this invention is to provide a vehicle wheel that is capable of being expanded so as to fit the tire, to obviate the necessity of removing, contracting, and replacing the tire.

IMPROVED FIFTH WHEEL.

Sanford P. Stillman, Westerly, R. I.—This invention consists of an axle and rocker having outer segmental guide rails and inner concentric rails or plates, the latter having toothed grooves and an intermediate spurred or toothed friction roller. The guide rails swing on a center bolt of the reach, while the rocker is steadily retained on the bed rails by a central connecting arm, bearing, by a notched part, on the flange of the inner rail or plate of the rocker.

NEW AGRICULTURAL INVENTIONS.

IMPROVED GATE.

Joseph T. Piggott and Albertus W. Hoyt, Newbern, Ill.—The object of this invention is to furnish an improved flood gate streams; and the invention consists in the combination of sill, posts, and crossbeam, gates, hinged trapdoors, stop hooks, latch hooks, catchers, and weights, ropes or chains, and swiveled pulleys. When the water rises, so as to have sufficient force to close the trapdoors, the hooks will be raised, and the gates allowed to swing open. As the water subsides the gates will be drawn shut by weights attached to the ends of ropes or chains.

IMPROVED CULTIVATOR.

James Sherrill, Harrisburg, Oregon.—The plow standard is pivoted between and at the ends of elastic bifurcations of the beam, and has a wedge-shaped projecting end beyond the pivot, the bifurcations converging from the top downward to hold the standard end. The plow beams have their forward ends bent sidewise into U form to receive a crossrod of the draw frame. The draw frame is formed of a crossrod, a curved bar, a crossbar, and parallel bars in combination with plow beams, clevis, and adjustable supporting bars.

IMPROVED MOWER AND REAPER KNIFE SHARPENER.

Zarda Frost, Kimmundly, Ill., assignor to himself and William H. White, of same place.—This invention consists in the combination in a grinding apparatus for mowing and reaper knives, of a centrally pivoted base plate, a swinging spring and treadle-acted frame, and a hinged vibrating and spring-cushioned supporting bar.

IMPROVED HARROW.

John W. Carpenter, Bridgewater, Va.—This harrow is so constructed that the teeth may be adjusted vertical, at a forward inclination, or at a rearward inclination, without stopping the team. To the inner side of the projecting ends of each side bar of the frame is attached a hook to receive the ends of the draw chain, to the center of which the draft is applied. This construction enables the draft to be changed from one side to the other, so that the wear may keep the teeth sharp. To the side bars of the frame are pivoted the ends of rollers, to which the teeth are attached.

IMPROVED STANCHION.

Zalmon W. Smith, Addison, N. Y.—This stanchion turns on central top and bottom pivots of a top crosspiece and the flooring, which pivots extend into socket holes of the top and bottom crosspieces of the stanchion. The lower crosspiece is supported on a lock iron or set screw, which projects into a groove of the lower pivot, which groove is not extended entirely around the circumference of the pivot, so as to admit only the turning of the stanchion into suitable inclination to either side, sufficient to admit of free side and up and down motion of the head of the cow.

IMPROVED PORTABLE CORN CRIB.

Benjamin F. Bedwell, Overton, Mo.—This crib is readily taken apart by drawing out hinge pins, disconnecting various stays and rods that hold it together, when it may be readily packed in small compass and transported from place to place. It may also be readily set up by first setting up the two ends and back, then placing the slatted doors and crossbar that is inside of the doors, erecting the posts, and connecting them by rods, putting on the middle rafter, the roof boards, and, last of all, the binding strips by which the roof boards are secured.

IMPROVED STUMP PLOW.

Washington Painter, Albion, Ill.—The object of this invention is to provide a stump plow that may be used in rough newly cleared timber land, that will readily cut the smaller roots, and will jump over or escape the larger roots. To the beam of the plow is attached a colter of peculiar form, which is held in position by a plate of rhomboidal form, having lugs, and is clamped to the beam by a bar and bolts. The plate is further secured to the beam by bolts, and by letting it into the side of the beam. The corners of the plate are disposed so as to offer the greatest resistance to the leverage of the colter.

IMPROVED DUMPING WAGON.

Charles S. Bateman, Battle Creek, Mich.—This invention is an improved dumping wagon, which is so constructed that it will dump itself when unfastened and started forward, and which may be made to discharge part or all the load at a time.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

For Sale—Patent Office Reports Mechanical. R. D. Cooke, 18 New Church street, New York. Send stamp.
Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Varnish Wanted—Perfectly protecting iron against wine and fruit juices, leaving no taste or odor, and to be readily applied inside of large iron tanks. Send prices and particulars to R. d'Heureuse, P. O. box 206, N. Y.

Wanted—Small Brown & Sharp Milling Machine, and small Lathe for making Taps. Address P. O. Box 2132 New York.

Wanted—A chemist by a western chemical factory. Must be well posted in volumetric analysis. Address, with references, H. W. H., P. O. Box 875, New York city.

Wanted—To purchase a second-hand Disintegrating Mill. Please address, stating size and price, J. O. & E. Smith, So. Canterbury, Conn.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsyth & Co., Machine dealers, Manchester, N. H.

Reliable Oak Leather and Rubber Belting. A specialty of Belting for high speed and hard work. Charles W. Army, Manufacturer, Phila., Pa. Send for price lists.

Shaw's Noise-Quelling Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quells all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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

"Abbe" Bolt, Forging Machines, and "Palmer" Power Hammers; best produced. Prices greatly reduced. Also sole builders Village and Town Combined Hand Fire Engines and Hose Carriages, \$350. Send for circulars. Forsyth & Co., Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Removal.—Fitch & Meserole, Manufacturers of Electrical Apparatus, and Bradley's Patent Naked Wire Helices, have removed to 43 Cortlandt St., N. Y. Experimental work.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.
For Best Presses, Dies, and Fruit Can Tools, Elias & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N. Y.

Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 479 Grand St., 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.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Skinner Portable Engine Improved, 2 1/2 to 10 H. P. Skinner & Wood, Erie, Pa.

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

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use prove them stronger and more durable than wrought iron. See advertisement, page 110.

Emery Grinders, Emery Wheels, Best and Cheapest. Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M. E., Providence, R. I.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical inquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which

should be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to inclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

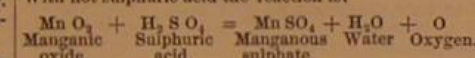
M. M. F. is informed that we could not recommend any steam engine or boiler as the most economical.—J. G. McC. is informed he can only ascertain the carrying capacity of his balloon by experiment. No rule for dimensions can be given. We know no manufacturer of the kind of balloon you refer to. See reply to C. E. L.

(1) C. L. asks: 1. Can salt or sea water be so filtered through a sand beach that a well dug from one to two hundred feet from the seashore will contain fresh water from the filtration of the sea? A. The salt cannot be removed from sea water by filtration. Land springs are sometimes struck close to the seashore, which leads to the delusion. 2. Can water containing coloring matter in solution be purified by filtration through sand or other material? A. The organic coloring matters in water are usually destroyed or removed, completely or in great part, by filtration through sandy soils, and contact with various rocks and minerals, but the complete purification of the water by these means depends much on the nature of the coloring matter and the degree of colorization. Granular animal charcoal readily deprives most liquids of organic coloring matters when they are allowed to filter slowly through it.

(2) W. H. C. asks if beef will keep fresh and sweet treated with acetate of soda? A. The process is an excellent one. See answer to W. E. S., on p. 43 present volume of the SCIENTIFIC AMERICAN.

(3) D. W. R. asks: What kind of potash is used in melting brass? A. Potash is not used to melt brass, but the carbonates of potash and soda are sometimes used as a flux.

(4) B. K. D. asks: 1. When sulphuric acid is used with manganese, to obtain its oxygen, what is the appearance or condition of the remainder? A. When separated from the undecomposed manganese dioxide in the flask, manganese sulphate is of a light pink or rose color. 2. Is there any other method of obtaining the oxygen from manganese than by mixing with sulphuric acid? If so, will you please inform me of the least expensive method? A. Oxygen may also be obtained from the oxide by strongly heating it in an iron retort in a good furnace. 3. Can you inform me how much sulphuric acid is required to free the oxygen from 10 lbs. manganese? A. For the complete decomposition of 10 lbs. of the pure dioxide, about 11.35 lbs. of sulphuric acid (specific gravity = 1.8) will be requisite, but it will be better to use an excess of the acid. These amounts will give you, if the action is completed, about 18 cubic feet of gas. 4. What are the other ingredients, or component parts of manganese, and what is the proportion? A. Manganese proper (Mn) is a metal, manganese dioxide, commonly called manganese, being a combination of that element with oxygen—(Mn O₂). The proportions are: Manganese, 54.8; oxygen 32.0. With hot sulphuric acid the reaction is:



(5) F. A. L. asks: Can you tell me how to remove ink stains from white marble? The ink is black French ink, and has been spilled on a white marble mantle. A. Try a strong aqueous solution of pyrophosphate of soda. If this fails, try a solution of a few drops of spirits of niter in a spoonful of water; apply with a feather, and wash well afterwards with water.

(6) I. H. E. says: Will you inform me how to melt and mould rubber? A. Rubber cannot be melted by heat without partial decomposition. The gum rubber (caoutchouc) may be softened by boiling water so as to admit of being worked or moulded as desired. After working, the rubber is caused to combine with a small per cent of sulphur, which vulcanizes it.

(7) A. K. S. says: Can you give me a recipe for making cement, one that will hold machine belts together? A. See SCIENTIFIC AMERICAN, p. 171, vol. 35. This composition is soluble in naphtha or benzole, and the addition of a little naphtha solution of caoutchouc is said to improve it.

(8) R. L. asks how red mottled soap is made? A. The mottled appearance is produced by the addition of a small quantity of an iron salt—usually copperas.

(9) J. H. C. asks: How can a strong solution of laundry starch and water be clarified, and the starch taste removed, without destroying its gelatinous properties? A. If we understand you, this may be accomplished by boiling the starch for half an hour with a slight excess of water, and straining the paste while hot. If starch is boiled for some time with dilute sulphuric acid, it is converted first into gum (dextrin) and then into grape sugar, which may be separated from the acid by precipitating the latter with chalk.

(10) W. M. asks for a cement that will unite parchment paper, and will stand hot and cold water and not lose any of its adhesive properties? A. Mix ordinary glue with about 3 per cent of potassium or ammonium dichromate in the dark. This may be used on the paper, and after exposure to light becomes perfectly insoluble in boiling water. This glue has been very largely used in Germany for joining the parchment paper envelopes of pea sausages. The strips of paper joined by this glue are dried quickly and exposed to light till the glue changes to a brownish color; they are then boiled with water containing about 3 per cent of alum till all the excess of alkaline dichromate is extracted, and then washed in water and dried.

(11) J. B. & Co. ask: Is there any way that the aniline colors red and blue can be mixed with varnish for japanning metal, or with oil to be used as paint? A. Many of the clear varnishes and oils may be colored directly with some of the aniline dyes by mixing the coloring material with the solvent used. These dyes do not hold their colors very well at high temperatures.

(12) F. W. H. A. says: I cut down some trees in my garden last year, and wishing to get rid of the stumps without digging up the ground, I followed your recommendation, by boring holes 12 inches deep in them, pouring in about a pint of sulphuric acid, and plugging. This was done both in fall and spring, but, notwithstanding, shoots are coming up from the roots (and stems a little below the surface) of all the trees. Can you suggest a cause and a remedy? The trees are (or were) fig, lilac and elder, and they seem to care as little for the sulphuric acid as "Dan'l" did for "them ere lions." A. The sulphuric acid treatment referred to was recommended by one of our agricultural contemporaries presumably well informed in the matter. We had not tried the experiment, but it would seem reasonable to suppose that if a sufficient quantity of the acid were used in the proper manner, it might effectually destroy the vitality of the roots. To our knowledge the surest method of getting rid of stumps is by mechanical means, for which purpose there are a number of excellent devices in the market. It has been stated that the following method has been used with good success. In the top of the stump a number of holes, each capable of holding a pound or two of saltpeter (potassic nitrate) are bored, filled with the salt, and during the latter part of the fall kept full of water, which will dissolve the salt, and the solution formed gradually passes into the roots. In the early spring the same holes are to be filled for a week or two with kerosene oil, and finally the oil-soaked stump set fire to, when the combustion will proceed, aided by the oxygen of the niter, until the greater part of the roots are consumed, after the manner of a slow match. How far this may be matter of fact we are unable to say, but the experiment is perhaps worth trying.

(13) J. P. T. asks for a recipe for white metal that will melt at a low heat? A. An alloy of bismuth 8 parts, lead 5 parts, tin 3 parts, will melt below 212° Fahr. Bismuth 2 parts, lead 5 parts, tin 3 parts, is said to melt in boiling water. Lead 3 parts, tin 2 parts, bismuth 5 parts, melts at 197°.

(14) H. E. asks for a recipe for manufacturing a good article of paste shoe-black at a moderate cost? A. Consult "Cooley's Cyclopaedia of Practical Recipes," published by Lindsay and Blackiston, Philadelphia. You can judge of cost by consulting dealers in the articles you require.

(15) F. N. B. asks: 1. How can I black the inside of a tin telescope tube so that it will not rub off or retain dust? A. Thin shellac varnish and lampblack will do. It must be a dull, dead black surface. 2. How tight should a 2 1/2 inch achromatic object glass fit in a tin cell? A. Not so tight as to bend or break the lens.

(16) W. B. asks for a cheap method of galvanizing iron? A. The iron is first cleaned bright by being kept for a time in sulphuric acid, then dipped in muriate of zinc, and then plunged in a bath of molten zinc.

(17) E. K. says: Can you give me the name of parties publishing a directory that gives the address of all the foundrymen in the United States and Canada? A. We know of no such directory.

(18) E. A. and others, who ask about carbolic soap: Take freshly prepared coconut oil soap 150 parts, and fuse; then add a solution of alcohol 10 parts, carbolic acid 6 parts, caustic potassa 2 parts, oil of lemon 1 part. Mix with stirring, and pour into moulds.

(19) W. E. asks: Will you please give me the mode of preparing the peroxide of hydrogen? A. It is prepared by decomposing the peroxide of barium with as much very cold solution of hydrofluoric or phosphoric acid as will exactly saturate the base. The barium salt then precipitates, leaving the hydrogen peroxide dissolved in the water. The filtered solution is then concentrated in vacuo by the aid of the absorbing power of strong sulphuric acid in an adjoining connected vessel.

(20) F. S. T. asks: What is the best method for cleansing kid gloves? A. Put them together with a sufficient quantity of pure benzine in a large stoppered vessel, and shake the whole occasionally with alternate rest. If on removing the gloves there remain any spots, rub them out with a soft cloth moistened with ether or benzole. Dry the gloves by exposure to the air, and then place smoothly between glass plates at the temperature of boiling water until the last traces of benzine are expelled. They may then be folded and pressed between paper with a warm iron. Another way is to use a strong solution of pure soap in hot milk beaten up with the yolk of one egg to a pint of the solution. Put the glove on the hand and rub it gently with the paste, to which a little ether may be added, then carefully lay by to dry. White gloves are not discolored by this treatment, and the leather will be made thereby clean and soft as when new.

(21) P. J. K. asks: Is there any way of drilling a small hole in glass? I wish to suspend a pane of glass by means of a thread or fine string. I have broken a large amount of glass in trying to bore a small hole in it, but have not succeeded. A. Use turpentine, and take care when the drill is about to break its way through the glass as the hole is finished.

(22) E. C. H. says: You answer that my difficulty in pouring Babbitt metal boxes is in the vent; this is not the case, as I have left one side of the box entirely open, and then I failed to get the box solid, the metal seeming to chill too quickly. A. Try heating the shaft and boxes, and give good ventilation. Are the wrinkles or ridges that are rolled in tinware intended to beautify or make more firm the vessel, or are both these objects intended? A. The principal use is to strengthen the vessels; although sometimes ornamentation is only desired.

Is an oscillating engine properly constructed as good as one with guides, connecting rod, etc., for all purposes? A. One great defect is that there is more wear in the parts of the oscillating, as usually made, than in the reciprocating. Where flat surfaces work upon each other with circular strokes, trouble is experienced in keeping them to wear equally, and consequently to keep them packed tight.

Can the edge of a razor, whetted to the keenest edge, be magnified? A. We presume it could be magnified.

(23) J. M. says: I have several small pieces of walnut 1/4 inch in thickness, which have become warped. How can I make them recover and retain their proper shape? A. Steam them so as to soften them, then fasten them in the position which you wish them to retain.

(24) H. B. P. asks: Can you inform me whether you published during the Centennial any account of the Vienna model bakery and their processes? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 60, p. 963.

(25) E. L. M. says: A friend claims it will take no stronger dam to hold a pond of 100 acres, 10 feet deep, than one of 1 acre, 10 feet deep. I claim that the larger the pond the greater the pressure, but it presses in all directions and the dam has a pressure on it, more or less, according to its length, supposing it to be the same depth in every place in both cases. A. Your friend is right, you are wrong.

He claims that gold sinks in quicksilver because the silver adheres to it. I say it is because the gold is heavier. A. You are right.

(26) H. W. asks: 1. What kind of wheel and stone does the scissor and razor grinder use? A. Any free cutting grindstone will answer. The diameter from 4 to 12 inches is generally used, and from 2 to 4 inches thick. 2. What kind of an oilstone to finish the razors? A. You can obtain suitable oilstones from dealers. 3. The name of a good book for the amateur machinist and jobber? A. Address H. C. Baird & Co., 510 Walnut street, Philadelphia, Pa.

(27) B. A. W. asks how to make shellac varnish? A. Take shellac, any quantity, put it in a glass jar or tin vessel, and add alcohol to just cover the shellac. Set in a warm place, beside a stove or even in the sunshine, and in two or three days it is fit for use. If too thick add alcohol. It is not necessary to strain, as impurities will settle to the bottom of the vessel. Keep covered to keep out dust. If closely corked, evaporation of the alcohol will be very small. It can be used for wood, brass, iron, paper, etc. Experience will determine the proper thickness of the varnish.

(28) I. F. B. asks how to make straw board impervious to water? A. Try soaking in linseed oil and then cover with repeated coats of varnish.

(29) W. E. B. A. Co. says: Can you tell us how to cut off iron rods in a more economical way than by means of a cold chisel and filing to length? A. If you have an engine lathe in your factory, run a circular saw, at a proper speed, between centers, arrange some method to hold the rods in the tool post, and cut them to gauge the proper length.

(30) H. C. McG. asks: Which way is the torpedo most destructive? Does it blow the vessel out of the water, burst it in pieces, or blow holes in the bottom? A. The torpedo, upon being exploded in contact with the side of the vessel, is intended to burst a hole in the hull and thus sink her.

(31) G. E. S. asks: How are glass water gauges cut off to proper lengths without breaking? A. One method employed by mechanics is to break off the end of a round file, say 1/4 inch, so as to obtain a sharp edge, then with it scratch a circle on the inside of the gauge, at the proper length, and it will readily snap off where the scratch is made.

(32) V. A. S. asks for a recipe for making tooth paste? A. Take sugar of milk 100 parts, pure tannin 15 parts, lake 10 parts, oils of mint, aniseed, and orange flowers, sufficient quantity. Rub together the lake and tannin, gradually add the sugar of milk, and then the oils.

(33) H. G. H. asks for a recipe for making boot blacking. A. Ivory black 1 part, molasses 1/4 part, sweet oil 1/4 part. Mix and stir in hydrochloric acid 1/4 part, and oil of vitriol 1/4 part. Dilute the acid with twice its weight of water before mixing. Another recipe is to take ivory black 4 lbs., molasses 2 lbs., sweet oil 1 lb., oil of vitriol 8 lbs. Mix and put in boxes.

(34) E. R.—The material of which you ask information is chloride of silver, and when found native is called horn silver. It is procured as a dense white flocculent precipitate on adding hydrochloric acid or the solution of any chloride to a soluble salt of silver.

(35) G. W.—The disease and remedy may depend much on the physiological condition of the individual. Apply to your family physician.

(36) F. W. F. says: Send me instructions for the building of a cheap single scull shell to be made of canvas. Length about 18 feet. A. See Nos. 25, 26, 29, 30, 32, 36, 37, 39, and 42 of the SCIENTIFIC AMERICAN SUPPLEMENT, which give illustrations, descriptions, and proportions of boats. As your query is very indefinite, we can give no exact rules for your guidance. We presume a perusal of the papers referred to will give suitable instruction.

(37) D. H. asks: How is citric acid manufactured? What machinery is required to operate a factory on a small scale? A. Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state, produced by evaporation by a gentle heat. It consists of citric acid 6 to 7 per cent, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is then gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor is well washed with warm water. It is then intimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1.13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be syrupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystallize, the mother liquor after a few days be-

ing evaporated as above, and again set to crystallize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystallized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about eight ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

(38) D. B. K.—Your inquiry was answered last week. To clean moss from trees, wash them with lye made by leaching wood ashes. To clean marble, wash with quicklime, clean, rub with fine putty powder and olive oil.

(39) Constant Reader is informed that there are many works on steam boilers and their management. He had better select those he considers best adapted to his wants.

(40) W. F. B. asks for a book that describes the locomotive. He had better procure Forney's "Catechism of the Locomotive."

(41) R. S. N. asks how to thin down printers' ink which will answer to print stencils made by a sharp needle, such, for instance, as the stencils made by an electric pen? A. You can thin ordinary printing ink with linseed oil or with kerosene.

(42) G. A. S. asks: How much water is contained in 1 cubic foot of steam at 30 lbs. pressure? A. Weight of a cubic foot of steam, at 30 lbs. pressure by gauge, about 0.0179 lbs.

(43) M. M. McP. asks: Can a dirt road engine be made to run in our Texas land successfully? If you know of any, please give me the address. A. Insert a notice in our "Business and Personal" column, which is especially designed for such inquiries.

(44) I. T. W. says: I am making an engine, the cylinder being 2½ inches in diameter, and 5 inches long. I have a smaller one ½ inch diameter and 5 inches long. I have a larger one 4 inches in diameter and 7 inches long. Please let me know what horse power each engine will be, and what sized boilers will be required? A. See pp. 33, 225, vol. 33.

(45) W. B. B. says: Suppose two rifles are so charged that they will send their bullets exactly the same distance, all things being equal, which of the two would send its ball to a given point the quickest, if one man remains stationary and the other man fires from a rail car going at the rate of 60 miles an hour, both rifles fired simultaneously and of course at an equal distance from the mark, and fired in the direction the rail car is travelling? A. The one on the car.

(46) I. T. C. says: I am running an 11 x 20 inch stationary engine, with one 40 inch two flue boiler 14 feet long. The boiler is good but not large enough for the engine. I have a good 14 inch flue. If I connect it to my boiler lengthways on top, and use it as a steam drum, would it not add considerably to my boiler power? A. As we understand the proposed mode of connection, we do not think it would increase the steaming capacity of the boiler.

(47) A. M. H. asks: Can I use an engine as large as 60 inches in diameter and 12 feet stroke, and condense the steam with an inside condenser of Lighthall's or some other good make, and whether I can make as much vacuum as I could form with a jet, also if a jet condenser works well with water that is muddy like our western rivers? A. Generally, surface condensers do not make quite as good a vacuum as jet condensers. If the water is very muddy, there might be some trouble in keeping the plunger of the air pump tight.

(48) L. E. N. asks: Would water, if deep enough, be so compressed that an iron ball would cease to sink? A. No. See p. 208, vol. 23.

(49) H. M. W. asks: 1. Why is the moon said to be viewed at an angle of ½ degree? A. On account of refraction.

Please give me the names of the metals as regards their expansibility with heat, heading with the most expandable? A. The principal metals are arranged, in the order of expansibility, as follows: Platinum, palladium, tempered steel, antimony, iron, bismuth, gold, copper, brass, silver, tin, lead, zinc.

Would a peg driven horizontally in an upright post at the equator, throw the same length shadow at noon as at 6 o'clock A.M. and P.M.? A. Yes.

What would be the relative time of the passing of a railroad train a point, say the edge of a building situated 300 feet from the point of observation, the train being a mile away, and that point being any other distance? A. Please send a sketch, to make your meaning plainer.

(50) D. F. H. says: M. says that the proper way to set carriage axles is to set them forward. I claim that an axle to run easy should be set straight, so there will be no friction against nut or washer. Who is right? A. You have the right idea, as we understand your question.

(51) B. says: In an argument with a friend on the subject of "Revolutions of a Wheel," he claims that the hub goes faster than the rim or outward part of the wheel, on the ground that the hub receives the first of the power of motion. On the other hand, I claim that there is no distinction, that when one part moves or receives motion, the whole does. A. It is a question of terms. As the outer portion of the wheel makes as many revolutions as the hub, it necessarily goes through a greater distance in a given time.

(52) A. Y. asks: What is meant by a circular inch? Is it 1 inch in diameter? Why divide by the decimal 0.7854 to get the area? How is this decimal got? What is the area of a valve that is 2 inches square? A. You should consult some elementary work on geometry.

(53) Southern Subscriber asks: What must tobacco leaf be sprinkled with before being cut, and what process is necessary, after cut, to obtain a good acceptable flavor? A. The flavoring ingredients are a matter of taste. Molasses, glycerin, cascarrilla bark, and anise seed are some of the materials employed.

(54) W. H. C. says: Can you tell me what will kill weeds, such as plantain, that grow around a well where it is wet and marshy? A. Perhaps the best plan would be to drain the land around the well, and fill in with stones or cement.

(55) I. W. W. asks: What pressure or resistance does mercury offer at 100°, 200°, or 300°, etc., per square inch? A. The pressure of the mercury vapor at the different temperatures is approximately as follows: 100°, 0.0015; 200°, 0.0114; 300°, 0.08 lbs. per square inch.

(56) R. H. McN. says: R. B. G. asks what the pressure against the collar of a horse is, traveling at the rate of 3 miles an hour, to raise 33,000 lbs. a foot high per minute? (I should have said pulling at the end of a lever.) It makes no difference what lever he pulls at, as the rate of travel is given, and the amount of resistance. The rate of speed is 3 miles per hour = 15,840 feet, to raise 33,000 lbs. at the rate of 1 foot per minute = 1,980,000 foot lbs. per hour, which if divided by 15,840 feet (the speed of the horse) gives 125 lbs. of resistance or pressure against the collar. A. We accept the correction with thanks.

J. Y. says: "If all the measures, length, surface, and capacity in the world, and all the weights, were lost, by what means could new ones be obtained to correspond exactly with those we now have?" The standard yard of the State of New York is a brass rod, which bears to a pendulum beating seconds in vacuo, in Columbia College, the relation of 1,000,000 to 1,066,141 at a temperature of 32° Fah. One third of a yard square of pure water at 60° Fah. weighs 62½ lbs. We could therefore get our weights and measures perfectly. A. The restoration of the British standard of length, that is, the reproduction of the one that was burnt, was found to be impossible. Scientific men generally agree that, if a standard and all copies of it are lost, it cannot be exactly reproduced. The weight of a definite volume of pure water has never been exactly determined, that is, the weights used as standards by different nations, when referred to water, do not exactly agree.

(57) S. R. H. asks: What can I use for filling for walnut before using shellac? A. Almost any cheap varnish will do. Scrape clean and thoroughly dry. The object is to fill the pores of the wood.

(58) J. W. G. asks for a solder to solder backs to stereotypes. A. Use common plumber's solder, and apply muriate of zinc as a flux.

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

A. R. McC.—It appears to be calamine—silicate of zinc.—W. A. N.—No. 1 is a limestone. No. 2 is clay slate. No. 3 is bitumen mixed with clay and sand. If distilled in a close retort it will yield rich illuminating gas and various oils. It may be used also as a fuel. No. 4 is crystallized carbonate of lime—calcite.—G. S. M.—It is pyrites. See p. 7, vol. 36.—K. R. F.—It contains iron, lime, magnesia, and silica—it is called augite.—Package marked Newburyport contains a piece of cinder and a small fragment of mica schist.—W. W.—No. 1 does not contain copper. No. 2 is jamesonite—sulphide of antimony and lead. No. 3 is crystallized lime carbonate. No. 4 is quartz crystals. No. 5 contains only a trace of lead and no silver. No. 6 contains bismuth sulphide—bismuthine, also copper. No. 7.—Neither rock nor flux contains silver—the bright specks are mica. No. 8.—The rock may contain silver; the sample does not. No. 9. The metal-like particles in the rock are iron pyrites. No. 10 is gray ore of antimony.—G. N.—There seems to be no patent on rose-leaf beads—the ones sent were nearly inodorous after a week.—F. A. D.—Please send more of the ore.—I. R. B.—The fragment contains fluor spar.—The contents of paper box marked F. G. seem to be a mixture of chalk and magnesia, with flour and other organic matters.—J. M. F.—It is a variety of bituminous coal, yielding considerable ash. You should have sent a specimen of more recent mining.—D. J. M.—It is an impure clay. It might be used for brick making, pottery, and similar purposes.—I. W. D.—It is arragonite—a pure lime carbonate. If in large quantities it might be used as a source of carbonic acid and lime.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Safe Filling. By C. W.
On the Telegraph. By T. G. G.
On a Mathematical Problem. By R. A.
On Solutions of Indeterminate Problems. By H. M.
On the Questions of Bacterial Origin. By S. L. N. F.
On the Great Strike, etc. By I. S. C.
On a Mechanic's Incog. By W. P. T.
Also inquiries and answers from the following:
W. A. D.—B. J. H.—G. W.—G. W. P.—J. S. A. B.

HINTS TO CORRESPONDENTS.

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

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

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

Hundreds of inquiries analogous to the following are sent: "Who publishes books on bricklayers, etc.?" "Who publishes books suitable for amateur mechanics?" "Who makes a small, good, portable steam engine?" "Where can spring levels be obtained?" "Who makes and sells egg incubators?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

July 10, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Agricultural boiler, H. Henley	192,993
Alarm, W. W. Climenson	192,961
Amalgamator, A. B. Paul	192,920
Animal trap, S. Earle	192,980
Axle box, W. G. Beattie	192,957
Bag fastening, T. B. Jackson	192,903
Bake pan, C. Roberts	192,840
Bale tie, R. De Gray	192,978
Bale tie, C. H. Victory	192,852
Basket, J. H. Van Arnum	192,851
Beer, device for tapping, J. Felbel	192,904
Beer cask, J. Hoffman	192,916
Beverage, table, J. J. Rogers	192,938
Billiard cushion, J. S. Mansur	192,911
Billiard register, R. M. Hoe	192,828
Binder, temporary, J. Reynolds	192,937
Blotter and ruler, L. P. McElhinney	192,926
Boilers, G. Steele	192,949
Book and cover, I. Reynolds	192,935
Book and cover, L. D. & I. Reynolds	192,878
Book binding, I. Reynolds	192,936
Books, line indicator for, I. Lopez	192,834
Boot and shoe heel protector, L. Richards	192,839
Boot cleaner, D. F. Bell	192,967
Bottles, packing, E. Vorster	192,956
Box, E. G. Gollner	192,983
Box fastener, J. C. Millard	192,920
Box, wooden, W. P. Coburn	192,815
Brake, wagon, Selvert, Dietzen & Stoetzel	192,904
Brake lever, E. J. Anderson	192,961
Brake, vehicle, W. P. Pickard	192,932
Brake, wagon, W. F. Ely	192,819
Breech-loading firearm, Wesson & Cutler	192,960
Breech-loading ordnance, A. Schroeder	192,942
Brick, Greenawalt & Anderson	192,986
Brush, Lawrence & Holmes	192,833
Bullet, rifle, B. B. Hotchkiss	192,829
Burglar alarm, J. Israel	192,902
Burial casket, J. Maxwell	192,914
Butter, dish, C. Van Skelline	192,955
Can for fluids, W. McClave	192,916
Car axle box, G. Williams	192,904
Car coupling, F. Heavener	192,915
Car coupling, J. Johnston	192,870
Car mover, Heshusen & Burn	192,866
Car, sleeping, C. E. Lucas	192,909
Car starter, S. Graham	192,984
Cars, propelling, J. B. Tibbitts	192,932
Carbureting air, R. P. Hanglitter	192,825
Carbureting air, G. W. Lamb	192,907
Carbureting machine, C. H. Pierson	192,934
Castanet, W. Hutchings	192,999
Caster, sewing machine, G. K. Proctor	192,877
Chain links, die for welding, J. H. Helm	192,827
Chair, T. Tostevin	192,850
Chair, barber's, J. Clough	192,898
Cheese, manufacture of, Baltz & Prindle	192,963
Churn, H. E. Pendleton	192,838
Churn, J. A. Cubitt	192,900
Churn, C. Isbell	192,829
Cloth measuring machine, G. P. Baker	192,962
Coffee pot, W. H. Sherwood	192,943
Composition articles, W. H. Dibble	192,833
Confectionery, Sibley et al	192,945
Corset stay, M. P. Bray	192,894
Cotton cleaner, Thomas & Robertson	192,961
Cultivator, S. N. Hench	192,992
Cultivator, H. P. Kynett	192,922
Cultivator, W. C. Ward	192,959
Curry comb, C. A. Hotchkiss	192,918
Curtain cord tightener, E. B. Byam	192,974
Dish warmer, J. H. Wright	192,958
Door check, J. Alexander	192,888
Draw knife, A. E. Brockett	192,856
Drop light, C. Henry	192,994
Drop press, W. C. Hicks (r)	7,788
Egg boiler, O. Smith	192,946
Electrical apparatus, J. Forbes	192,909
Elevator, R. Schmidt	192,940
Engraving machine, A. E. Ellinwood	192,907
Exercising machine, I. W. McGaffey	192,836
Exterminator, ground squirrel, H. Dryer	192,905
Fence post, N. T. Dye	192,818
Fence, post, portable, S. R. Beam	192,965
Fence wire stretcher, W. S. Kime	192,905
Fifth wheel, S. P. Stillman	192,949
Firearms, sight for, M. B. White	192,961
Fire escape, C. Henry	192,965
Fire escape, T. K. Ricketts	192,930
Fire extinguisher, W. W. Crooker	192,862
Fire place, C. S. Rankin (r)	7,787
Fisherman's apron, A. J. Tower	192,954
Floor covering and wainscoting, S. P. Groocock	192,913
Flour, process, etc., C. M. Roberts	192,939
Forge, Canedy & Larson	192,975
Forks and spoons, H. E. Fowler	192,910
Gas process, A. W. Wilkinson	192,962
Gas retorts, D. R. Shiras	192,944
Gas retorts, T. Ubbil	192,884
Gate, J. Bundy	192,971
Gate, H. A. Stearns	191,862
Glue, apparatus for drying, S. T. Swasey	192,846
Glue pot kettle, J. F. Lucas	192,910
Governor, G. Steele	192,900
Grain separator, J. E. Smith	192,941
Grate, G. B. Mershon	192,918
Grate cleaner, C. E. Murray	192,922
Grinder for harvest knives, W. Comey	192,816
Gun carriage, B. B. Hotchkiss	192,830
Gutter, street, C. Bignon	192,811
Hame fastener, A. B. Woodard	192,967
Hame tug, W. S. Thayer	192,848
Harrow, W. G. P. Sharp	192,942
Harvester, C. W. Levalley	192,871
Harvesters, H. L. Hopkins	192,998
Hat and bonnet stand, E. H. Hart	192,826
Hay rake and loader, W. Ingledue	192,900
Heating apparatus, H. B. Smith	192,946
Heating purposes, T. F. Rowland	192,938
Hog hanger and carrier, J. Meyer	192,928
Hog trap, C. R. & J. W. Rutledge	192,939
Hoisting machine, H. Batt	192,891

Holting machine, N. P. Otis.....	192,997
Hook, balance spring, E. Blackman.....	192,812
Hoop poles, J. A. Peoples.....	192,874
Hoops, B. L. Bittling.....	192,970
Hop yards, twine holder, G. E. Pierce.....	192,933
Horses' feet, sponge holder for, T. T. Furlong.....	192,821
Hose nozzle and sprinkler, P. H. Ryon.....	192,860
Hot air furnace, C. Marchand.....	192,835
Hot air furnace, J. F. Pease.....	192,837
Hydrocarbon burner, Stewart & Makepeace.....	192,948
Inkstand, W. J. Thorn.....	192,849
Iron and steel, refining, Smyth & Simpson.....	192,948
Ironing apparatus, H. Monk.....	192,929
Knife scourer, C. V. Hadley.....	192,865
Labels, tobacco, C. W. Van Alstine.....	192,885
Lamp, W. McCarthy.....	192,915
Lamp burner, W. Silvester.....	192,945
Lamp chimneys, attachment for, G. W. Martin.....	192,913
Lamp trimmer, E. Stone.....	192,962, 192,963
Lap link, L. E. Burdin.....	192,972
Latch for gates and doors, A. L. Beardsley.....	192,966
Latch, gate, C. B. & M. S. Austin.....	192,889
Latch, locking, J. Haptonstall.....	192,968
Leather-skiving machine, C. F. Packard.....	192,928
Life preserver, D. Kahnweiler.....	192,832
Lifting jack, T. J. Jenne.....	192,831
Lighting gas, W. W. Batchelder.....	192,964
Loading vessels, etc., S. Marsden.....	192,872
Locomotive wheel, J. Larmanjat.....	192,923
Loom shedding mechanism, W. R. Andrews.....	192,960
Loom temple, W. H. Burns.....	192,897
Lubricator, H. Winter.....	192,887
Mallet, A. Holbrook.....	192,867
Marble, artificial, C. Schaeffer.....	192,941
Mask for horses and cattle, A. H. Trueblood.....	192,965
Milk cooler, L. T. Reed.....	192,935
Mill pick, W. B. Morris.....	192,921
Mop, E. S. Ellis.....	192,906
Mudlage holders, etc., S. S. Newton.....	192,923, 192,924, 192,925
Needle machine, Payne & George.....	192,931
Nut, F. A. Bradley.....	192,859
Oil can, T. W. McNally.....	192,917
Paddle wheel, I. A. & E. E. Kilmer.....	192,921
Paddle wheel, D. Lindsay.....	192,908
Padlock, W. H. Taylor.....	192,847
Paper box, W. H. Swift.....	192,883
Pavement, wood, H. M. Stow.....	192,951
Pen and pencil case, R. M. Collard.....	192,899
Pencil, lead, H. T. Cushman.....	192,902
Photographic apparatus, G. W. Baker.....	192,854
Piano lids, hinge for, J. D. Peoples.....	192,932
Plaiting machine, J. H. Brown.....	192,860
Plaiting machine, W. Painter.....	192,929
Plow, stump, W. Painter.....	192,930
Postal card, C. K. Marshall.....	192,912
Pottery, R. Gracey.....	192,823
Powder flask, J. Covode.....	192,977
Printing machines, S. D. Tucker.....	192,954, 192,955
Pulley block, E. U. & W. L. Scoville.....	192,881
Pump, A. M. Searls.....	192,943
Pump, J. Robertson.....	192,937
Pump, J. Luster.....	192,924
Pump, T. B. Swan.....	192,950
Pump, J. W. Douglas.....	192,979
Pump, J. W. Pearce.....	192,873
Pump, J. N. Wilson.....	192,906
Punching and shearing machine, H. O'Neill.....	192,926
Quilting frame, R. W. Burk.....	192,973
Railroad crossing, J. S. Williams.....	192,963
Railroad switch, E. Hugron.....	192,968
Railroad track, A. D. Serres.....	192,843
Railway, E. Frere.....	192,981
Railway crossing, J. S. Williams.....	192,963
Saddler's trimming tool, M. M. Sulgrove.....	192,845
Sash fastener, J. Andrews.....	192,869
Sash fastener, W. H. Brown.....	192,896
Sash fastener, F. J. Hoyt.....	192,919
Sausage stuffer, I. W. Haysinger.....	192,996
Saw mill, J. R. Hoffman.....	192,917
Saw mill, O. L. Jenks.....	192,904
Saw mill dog, A. Cunningham.....	192,817
Saw set, C. Heinen.....	192,991
Saw tooth adjuster, J. F. Damon.....	192,903
Sawing machine scroll, W. H. Tufts.....	192,957
School desk, Walgrain & Buscall.....	192,967
Scoop, W. J. Griffiths.....	192,867
Screw-cutting dies, J. J. Grant.....	192,824
Screw driver, A. J. Curtis.....	192,901
Sewing machines, C. H. Warner.....	192,886
Shovel, C. H. Victory.....	192,853
Show case, Bartlett & Bickford.....	192,853
Shutter worker, H. Smith.....	192,847
Sign, street, P. A. La France.....	192,906
Soap and shaving box, combined, A. Hopfen.....	192,997
Soldering machine, Brooks & Gornall.....	192,813
Spark arrester, W. Ilushton.....	191,841
Spool case, B. R. Hamilton.....	192,914
Stamp, postage, D. G. Beaumont.....	192,893
Stamp, postage, W. W. Bierce.....	192,963
Station indicator, J. W. Graydon.....	192,985
Stirrup, W. B. Conway.....	192,976
Stock feeder, A. W. Prather.....	192,876
Store reacher, Rutherford & Mitchell.....	192,879
Stove, C. Lyman.....	192,925
Stove grates, E. A. C. Fox.....	191,911
Stove, E. A. C. Fox.....	192,864
Stove register, B. F. Clement.....	192,914
Straw cutter, S. Mepharm.....	192,927
Tag, O. T. Smith.....	192,947
Telegraphic circuit, S. J. M. Bear.....	192,856
Tile-laying machine, W. J. & J. I. Mettler.....	192,919
Toilet articles, J. Vernon.....	192,958
Toy Noah's ark, G. H. Ireland.....	192,901
Toy pistol, J. Barry.....	192,880
Tramways, T. H. Day.....	192,904
Umbrella, R. S. Galbraith.....	192,822
Umbrella tip cup, H. S. Frost.....	192,912
Vehicle body, T. Tostevin.....	192,933
Vehicle spring, A. B. Bishop.....	192,969
Vehicle wheel, M. J. Racer.....	192,934
Vehicle, G. M. Peters (r).....	7,789
Wagon, C. S. Bateman.....	192,892
Wagon end gate catch, F. A. Havens.....	192,989
Wagon, C. W. Salade.....	192,968, 192,969
Water and wine cooler, D. K. Enright.....	192,830
Water meter, H. B. Hayes.....	192,990
Waste, cleansing, etc., C. W. Smith.....	192,844
Wind wheel, J. P. Preston.....	192,931
Windmill, I. H. Palmer.....	192,933
Window light, P. E. Sloan.....	192,843
Window screen, F. A. Gilbert.....	192,882
Window screen, E. P. Pomeroy.....	192,875
Wood molding machine, M. Bostwick.....	192,858
Wrench, B. F. Joslyn.....	191,922

Advertisements.

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

Kemlo's Watch Repairer's Hand Book

The Watch Repairer's Hand Book. Being a complete Guide to the Young Beginner in Taking Apart, Putting Together, and Thoroughly Cleaning the English Lever and other Foreign Watches, and all American Watches. By F. Kemlo, Practical Watchmaker. With Illustrations. 12mo, \$1.25.
A Rudimentary Treatise on Clocks, Watches, and Bells. By Sir Edmund Beckett, 12mo, \$1.75.
Time and Time Tellers. By J. W. Benson. Illustrated. 12mo, \$1.25.
A special list of books of interest to Jewelers, Silversmiths, and Watchmakers sent free upon application.
The above, or any of our Books, sent by mail, free of postage, at the publication price.
Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—60 pages, 8vo—sent free to any one who will furnish his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers and Importers.
810 Walnut Street, Philadelphia.

LADIES can make \$5 a day in their own city or town. Address Ellis Man'g Co., Waltham, Mass.

MADE TO ORDER.

Special Machinery, Tools, Models, and Patented Articles. A. A. Pool & Co., 55 R. R. Ave., Market St. Sta., Newark, N. J.

CIVIL AND MECHANICAL ENGINEERING AT THE
Kenselauer Polytechnic Institute, Troy, N. Y.
Instruction very practical. Advantages unsurpassed in this country. Graduates obtain excellent positions. Reopens Sept. 18th. For the Annual Register, containing improved Course of Study, and full particulars, address Prof. WM. L. ADAMS, Director.

FOR SALE.—THE ONLY MACHINE
Shop in one of the largest boot manufacturing towns in Massachusetts. Land, shop, tools, and business. For particulars, apply to G. G. WRIGHT, Spencer, Mass.

FOR SALE.—A 10 H. P. PORTABLE ENGINE. Address G. E. STAUFFER & CO., East Stroudsburg, Pa.

AGENTS WANTED.
For particulars address
WILSON SEWING MACHINE CO.,
829 Broadway, New York City,
New Orleans, La., Chicago, Ill.,
Or San Francisco, Cal.

ENGINES, BOILERS AND MACHINERY,
new and second-hand. Send for circular.
GEO. M. CLAPP, 26 Broadway, N. Y.

MEN WANTED to sell goods to Merchants. NO PEDDLING from house to house. HOTEL AND TRAVELING. QUERETZ CITY OILS and LARD WORKS, CLEVELAND, OHIO.

TWO LARGE IRON PLANERS FOR SALE VERY cheap. E. E. ROBERTS, 119 Liberty St., N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 52 & 54 of our Book of Sections—which will be sent on application to those contemplating the erection of fire proof buildings—THE COST CAN BE ACCURATELY CALCULATED, the cost of insurance avoided, and the serious losses and interruption to business caused by fire, these and like considerations fully justify any additional first cost. It is believed, that were owners fully aware of the small difference which now exists between the use of Wood and Iron, that in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

Can I Obtain a Patent?

This is the first inquiry that naturally occurs to every author or discoverer of a new idea or improvement. The quickest and best way to obtain a satisfactory answer, without expense, is to write to us (Munn & Co.), describing the invention, with a small sketch. All we need is to get the idea. Do not use pale ink. Be brief. Send stamps for postage. We will immediately answer and inform you whether or not your improvement is probably patentable; and if so, give you the necessary instructions for further procedure. Our long experience enables us to decide quickly. For this advice we make no charge. All persons who desire to consult us in regard to obtaining patents are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us a careful consideration of their plans, an honest opinion, and a prompt reply.
What Security Have I that my communication to Munn & Co. will be faithfully guarded and remain confidential?
Answer.—You have none except our well-known integrity in this respect, based upon a most extensive practice of thirty years' standing. Our clients are numbered by hundreds of thousands. They are to be found in every town and city in the Union. Please to make inquiry about us. Such a thing as the betrayal of a client's interests, when committed to our professional care, never has occurred, and is not likely to occur. All business and communications intrusted to us are kept secret and confidential.

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

Wood-Working Machinery,

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

SPARE THE CROTON AND SAVE THE COST.

Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 414 Water St., N. Y., who control the patent for Green's American Driven Well.

65 MIXED CARDS, with name, 10c. and stamp. Agent's Outfit, 10c. L. C. COE & CO., Bristol, Ct.

THE NEW GERMAN PATENT LAW.

Being the Full Text of the New Law for Patents, passed July 1st, 1877, covering all the States of the German Empire. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 80. Price 10 cents. To be had at this office and of all newsdealers.

DUC'S SPHERICAL ELEVATOR BUCKET.

OVER 20,000 ALREADY SOLD.



Endorsed by the leading millers and manufacturers in the country. NO CORNERS TO CATCH; requires less power to run; will throw clean every time; made of the best charcoal stamping iron, and positively indestructible; cost about the same as tin or sheet iron square buckets. Ask your nearest Mill Furnishing House or Millwright for them. Samples furnished. Address

T. F. ROWLAND, Sole Manufacturer,
Brooklyn, E. D., New York.

LEFFEL WATER WHEELS.

With recent improvements.

Prices Greatly Reduced.

7000 in successful operation.

FINE NEW PAMPHLET FOR 1877.

Sent free to those interested.

James Leffel & Co.,
Springfield, O.

109 Liberty St., N. Y. City.

N. F. BURNHAM'S

1874

WATER WHEEL

Is declared the "standard turbine," by over 600 persons who bought and used them with part and full gate open.

N. F. BURNHAM, York, Pa.

Pond's Tools

Engine Lathes, Planers, Drills, &c.

Send for Catalogue. DAVID W. POND, Successor to

LUCIUS W. POND, Worcester, Mass.

OTIS' Machinery.

OTIS BROS. & CO., No. 348 Broadway, New York.

IRON AND STEEL. BY DR. C. W. SIEMENS.

A most interesting and valuable paper, containing accounts of the most recent practical improvements in the Production, Working, and Application of Iron and Steel; embracing the question of Labor in its relation to Capital; the Character, Value, Cost and Production of the various kinds of Fuel, including Bituminous Coals, Coke, American Fuels, Peat, Natural Gas Fuel, Liquid Fuel, Solar Fuel. Motive Powers and their Transmission over long distances. Water Power; its Transmission by steel Ropes; its Transmission by Electricity. Wind Power. Bessemer Steel History. Siemens and Martin Steel. The Regenerative Furnace. The Open Hearth System. The Use of Ferro-Manganese. Use of Chromium. Production of Mild Steel. Piping of Steel. The Applications of Steel. Iron and Steel Nomenclature. Wrought Iron. Mechanical Puddling. Bell's New Process. Wrought Iron Direct from the Ore. Methods of Protecting Iron and Steel from Rust. Aniline's Method. Bar's Method. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS Nos. 70 and 71. Price 10 cts. each. To be had at this office, and of all newsdealers.

Boulton's Patent Reverse Motion

Paneling, Variety Moulding & Dovetailing Machine. Cuts Panels of any design or style of mould in the solid wood with neatness and dispatch.

Is a first-class Shaper, Edge, and Scroll Moulder. Does general Dovetailing.

Thin stuffs. Simple, Durable and Efficient. Send for Pamphlet and Sample of work. Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

B. C. MACHINERY CO.,
Battle Creek, Mich.

\$55 & \$77 a week to Agents. \$10 Outfit Free. P. O. VICKERY, Augusta Maine.

ENGINES AND MACHINERY, ALL STYLES, NEW and Second-hand. E. E. ROBERTS, 119 Liberty St., N. Y.

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.,
NEW YORK.

YALE IRON WORKS,

New Haven, Conn.

Builders of the YALE VERTICAL, the best and most Economical, either for land or marine use; also

HORIZONTALS, with or without the Rider Cut-off.

SPECIAL TOOLS made to order, all at prices that defy competition. Send for Circular.

The George Place Machinery Agency

Machinery of Every Description.

121 Chambers and 103 Reade Streets, New York.

THE "ROBERTS" PORTABLE, HOISTING AND

Yacht Engines. Send for circular. 119 Liberty St., N. Y.

WE ENAMEL

IN FINE JET BLACK every variety of turned woodwork parts of machinery, castings, linings and other metal work ENAMELED JET BLACK, in wood or metal, made to order.

AMERICAN ENAMEL CO., 101 W. 23rd St., N. Y.

Lathes, Planers, Shapers, Drills,

Gear & Bolt Cutters, &c. E. GOULD, Newark, N. J.

PIONEER IRON WORKS,

Nos. 149 to 153 William St., BROOKLYN, N. Y.

Manufacturers of the A. LINCOLN Patent Steam

ROAD ROLLER and TRACTION ENGINE. All kinds of Paving Machinery.

Machinery for Sugar Houses and Plantations a specialty.

Alexander Bass's Patent Portable Iron Railroad.

Salaries. Salesmen wanted to sell our

Simple Goods to Dealers. No peddling. Expenses paid. Permanent employment. Address H. A. GRANT & CO., 2, 4, 6 & 8 Home St., Cincinnati, O.

TORPEDO VESSELS. BY MR. DONALDSON.

A valuable paper, lately read before the United Service Institute. Being a full exposition of the Torpedo-boat system, from the earliest efforts to the present time. Giving dimensions and performances of the several sizes built by the various governments, and the various trials of these boats, and experiences in war, and a description of the torpedoes used. 1 illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 79. Price 10 cents. To be had at this office and of all newsdealers.

WESTON DYNAMO-ELECTRIC MACHINE CO

Machines for Electro-plating, Electrotyping, Electric Light, etc., in addition to testimonials in our Catalogue of Jan. 1. We beg to refer to the following houses: MEYDEN BRITANNIA CO.; RUSSELL & ERWIN MFG CO.; RICE & BAILEY; HALL, ELTON & CO.; RICHARDSON, LYON & CO.; WM. H. JACKSON & CO.; STANLEY BROS. & CO.; CUTLER, CHAS. ROGERS BROS.; EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NORWALK LOCK CO.; HAYDEN, GERE & CO.; DOMESTIC SEWING MACHINE CO.; EBERHARD FABER; JOS. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 200 others. Outfits for NICKEL, SILVER, BRASS, PLATING, etc. The two highest CENTENNIAL AWARDS, and the CENTENNIAL GOLD MEDAL of American Institute.

CONDIT. HANSON & VAN WINKLE

Sole Agents NEWARK, N. J.

FOR THE LATEST IMPROVED STAVE

Heading and Shingle Machinery, also the celebrated Bailey Gauge Lathe, Second-hand Boilers and Engines, or Special Machinery, address T. R. BAILEY, Agt., Lockport, N. Y.

STUDIES OF MATTER AND LIFE.—By

Prof. Henry J. Black, F.R.S. A most interesting and valuable paper, explaining the latest scientific theories, researches and calculations, concerning the various Modes of Motion, the Ether of Space, the Transmission of Wave Forces, the Limits of Vision, the Size of Atoms, Motion and Force of Atoms, Grouping of Atoms, Phenomena of Reproduction, Mental Phenomena. SCIENTIFIC AMERICAN SUPPLEMENT No. 37. Price, 10 cents. To be had at this office and of all newsdealers.

BENTLEY, MARCEDANT & CO

MANUFACTURERS OF SUPERIOR

UNIVERSAL WOOD WORKERS

BAND SAWS, SCROLL SAWS

PLANING & MATCHING MACHINES

UNIVERSAL HAND JOINTERS

MOLDING, COVETAILING, SCROLLING, RIEZING, SHAPING & SANDRAPPING MACHINES, PLANE KNIVES & SHARPENING BITS.

HAMILTON, OHIO.

WANTED

Salesmen to sell to Merchants, \$90 Salary and expenses paid to acceptable men. Mound City Manufacturing Co., St. Louis, Mo.

\$3 GOLD PLATED WATCHES.

In the known world. Sample Watch Free to Agents. Address, A. COULTER & CO., Chicago.

SEALED PROPOSALS

Will be received at the office of the City Clerk of Hamilton, Ohio, until 12 o'clock noon of Thursday, September 6th, 1877, for the lighting the streets and public buildings of the city of Hamilton with Gas for a period of 10 years from the 31 day of June, 1878, according to plans and specifications on file at the city clerk's office, which will be furnished on application.

The city reserves the right to reject any or all bids. Bids will be marked "Proposals for Gas," and addressed to

R. B. MILLIKIN, City Clerk, Hamilton, Ohio.

Blake's Patent Stone & Ore Crusher.

NEW PATTERNS, with important improvements, and abundant strength. This is the only machine used by the principal MUNICIPAL, RAILROAD and MINING CORPORATIONS and CONTRACTORS in the United States and foreign countries, for breaking hard and brittle substances TO ANY SIZE. Send for circular. Address, BLAKE CRUSHER CO., New Haven, Ct.

CONCRETE AS A BUILDING MATERIAL.—A

Lecture delivered before the Royal Institute of Architects, London, by L. FAYE, with discussion of the subject by prominent architects. This lecture and the extended discussions of the subject are contained in SUPPLEMENT Nos. 26 and 34. Price, 10 cents each. They present a large amount of valuable information, upon Concrete building, in concise form.

FOR SALE.—LOCATED IN RICHMOND,

Va., a small Brass and Iron Foundry, in complete working order, under house rent of \$30 per annum, with two Brass Furnaces and all appurtenances, and 300 Patterns; 8-Horse Power Engine; Sturtevant Blower; one ton capacity of coal; good assortment of Blanks and Patterns for Flows; Fronts and Grates, and so on; with room and capacity of \$50,000 per annum. Price \$2,000. Address W. L. COX, 512 Cary St., Richmond, Va.

LOCOMOTIVE ENGINEERING.—THE

most recent and best examples of Locomotive Construction, with scale drawings, tables of principal dimensions, general description, etc., are given in the SCIENTIFIC AMERICAN SUPPLEMENT. The following may be had at this Office, or ordered through any Newsdealer. Sent by mail prepaid. Please order by the numbers here given.

Express Locomotives of the London, Chatham and Dover R. R. Tank Locomotives. With Specifications, Dimensions, Particulars and three Engravings. Supplement No. 23. 10 cents.

Locomotives of the Centennial. A series of Eighteen Outline Illustrations, showing the Principal Locomotives exhibited at the Centennial, with their measures, and a table of principal dimensions of each locomotive. Supplement No. 33. 10 cents.

Baldwin Locomotive.—Large engraving in sectional elevation, with measures, scale, and table of dimensions. Supplement No. 38. 10 cents.

Narrow Gauge Swedish Locomotive, with one page of engravings. Supplement 41. 10 cents.

Locomotive of the Eighteen Inch Railway at Crewe, Eng. Two engravings. Supplement 44. 10 cents.

Locomotive Passenger Engine of Midland Railway, with table of dimensions. Three engravings. Supplement No. 27. 10 cents. The same number contains report of valuable information given before the Master Mechanics' Association, concerning Locomotives and Locomotive Improvements.

Narrow Gauge Locomotives, Indian State Railways, engraving and dimensions. Supplement No. 53. 10 cents.

New Railway Locomotive Crane, by Black, Hawthorne & Co. Four engravings to scale, dimensions, etc. Supplement No. 54. 10 cents.

New Road Locomotive, by Marshall Sons & Co. General description and one engraving. Supplement No. 56. 10 cents.

Express Passenger Locomotives, Great Western Railway. With five engravings, and table of all the principal dimensions. Supplement No. 58. 10 cents.

Locomotive for Burning Petroleum.—Used on Russian Railways. With description and five illustrations. Supplement No. 63. 10 cents.

Steam Trolley or Chair.—Used on Oude Railway. Two engravings. Supplement No. 63. 10 cents.

PATENTS AT AUCTION.

Next Sale Sept. 3d. Patents for this Sale should reach us before August 21st. Send for circular.
GEO. W. KEELE, 55 & 57 Liberty St., N. Y.

AIR COMPRESSORS

FOR ALL PURPOSES.

A SPECIALTY OF HEAVY PRESSURES.

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

BIG PAY to sell our RUBBER PRINTING STAMPS.

Terms free. TAYLOR & CO., Cleveland, O.

PATENT SCROLL AND BAND SAW MACHINES A specialty. CORDESMAN, EGAN & CO., Cincinnati, O.

WESSELL METAL, A PERFECT IMITATION

of gold in color, surface, etc., for manufacturers of imitation jewelry, and other workers in fine yellow metal. Wessell Manufg Co., No. 204 East 23d St., N. Y.

Price \$290

YOU ask WHY we can sell First-Class 7-8 Octave Rosewood Pianos for \$290. Our answer is, that it costs less than \$300 to make any \$400 Piano sold through Agents, all of whom make 100 per cent. profit. We have Agents, but sell direct to Families at Factory price, and warrant five years.

We send our Pianos everywhere for trial and require no payment unless they are found satisfactory. Send for our Illustrated Circular, which gives full particulars, and contains the names of over 1000 Bankers, Merchants and Families that are using our Pianos in every State of the Union. Please state where you saw this notice. Address,

U. S. PIANO CO., 810 Broadway, N. Y.

\$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

EXTRAORDINARY. With engravings, price, \$1. Contains also, fifty original prescriptions for prevailing diseases, each worth ten times the price of the book. Gold Medal has been awarded the author. Descriptive circulars sent free. Address

Dr. W. H. PARKER, No. 4 Bulfinch Street, Boston.

WONDERFUL, AND VALUABLE

MEDICAL WORK.

STRONG AND CHEAP SPAR BRIDGES.

General description, dimensions, and particulars, with 2 pages of drawings, covering illustrations of all the details for a bridge of 100 feet span or less; specially useful for crossing of creeks, small rivers, gullies, or wherever a costly structure is not desirable. The drawings are from the Spar Bridge exhibited at the Centennial, in the U. S. Department of Military Engineering. These bridges are wholly composed of undressed stuff. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 71. Price 10 cents. To be had at this office and of all newsdealers.

BIBB'S

Great Original Baltimore-Made

Fire Place Heaters

Mantels and Registers.

B. C. BIBB & SON,
Baltimore, Md.

Best workmanship. Lowest prices guaranteed. Send for circular.

IMPORTANT FOR ALL CORPORATIONS AND

MAN'S CONCERN.—Buerk's Watch-

man's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.

J. E. BUERK, P. O. Box 979, Boston, Mass.

N. B.—The suit against Inhauser & Co., of New York, was decided in my favor, June 13, 1874. A fine was assessed against them Nov. 11, 1876, for selling contrary to the order of the court. Persons buying or using clocks infringing on my patent will be dealt with according to law.

BARNES' FOOT POWER MA-

CHINERY.

13 Different machines with which Builders, Cabinet Makers, Wagon Makers, and Jobbers in miscellaneous work can compete as to QUALITY AND PRICE with steam power manufacturing; also Amateurs' supplies, saw blades, fancy woods and designs. Say where you read this, and send for catalogue and prices.

W. F. & JOHN BARNES,
Rockford, Winnebago Co., Ill.

LIGHT CASTINGS to order promptly.

Plain, Bronzed, or Galvanized.

We make a specialty of light work.

LIVINGSTON & CO., Iron Founders, Pittsburgh, Pa.

THE SUCCESS.

Why is the Success ahead? Because its great merits were attested by the managers of the late Centennial in causing the first award on Turbines to be given it, and in selecting it as the Standard Wheel for estimating the leakage of the wheels of the world there represented.

Because it gives over 80 per cent. of power under PART as well as FULL GATE. Send for descriptive Pamphlet and Price List to S. M. SMITH, York, Pa.

65 LARGE MIXED CARDS, with name, 10c. and 3 ct. stamp. 25 Styles Fun Cards, 10c. Samples 6c. M. Dowd & Co., Bristol, Conn.

\$66 a Week in your own town. Terms and \$5 outfit free. H. HALLETT & CO., Portland Maine.

Steel Name Stamps.

N. Y. STENCIL WORKS, 87 Nassau St., N. Y.

GOLD, SILVER and NICKEL PLATING

made easy. The Electro Platers' Guide, a 72 page Manual of Instructions sent free for 10 cents. All information relating to plating furnished free. Address F. LOWEY, 10 Fulton St., N. Y.

\$5 to \$20 per day at home. Samples worth \$5 free. STINSON & CO., Portland, Me.

BRADFORD MILL CO.

THE "Scientific American" is printed with CHAS. F. JOHNSON & CO. PRINTERS, Tenth and Locust Sts., Phila.

19 July

SCIENTIFIC AMERICAN

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

Vol. XXXVII.—No. 9.
[NEW SERIES.]

NEW YORK, SEPTEMBER 1, 1877.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

ELECTRO-PLATING MACHINERY.

There are many advantages in an electro-deposit of nickel, silver, gold, etc., to prevent and protect the surfaces of inferior metals from oxidation, but the source of electricity from the various batteries employed has always been an obstacle to its greater development.

In the machine we illustrate there is shown a mechanical source of electricity of constant uniform power, light cost of running, and of easy management. Mr. Edward Weston, a practical electro-metallurgist, and the electrician of the Weston Dynamo-electric Machine Company, of Newark, N. J., is the inventor, and Condit, Hanson & Van Winkle, also of Newark, are the agents.

The interior of a large plating works is shown in the cut, Fig. 1. The dynamo-electric machine, as it is termed, and the method of driving it is shown upon the right. It is rotated about 800 revolutions per minute, and furnishes the current for plating. It is connected by means of wires to rods running across the various tanks containing the metal solution to be deposited. On the tanks are rods supporting the anodes or metals to be deposited, and also the work to be plated.

It is usual to place the tank containing the nickel solution nearest the machine, as this solution offers the greatest resistance to the electrical current. A solution of cyanide

of copper is used in many cases as an intermediate deposit upon iron or steel before the nickel, as it prevents the tendency to rust upon exposure. This solution is also used for depositing copper on zinc and lead, or articles made up of several metals.

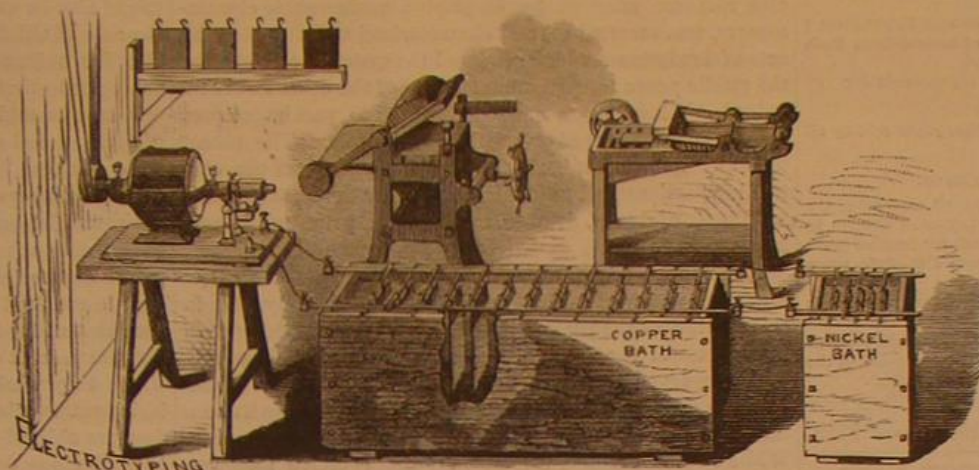
In Fig. 3 is shown a cut of the Weston dynamo-electric

copper wire, in the manner usually employed in making electro-magnets. They are so connected that the poles will be alternately positive and negative.

In the central space left between the inward ends of the magnets, is arranged a shaft which is rotated by the pulley, E. A series of armatures made in segments are firmly secured to this shaft. These armatures are of soft iron, and are also wrapped with wire. The outwardly projecting ends are thin pieces of iron, and so arranged that, when they are simultaneously revolved, by the turning of the shaft, these outwardly projecting ends will pass closely, but without touching, the inwardly projecting ends of the magnets. When the shaft, as it carries the armatures, is very rapidly revolved past the electro-magnets, currents of electricity will be induced in the wires surrounding the armatures; but as such currents are constantly changing their direction, a device called a commutator has to be used. This commutator consists of two pieces revolving on the shaft, on which they are mounted. One part is

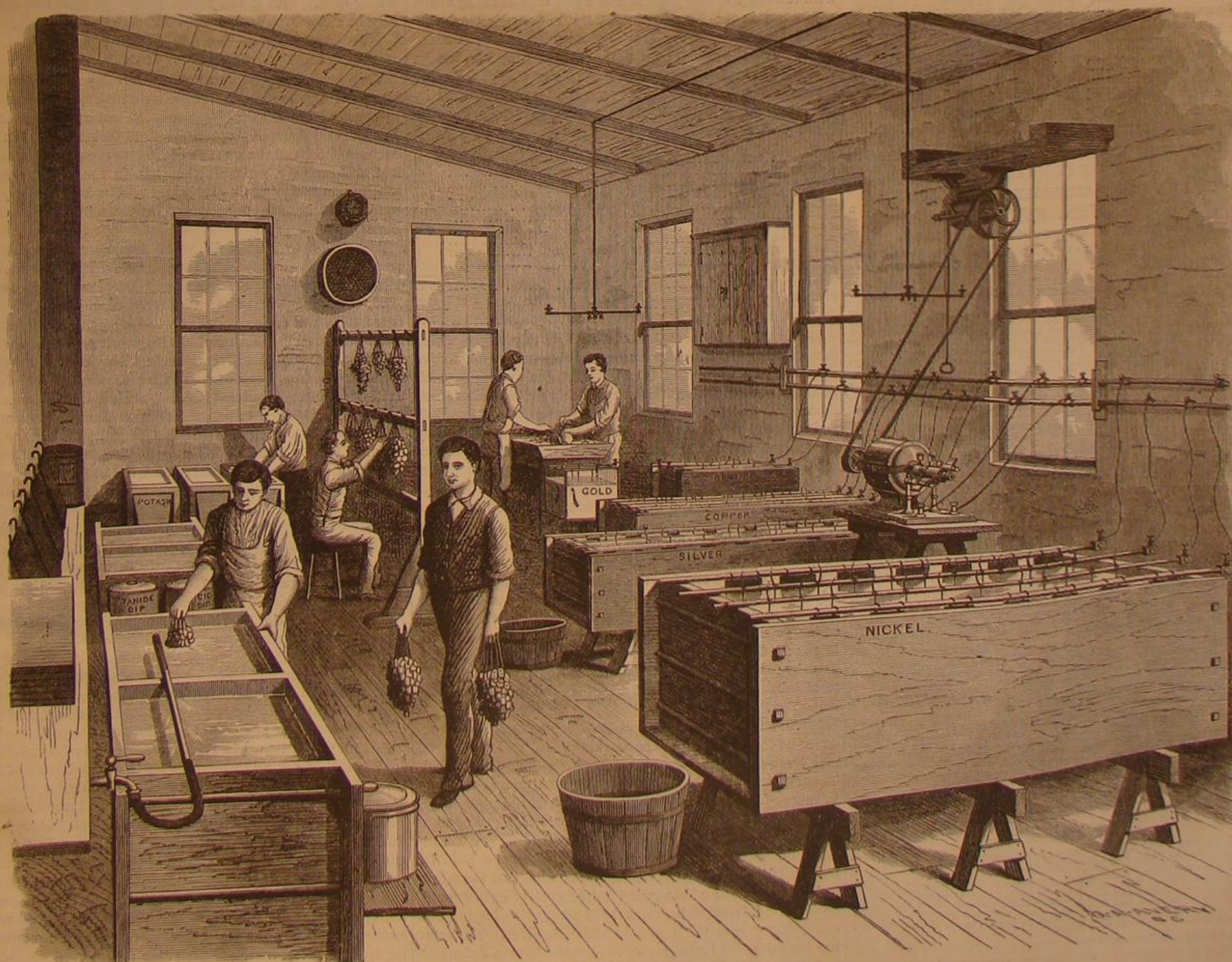
slipped upon the shaft and is insulated from it and from the other part. In construction a thimble of wood is slipped upon the shaft, and upon this thimble a brass washer is placed, to which the wires proceeding from the armatures through a steel bushing containing wooden tubes are passed. One half

[Continued on page 130.]



ELECTROTYPING APPARATUS.—FIG. 2.

machine. As will be observed, an iron cylinder, D, forms the outside of the machine, and is attached to a wooden base. From the interior of this cylinder a number of radially projecting magnets are arranged, all pointing to a common center. These magnets consist of a case of iron, to which are fastened a number of tempered steel plates, insulated with



MACHINERY FOR ELECTRO-PLATING.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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

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.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$3.00 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.

Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVII., No. 9. [NEW SERIES.] Thirty-second Year.

NEW YORK, SATURDAY, SEPTEMBER 1, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

American Institute Exhibition.....	136	Lady's slipper, snowy lipped.....	135
Aniline red, appearance in.....	132	Muscular contraction, electrical.....	129
Astronomical stars.....	133	Needles.....	131
Axial change of the earth.....	132	Nitro-glycerine, how to make (B.).....	140
Bacteria, influence of light on.....	132	Patents, American and foreign.....	138
Bolter test challenge.....	129	Patents, official list of.....	140
Borax varnish.....	137	Patent office decisions, notes of.....	129
Casting in plaster moulds (C.).....	128	Pants, to dye black (S.).....	140
Connecticut manufactures, early.....	128	Panama hats, to bleach (J.).....	140
Correspondence, Washington.....	132	Piano, strings in (I.).....	140
Couch, equilibrium.....	134	Poison ivy and its remedies.....	132
Crow, good words for.....	133	Railway workmen, how shall live.....	128
Cylinders, to re-bore.....	133	Resistance of wires.....	138
Eburies.....	137	Rice, how prepared for market.....	137
Electroplating machinery.....	127	Rosewood finish.....	136
Engine, the Tuxford mining.....	134	Sallylic acid, test for.....	133
Engine "spurts".....	137	Saurian, the largest.....	133
Fans, Japanese.....	138	Sea, distance of the.....	138
Gas pipes, leaks in.....	132	Steam power of France.....	129
Gorilla, the.....	135	Suspension bridges, Chinese.....	136
Hels, Prof. Edward.....	129	Telegraph poles, preservation of.....	133
Human voice, diseases.....	136	Telegraph wires and lightning.....	134
Hydraulic hauling machinery.....	130	Tricycle, the Coventry.....	134
Indoline.....	133	Tunnel in America, the longest.....	135
Inventions patented in England.....	138	Vanda Lowi.....	135
Keely motor deception.....	137	Venus, seeing the crescent of.....	129
Laboratory conveniences.....	132		

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 87,

For the Week ending September 1, 1877.

I. ENGINEERING AND MECHANICS.—Pennsylvania Railroad Stock-yards and Abattoir; 1 engraving.—Design for a Truss Bridge. By J. H. SYDNER. 1 figure.	
Continuous Girders.—"Potential" Energy. By S. T. PRESTON. Natural Gas at Sacramento.—New Ventilating Apparatus; 1 figure. Friction of Pitch.	
Steam Excavator. By DUNBAR and RUSTON. 3 engravings.—New Straw and Coal Burning Engine. 3 illustrations.—New Vertical Engine and Boiler. 1 figure.—The "Alta" Leveling Apparatus. By HENRY ENOCH. 2 illustrations.—Improved Steam Pump. 1 figure.—Effects of Torpedoes on the Hulls of Vessels. 2 engravings.	
How to Draw a Straight Line: No. IV. Lecture at South Kensington, with Loan Collection. By A. B. KEMPE, B.A. 5 figures.	
II. LIGHT, HEAT, ELECTRICITY, ETC.—The Elasticity and Density of Vapors. By ALEX. MORTON. A series of valuable experiments.—Irritation of Glass. By E. FLEMYN and CLEMONDOT.—New Reflecting Magic Lantern. By J. B. KNIGHT.	
Can we Transmit Power in Large Amount by Electricity? By N. S. KEITH. Read before the American Institute of Mining Engineers.	
III. TECHNOLOGY.—Spongy Iron Filter. By GUSTAV BISCHOP. 1 figure.—A Police Shelter. 1 figure.—Improved Foot Bellows. 1 figure.—The Clockmaker's Hand-turning Tool. 5 illustrations.—New Iron Salt for steeling Engraver's Copper Plates.	
IV. CHEMISTRY.—Chemistry of the Barks of the Oak, Willow, and Elm. By E. JOHANNSEN. Oak Tannin, Willow Tannin, Elm Tannin, Lead, Copper, and Tin Salts.—Spongy Iron and Putrescent Organic Matter. 1 figure. By GUSTAV BISCHOP. Read before the Royal Society.—New Derivative of Aluminoid Substances. By P. SCHUTZENBERGER.—Ostrubion. By E. V. GORUP-BESANZ.—Testing Aqueous Liquids for Blood. By V. SCHWARTZ.—Hydrocarbons. By O. SILVESTRI.	
V. NATURAL HISTORY, ETC.—On the Origin of Bacteria. By FRANCIS GERRY FAIRFIELD.	
The Cell-Doctrine in the light of Recent Investigations, 5 figures. By C. HETZMAN, M.D. An Able and Interesting Paper, dealing with the various questions of Pangenesis, etc. Hatching Infusoria; Amoebae; Revelations of the Microscope; the first form of Living Matter; the Blood Corpuscles. Structure of Protoplasm; growth and division of granules.	
Disease spread by Tailors.—New Method of Curing Popliteal Aneurism.—Intestinal Obstructions treated by Electricity.—Cure of Intussusception by Soda Water.—Cure of the Use of Spectacles.—Treatment of Hydrophobia.—Cure for Rattlesnake Bite.	
VI. MEDICINE AND HYGIENE.—The Genesis of Nerves.—Rhino-plasty by the Tissue-like Plan.	
VII. CHESS RECORD.—Mrs. G. W. GILBERT, Queen of Chess, with Portrait.—Centennial Tourney.—Two Problems by R. LOYD.—One Problem by DR. C. C. MOORE.—Three Games between MRS. GILBERT and Messrs. A. MOOD and HENRY.—Solutions to Problems. Chess Journal "R." of Tourney.—BLACKBURN vs. STEINER.—Scientific Queen Problems.—Historical Chessmen.—Mrs. GILBERT vs. Mr. GORUP.	

Terms.—SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, 75 cents. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, seven dollars. CLUBS.—One extra copy of the SUPPLEMENT will be supplied gratis for every club of five SUPPLEMENT subscribers at \$5.00 each.

All the back numbers of the SUPPLEMENT, from the commencement, January 1, 1876, can be had. Price 10 cents each.

NOW READY.—The SCIENTIFIC AMERICAN SUPPLEMENT for 1876. Complete in two large volumes. Over 800 quarto pages; over 2,000 engravings. Embossed History of the Centennial Exhibition. New Illustrated Instructions in Mechanical Drawing. Many valuable papers, etc. Price five dollars for the two volumes, stitched in paper; six dollars and fifty cents, handsomely bound in stiff covers.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,

37 Park Row, New York.

Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

HOW SHALL RAILWAY WORKMEN LIVE?

According to the last census the total number of railway employees (exclusive of clerks, in this country was, in 1870, 154,027. During the period which has elapsed since the enumeration, our railway mileage has increased from nearly 45,000 to 73,508 miles. Allowing for a proportionate increase in the number of employees, as well as reductions in working force due to economical reasons, it is probably safe to estimate that the railroad workmen of the United States given in Poor's "Manual of the Railroads of the United States for 1877-8," it appears that while the gross earnings of the roads have fallen off nearly six million dollars, the net earnings have increased nearly by a million, and this is ascribed chiefly to the great economies practised in conducting the operations of the lines. In furtherance of this system of economy there have been, as our readers are aware, reductions in the wages paid railroad employees. These reductions have been in many cases claimed by the persons affected to render the returns for their labor inadequate for a living support; and accordingly the strike, the usual coercive measure adopted by employees under such circumstances, was resorted to, and characterized unfortunately by acts of lawlessness which rendered the question of restoring the public peace far paramount to any of the other issues involved. When such a course is resorted to, past experience has abundantly proved that failure is the rule. The recent difficulty has shown itself to be no exception, and the contending parties stand to-day in practically the same position as to their causes of dispute as they did prior to the outbreak.

There are certain facts which we believe do not admit of argument which should here be postulated, namely, that in this country at the present time the supply of working men is in excess of the demand, that a railway company, or any other employer, is under no obligation to furnish living incomes as such, and that it has a right to regulate its own rates of payment in accordance with its own best interests. While such is the case, it is obvious that coercive measures to compel an employer to raise wages must prove futile. Until, therefore, through the natural working of the laws of supply and demand some condition of affairs more favorable to the working classes shall come into existence, the problem is not how to force employers to improve matters by increasing the revenue of the working men, but how to do so by enabling the working man to obtain the necessities of living out of the means which he can earn. This we take to be the question of all others which is now pressing for solution with reference to the present labor and capital antagonism.

We find in the New York Times a communication, very intelligently written by the wife of a working man, in which she sums up the actual least cost of supporting her family, which includes her husband, self, and five children, the latter under nine years of age. As a matter of statistical information this schedule is of exceptional value. It is as follows:

WEEKLY.	DAILY.
Rent..... \$2 00	1 quart milk, 6c..... \$ 42
1 barrel wood..... 25	2 quarts potatoes, 6c..... 42
2 pails coal..... 16	2 8-cent loaves..... 1 12
Burial society..... 22	1½ pounds meat, 20c..... 1 40
Oatmeal..... 14	Salt..... 2
2 pounds butter..... 60	Pepper..... 2
3½ pounds sugar..... 40	Mustard..... 2
Half gallon oil..... 9	Matches..... 1
2 cakes soap..... 14	Starch..... 3
1 pound soda..... 3	Bluing..... 1
Half pound tea..... 25	
Newspapers..... 12	Total..... \$3 47
Shaving..... 10	4 50
Total..... \$4 50	Total..... \$7 97

Here is 97 cents more than the dollar a day wages which our contemporary's contributor says she undertook to live upon for some time, and failed. Now, the above are retail prices, and the commodities are probably purchased of small dealers, so that the goods have been numerously handled, and repeated profits thus added. It has been determined by Professor Fawcett, the well known English political economist, that the loss incurred by average working men, on account of their articles passing through the hands of shopkeepers, is about 20 per cent. Deducting the \$2 rent, and taking off this proportion from the remainder, we have a balance of \$4.78 as the actual cost of the food, etc., less shopkeepers' profits. Now the rent quoted amounts to \$104 per year, or about one fourth of the total expenses. This is a large proportion to pay for rent. In England the same item amounts rarely to more than one eighth of the amount of wages earned. We find it stated that the general 3 shillings and 6 pence (87 cents) per week dwelling is largely used by families earning 30 shillings (\$7.50) per week, which last is about the same as that earned in the case under consideration.

It will be obvious that the problem before us is how to reduce the cost of living to the working man, and of this we may learn something from what has been done in England. There societies for this very object have for some time been in successful existence. The Permanent Building Society, of Leeds, has furnished healthy tenements at very low rates to about 200 families. In Burnley, another society has assisted hundreds by advancing money on mortgages paid by easy installments. The arrangement is such that the workman pays a small subscription to the society until enough has been contributed to warrant the association buying and conveying to him the house in which he lives. The same has been done by large employers, like the Messrs. Ashworth and the late Sir Titus Salt; and in London there is a large corporation called the Industrial Dwellings Company, which now rents 2,799 tenements, capable of accommodating 12,115

people. Not only has this enterprise greatly benefitted the working men, but as an investment, in five years, it has earned large surplus profits after paying 5 per cent dividends. The rent averages about 50 cents a week for an apartment furnished with every modern convenience.

Not only might similar societies be established here; but others might be started for supplying working men with the necessities of life at prices certainly *minus* the retail profits already noted. These last could evidently be begun on a small scale and with little capital. The railroad companies themselves might establish stores for their men, or benevolent societies such as the Young Men's Christian Association would here find an excellent object for their philanthropic efforts. A few persons in well-to-do circumstances in every railroad town could easily subsidize such sources of supply, and eventually change them into co-operative establishments as the men learned to live on their reduced incomes. Nor need the work of the benevolent end here. Some of the railroad companies now, in order to prevent their men joining unions, afford them all the advantages of life insurances, etc., which the unions offer. Outside societies for this purpose might also be organized. We have benevolent societies for the care of children, for the aged, and for sailors—why not also for railroad employees whose life presents many analogies to that of the sea-faring man.

It may be said that in dealing with so great a class the laws of demand and supply, inexorable as they are, should only be considered, and that philanthropy has here no place. We think otherwise. The life of a railway employee has its duties and dangers which cannot, morally viewed at least, find compensation in the market rate of wages. Here is an immense number of men who in their daily work expose their lives to constant peril, greater, says an eminent statistician, than that of the soldier in battle. They are subject to peculiar and painful diseases, produced by the conditions under which they work; they are subjected to every hardship of inclement weather and of absence from home, and through all they are obliged to keep tireless watch. Their record is one of unflinching devotion to duty, even in the face of imminent death, and to their hands are committed the safety of enormous wealth, vast interests, and human life. The benevolence of the community may safely rest upon such a showing. Mr. W. H. Vanderbilt has already emphasized this fact by his gift of \$100,000 to the employees of the New York Central and Hudson River Railroad, over which he presides. This is one good example, and we hope to see it imitated. The workmen, however, do not ask alms—true charity in their case is to show them how to live on what they can honorably earn. And it is by such action as this that strikes may be caused to become forgotten weapons.

EARLY CONNECTICUT MANUFACTURES.

Very few of our readers are aware that patents, or exclusive privileges to manufacture certain articles, were granted by some of the colonial governments, but such is the fact. The General Assembly of Connecticut took the lead in this encouragement of the growth of infant manufactures, and it is therefore very probable that this is the reason why so much manufacturing is carried on within her borders, and so many of her sons are engaged in the same line in other States.

In addition to the special grants hereafter given, the Assembly passed at least three general acts for the encouragement of discoveries and inventions; one of which, passed in 1663, related solely to the discovery of mines; a second, dated 1672, was enacted for the same purpose, but it had an additional section which forbid the passing of monopolies, "except for such new inventions as shall be judged profitable to the country, and for such time as the General Court shall deem meet;" and a third act, passed in 1715, enacted "That if any person or persons shall set themselves on work to discover any commodities that may be of use for the country, for the bringing in a supply of goods from foreign parts, that is not as yet of use among us, he that discovers it shall have due encouragement granted to him and the adventurers therein" (Statutes of 1715, p. 5).

Many of the special privileges granted will be found to be more of the character of monopolies, or bounties for the introduction of new trades and manufactures, rather than patents for new inventions, but the latter are not wanting.

The first individual or private grant that we find is that issued to John Elliot, in 1708, which gave him the exclusive right for ten years of manufacturing pitch, provided he started the manufactory within two years.

In 1717, E. Hinman obtained a grant giving him the exclusive right to make molasses from corn stalks for ten years—a right which he probably would have found no one to interfere with if he had not had the grant.

A third grant, issued in 1718, gave the exclusive privilege for 20 years of setting up oil mills for the manufacture of linseed oil, to Messrs. Prout, Mansfield & Atwater.

The next patent appears to be one issued to Ebenezer Fitch, in May, 1728, which granted to said Fitch and Co., the exclusive right for 15 years of erecting slitting mills, "to slit and draw out iron rods for nails, and other artificers in iron."

In the same month a patent was granted to Samuel Higley and Jos. Dewey, giving them for ten years "the sole practicing of the said art of steel making," which "said art" seems to have been a method discovered by them of converting iron into steel by the cementation process.

Another patent was issued for a similar process to Messrs. Fitch, Wyllis & Walker, in 1740, for fifteen years, on condition that they should begin operating within two years.

This proviso, however, they failed to keep, owing to the death of the capitalist they had engaged to help them to the necessary funds; and in consequence, at the end of three years, we find them making an application for the renewal of their grant, which was done and, as other documents show, they succeeded in making good steel in considerable quantities.

In May, 1741, the exclusive right of making potash for 20 years was given to Messrs. Willard, Hamlin, Wetmore, Chauncey & Fairchild.

In 1746, John and Stephen Jerom obtained the exclusive right for 14 years of making salt by evaporating sea water; and three years after procured a loan from the Assembly of £1,000, for two years, to enable them to continue their operations, as they had not yet succeeded commercially for want of sufficient capital.

The exclusive privilege of making glass for 20 years was given, in 1747, to Thomas Darling, on condition that he and his assignees should set up suitable works and prepare a stock of materials within four years, with a further proviso that they should make at least 500 feet of good window glass every year thereafter.

It would appear that Darling did not succeed in introducing the manufacture of glass, for in 1779 we find a grant giving "during the pleasure of the Assembly," to Messrs. Hubbard, Mosely, Little & Latimer, a similar exclusive privilege, except that only one year was given in which to commence operations. Before this year had expired, however, a memorial was filed by Mosely and Little, stating that Hubbard and Latimer had withdrawn on account of the great expense and risk, and asking that they (Mosely and Little) may be allowed to raise £2,000 by a lottery. This lottery privilege does not appear to have been granted, but instead an exclusive right for 15 years was given on the same conditions as the last.

This project would also appear to have failed, for we find another exclusive grant, three years after, to Pitkin, Bishop & Pitkin, for the term of 25 years, on condition that they began manufacturing within three years. These parties also seem to have met with little or no success, for we find a memorial from them complaining of the discouragements they had met with in their efforts, and asking that a lottery may be granted to them for the purpose of raising £400, which was allowed.

In 1753 a grant of the exclusive privilege, for 15 years, of setting up "a new invented water machine for the dressing of flax," was given to Jabez Hamlin and Elihu Chauncey.

A bounty of 2d. per quire of writing paper and 1d. per quire of printing paper or coarser paper, was ordered by the Assembly in 1768 to be paid to C. Leffingwell on all paper made by him; which appears to have been done for one year only, during which he made 4,020 quires of writing paper and 10,600 of inferior quality, after which the bounty was discontinued.

Another document, a memorial from Abel Buell, dated October 8, 1766, states that the writer had been sentenced to imprisonment for life for "altering the bills of public credit," which sentence had been remitted on account of his youth; and after stating that he had discovered a method of grinding and polishing crystals, asks that the privileges which he "had justly lost" might be restored to him, that he might carry on the aforesaid business. On his giving bonds as to future good behavior, this was done.

Three years after we find another petition from the same man stating that he had discovered the art of letter founding, and asking that he be allowed to "raise money by lottery to carry on the same, or in some other way." With the memorial he furnished specimens of his handiwork, which are said by those who have seen them to have been superior to the type of that day and equal to the average of that of a much later date. A committee of the Assembly was ordered to investigate the project, and on their favorable report the treasurer was ordered to loan Buell £100 at at once and another £100 at the end of a year, on condition that he give a bond in £200 that he would pursue said business and would not leave the colony within seven years. It appears, however, that he did not meet with much success, for we find a petition from his wife, dated August 8, 1777, stating that the long absence of her husband made her despair of ever seeing him again, and requesting the Assembly to be allowed to pay £100 in full of all demands against them, which the Assembly accepted.

In 1774, George Phillips applied for and obtained the privilege of refining loaf sugar for ten years, which was to be exclusive, except that the Assembly retained the option of allowing two other refineries to be set up, and during the next two years granted such permits to other parties.

A patent was issued in the same year, granting to John Shipman for 40 years the exclusive privilege of erecting within certain territory his newly invented tide grist mill, on condition that it should be erected within five years.

Under the date of February 3, 1776, we find that the sum of £200 was ordered to be paid David Bushnell, as some encouragement for him to proceed in preparing his machine for blowing-up ships, etc. No particulars of the plans appear on the files, but from other sources we learn that this, "the American Turtle," as it was called, the prototype of the modern torpedo boat, was composed of two shells joined together water-tight, and of sufficient capacity to contain the operator and air enough to support him under water for half an hour. The "turtle" was caused to rise or sink by pumping the water from or allowing it to enter into a chamber beneath him, at the same time lowering or raising an in-

got of lead of 200 lbs. weight, which might be made to touch bottom. The propelling force was an oar worked from a compartment in the forepart; and at its stern a magazine of powder was attached, which could be detached and secured to, or sent against another vessel. The magazine was provided with a gun-lock to fire the powder, which was operated by clockwork calculated to run sufficiently long after being set in motion to allow the operator to reach a place of safety previous to explosion. With this apparatus he made an attack on the British ship "Eagle," of 64 guns, in New York harbor, but only succeeded in frightening the crew, although he afterwards succeeded in blowing up a schooner at New London.

In 1778, the Assembly granted permission to two widows named Hannah Watson and Sarah Ledyard, to raise £1,500 by lottery to rebuild a paper mill owned by them, which had been destroyed by fire. From a statement in their memorial, it appears that the Hartford newspapers of that day circulated about 8,000 copies weekly.

In 1783, a patent was granted to Benjamin Hanks for fourteen years for "a clock or machine that winds up itself by help of the air, and will continue to do so without any other aid or assistance until the component parts thereof are destroyed by friction." This was probably a clock provided with a windwheel set in such a position that the heated air escaping from a room would operate the wheel and so keep the clock continually wound. A clock similar to this was patented to Robert Hitchcock, September 10, 1861.

The exclusive right to make snuff was granted to William Pitkin in 1784, for 14 years.

In 1787, an act was passed giving to Samuel Loomis the exclusive right of erecting works for the manufacture of wool, cotton, hemp, flax, and silk, "upon a new constructed plan," on the east side of the Connecticut river, or within ten miles west thereof, for seven years, and an exclusive privilege for seven years longer on any ground within thirty miles of such works.

In addition to the above we find a number of rejected applications for special privileges in manufacturing various articles, from pins to perpetual motions. (The perpetual motion man's memorial was endorsed "Prisoner in jail.") Some of the applicants wanted an exclusive right only; others wanted loans from the Assembly—some with interest and some without; and still others, to enable them to start the manufacture of some article not then made in the colony, petitioned for the privilege of raising stated sums of money, ranging from £100 to £6,000, by means of lotteries—which last appears to have been a favorite mode of "raising the wind" in those days, if we may judge by the number of applications for the privilege.

From another series of documents, too long to give even a synopsis of them here, we find that considerable attention was given to the manufacture of iron, both cast and wrought, and that as far back as 1736 iron works were building in Salisbury, where during the revolutionary war about 60 men were employed in casting cannon alone, to say nothing of other work.

NOTES OF PATENT OFFICE DECISIONS.

PATENTS.

In the recent interference case of Anson vs. Woodbury, the Commissioner of Patents has decided that the Patent Office will take judicial notice of matters of public notoriety affecting the right of an applicant to a patent. Anson applied for a patent for the use of a presser bar in a planing machine, but the Commissioner holds that, as a matter of public notoriety, presser bars of the description claimed by Anson have been in public use for upwards of twenty years, in support of which he cites the *SCIENTIFIC AMERICAN* for July 5, 1873, vol. 29, p. 7; and November 20, 1875, vol. 33, p. 25. He therefore dissolves the interference and rejects Anson's application. The rule is laid down in this case that, on a motion to dissolve the interference on the ground of notorious public use for more than two years prior to the filing of the application for the patent, *ex parte* affidavits made by adverse parties cannot be received to impeach the patentability of the applicant's invention. It is immaterial that such affidavits were not submitted to show any particular instances of use, but rather to show notoriety of use. In admitting and considering such affidavits as evidence, the Patent Office would be adjudicating upon the rights of applicants on testimony not taken in accordance with any requirements of law, and of witnesses which the parties in interest had no opportunity to cross-examine.

A claim for an improvement in anti-guards, consisting of a concave flange, arranged on the leg of a table or other piece of furniture, and coated on the under side with chalk, is decided in the case of Strong vs. Cruikshank to be lacking in patentable novelty. The peculiar property possessed by chalk, rendering it an impassable barrier to the march of ants, is well known, and the use of concave flanges on corn-crisps, trees, etc., to prevent the ascent of insects is old in the art. The only novelty that could be claimed, therefore, was the fact that protection was afforded by the flange to the chalk. This is not patentable, since it is but the exercise of simple intelligence to put the chalk on the under side of the flange, where it is best protected from being rubbed off.

On the application for a reissue of letters patent in the case of a machine patent, the model and drawings cannot be amended except each by the other, and the Commissioner cannot go outside of the record to ascertain what was the scope or detail of the original invention. Thus in the case of Stockwell vs. Haines, just decided, the Commissioner re-

jects affidavits offered to prove that a certain pin—not shown in the drawing or specification, although there was a horizontal perforation in the model, in which such pin might be placed—did form a part of the original invention. An invention not set forth in the original specification, nor fully shown in the original drawings, cannot be incorporated on reissue, where its existence depends upon the restoration of a missing element to the model in a particular position, it not appearing that such position is necessarily the only one it can have, and both original specification and drawings failing to indicate its location.

TRADE MARKS.

An application for the registration of an arrangement of a star and crescent as a trade mark for soap was lately filed by Cornwall & Brother. The Examiner of Trade Marks referred them to a registered trade mark consisting of the figure of a star alone, also applied to soap, and contended that the employment of the combined symbol of a star and crescent would be likely to deceive parties desirous of purchasing soap having the brand of the star alone. This decision has just been reversed on appeal.

The fact is referred to that the flags of two nations are distinguished by almost the same difference in symbol as that employed by Cornwall & Brother to distinguish their soap from that made by the owners of the registered trade mark. The flag of Egypt is a crescent on a red ground, and the Turkish man-of-war flag is a crescent and star on the same colored ground, but there is no mistaking one flag for the other by persons of the slightest discernment; and the same may be said when those symbols are applied in a similar way to the soap of two different owners.

The application for the registration of the figure of a "swan" with the words "Our London Swan Gin" as a label is refused to John D. Park. The figure of a swan with some other arbitrary matter had previously been registered by other parties as a trade mark applied to this article. The Commissioner decides that as Park's label includes arbitrary and fanciful words and figures constituting a proper trademark, in addition to matter properly a label, he should first register the fanciful matter as a trademark; but before he could do this, under the circumstances, he must first establish his right to the trademark. This he could do by proof adduced in an interference proceeding, or by an adjudication of a court of competent jurisdiction establishing his title to the same.

MUSCULAR CONTRACTION AND ELECTRICITY.

Muscular contraction is always accompanied with electrical phenomena. The difference of electric force between two points of a muscle undergoes a diminution, which, according to Beunstein, precedes the contraction by $\frac{1}{100}$ of a second. M. De la Roche has recently examined the electrical power of the human heart. The electrodes consisted each of a plate of amalgamated zinc with a pledget of muslin saturated with sulphate of zinc at the lower extremities. These were applied, one with its muslin wad opposite the heart on the left breast, the other on another part of the chest, and connection was made with a capillary electrometer. The mercury column executed a very distinct series of periodic pulsations, synchronic with the pulse. Each pulsation marked the double movement of the heart. The result obtained corresponded to $\frac{1}{1000}$ of a Daniell element.

BOILER TEST CHALLENGE.

To the Editor of the *Scientific American*:

Being an interested party at the Centennial boiler test, and knowing that the Root boiler is ahead, according to the official report issued by the Director-General, Hon. A. T. Goshorn, and as certain interested parties have put restrictions on the further issuing of the report as officially made, and as Messrs. Babcock & Wilcox are not satisfied with the result, we propose to make an economy test against them at the American Institute this fall, for from one thousand to five thousand dollars a side, each party to select one man and those two to select the third, as judges, they to make all rules and regulations, and their report to be final.

Yours respectfully,

ARENDROTH & ROOT MANUFACTURING COMPANY.
New York, August 16, 1877.

Professor Edward Heis.

The death is announced of Professor Edward Heis, of Munster, one of the most assiduous and accurate observers in those branches of astronomical research which can be cultivated, without any powerful instruments, by means of observations made with the naked eye. He was born in 1806. He made observations of the relative magnitudes of all stars visible to the naked eye, the results of which were embodied in his *Uranometria Nova*, published in 1843, the first really trustworthy Star Atlas. Heis, being gifted with eyes of uncommon acuteness, devoted many years to the observations requisite for a greatly improved edition of this work. Variable stars, shooting stars, auroras, the zodiacal light, the course of the Milky Way, etc., were diligently observed by Heis, and his publications referring to them are of great value.

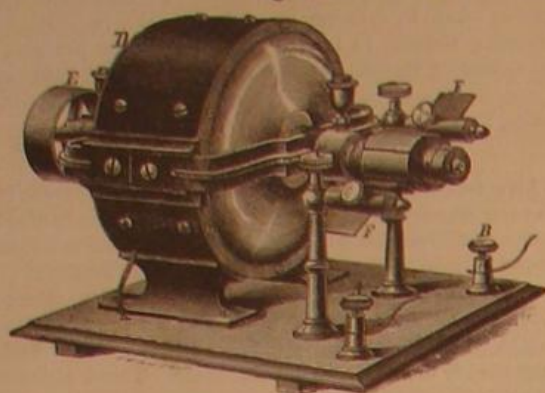
Seeing the Crescent of Venus.

Mr. D. H. Temple, of San Francisco, Cal., informs us that he saw the crescent of Venus at Mazatlan, Mexico, on the morning of January 24th last. This is considered a very difficult feat of vision.

[Continued from first page.]

of the commutator slips over the shaft and rests upon the thimble, and is pressed against this brass washer; the other half of the commutator slips upon the shaft, but there is

Fig. 3.



placed between the two halves a thin rubber washer, so as to insulate them from each other. The ends of the wires from the armatures are connected to the shaft, and through the shaft to that half of the commutator which bears upon it. A nut is used to keep the two parts of the commutator together and upon the shaft. Two springs, F F, made of thin, hard rolled sheet copper—silver plated to prevent oxidation—are used to secure good contact with the commutator. These springs are fixed in adjustable clamps, C, supported on brass pillars.

The operation of the machine is as follows: When the apparatus is first made, the electro-magnets are for a moment connected to a battery, or other source of electricity which renders them permanently magnetic. Now if a belt from any source of power be put on the pulley, E, and the machine set in motion, weak currents will be induced in the wires surrounding the armatures, which are picked up by the springs, F F, and carried to the two pillars. If the two wires, A and B, leading from coils of the electro-magnets be placed in contact with these pillars, the weak currents will pass around the electro-magnets and will strengthen them; this will again increase the strength of the currents induced in the armatures, and so on until a maximum is reached. To utilize the currents from such a machine, it would be simply necessary to place the work to be done in circuit with the electro-magnets and armatures, so that the currents induced in the armatures may pass through that circuit, and through the coils of the electro-magnets.

The machine as described would have limited applications, as the currents resulting from the polarization of the electrodes in the vat would, when the speed of the machine fell below a certain point, reverse the polarity of the electro-magnets and the direction of the current, thus undoing what it had previously done, and spoiling the work.

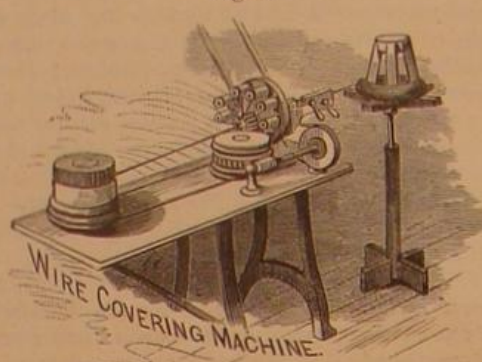
In order to prevent this an automatic device called a governor is employed, which accomplishes the purpose admirably. A metal pillar is fixed to the base of the machine, on the top of which is a cup containing mercury, which cup is made to rotate by a belt running from the shaft of the machine. At a little distance from this pillar is placed another one, with its top part at a right angle and projecting over the cup of mercury. An amalgamated wire is so adjusted in the end of the bent portion that it just touches the mercury in the cup. If the cup be stationary, the mercury will remain in the bottom of the cup; and there is a metallic connection. If the cup be rotated the mercury will rise on the sides of the cup by centrifugal action, and the connection is broken. Fig. 4 shows the process of covering the wire for the magnets, and in Fig. 5 the

process of winding them. One of the machines is also shown in Fig. 2 as arranged for work, together with tanks, press, black-leading machine, and other paraphernalia used by electrotypers—electrotyping being one of the uses in which the machine is largely employed. A shell can be obtained by the machine in from 2 to 2½ hours, being equal to that from the usual batteries employed in 10 to 12 hours.

Among the advantages of the machine, as used for electroplating, is the automatic adjustment of current to the surface of the work to be plated, preventing the burning of small quantities of work; economy by dispensing with batteries; a saving of time and cost of material, as the machine supplies the current the moment the power starts it; uniformity of deposit, as a given speed always gives the same results. A deposit can be made in about one half the time used by batteries.

The machines are made with 6, 8, 12, and 16 inch cylinders. The 12 inch machine is considered as a standard with

Fig. 4.



electrotypers and in large electro-plating establishments. They are in some of the largest silverware plating establishments in the country, and are also being rapidly adopted by manufacturing jewelers, etc.

Further information regarding the machines may be ob-

Fig. 5.

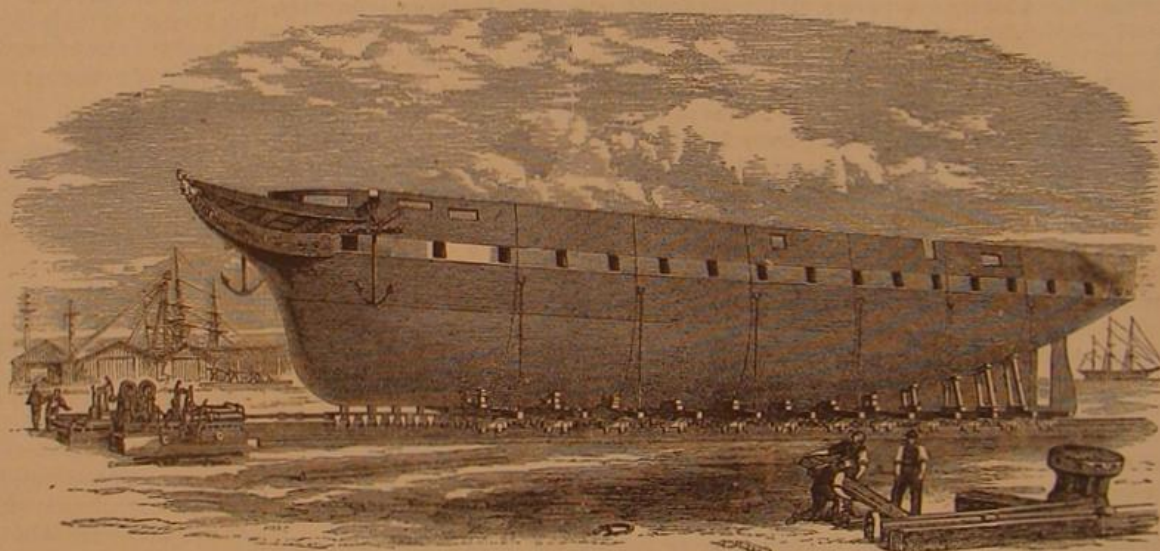


tainment of the agents, Messrs. Condit, Hanson & Van Winkle, 236 Market St., Newark, N. J., who are also manufacturers of nickel and electro-plating material, chemicals, etc.

when there is no pressure against it; and by turning the lever on the end of the horizontal shaft the stopper is thrown down into its place between the short pair of links and against the crosshead which couples the pair of rams.

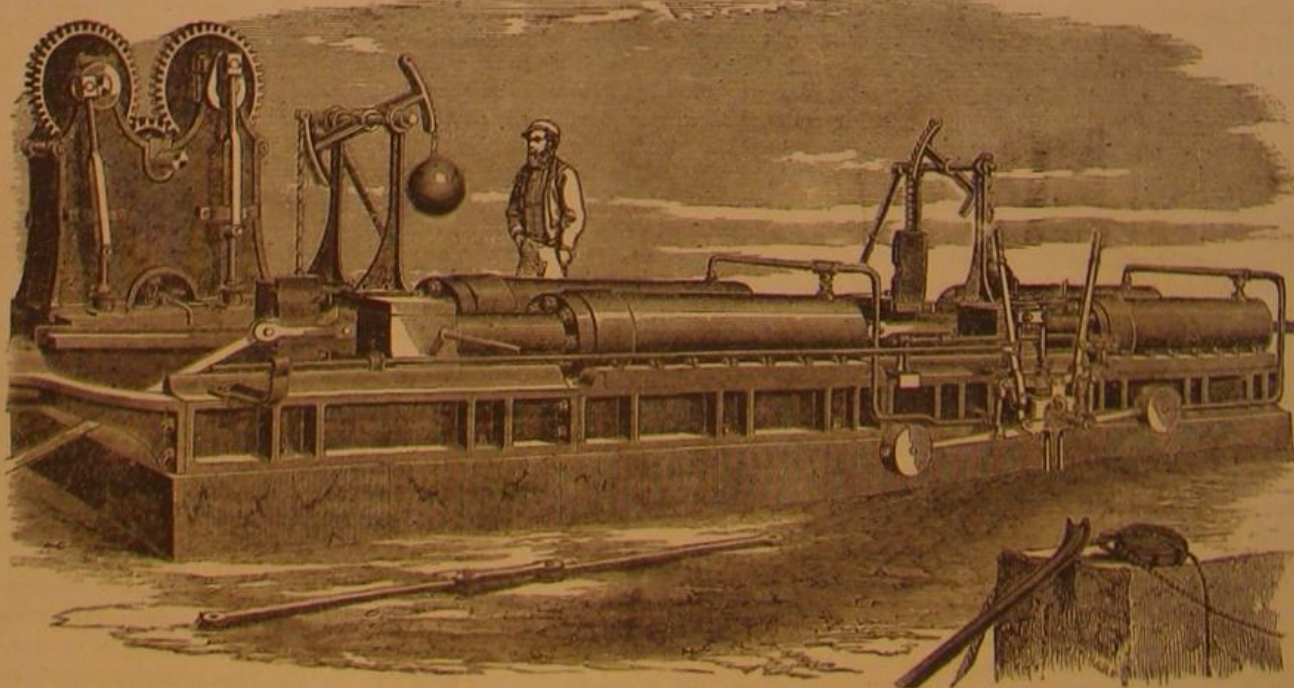
The action of the machine is as follows: When the traction rods have been connected to the cradle and led up to the cylinders, the forward stopper is depressed into its position between the links, and the rams are put in motion, carrying forward the traction rod, and hauling the vessel up the slip. Immediately before the travel of the first pair of rams is completed the second stopper is thrown down to engage between another pair of links, and the other two rams then are set in motion, continuing the work. As soon as the strain is thus taken off the first stopper, the latter is raised clear of the links by the balance weight on the segment, and is thrown down again only when the second pair of rams has nearly completed its stroke, when the operation is repeated, the rams having been previously run back, hauling the cradle up proceeds.

HYDRAULIC HAULING MACHINERY FOR INCLINED SLIPS.—Fig. 1.



IMPROVED HYDRAULIC HAULING MACHINERY.

We illustrate herewith from *Engineering* a new arrangement of hydraulic machinery for raising vessels up inclined slips,



HYDRAULIC HAULING MACHINERY FOR INCLINED SLIPS.—Fig. 2.

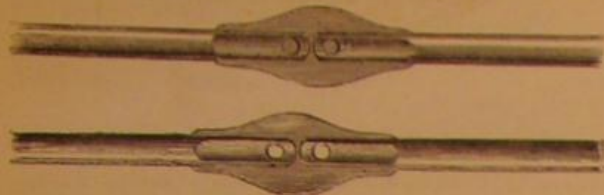
THE MANUFACTURE OF NEEDLES.

Needles are most usually made from steel, though the cheaper and coarser varieties are made of iron wire, which in the course of manufacture becomes converted into steel. The first operation is to wind the wire upon large reels or drums of from fifteen to eighteen feet in diameter. The large coil so obtained is next cut into two portions by means of pow-



Fig. 1.—STRAIGHTENING THE NEEDLES.

erful shears, and these two bundles are further reduced by the same means and the use of a proper gauge, to pieces of double the length of the future needles. In this way one workman can produce in an hour 40,000 of these pieces, or shafts as they are technically called, equivalent to eighty



Figs. 2 and 3.—PUNCHING THE EYE.

thousand needles. This rate of production has been greatly exceeded by the introduction of automatic machinery.

The shafts now undergo a process of straightening, and to this end are gathered into bundles of five to six thousand pieces, upon which strong iron collars are slid. These bundles are slightly heated in order to soften the metal, and are then inserted between two plates of steel, the lower one of which is fixed while the upper

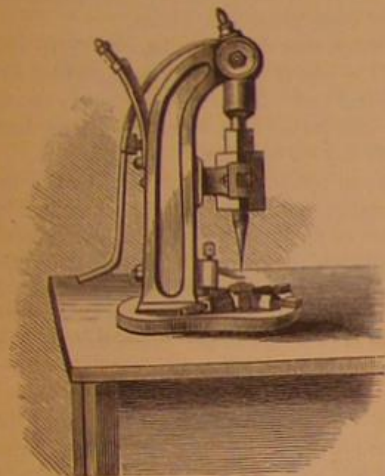


Fig. 4.—MACHINE FOR PIERCING THE EYE.

one is made to swing about an axis. These plates have longitudinal grooves for the reception of the iron collars so that the pressure is mainly and properly exerted upon the wires alone. The next operation consists in pointing the shafts at both ends. Grindstones of fine-grained sandstone are used with this view, rotating by means of belts with a velocity of about two thousand revolutions per minute. The workman, according to the fineness of the wire and the skill he possesses, takes one or two dozen or more shafts at a time and spreads them out upon the stone, giving them a slight rotary motion by means of his thumb and forefinger. In order to prevent the formation of rust the grindstone must be kept dry so that quite a quantity of stone and metal dust is produced, rendering the operation



Fig. 5.—PIERCING THE EYES.

one not unattended with considerable danger to the health of the workman. After this sharpening operation the mode of procedure branches off into two different methods, the first and older one being to cut the shaft at this stage into components, while the one more recently brought forward continues the operations upon the double needles until very near the concluding steps. We will begin with the former method, being the one at present more extensively pursued.

The divided shafts, after leaving the shears as such, have their blunt ends flattened preparatory to the formation of the eye. This operation is conducted with great rapidity upon a small iron anvil. The workman takes a few dozen needles by their pointed ends, spreads them out fan-shape upon the anvil, and strikes several light and rapid blows with his hammer, flattening the heads of five or six at each blow. The ends, having been rendered too hard by this procedure for the following operation, have first to be heated and slowly cooled.

The eye is formed either by punching or piercing, never by drilling in the true sense of the word. In punching, the flat end of the needle is first placed upon a vertical steel point and struck with a hammer. Into the depression thus formed a steel punch is placed and the hole completed by another blow. A few taps about the punch then finishes the eye. The two stages of this operation are shown in Figs. 2 and 3. The delicacy of such manipulation, especially in the case of very fine needles, is really surprising and can scarcely be acquired by other than children, who attain an incredible degree of skill and rapidity. Their favorite trick of forming an eye in one end of a human hair and threading it with the other is no doubt familiar to all.

The idea of piercing the eye originated in England. The

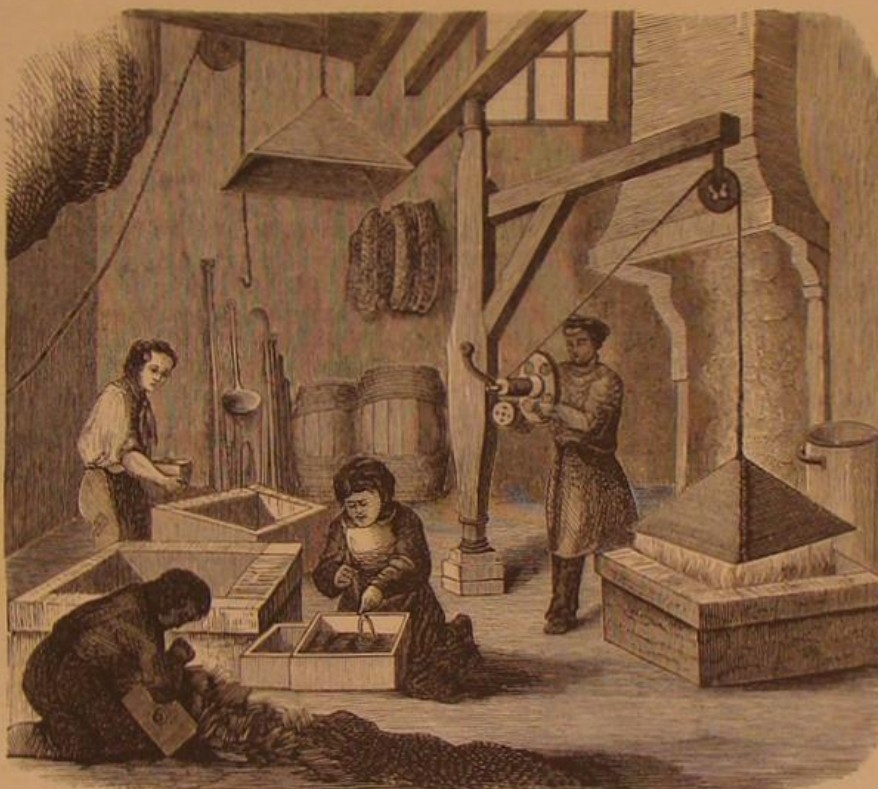


Fig. 6.—CEMENTING.

machine employed is shown in Fig. 4, and will be readily understood. A lever worked by hand lowers the steel point and drives it through the end of a needle placed properly beneath. The needles after receiving the eye have next to be provided with the groove serving to guide the thread to the hole. This is accomplished by means of a file which, at the same time, removes any burrs or other irregularities that may still be remaining.

We will now go back a step in order to describe the second and improved mode of bringing the needles to the stage where we here stop.

The shafts, after being sharpened, are not divided as in the former instance, but are introduced whole, one by one, into a small stamping machine. They here are made to undergo the following changes by one stroke of the heavy die, both sides being acted upon at once. The central portion is flattened, the two longitudinal grooves in which the eyes are to lie are formed, together with a notch which is to assist later in separating the needles, and any numbers, letters, or other marks which the latter are to bear. Both eyes are formed at the same time by means of the piercing device shown in Fig. 5, after which the double needles are strung upon cords, and passed to a workman who files the whole string at once, breaks the shaft into two, and finally rounds their heads. Hardening of the needles made from steel wire then follows, the iron ones being converted into steel by means of the process of cementation (Fig. 6).

The next stage of the manufacture—scouring and polishing—is about the most tedious and troublesome of all, though several millions of needles are worked upon at once. The needles are arranged in parallel layers upon pieces of coarse, strong cloth, mixed with sharp sand or emery, moistened with oil, usually linseed, and, after the mass is sufficiently large, rolled up into bundles of about eighteen inches in length by four in diameter. Twenty or thirty of these bundles, each containing about half a million of needles, are placed in a scouring mill and rolled back and forth under

heavy pressure for about twelve to eighteen hours. The filthy looking mass is then removed from the bundles and stirred about in a large drum full of sawdust, which removes the oil, dirt, and sand, and leaves the needles already pretty bright. These are then separated from any adhering sawdust by means of an air-blast, and are again submitted to the scouring operation. This is repeated for about ten times, finer grades of sand and emery, binoxide of tin, rouge, or bran being successively used. After this the needles undergo a thorough washing in warm soap water, and are dried in sawdust, which completes the cleansing process.

The common cheap varieties are then hastily gone over again with a piece of cloth or soft leather, after which the broken and otherwise defective ones are removed and the rest properly assorted and arranged. The better classes of needles undergo various additional manipulations. To begin with, their points are gone over again more carefully, the rough treatment in the scouring mill being very apt to render them blunt. They are held about twenty-five at a time against a cylindrical or prismatic grindstone (Fig. 7), at the same time being slowly rotated between the fingers. In order to prevent the fraying or cutting of the thread against the possibly rough edge of the eye, these latter are gone over again with a rapidly rotating fine steel drill. This operation is shown in Figs. 8 and 9, the latter giving a clearer view of the mechanism employed.



Fig. 7.—RE-SHARPENING.

England and Germany are the two principal countries engaged in the needle manufacture. Redditch is the needle-producing center in England, and enjoys in its own special branch of manufacture as high a reputation as do Sheffield and Manchester in theirs. The largest factories in Germany are situated at Ichtershausen, in Thuringia, and at Aix-la-Chapelle, and

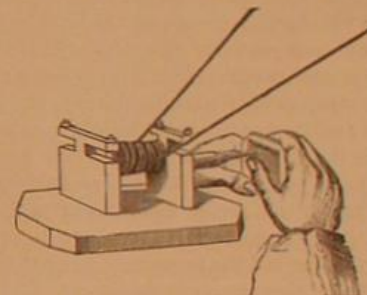


Fig. 8.—DRILLING.

turn out, in the course of a year, respectively about three hundred and fifty millions and one hundred and fifty millions of needles of all grades.

The earliest needles were "square eyed," that shape being the most readily produced. Drill eyed needles, after many unsuccessful attempts, were first brought out in 1826. The burnishing machine, in which the needles are introduced two years later. By this, a beautiful finish is imparted to the eye. The process of hardening them in oil was introduced in 1840, water having been previously used for this purpose, which caused a large proportion of them to become crooked, requiring the services of a large number of workmen to straighten them. These being thrown



Fig. 9.—THE DRILL BENCH.

out of employment by the introduction of the new process made a riot, and drove its introducer out of town; but it was generally adopted. A similar disturbance had taken place in 1830, on the introduction of the stamping machine. The machine for pointing is of still more recent introduction.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The following appeared in the *Star* of this city:

A board appointed by Secretary Schurz, consisting of Z. F. Wilbur, examiner of interferences in the Patent Office; N. S. Howe, of Assistant Attorney General Marble's office; and J. A. Armstrong, chief of the private land claim division of the General Land Office, met to-day to inquire into the truth of the charges preferred by Mr. Doolittle, Assistant Commissioner of Patents, against J. McClary Perkins, a patent attorney of this city. The charges allege malpractice and irregularity on the part of McClary. When the board have finished their investigation they will report to the Secretary, with their recommendations.

This is the same J. McClary Perkins that reported that he had preferred charges against the Commissioner some time ago.

Among the patents recently issued, I notice several to Mr. Holly, of waterwork fame, for his system of warming a city by steam, supplied as gas and water is now through a series of mains. The idea of distributing hot air and steam for heating buildings, etc., from a number of heaters or boilers in a central location has been a favorite idea of many inventors, and some have proposed the distribution of cooled air in the same way, one at least of which proposed to erect a tall tower to draw down from the upper regions cool and pure air. Mr. Holly, therefore, is not the first worker in this field, and all that he can cover is his peculiar arrangements, which, it must be confessed, are very comprehensive, as they include, besides heating buildings, furnishing steam for driving machinery, operating steam fire engines by connecting them direct to the mains, protecting hydrants from freezing, freeing the streets from snow and ice, heating greenhouses, supplying steam and hot water for culinary purposes, etc.

One of the members of the Virginia Legislature, having invented a register, succeeded at the last session of that body in getting a law passed to compel every barkeeper to purchase one of his instruments to record every drink sold, and on every drink thus registered the landlord was to pay a tax to the State. This, of course, caused considerable excitement among the dealers in the "ardent," and they no sooner became aware of the law than they set about finding some means to evade it. Having learnt that the Moffett liquor register had been rejected in the Patent Office, they bought up the patent that formed the basis of the rejection and engaged Messrs. Hill & Ellsworth, of this city, to bring suit against the manufacturer of the Moffett register, which was done, and an order has been issued by Judge Hughes, at Norfolk, restraining the issue of the registers until the question as to a preliminary injunction can be argued.

General Le Duc, the new Commissioner of Agriculture, has instituted a series of inquiries from which he expects to procure such information as will enable him to prepare a plan of operations that will very much increase the economic value of the department under his charge. The department has been of little real use so far, as very little has been accomplished beyond the collection of statistics regarding crops and the ravages of insects, which, though in themselves valuable to the commercial and agricultural interests of the community, are not all that the country has a right to expect from the operations of the department. General Le Duc proposes, among other things, to establish a comprehensive system of inquiry into the physical characteristics of the various sections of the country, with a view to the propagation of various products thought to be adapted to certain localities, but as yet have not been cultivated there, and also intends to stimulate, as far as practicable through the agency of the department, the cultivation of those agricultural productions for which we have now to send to foreign countries. The reports so far received show that the climate and soil of the Pacific coast are apparently very well suited to the cultivation of teas, which he thinks could be made an important industry, especially in view of the number of Chinese already on that coast, and the ease with which more could be had if found desirable. Sugar, also, though now largely cultivated in the South, it is believed could be made a much larger item in our annual production, if properly tried in other suitable regions. In view of this proposed action, the Commissioner recently addressed letters to prominent senators and representatives, asking them to furnish the department with all information in their power as to the character and diversity of the crops in their sections, the kind of soil and climate, and any other data that they might consider of interest on the subject; and also requesting them to furnish the names of such leading farmers as would be likely to receive and experiment with such seeds and plants as might be sent to them from time to time.

The Bureau of Statistics having now received full returns from all the customs districts, of the exports and imports during the last fiscal year, furnishes the following corrected statement: Total exports (specie values) \$602,474,581; total imports, \$451,307,549—showing an excess of imports over exports of \$151,167,032. In the fiscal year 1876, the excess of exports over imports was \$79,463,481. In the fiscal year 1877, the exports of coin and bullion amounted to \$56,163,

237, and the imports to \$40,774,414, while in the preceding year the exports were \$56,606,305, and the imports only \$15,936,681.

It is reported that the Post Office authorities here have serious apprehensions of a general strike of the engineers and firemen of the various roads throughout the country, which it is thought will begin towards the close of the present month, or the beginning of next. The information is said to come from reliable sources; and it is feared that great inconvenience in all the departments of business, and especially in the postal service, will be caused by it. *Per contra*, Chief Arthur of the Brotherhood of Locomotive Engineers positively contradicts these rumors and says that his society is at present on amicable terms with the railroad companies, and that in the event of a future disagreement the brotherhood will not resort to a strike until all other efforts at a settlement have failed.

Mr. O'Sullivan, who has been prominent in the Nicaragua Canal scheme, has been at the State Department on diplomatic business connected with that enterprise. He says that the work will cost about \$80,000,000, and can be completed within five years. It is said that no appropriation is to be asked of Congress, but subscriptions are to be opened in all the money markets of the world. He speaks confidently of the success of the work, the surveys of which have been made by United States officers.

Since the first of July the Secretary of the Navy has given employment to 3,400 men at the different navy yards throughout the country. The appropriations for the several bureaus of the departments, although smaller than usual, have been liberally distributed so as to give employment to as many men as possible; and that it may be made to go as far as practicable, the wages paid per day to each man have been reduced to some extent, so that the more men may be employed.

There has been more activity in the Navy Yard in this city during the past month than for many years, except for a short time during the Cuban trouble.

Captain Howgate of the Polar expedition has returned from New London, where he has been superintending the sailing of the *Florence* for the Arctic seas. He is well pleased with the success that has so far attended his enterprise and will not let the grass grow under his feet, but, it is said, will immediately urge all the members of Congress that he can reach to aid him by passing the bill which was presented to the last Congress, making an appropriation to aid him in his exploration. He does not, however, intend to rely wholly upon the rather uncertain favors of Congress, but hopes to take such steps that, in case it refuses him any aid, he will still be able to leave in August, 1878, with the second and most important part of the expedition.

There are imprisoned in Fort Marion at St. Augustine, Fla., some seventy Indians, and Clark Mills the sculptor, of this city, has been sent down by the Government to take casts of the more prominent among them. Some anxiety was felt as to the success of the operation, as it was quite uncertain how the Indians would relish the operations incident to having their casts taken. They, however, made no trouble, and were quite interested in the matter, allowing sixty-two casts to be taken, which are to be given to the Smithsonian Institute, and are said to be the most remarkable collection of Indian heads in the world.

Washington, D. C.

OCCASIONAL.

A Question of Axial Change of the Earth.

To the Editor of the Scientific American:

Granting the axial motion of the earth to have been communicated by the sun, at the time it was thrown off from the sun: First, does it necessarily follow that the present axis is the same as at the time the earth took position in its orbit after severance from the sun? Second, would not the destruction of individual fixed stars and planetary bodies by combustion or disruption change the position of the earth relative to our solar center, affect its orbital motion, and change its original axis? Third, if the axis of the earth has changed, or its obliquity to the plane of its orbit has changed, from any cause within or outside our solar system, could not the glacial drift be imputed to this cause as necessarily producing climatic disturbances resulting in the conversion of the frigid to the torrid zone, and *vice versa*?

Nashville, Tenn.

JOSEPH PHILIPS.

Leaks in Gas Pipes.

To the Editor of the Scientific American:

It sometimes happens in fitting gas pipes, no matter how careful or cautious the workman has been, small leaks will occur. Any one who had the mercury go down on him, after he has used every endeavor, made every precaution against leaks, knows how exceedingly annoying it is. It often takes nearly as much time to locate the leaks and stop them as it does to do the work previously done.

If gas fitters will act on the following hints, which is my plan, they will save themselves a large amount of unnecessary labor. I am going on the idea of a job worth doing at all is worth doing well. I have no patience with botches, or workmen whose highest ambition is to deceive the inspectors, or those who will do a job and leave without being able to tell truthfully whether their work is tight or not.

In getting out pipe, I notice each length and see that it is perfect. It sometimes gets damaged in transportation. In screwing on the fittings, see that they are cemented inside and out. Have the pipe just warm enough to melt the cement. Have the fitting as hot as it can be without burning the cement. Screw together tight, and when cold the

fitting, by reason of its greater heat, will contract more in proportion than the pipe. You will not lose much time by this extra care, and certainly no reputation.

If, after all your pains, a leak is indicated by the gauge, you may be sure it is a very small one, or, as for that matter, the rapidity of the mercury's descent will indicate the character of the leak.

If it is small, and you are pushed with other work, it may be stopped effectually by screwing a short piece of inch pipe, with a cap on one end, to the bottom of the receiving main, having previously poured into it some commercial hydrochloric acid—a half pint or thereabouts—with a handful of zinc scraps. A chemical action sets up between acid and zinc, liberating gas that soon rusts the leak tight. What might be termed large leaks can be stopped in this way. I have reference to new pipe. Whether this will stop leaks in old pipes or not I am unable to say.

Frankfort, Ky.

M. A. JONES.

Poison Ivy and its Remedies.

To the Editor of the Scientific American:

Poison ivy, poison oak, mercury vine, *rhus toxicodendron*; climbing ivy, *rhus radicans*; poison sumach, poison elder, dog elder, poison dogwood, *rhus venenata*.

The milky juices of these shrubs are neutralized and made harmless by almost any alkali. Strong suds made from soft or potash soap, white lye, ammonia water—four or five teaspoonfuls to a pint of common water—or a little saleratus dissolved in water, make good washes for the purpose. These washes may be used as preventives and as remedies.

White lye is made by throwing a couple of quarts of the ashes of hard wood—hickory, oak, or any other hard wood—into a pail of water. Stir and let settle. The clear liquor is white lye, and is a good wash.

First, as preventives—when one is going, or thinks he is going, to be exposed to the influence of these plants—wet every part of the skin that is exposed or uncovered with one of these washes, and be sure to let the wash dry on the skin, by no means wiping it off. This treatment protects the skin from the influences of these poisonous plants.

It must be kept in mind that these shrubs, especially when crushed or cut, have the power of affecting some skins even at the distance of several feet. After one has been exposed, or fears he has, let him follow the same directions, being careful to let the wash dry on the skin.

If, by the swelling and reddening of the skin, by the heat and itching and stinging, one finds that he unawares has been "poisoned," use these washes freely on the inflamed parts, only let them dry on the skin. Keep cool and quiet, restrict oneself to a spare and cooling diet, and keep the bowels gently open.

If much of the skin is involved in the inflammation, some caution may be needed in applying the washes. I once knew a case where the inflammation left the skin—on the hands and face it was—and settled on the lungs. For a few hours it seemed as though every gasp of the patient would be his last. A large and very strong mustard poultice on the chest at last brought the poison all out of there. But it left on the lungs a cough that lasted for months.

Ithaca, N. Y.

W. M. KINNE.

Another Remedy for Poison Ivy.

To the Editor of the Scientific American:

I have a remedy which I have used for several years with success. It is one half ounce of salts of tartar dissolved in two ounces of water, and applied to the affected parts several times daily.

Branford, Conn.

R. O. SMITH.

Laboratory Conveniences.

To the Editor of the Scientific American:

Little laboratory experiences, the knowledge of which saves much annoyance and contributes greatly to the pleasure of working, are naturally overlooked by the inexperienced. The repetition here of some of them may be of benefit.

A piece of wire gauze soldered over the escape in a sink will prevent the pipes becoming clogged.

To clean greasy utensils, some pieces of newspaper, a soaped sponge, and a little powdered pumice does the work in a twinkling; whereas many will thoughtlessly and laboriously try the effect of soap and water alone. Profanity is known to have been occasioned by a hard water complication.

Bits of paper, with or without muriatic acid, are nearly always preferable to shot for cleaning bottles, of course when there is no thick sediment.

A wet cloth, on which the glass receptacle of a hot liquid is set, will, in some way I am unable to explain, obviate breakage.

A rubber band to keep the cloth used in straining from the sides of a funnel is a convenience.

F. E.

Belleville, Ill.

A Peculiar Appearance in Aniline Red.

To the Editor of the Scientific American:

A few evenings ago I put a small quantity of aniline red in a jar of water, to notice the minute division of matter. A lamp stood on one side of the jar. After the liquid had been stirred up and stood a while, I observed little specks of the aniline floating on the top, with what resembled little tails projecting in the opposite direction from the lamp, and as the specks appeared to have no motion I thought this rather peculiar. I changed the lamp to the opposite side of the

jar, and found that after a short time the tails changed also. I thought the appearance bore a striking analogy to the tail of a comet. Will some one give an explanation of the phenomenon.

Albany, N. Y.

W. J. WATSON.

The Largest Saurian.

Professor O. C. Marsh has recently received a collection of reptilian remains from the crustaceous deposits of Colorado, among which he has found portions of an enormous dinosaur which he states is larger than any land animal hitherto discovered. The dinosaurs were a tribe of immense saurians, having many mammalian characters, such as a medullary cavity in the long bones, short pachyderm-like feet, a sacrum of five united vertebrae, and a lateral motion of the lower jaw. They include the iguanodon, megalosaurus, etc., herbivorous and carnivorous. The alligator belongs to the same order. The reptile discovered by Professor Marsh probably measured from 50 to 60 feet in length. It was herbivorous and seems quite distinct from any species hitherto described. The name *Titanosaurus montanus* has been applied to it.

Preservation of Telegraph Poles.

M. Tivey proposes to protect the portions of telegraph poles which are buried in the earth by sleeves of galvanized iron about 0.4 inch in thickness, covered with tar or red lead. The sleeves are imbedded in the wood of the post and extend somewhat above the ground. Tar is applied to the upper joint so that no water can enter between the sleeve and the wood, and the lower part of the former is bent over the bottom of the post and covered with an iron cap.

HOW TO RE-BORE THE ENDS OF STEAM CYLINDERS.

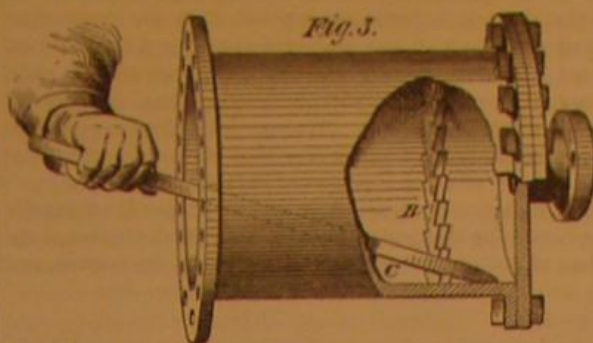
A correspondent asks: The wear of the bore of my 16 inch engine cylinder has left a projecting ridge all round the bore of the cylinder at each end. Having no boring apparatus, how can I remove the ridges?

Take a bar of steel about $\frac{3}{4}$ inch square and three feet six inches long; forge it at one end to the shape shown in Fig. 1, in which from A to B is the forged end. This end must then be heated along its entire length to a cherry red, and dipped vertically into cold water to harden it; after which it must be ground from A to B on all four faces square across, and as nearly of an even curve as can be ascertained by the eye. Next take a piece of hard wood—oak for instance—about an inch thick and three inches wide, cut it to such a length that when placed upright its ends will wedge tightly into the counterbore of the cylinder. Into the edges of this piece of wood saw out a series of notches, making its finished appearance to be such as shown in Fig. 2. The object of fitting its length tightly into the counterbore of the cylinder is as follows: If both cylinder covers are off or can be conveniently taken off, the ridge can be operated upon at each end of the cylinder; hence our piece of wood—which is merely an improvised rest to act as a fulcrum for the bar scraper shown in Fig. 1—would require to fit into the counterbore. If, however, only one cylinder cover can be conveniently taken off, the piece of wood will require to fit in the counterbore at

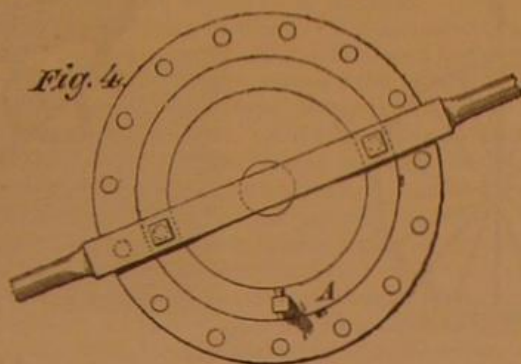
the open end and in the cylinder bore at the closed end of the cylinder, hence we make it large enough for the counterbore, and after having removed the ridge at that end we cut the length of the wood down to fit the cylinder bore, whereas if we made our rest to fit the bore at first, we should require to use wedges to make it fit the counterbore. In some cases holes might be bored near the ends of the rest or fulcrum to serve the same purpose as the notches. The method of using the scraper, Fig. 1, is shown in Fig. 3, which represents an engine cylinder. B is the wooden rest or fulcrum; C, the lever scraper operating on the ridge at the closed end of the cylinder. The lever, C, is worked on the pulling stroke only, and is so held that the edge presents a keen scraping tool which will cut very freely. The fulcrum, B, should be adjusted as closely as convenient to the work, so as to obtain good leverage for the scraper. It should be moved in its position so that during the roughing out only the lower notches in the fulcrum are used.

A plan was lately resorted to on the White Star line of steamships for re-boring a cylinder. The cylinder heads and

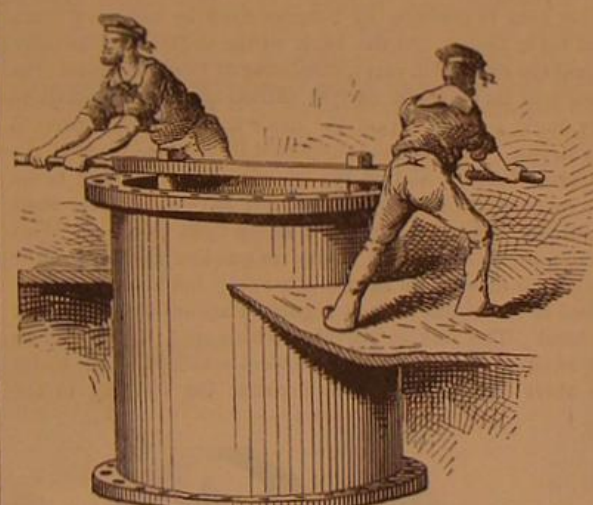
piston follower were taken off; a groove was cut from the outer end of the cylinder along the bore as far and as deep as the counterboring was required to be done. The counterboring was then accomplished in the manner shown in Figs.



4 and 5. The junk ring was provided with a small tool holder, such as is used upon boring bars. The tool was fastened in the holder while its cutting edge was in the groove referred to, cut as deep and as far up the cylinder as the counterboring was to be. To the junk ring was fastened,



by two long bolts, a wooden lever extending above and across the cylinder. Two men walked around pushing the lever, and when the tool at each revolution arrived at the groove, a fresh cut was taken by moving the engine so as to raise the piston the necessary amount. It is obvious that the piston head may be steadied and held true in the bore of



the cylinder by means of a few wooden wedges. Thus we see that in this operation the junk ring was made to serve as a boring bar head, the men furnishing the necessary rotative motion, the feed motion to the tool being obtained by advancing the piston toward the end of the cylinder where the work was being done.

Testing for Salicylic Acid.

This is best done either in wine or urine, says M. Harty, by Yvon's process. The liquid, to which is added a few drops of hydrochloric acid, is agitated with a little ether. The ether combines with the salicylic acid and abandons it, by spontaneous evaporation above a weak solution of perchloride of iron, producing a strongly colored violet ring.

ASTRONOMICAL NOTES.

OBSERVATORY OF Vassar College.

Positions of Planets for September, 1877.

Mercury.

On September 1 Mercury rises at 7h. 53m. A.M., and sets at 7h. 18m. P.M. On September 31, Mercury rises at 5h. 34m. A.M., and sets at 5h. 24m. P.M.

Venus.

Venus is in south declination, but may be seen for a little while after sunset. On September 1, Venus rises at 8h. 9m. A.M., and sets at 7h. 43m. P.M. On the 30th, Venus rises at 9h. 17m. A.M., and sets at 7h. 7m. P.M.

Mars.

On September 1, Mars rises at 7h. 10m. P.M., and sets at 5h. 44m. A.M. of the next day. On September 30, Mars rises at 4h. 54m. P.M., and sets at 3h. 22m. of the next morning.

The motion of Mars, which has been retrograde or westward among the stars, is becoming less so, and will scarcely be perceived during the latter part of the month.

Astronomers are interested in making observations on the change of place between Mars and the stars near it, in order to determine the distance of Mars and that of the sun. The observations will be made at night and at morning, when Mars is in the east and when it is in the west. Mars is in its best position early in September.

Jupiter.

On September 1, Jupiter rises at 2h. 19m. P.M., and sets at 11h. 19m. P.M. On the 30th, Jupiter rises at 0h. 35m. P.M., and sets at 9h. 35m. P.M.

Jupiter sets so early in September that observations upon it must begin as soon as twilight is over. If we take the hours from 7 P.M. to 9 P.M., Jupiter may be seen without its 1st satellite, on the 5th, 11th, 19th, 20th, 27th and 28th of September. Jupiter may also be seen between 7 and 9 P.M. with only three satellites, the smallest being invisible, on the 1st, 10th, 17th and 19th of September. Jupiter will be seen without the largest satellite on the 13th and 24th, and without the 4th on September 22.

When, with an ordinary telescope, these moons cannot be found, they are hidden by Jupiter, or they pass into the shadow of Jupiter, as our moon passes into the earth's shadow in an eclipse, or they come between us and Jupiter, and they are lost in the stronger light of the planet.

Saturn.

Saturn and Mars continue to rise at nearly the same time throughout the month of September. In the early part of the month Saturn rises before Mars, but will not be so readily seen, as its apparent size is less and it is a pale yellow in color. As soon as Mars is well up above the horizon, Saturn can be found from 4° to 5° further north than Mars.

These two planets will be in their best position early in September, and will be very brilliant near midnight. Jupiter, Saturn and Mars can be seen from about 7 P.M. to 9.30 P.M. in September.

Uranus.

Uranus makes its diurnal path so nearly with the sun that it cannot be seen except for a few hours in the early morning. On September 30, Uranus rises at 2h. 35m. A.M., about one third of a degree north of Regulus.

Neptune.

Neptune rises on September 1 at 8h. 51m. P.M., and sets at 10h. 20m. A.M. of the next day. On September 30, Neptune rises at 6h. 56m. P.M., and sets at 8h. 24m. A.M. of the next day.

A Good Word for the Crow.

Let me speak for the crow. Last year as I was harrowing corn with a vibrating harrow having teeth (you know it is a noisy thing), it uncovered a great number of white grubs, which you could see all about the ground. They are very destructive to vegetation of all kinds. They ate or destroyed thousands of hills of corn that year. You could see the track of the grubs as they traveled to get something to eat, for they travel when in search of food. You could see the surface of the ground a little elevated, and checked when the surface is hard and dry. Well, you see, when I was harrowing, as soon as the crows heard the harrow at work, they would come and light on the ground that was being harrowed, and the fresher the better they liked it; when going one way they would light after I had passed along; when I returned, and came within six or eight rods of them, they would rise gently and circle around in the rear again. I have counted as many as seventeen grubs that one crow has picked up at one lighting. They take any and everything, large and small—that is, worms, grubs, and beetles. Crows can't pull corn when planted with a machine; we have no fear of them from that source. Finally, wherever civilization is, there are rooks and crows.—*Letter to Chautauqua (N. Y.) Farmer.*

Indoline.

This name has been given by M. Schutzenberger to a new derivative of indigotine. It has the formula $C_{12}H_{11}N_3$. It dissolves by heat in dilute hydrochloric acid and sublimes in needles in concentrated sulphuric acid.

Influence of Light on Bacteria.

Arthur Downes and T. B. Blunt announce as a new result in their investigations, that light is inimical to the development of bacteria, and under favorable conditions may prevent their development.

THE COVENTRY TRICYCLE.

The tricycle, as it is designated, shown in the accompanying engravings, consists of a rectangular frame made of iron or steel tube, which carries a double cranked shaft in patent parallel bearings. The driving wheel, 42 inches in diameter, is arranged on a left hand side of the rider; and the other side of the rectangular frame is produced, front and back, for carrying the forks of two 22-inch steering wheels. These forks are connected by a rod, fixed to the outside of of one and the inside of the other, so that both wheels are turned together by the steering handle. The effect of this arrangement is that the rider is enabled to thread his way between other vehicles with the greatest ease; and it is even said that he can describe a figure 8 in a length of 12 feet. The seat is mounted on four steel springs of S form, which

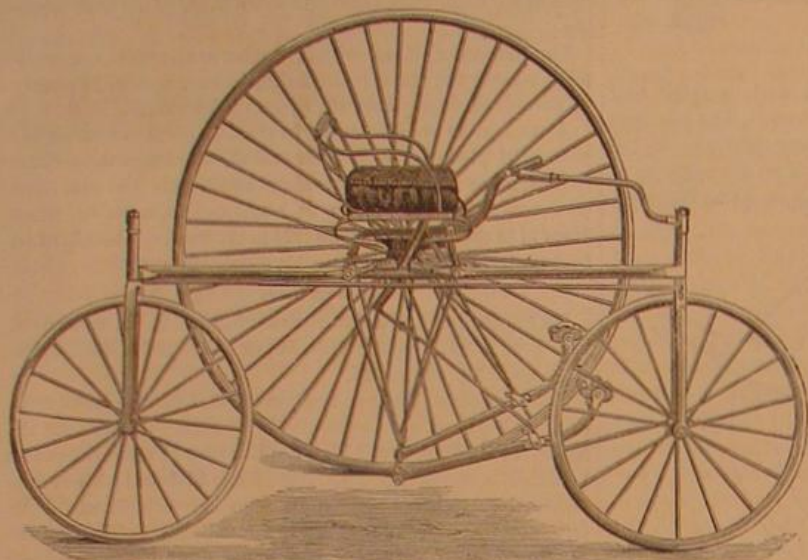
the compartment nearest the fire; that in the middle compartment a less degree of heat was obtained, while in the compartment the furthest from the fire the temperature was below the boiling point. This showed that by the time the gases reached the end furthest from the furnace they became cooled down to a lower temperature than the steam generated at the end of the nearest furnace; and therefore exerted a condensing influence on the steam already generated, thereby causing a tendency to prime, in addition to the direct loss of heat. The result of these experiments was that the form of boiler described above was adopted as the type of all those constructed in future by the firm.

All radiation of steam from the cylinders is effectually prevented by an ample steam jacket, which also takes the place of a dome, carrying the safety valve, the heating, and

internal thread to be stripped off by the tool used for clearing out the mud.

The crank shaft has a spur pinion keyed on its end, which works into an internal or annular spur wheel keyed on the drum shaft, in the proportion of 1 to 9. The drum runs loose on its shaft for lowering, until connected by a sliding clutch for raising the cage; the barrel is of wrought iron, but it has cast iron flanges, with a rim for the brake to act upon. On the end of the drum shaft is keyed an eccentric crank disk for working the spear rod; it is provided with a slot in which the pin is adjustable, so as to give a longer or a shorter stroke to the pumps, as may be required.

The starting lever of the engine, the striking lever of the clutch, and the foot plate of the lever acting on the brake, are all within reach of the driver, and his position enables him to see the pit mouth, so that overwinding is almost an



THE COVENTRY TRICYCLE.—Fig. 1.

are attached to the frame by nuts on the screwed ends of the stays carrying the pin on which the pedals work. Rods jointed to the pedals turn the crank shaft, as will be seen in the engraving, Fig. 1. The second handle is merely to afford support for the left hand while the right is occupied in steering.

Fig. 2.



The tricycle is fitted with tangent wheels, in which, as will be seen in Fig. 2, the spokes are crossed, and each spoke locks the other. By this arrangement greater lightness can be obtained for a given strength; and another great advantage is that in the event of a spoke being broken, another can be replaced by the rider in a few minutes. The

machine can be readily taken to pieces and packed in small compass.

IMPROVED MINING ENGINE.

We reproduce from *Iron* the engraving and description of an engine called the Tuxford Mining Engine, which has been erected for the Votty and Bowydd Slate Company, Festiniog, North Wales.

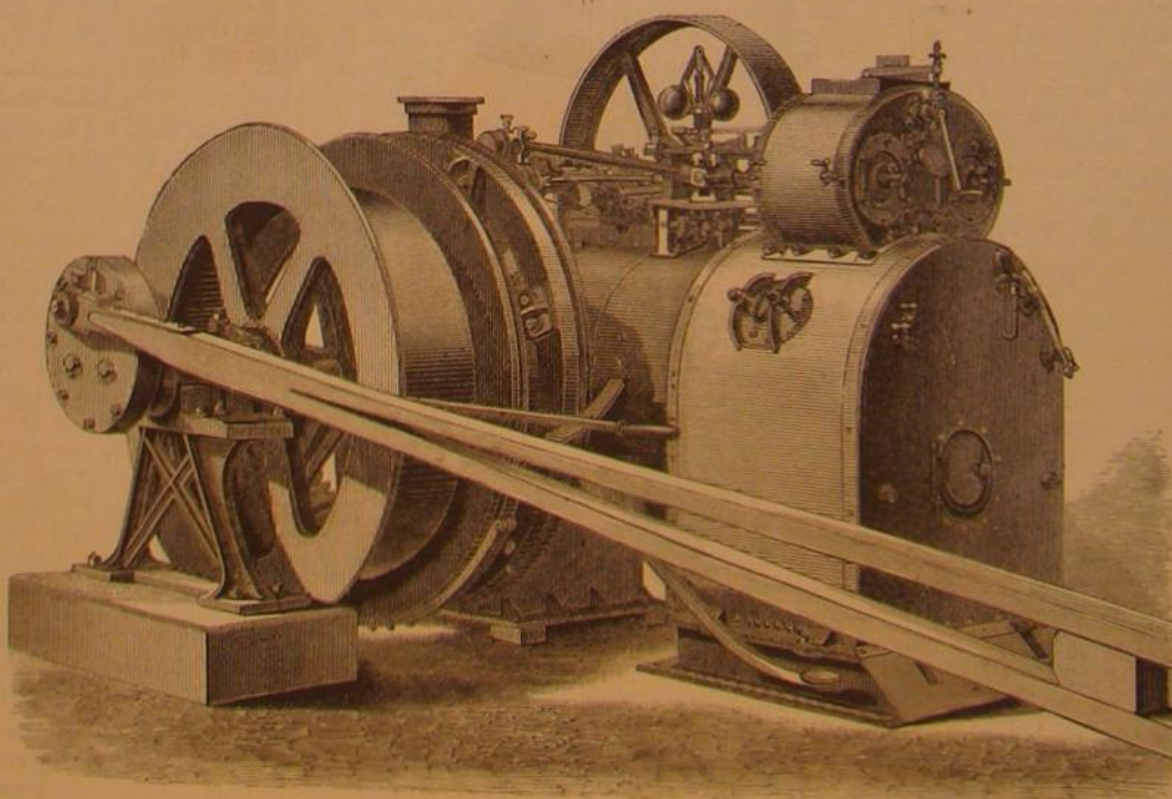
The fire box rests upon a cast iron ash pan, while the smoke box end of the boiler is supported on a crutch, forming a feed tank and heater. The crank shaft is geared to the drum, from which is worked the spear rod attached to the bell crank of the pumps.

In all the Tuxford engines, great attention is paid to economy of fuel; and it may be said that the proportions of the boilers differ from those adopted by any other maker. The fire box has an unusually large surface, but the grate area is reduced by fire logs mitred at the corners; the tube surface is unusually small; indeed, the tubes are only six feet long. The effect of this is to make the boiler remarkably short and compact; and it will be interesting to state the reason why these proportions have been adopted.

About ten years ago Mr. Tuxford was led to make

some experiments with boilers to ascertain the relative value of great area and tube surface, and of long as compared with short tubes. He had a model boiler of the horizontal type constructed with three tubes, and divided vertically into three compartments; on trying the temperatures of these compartments with the thermometer, he found that steam of high temperature, and therefore pressure, was generated in

regulator valve. In this way the steam enters the cylinders at boiler pressure by a short and direct passage, instead of by a long, tortuous pipe, which is apt to throttle the steam as well as reduce the pressure, owing to radiation. The pistons have two cast iron rings, each divided into three segments, so that the wear on the inside of the cylinder is perfectly uniform. These segments are arranged outside a circular steel spring, being held in position by tongues fixed by means of studs and back plates. At the back of the ordinary slide-valve works the expansion valve, consisting of two iron plates; the sheave of its eccentric may be shifted on the main shaft to any angle, so as to cut off the steam at any desired point in the stroke. The rods are supported in bearings fitted to the governor bracket, so that the glands of the stuffing boxes are relieved of all weight, and only have to perform their legitimate office of keeping a steam-tight joint. A Watt governor, with a spiral spring to quicken the fall of the balls, acts directly on the throttle valve; but its effect on the speed of the engine may be regulated according to the work in hand. The fork is provided with a stud, which may be adjusted on a small slotted quadrant attached to the throttle valve spindle, so as to regulate the opening of the



THE TUXFORD MINING ENGINE.

latter by the action of the governor balls. By means of a regulating valve, any portion of the exhaust steam may be turned into the feed tank with the surplus water from the pump; in this way the feed water may be raised to boiling point before being forced into the boiler. The mud plugs are screwed into the boiler, and have an external screw for receiving the cap, so that there is no

impossibility. This arrangement is, in fact, the great feature of the engine.

ANDERSON'S EQUILIBRIO COUCH.

This couch is designed for use in passenger ships, to counteract the rolling motion, and so provide for its occupant a means of exemption from the principal cause of sea sickness. Its dimensions are similar in all respects to those of an ordinary couch. Any number may be placed together, end to end, when they will act in unison, and occupy very little more space than is required for ordinary couches.

The couch is provided with two pairs of flanged wheels, with india rubber tires running upon concave rails, attached to any suitable frame, and forming arcs of a circle, of which the length of the couch may be the radius, and consisting of as many degrees on either side of the center as it is desired to counteract; it is thus caused to maintain its own level by the influence of gravity, and when placed transversely across the ship, remains horizontal while the latter is rolling.

The extent to which the motion of the ship may be thus neutralized is only limited by the length given to the concave rails, a very slight extension of which—in the ratio of about an inch to a degree—will considerably increase the counteracting action. The rails in our illustration do not exceed the length of the couch itself, but the couch will nevertheless counteract 15 degrees of rolling each way, or 30 degrees in all, and will therefore allow of its free action in either direction while the ship may be rolling to that extent. The india rubber tires on the wheels render the motion and the checking of the couch easy and noiseless.

—The Engineer.

Telegraph Wires Melted by Lightning.

A very severe thunderstorm passed over London on the evening of July 5. Between eight and nine there came a very brilliant flash of lightning, followed by a deafening peal of thunder. Many people were stunned, and in several cases were found quite insensible. Immediately after it was found at Kilburn that the telegraph wires, running from the top of the Queen's Arms to a house about 300 yards higher up the Edgeware Road, were struck by the lightning, and fell in red-hot fragments, varying in length from six inches to an inch, all along the road, a great deal of yellow smoke attending the fall of the wire. This shows that ordinary telegraph wires are not probably large enough to carry heavy strokes of lightning with safety.

SNOWY-LIPPED LADY'S SLIPPER.

The annexed illustration represents a pretty little plant which was exhibited in May last at the South Kensington (England) Flower Show. This graceful little species of the



hardy lady slipper attains 10 inches or 12 inches in height, and generally bears a couple of flowers at the top of its leafy stems. In general habit, size, and form of its flowers, it closely resembles *c. calceolus*, but is readily distinguished from all other hardy cypripediums by its egg-shaped lip being of a pure white color. It is undoubtedly a desirable plant. Lindley describes a similar plant under the name of *c. cordigerum* as being found scattered through Europe, Dahuria, and, according to Thunberg, also in Japan, adding that its characters are those of our native *c. calceolus*, except that the lip is pure white. For a long time neither cultivators nor botanists recognized the vagaries in size, form, and color, which are now apparent in tropical and epiphytal orchids; and the immense variety observable in the hardy, exotic, terrestrial species is just beginning to be apparent. That the hardy lady slippers, however, do vary quite as much as their tropical congeners was shown in a luxuriant batch of the rosy-lipped *c. acule* (*c. humile*) recently exhibited, among which we noted three forms so distinct in size and color of the flower and in breadth of the leaf that only a few years ago they would undoubtedly have been described as new species.

Longest Tunnel in America.

Few people know how great an engineering enterprise is going on in Baltimore county. For one thing alone, a tunnel six and four fifths miles long—36,510 feet—is being built underground, for over four fifths of the distance through hard gneiss and granite. It will be the longest tunnel in the country, and there will be only two larger in the world—the Mont Cenis, which is eight miles in length, and the St. Gothard, now in progress of construction, and which is to be nine and one quarter miles. The fact that the water supply tunnel lies near enough to the surface to allow of numerous shafts greatly facilitates its construction. The tunnel is a circle 12 feet in diameter, and extends from the Gunpowder river, about eight miles from the city, to Lake Montebello—the distributing reservoir—near the Hartford turnpike, about one mile and a half from the city, the direction being 26° west of south. This tunnel will conduct the water from the Gunpowder river to

Lake Montebello. Thence a conduit, 4,120 feet long, known as the Clifton Tunnel, from the fact that it passes under a portion of the Clifton Park, conducts the water to a point just south of the Hartford road, where it enters six mains, each 4 feet in diameter, which convey the water to the city, a distance of 1,900 feet. The country along the line of the works is hilly, and the tunnel varies in depth below the surface from 67 to 353 feet. There are 15 shafts in the main tunnel, the deepest extending 294 feet below the surface. The water rains down from the crevices of the rocks, and pours along the bottom of the drift. Gangs of men, each with his miner's lamp attached to his hat, are hard at work picking and delving in the flinty bowels of the earth; and the monotonous clang of the hammer upon the drill is constantly heard, except when everything is in readiness for firing a mine, when all retire to a safe distance, and thunderous reports roll through the rocky corridors. The work of the tunneling is all done by hand, it being cheaper than the machine work in a drift of such narrow diameter.—*Baltimore Gazette*.

LOW'S NECKLACE VANDA.—(*Vanda Lowi*).

This species is one of the most distinct of all the vandas, and, although as yet not common, it has several times bloomed and been exhibited in England. Although a strong-growing plant, it flowers in a comparatively small state. The plant attains a height of from 2 feet to 10 feet, and has distichous, leathery leaves, 2 feet or more in length. We have other vandas from Malaysia of similar habit, notably *c. Batemani*, from the Philippines, which grows in co-partnership with the glossy leaved *cypripedium latigatum*. There are one or two characteristics about Low's vanda, however, possessed by no other species. The flowers are arranged on a slender, zigzag raceme, which not unfrequently attains a length of from 6 feet to 8 feet, and when furnished with buds somewhat resembles an elegant necklace, finally changing to a wreath of gold and purple-blotched blossoms, as shown in the annexed engraving, with the trifling exception that the slender flower stem is densely hairy or hispid and not smooth as therein represented. Perhaps the most singular point in the history of this curious plant, however, is the production of flowers of two distinct kinds on one spike.

At the extreme base of the flower stem, say 1 foot or more from the leaf axil whence it emerges, two flowers are produced at about 3 inches or more apart. These flowers are golden yellow, the blotches being very small and scarcely visible, and having moreover a delicate perfume. Then comes a space of 12 inches or 15 inches, and then the ordinary flowers, the petals of which are broader than the basal yellow flowers, and are heavily and richly blotched with crimson purple. This production of two distinct sorts of hermaphrodite flowers on the same spike is, however, only

one of numerous instances of the kind now known to botanists. The spikes, which are often longer than the plant which produces them, occasionally trail along the ground, thus forming a ladder to nectar-hunting beetles and other



VANDA LOWI.

insects, just as do the long-tailed petals of *cypripedium caudatum*, or the singularly bearded inflorescence of *attacia cristata*. The plant, which is one not at all difficult to cultivate, is propagated by means of offsets, which sometimes make their appearance on strong specimens.

THE GORILLA.

I have had several interviews with Pongo, the gorilla, at the Westminster Aquarium, and at every visit I am more impressed with the interest of this remarkable animal. It is quite evident he is not very arboreal in his habits. He sits nearly always on the floor with his legs tucked under him, exactly as a tailor. His face cannot be called ugly certainly, but at the same time it cannot be called intelligent. The nose is much depressed into the face; the lips are even with the nose, and pink inside. He cannot smile, but he grins like a dog. He will snatch and pull away anything put near him. He took a pocket handkerchief from a lady's pocket, put it around his neck, and afterwards wiped his nose with it. This, I am inclined to think, was not imitation, but an accident. He is apparently not right-handed, but uses both hands equally.

If there is any one distinctive point between man and the gorilla, it is in the conformation of the hands. The thumb is exceedingly short, and cannot be used with anything like the facility as in the human subject.

No one seems to have noticed in this specimen the great difference between the human hand and that of the gorilla. In the human hand the three bones forming the finger spring direct from the palm of the hand. In the gorilla, the spaces from the knuckles to the first joint of the finger are united by a membrane, and become practically a continuation of the palm of the hand. The gorilla uses his hand as a foot much more than as a hand. When he progresses the fingers are bent inward on to the first joint of the fingers, thus forming a sort of pad on which the animal walks. When walking the fore arms and hand form, as it were, supports for the rest of the body; in fact, the gorilla's gait may be likened to a man going on crutches. The hind legs are comparatively small



THE GORILLA—MR. PONGO.

and much bowed outwards like the legs of a baby. The thumb of the foot has great powers of prehension; indeed, it may be said that the thumb proper is carried on the foot.

It is to be carefully marked that the gorilla has no calf to the leg and no biceps in the forearm. According to my observation, he cannot stand upright without supporting himself by means of some object. I have frequently seen human beings acting the part as monkeys. It will be remarked that in this case the moment the man is able to relax his performance he stands instantly upright; the gorilla, on the contrary, instantly he possibly can do so, drops on all fours on the ground.

As the gorilla walks, it will be seen that his back is almost square. I have ascertained that this great breadth of back is given by the ribs, which are broad and very strong. In the human subject the space of about a hand's breadth intervenes between the bottom of the ribs and the top of the pelvis or hip bones. In the gorilla the ribs come close down on to the top of the hip bone. The hip bones themselves are not spread out laterally to support the weight of the body as in man, but are narrowed as in many running animals. The gorilla has apparently no more voice than a roughish guttural sound. We have not, however, yet seen him in a rage. Under these conditions it is just possible he may make a great noise. I have put my finger into his mouth, and have ascertained that he has no pouch, nor anything like a pouch. He puts everything he can get hold of into his mouth, and on all occasions his mouth and teeth are used as weapons of offence and defence. In this one fact alone there is a vast difference between human beings and gorillas. When men quarrel they always use their hands, and in very exceptional instances their teeth.

The gorilla, as far as I have ascertained, does not use a stick for the purpose of striking, nor does he as yet ever strike with his hands; it is, however, most remarkable that he frequently claps with his hands; in doing this, his right hand is always uppermost. I do not think this is the result of imitation, or that he has been taught; it is, I think, a natural action. I gave him my hat, he placed it before him upon the floor and began immediately to drum upon it.

I am afraid the disciples of Darwin will be greatly discomfited by the advent of this gorilla. If the reader will kindly put his or her hand to the ear, he or she will find a very slight hard little knob on the external edge of the fold of the ear, about a quarter of an inch from its highest part. The presence of this knob, according to Darwin, indicates "the descent" of you and me, my friends, "from a hairy quadruped, furnished with a tail and pointed ears, probably arboreal in its habits, and an inhabitant of the Old World."

I was especially careful to examine the gorilla's ear, and I discovered that he does not wear a knob on his ear.

Pongo is but three and a half years old, and therefore quite a baby. I was most interested to see how his infantine instinct is more in accord with the human infantile rather than with the adult mind. He is respectful, grave, and somewhat distant towards adult ladies and gentlemen. A little boy and girl luckily came in to see him while I was present. After a while they both began to play in a child-like fashion with Pongo. Gradually they fraternized, and began to play together after the manner of little children. Not being a child, I cannot enter into their funny sayings and doings about nothing at all. So these three, the little fair-haired boy and girl and the gorilla, played together after their own childish fashion for nearly half an hour. Pongo evidently liked the little girl best, and I made her experiment on him with ornaments, handkerchiefs, etc.; but no—the ape's brain could not understand the human. Pongo put everything in his mouth, and tried to bite it up.

One little point—the human lips are made for speaking, not so the gorilla's. They are the lips of a beast. Moreover humans have hair on their heads. Pongo's hair is simply a kind of fur continuous with the other covering of the body.

I now come to a point to which I think attention has not been sufficiently called in the examination of the comparative anatomy of the man and the monkey. I mean the presence in the actual brain of that curious body which feels to the fingers like a grit of sand. This is called in anthropology (*i.e.*, human anatomy) the "pineal body." I have often examined this pineal body and wondered what the meaning of its presence in the human brain could possibly be. This pineal body is thus described by a high authority

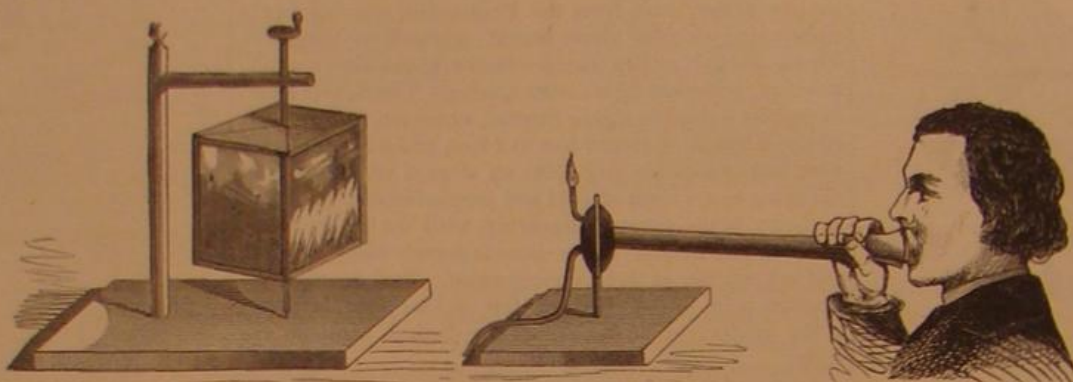
in anatomy: "The pineal body consists principally of large uncleated vesicles, and contains some tubular fibers. In a cavity which is formed towards its base is contained a mass of sabulous (sand-like) matter, which is composed of phosphate and carbonate of lime. To this Semmerring gave the name *Acervulus*. It is found only in subjects after seven years of age, and is in a great degree peculiar to the human subject."

"The subject of the pineal body is very imperfectly known, and although its office has been a theme for some of the wildest speculators in physiological theories, we are still utterly in the dark respecting it."

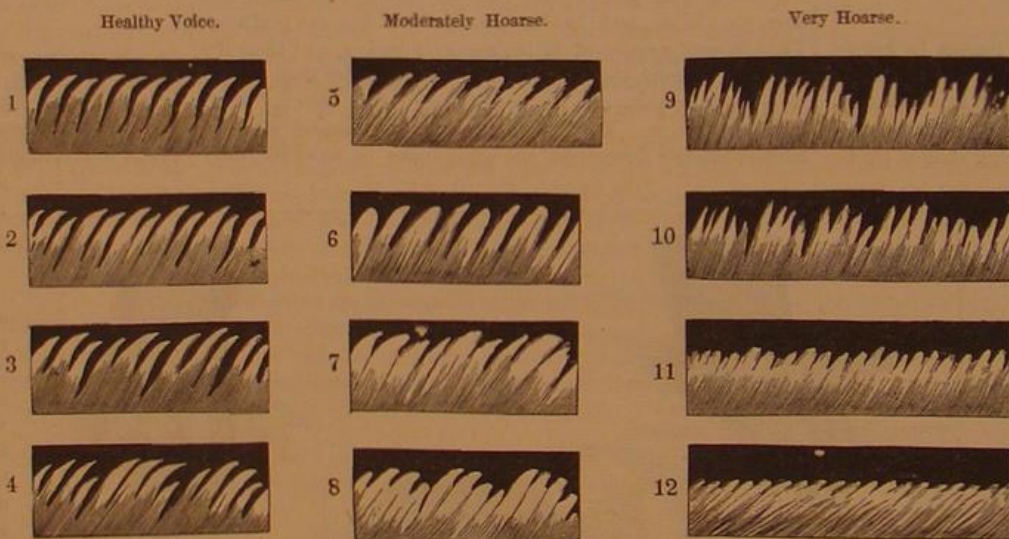
Now, has the gorilla a pineal body in his brain, or has he not? I confess I am exceedingly curious, and doubtless the readers of these lines are also curious, to know whether the gorilla has or has not a pineal body in his brain.

Chinese Suspension Bridges.

The most remarkable evidence of the mechanical science and skill of the Chinese is to be found in their suspended bridges, the invention of which is assigned to the Han dynasty, which flourished 1,600 years ago. According to the concurrent testimony of all their historical and geographical writers, Shang-leang, the commander-in-chief of the army under Kao-tsoo, the first of the Hans, according to Thornton's "History of China," undertook and completed the formation of roads through the mountainous province of Shen-se, to the west of the capital. Hitherto its



APPARATUS TO REPRESENT GRAPHICALLY THE CONDITION OF THE HUMAN VOCAL ORGAN.



FLAME PICTURES OF HEALTHY AND DISEASED VOICES.

lofty hills and deep valleys had rendered communication difficult and circuitous. With a body of 100,000 laborers he cut passages over the mountains, throwing the removed soil into the valleys, and where this was not sufficient to raise the road to the required height, he constructed bridges, which rested on pillars or abutments. In other places he conceived and accomplished the daring project of suspending a bridge from one mountain to another across a deep chasm. These bridges, which are called by the Chinese writers, very appropriately, "flying bridges," and represented to be numerous at the present day, are sometimes so high that they cannot be traversed without alarm. One still existing in Shen-se stretches 400 feet from mountain to mountain, over a chasm of 500 feet. Most of these flying bridges are so wide that four horsemen can ride on them abreast, and balustrades are placed on each side to protect travelers. It is by no means improbable (as M. Pauthier suggests) that, as the missionaries in China made known the fact more than a century and a half ago, that the Chinese had suspension bridges and that many of them were of iron, the hint may have been taken from thence for similar constructions by European engineers.

American Institute Exhibition.

Persons intending to exhibit this fall should at once forward their applications for space to the General Superintendent, otherwise they will not be able to secure the room they may desire. The managers are exceedingly anxious to have the exhibition in good shape upon opening day (September 12), and will do so if the exhibitors will only be as prompt as they should be in placing their exhibits in order.

THE STUDY OF THE DISEASES OF THE HUMAN VOICE.

The graphical method of investigation, which has rendered such important services in the study of purely physical phenomena, has of late years been called upon to perform kindred offices for the sciences of physiology and medicine, in order to represent definitely and directly the normal as well as the morbid or abnormal functions of the human body.

Though as yet but little cultivated, it has already given results which have led to discoveries of great practical as well as theoretical interest and importance.

The examination of the character of the pulse in various diseased conditions of the body, more especially of the heart, by means of the apparatus known as the *sphygmograph*, is a notable case in point. From the charts produced in this method one skilled in the art is able to read at a glance not only the nature of the disease, but also the stage at which it has arrived, and the degree of danger existing.

These happy results gave the impulse to similar experimentation regarding the influence of throat diseases upon the quality of the voice.

The apparatus used in this investigation is shown in the annexed engraving. It is ordinarily known as Koenig's flame manometer, though for the present purpose it has been so modified as to be capable of responding to the slightest variations in sounds. It is composed of a large cube whose four vertical sides are covered with mirrors, and which is revolvable about a vertical axis; of a gas jet, burning with a small flame; and of a mouthpiece which terminates in a lenticular box or capsule. A very thin, tense, and impermeable rubber membrane divides this capsule into two compartments, in one of which the sounding tube terminates, while the other serves as a passage way for the gas from the conducting tube to the jet at which it is burned.

On singing or speaking into the mouthpiece, sound waves are produced by the alternate condensation and rarefaction of the air within the tube; the rubber membrane acquires a corresponding rate of vibration, and so modifies continuously the rapidity of the delivery of the gas to the burner, causing the gas flame to leap up and down in unison with the sounds transmitted. On rotating the prismatic mirror this but slightly perceptible motion is rendered distinctly obvious, persistence of vision spreading out the image of the flame into a broad serrated band of light. These serrations vary with the character of the tones produced, as well as the degree of the diseased condition of the vocal chords. In the latter case especially the difference in appearance of the image becomes so striking that a skilled observer can very readily form a correct idea as to the actual state of the vocal organs. The flame pictures shown in the accompanying engraving will enable one to form but a very feeble idea of the great variety and richness of the forms, and the many curious light effects, which are here caused to make their appearance.

The first series of flame pictures shown in our engraving was produced by a normal human voice, the upper variety being the effect of a high note, while the lower three, containing respectively sets of two, three, and four teeth, were produced by successive lower notes. With a proper delicate adjustment of the instrument the differences between a fine, cultivated voice and a defective one were rendered strikingly manifest in a clear, regular, well-defined cut of the teeth of light in the case of the former, every fluctuation in the intensity of the notes being made distinctly visible.

The second series represents a moderate degree of hoarseness; the serrations are but imperfectly formed, and are no longer so regular or so constant in appearance. The tongues of the light are not so clearly cut and are shorter, since the range of vibration of the vocal chords is much smaller.

The third series refers to a severe degree of hoarseness, especially that attending the formation of tubercles in the lungs, syphilis, and various kinds of chronic inflammation. A thickening and partial destruction of the vocal chords here present great obstacles to their vibration, so that in 9 and 10 the serrations have gotten to be very irregular. The two last flame pictures represent an almost complete immovability of the vocal chords, the glottis remaining constantly open, and the passing air capable of setting the chords in but very slight vibration. This method of investigation has not yet reached the limit of its applicability, and further important and interesting results are continually being reached.

To produce a rosewood finish, stain the wood with dilute nitric acid, and grain with burnt umber, and glaze with carmine or lake.

RICE.—HOW IT IS PREPARED FOR MARKET.

BY COLONEL C. K. HUGER, OF CHARLESTON, S. C.

When the rice is ready for the harvest, it is cut by hand about 12 inches from the ground, and laid across the stubble for two days to cure. It is then tied into sheaves and put into small cocks in the field to more thoroughly dry. After a few days it will be ready to be carried to the barnyard, where usually the thresher is situated, and put into stacks, where it remains until the owner is ready to thresh it out. In some localities it is only removed from the fields daily in sufficient quantities to supply the thresher, which is almost always a frame building, one and a half stories, with high shingle roof, filled with the necessary machinery for separating the rice from the straw. The usual motive power is steam, the boiler and furnace of which should be placed outside the main building and encased in brick. The smoke-stack is frequently of brick, at least forty feet high, and placed at least fifty feet from the building, with an underground flue running to the furnace. This is the best and safest construction; but sometimes it is not practicable, and then an iron smoke-stack is substituted, and when that is the case the main building and boiler house should both be covered with metal, and the exhaust steam not allowed to be vented into the smoke-stack, as it causes to be thrown out a volume of sparks, not only endangering buildings, but also any stacks of rice that may be in the yard or on flats near by. This evil is supposed to be obviated by placing a spark arrester in the smoke-stack; but the experience of practical machinists is that they cannot be recommended as safe, and therefore should be avoided. The speed of the different portions of the machinery is not great; the smallest sized beater, which is the thresher that takes the grain from the straw, revolves not exceeding 600 per minute, and the largest 250, and of course sizes between these at proportionate rates. The speed of the fans varies from 100 to 300 per minute; therefore, if ordinary attention is paid to oiling the machinery, there should be no fear of fire from friction.

As threshing should only be done by daylight, and no artificial light allowed in the building at any time, there will be very little danger of fire; but, as the whole is of an inflammable character, if fire once gets under way the loss will most probably be total. Therefore, as fast as the rice passes through the thresher it should be removed to a storage barn, at a sufficient distance to make it comparatively safe in case of a fire occurring in the thresher, and should be kept there no longer than is necessary to accumulate a vessel load, when it should be sent to market to be sold at once as rough rice, or stored in mill until the owner desires to have it pounded and sold as clean rice. The straw, which is separated from the grain in the thresher, is by machinery delivered outside the rear of the building, and should be removed as fast as it accumulates to a safe distance from the thresher.

This rice straw is a good forage for animals, and valuable as a fertilizer for high land crops; but where it is not wanted for such purposes, it is much used for fuel in the furnace, and in the vicinity of Savannah, Ga., a considerable amount is used in a paper factory, as it is found to be valuable in the manufacture of that article, which is then frequently turned into "genuine Havana cigars." When it cannot be utilized by some of the above methods, it is burnt on the plantation, and the ashes applied as a fertilizer to the land.

Rice pounding mills are of two classes as to fire hazard. First, the mills on plantations, which are nearly all two story frame, shingle roof buildings, and next, the mills in cities, which are usually three and sometimes four story brick, with slate or metal roofs, but all run by steam, with furnace and boilers bricked up outside of building, and containing the same kind of machinery.

The city mills generally have warehouses adjacent to them, as the storage capacity of the mill itself is rarely sufficient for its wants. These mills are always located on some navigable stream, so as to be easy of access to vessels for the delivery to them of the rough, and the receipt from them of the clean rice. When rough rice is sent to mill to be at once pounded, elevators are lowered into the hold of the vessel, and the rice taken out and carried into the mill by horizontal screws, and at once elevated to the highest floor, and run through screws which take out all rubbish, such as bits of stick or straw, and sand. It then passes slowly into large millstones, six feet in diameter, revolving 120 per minute, and set so as not to break the grain of rice, but to cause the hull to split off. From the stones it passes through a fan, which blows the hull or chaff into an apartment, from which it discharges itself by a spout to the outside of the building, and is at once removed. The rice is carried from the fans to bins over the mortars. These mortars hold about four bushels each, and are made of wood, egg-shaped, large end down, lined with Russia iron. The pestles are pieces of timber 8 x 12 inches, ten feet long, shod with a heavy iron boot, and are lifted by arms from the pestle shaft in rear, and dropped about thirty inches into the rice in the mortars. This pounding continues from one to two hours, according to quality of grain, which reduces to flour a skin or coating that was left on it by the stones. It is then emptied out of the mortars, and carried by elevators to the upper part of the mill, and passed through screws, which take nearly all the flour off. It is again elevated to upper floor to screws which separate it into three qualities—whole, middling, and small—and then passes to the brushes. The brushes are cylindrical wooden drums, varying from two to three feet in diameter, and in length from six to ten feet. They are placed on end, the spindles running through an iron bar, and long enough to

pass the floor, so as to be easy of access for oiling; as, before this plan was adopted, the spindles could not be got at while working, and have been the cause of fires. This drum is covered lengthwise with strips of sheepskin, wool side in, about six inches wide and eighteen inches long, backed on one side only to the drum, each slip lapping a little the one adjacent to it. The cylinder is then enclosed by a wire screen firmly screwed in position. The rice from the fans passes between the wire screen and the skins. The brushes when working revolve, the largest 300, and the smallest 450 per minute. This motion causes the loose edges of the skin to fly off and rub the grain against the wire screen, driving any flour on it through the screen, and polishing the rice. As it is brushed according to its grade of whole, middling, or small, as previously separated by the screens, it so passes by spouts to tierces prepared for its reception, standing each on a platform to itself, so arranged on a shaft underneath as to give them a slight jerk up and down, which packs the grain as it falls into the tierce. As soon as it is full, it is removed, the head put in, branded, and rolled into the shipping shed, ready to be sent to market. This completes the process of milling. The speed of the different parts of the machinery is, with slight variations, as follows: Pestle shaft, 12 revolutions per minute; millstones, 120; brushes, from 300 to 400, according to size; fans, from 100 to 300, according to size; elevators, 40. It is therefore evident that there should be no danger from friction, if ordinary attention is paid to lubricating. The rough rice, and nothing that comes from it during the process of pounding, is at all inflammable, but, on the contrary, is slow of combustion; but as these mills work at night, carelessness in the system of illumination should be avoided. All lights should, as far as practicable, be fixed, and no hand lamps allowed, except lanterns fully protected under glass; and where coal gas is not used, lard or whale oil should be. In case of a partial loss, the greatest damage would be from water, as fresh water softens the grain so much that, if saved from heating and sprouting, it never recovers its original firmness, and is therefore very seriously deteriorated in value; and if with salt water, it soon becomes as offensive as decayed flesh, and is valueless.

These mills are costly, and generally pay well, and every precaution is used by those in charge to protect them from accidents; but still they are classed as extra hazardous, and some companies, particularly the English, write only very small lines on them, or decline them altogether. This I can only attribute to a want of knowledge of the risk. The writer has been familiar with the rice interest of South Carolina for over thirty-five years, and can remember the burning of only three pounding mills in that time, and therefore cannot regard them as extra hazardous.

The particulars as to speed of machinery, and much other valuable information, have been kindly furnished me by two of the most experienced practical millers in the State.

THE KEELY MOTOR DECEPTION.

The Keely Motor lunatics are still at work, according to the *Philadelphia Times*. The "directors" it is said, held a meeting, August 8, to witness Keely's experiments with a "new" machine. The following description of it as given by the reporter of the above paper is as clear as mud:

"The machine is made of wrought iron and cast steel. It consists of spheres, basins, standing tubes and small reservoirs, with a wilderness of connecting rods, valves and tiny copper tubes. A globe of cast steel, four feet in diameter on the outside, holds only twelve gallons. The center cavity is in a shell of nine inches thickness. The perpendicular tubes that reach from floor to ceiling, at the other end of the machine, have a central chamber of three inches diameter, the surrounding metal being three inches thick, and outside of it, one above the other, are huge rings of wrought iron shrunk upon the pipe. The copper tubes appear to be one fourth and one half inch in diameter, but the aperture in their center is not large enough to admit a pin head."

Mr. Keely made nine tests, and with $\frac{5}{8}$ suspension of the water column and 10 lbs. air he produced 11,000 lbs. pressure to the inch, and had to shut off the pressure because the gauge would not stand more. The condensing apparatus into which the vapor is discharged is a cylinder that holds three gallons of water, and so strongly bolted and barred that it looks as if made for the discharge of a twenty inch projectile. Its design is to reduce the vapor, the force of which has just been used, to water, for use over and over again in the working of the machine. The *Times* representative had an opportunity to test the quality of the water introduced into the machine from the hydrant and that in the condenser after its power had been used. He drank a pretty good quantity from each cylinder and found it cold, and free from any foreign taste, such as would probably be caused by explosive powders. He had a chance to breathe the mysterious vapor while the wonderful pressure was upon the tubes. It was discharged into his hands, his eyes, and mouth. It was perfectly cold and dry. Within a month, when he has made all his experiments with his now completed machine, Mr. Keely will endeavor to show the extent of its power.

In his talk with the *Times* representative Mr. Keely said: "This is a new substance; a new force, altogether unknown to science; I don't pretend to be the inventor; I discovered it by accident. I could work this machine up to ten thousand horse power if the metal would hold. I shall certainly work it upon a two hundred horse power engine soon. The little machine you saw in the office, up stairs (it is only

nine feet long, two feet wide and three feet high in its highest part), is the most powerful machine ever constructed. It was built for us by Mr. Willard of Bordentown, who was drowned a few days ago. It is a quart machine—that is to say, it uses only a quart of water. With the condenser that I have now nearly complete I will make that quart of water produce a thousand horse power motion of sufficient duration to run a steamship across the ocean."

One of the directors said: "We have been laughed at and called cheats and impostors, but out of the original company who joined in raising the \$120,000 already expended upon this invention only three or four have withdrawn. We are the original crowd, and we don't think of weakening. In a month or two now all Mr. Keely's tests will be finished, and we will show the world whether he is the greatest inventor or the greatest humbug of this age. Scientists, machinists, and learned societies are invited to come and make every test they can think of."

The purport and substance of all the foregoing bosh is, we suppose, that the Keelyites are short of funds and are about to make a new effort to shove off upon the unwary, another batch of their worthless stock.

EBURINE.

M. Latty has recently exhibited to the French Society for the Encouragement of the National Industry a new compound, to which the above name is given, and which is composed of ivory or bone pulverized, and in some cases mingled with agglutinative material. The latter is not, however, uniformly necessary, as by M. Latty's process the dust can be caused to agglomerate by simple pressure and heat. The operation is rather a difficult one, as too high a temperature produces disaggregation; but by experiment M. Latty has succeeded in so regulating the heat applied to the moulds by observing the behavior of wafers of fusible metal, that instead of a porous and almost friable mass the resulting product is extremely hard and resistant. It is believed that the natural organic material in the bone or ivory dust becomes partially melted, and so serves as a cement.

The color of the eburine is a grayish-white; and to make it pure white, suitable pigment is added. This, however, necessitates the further addition of a little albumen or other agglutinative material, as already noted. The material may be colored any hue, and is best utilized in combination with the so-called "bois durci," or wood concrete, which is made of sawdust and beef's blood pressed also in moulds under heat. The eburine serves for the raised portion of ornamentation of furniture, etc., and when moulded with the "bois durci," adheres to it with great firmness. It does not crack, and when not rendered too hard may be worked with ordinary wood tools. The grain of the hard variety is so fine that by suitable coloring it is easily made to imitate certain stones, such as jasper, malachite, and lapis lazuli, or by painting beautiful and accurate imitations of cameos and mosaics may be produced upon it. The invention appears to be of considerable industrial importance, as it opens a new mode of utilizing waste products, for which hitherto there has been comparatively little employment.

ENGINE "SPURTS."

There are numerous instances of collisions and other marine casualties on record, from which it would appear that the danger might have been avoided had there been some means on board the injured vessels for developing a sudden and great increase of power in the engines for a brief length of time. A long and heavily laden steamer, for example, is not easily manoeuvred even under full steam power, and when moving at high speed it is a matter of considerable difficulty to check her way. Similarly a heavy war vessel, in order to avoid torpedoes, may find a means of suddenly swerving, backing, or shooting ahead a potent safeguard against suddenly discovered obstacles.

M. Bertin proposes a simple means of effecting this object, which merely involves providing each vessel with a blower, by which strong jets of air can at a moment's notice be forced in at the base of the smokestacks in order to increase the draft. This has recently been tested in France on board the frigate *Resolue*. Combustion was found to be nearly doubled in activity under the transitory action of the jets of compressed air. The motive power developed was equal to 1.8 times the primitive power of the engines; and the increase of consumption of fuel was 20 per cent. This last is of no importance, however, in view of the necessities of the case and the brief period over which the augmented power would in most instances be excited.

Colored Borax Varnishes.

It is well known that an aqueous solution of borax is able to dissolve shellac, forming a kind of varnish, to which any desired color can be imparted by mixing with pigments. Major Dr. Kahl of Dresden has communicated to the Dresden branch of the Saxon Society of Engineers the results of a large series of experiments made with these varnishes. He reports that they are very cheap and dry very quickly, but they scale off from wood too easily. When this varnish is colored black with india ink and applied to paper, it possesses a fine gloss, but other colors, especially carmine, when mixed with this solution acquire an impure shade, and many pigments cement together in this solution, forming a hard and totally useless mass. The black shoe polish sold for ladies' boots is often made by adding some black pigment to this shellac solution. For bronze boots, rosinolin may be dissolved in any alcohol varnish.

The Probable Distance of the Sun.

A particularly good opportunity of determining the distance of the sun, by observations of the planet Mars at its opposition, occurs in August and September of the present year, the planet being about that time in perihelion, or nearest the sun in its eccentric elliptic orbit, within a fortnight of its being in opposition to him from the earth. The result of this is that in the early days of September, Mars approaches us to within a distance of about thirty-five millions of miles. Advantage will be taken of this near approach to obtain a value of the solar parallax and distance; and all astronomers wish good-speed to Mr. David Gill, who is now proceeding to the Island of Ascension for that purpose, taking with him an excellent heliometer belonging to Lord Lindsay, and made use of by him in observing at Mauritius the transit of Venus over the sun's disk, in December, 1874. With this instrument, Mr. Gill proposes to make observations of Mars and neighboring stars for comparison, when east and west of the meridian, so as to deduce the parallax of Mars from its parallactic change of position in the interval, owing to the diurnal rotation of the earth. This method has been suggested before, and partially carried out (but not sufficiently to obtain a reliable determination by it) at the last favorable opposition of Mars, in 1862. That opposition, however, was utilized very fully in another way, by making a large number of meridian observations of the planet at stations in both the northern and southern hemispheres, so as to give parallactic displacement at different places, instead of different times. The most complete discussion of all these observations was made by Professor Newcomb, of the United States Navy, and published by him as an appendix to the Washington Observations for 1865. The final result he arrived at from them was the value $8''\cdot855$ for the solar parallax. We will compare this with that obtained by the transit of Venus. The observations made of the transit in 1874 have not yet been fully reduced, and it would be premature to make use of them till the reductions are completed. The last preceding transit of Venus was that of 1769, about some of the observations of which there was, for a considerable period of time, a misunderstanding, which led to their being supposed to give a much smaller parallax and larger distance than was fairly deducible from them. This was particularly the case with regard to the observations made at Otaheite (or Tahiti) by Captain Cook and Mr. Green, as was satisfactorily pointed out in 1868 by Mr. Stone, now Astronomer-Royal at the Cape of Good Hope. His improved reduction of all the observations of duration of transit in 1769 gave $8''\cdot91$ for the solar parallax; and we may reasonably give this a weight of half, in combining it with the result obtained by the opposition of Mars in 1862, to conclude what may now be considered the most probable value of the sun's parallax and distance. Such combination gives for the parallax the value $8''\cdot873$; and as sun's distance = earth's equatorial semi-diameter (i.e., 3962.5 miles) $\times$ cotangent equatorial horizontal parallax, we thus obtain 92,113,600 miles for the present most probable mean distance of the sun. It will be interesting to see how this agrees with the value to be derived from the last transit of Venus and the forthcoming opposition of Mars, when the reductions of both are completed.—*King's College Magazine.*

Japanese Fans.

The folding fan is a Japanese invention. Even to this day the fan forms an integral portion of the national costume of Japan, and plays a large part in the every day life of that country.

An almost fabulous number of fans are exported from Japan to all parts of the world; no fewer than 3,000,000 fans, valued at \$90,000, were shipped from Hiogo and Osaka in 1875. Osaka is the principal city for the manufacture of the "ogi," or folding fans, which are almost exclusively those exported, all descriptions of the bamboo kind being made there, the figures, writing, etc., being executed in Kyoto. The principle of division of labor is carried out a long way in this branch of industry. The bamboo ribs of the fans are made by private people in their own houses, and combinations of the various notches cut in the lower part are left to one of the finishing workmen, who forms the various patterns of the handles according to plans prepared by the designer. In like manner the designer gives out to the engravers the patterns which he thinks will be saleable, and, when the blocks have been cut, decides what colors are to be used for each part of the design, and what different sheets are to be used for the opposite sides of each fan.

When these sheets, with the sets of bamboo slips which are to form the ribs, have been handed over to the workman, he, in the first instance, folds them so that they will retain the crease. This is done by putting them between two pieces of heavily oiled paper, which are properly creased. The fans are then folded up together, and placed under pressure. When sufficient time has elapsed, the sheets are taken out, and the mould used again, the released sheets having been packed up for at least twenty-four hours in their folds. The ribs, which are temporarily arranged in order on a wire, are then taken and set in their places on one of the sheets, after it has been spread out on a block and pasted. A dash of paste then gives the woodwork adhesive powers, and that part of the process is finished by affixing the remaining piece of paper. The fan is folded up and opened three or four times before the folds get into proper shape, and by the time it is put by to dry, it has received an amount of handling which Japanese paper alone would endure. When the insides are dry, the riveting of the pieces

together—including the outer covering—is rapidly done, and a dash of varnish quickly finishes the fan.

The sale of fans in the olden time in Japan seldom exceeded 10,000 for the whole country; times have changed however, for the foreigner has set foot there, and the old days of seclusion and limited trade are over. The number of fans ordered for the Philadelphia Exhibition alone amounted to over 800,000, at a cost of about \$50,000.

The designs for the mounts of Japanese fans are sometimes of a very interesting description, and always strikingly unlike the productions of European art. One peculiarity of the art of Japan has been pointed out by a recent critic. If a Japanese artist has any space to adorn, he does not seek out the center and place his ornament there, for although that would be the obvious means of securing proportion, it would not satisfy a taste directly derived from a study of nature, where proportion is rather suggested than expressed. We find, therefore, that the Japanese artist, imitating the ways of nature, throws his design a little out of the precise balance and trusts to the spectator to judge of the result by an association of impressions similarly derived.—*Harper's.*

Resistance of Wires.

This is a subject on which several series of researches have been made, but the results have been discordant. Thus MM. Becquerel, Siemens, and Matthiessen, with comparatively good agreement, have found in the case of copper, silver, gold, iron, and platinum, a diminution of resistance through annealing. M. Mousson, on the other hand, in the case of steel wires hardened by extinction, also obtained a decrease of resistance through the softening; but in steel wires, which were hardened by drawing, as also in copper wires, he got an increase of resistance through annealing.

With a view to explain this discordance, and to examine the behavior of a large number of metals, M. Chwolson, of the St. Petersburg Academy, has investigated the action of softening through annealing (either by means of a strong electric current or a gas flame) on the galvanic resistance of hard-drawn wires of 15 different metals—namely, platinum, platinum-iridium, palladium, aluminum, aluminum-bronze, iron, steel, copper, brass, German silver, zinc, silver, lead, magnesium, and cadmium. The last of these gave no distinct results, whereas, in the case of all the others, the question was answered unequivocally. We will not here further describe M. Chwolson's method, but merely give the results of the measurements in the following table, in which under A is represented the maximum of the observed change of the resistance in consequence of the first glow; under B the maximum of the resistance-change at a strong glow; and under C the greatest change of the resistance at extinction, all explained in percentage of the original existence of the hard drawn wires:

Wire.	A.	B.	C.
Steel.....	-4.8 p.c.	+8.6 p.c.	+0.6 p.c.
Iron	-0.4	+5.3	+0.7
Brass	-8.3	+0.8	+1.0
Copper.....	-2.9	+1.4	+0.4
Platinum.....	-5.3	+5.8	+0.7
German silver.....	-1.1	+2.0	-1.8
Aluminum bronze.....	-8.0	—	+2.7
Palladium.....	-0.4	—	+0.1
Platinum-iridium.....	-3.2	—	+0.3
Silver copper alloy.....	-11.3	—	+1.7
Zinc	-1.8	—	—
Aluminum.....	-1.9	—	—
Lead.....	+0.5	—	—

We see from this table that, in the case of twelve out of thirteen metals, the galvanic resistance is diminished in the softening of the wires in consequence of the first not very strong glow; only lead forms an exception, showing a slight increase. On increased and strong glow, six metals showed a distinct increase of the resistance; consequently an effect opposite to that of the softening. This double action of glow, in the case of some wires—for example, iron—where the decrease through softening is slight, and the increase through increased glow is strong, can only be observed by very careful measurements. That the second action is not simply to be attributed to an oxidation of the wire, is shown clearly by the high value obtained for platinum (with strong glow the resistance again rose above its original amount), and the comparatively very small value found for brass and copper. In extinction of the wires in water, lastly, nine out of ten metals showed an increase of the resistance, and only brass (German silver?) showed a considerable diminution of it.

The double action of annealing here demonstrated sufficiently explains the contradictions in the results of previous investigators.—*Der Naturforscher.*

Inventions Patented in England by Americans.

July 19 to July 30, 1877, inclusive.
 BOOTS AND SHOES.—C. Edwards, Jamaica, N. Y.
 CARDING ENGINE.—R. F. Barker (of Boston, Mass.), Manchester, Eng.
 DRYING FRUITS, ETC.—A. J. Reynolds, Chicago, Ill.
 ELECTRICAL MACHINE.—T. A. Edison, Menlo Park, N. J.
 EYELET.—James Whitehead et al., Cranston, R. I.
 FILE HOLDER.—Nicholson File Company, Providence, R. I.
 FURNACE.—W. Stewart et al., Paterson, N. J.
 HOP PICKING MACHINE.—H. G. Locke, Waterville, N. Y.
 LOOM.—E. J. Bicknell, Providence, R. I.
 RAILWAY CARRIAGES.—E. P. Kellogg, New York city.
 ROCK DRILL.—A. A. Goubert et al., New York city.
 SEPARATING PRECIOUS METALS.—A. K. Eaton, Brooklyn, N. Y.
 SIGNALLING.—J. L. Plimpton (of New York city), London, Eng.
 SPINNING RINGS.—F. Rabeth, Providence, R. I.
 SPINNING MACHINERY.—John Good, Brooklyn, N. Y.
 SPRING MATTRESS.—T. L. Snyder, Montclair, N. J.
 STOP NOTCHES.—H. A. Lugin et al., New York city.
 TYPE-DISTRIBUTING MACHINE.—D. Reynolds, Albany, N. Y.
 WHEELS.—James Bowson et al., South Pittsburg, Tenn.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED PIPE COUPLING.

Rufus H. Moss, Salem, Oregon.—The object of this invention is to provide a coupling for uniting pipes used in conveying hot air for heating cars, that may be quickly coupled and readily uncoupled. It consists of a cylinder attached to the end of the pipe that conveys the heated air. In this cylinder a tube is placed which is provided with a flange or collar which fits the cylinder, and is packed to insure an airtight joint. A spring presses against a collar and throws out a tube provided with catches, which seize and retain the collar of the coupling to be united. The parts of the coupling are alike on each end of the car, and when the parts on adjacent cars are united, the catches of one part engage the flange of the other. The tube and flange move longitudinally in the cylinders, as the cars move toward or from each other in running, and when the couplings are detached the valve closes automatically, preventing the escape of air.

IMPROVED PROCESS AND APPARATUS FOR COATING METAL ROLLERS.

Henry Wilde, Manchester, Eng.—This invention consists in a method of securing a sufficient amount of adhesion between the iron and deposited copper surfaces to enable the roller to withstand the various engraving and other operations without the separation of the metals. For this purpose the iron roller, before receiving a coating of copper from a hot cyanide solution of copper, is heated to a temperature ranging from 150° to 212° Fah. by plunging it into boiling water, or by other means. The roller, after receiving a film deposit of copper from the cyanide solution, is then transferred to the bath containing a sulphate solution of copper, where it receives one or more thin coatings of copper. These coatings are subjected to considerable pressure by the action of a burnishing roller of hardened steel, for the double purpose of forcing the deposited copper into closer contact with the iron, and detecting any want of adhesion between the two metals. The burnished coppered roller is then replaced in the bath of sulphate of copper solution, and subjected to the action of the electric current until the desired thickness of copper deposit is obtained. Attempts have been made from time to time to substitute iron rollers covered with a thin layer of copper by means of electricity for the solid copper rollers used in calico printing, and in other processes; but, owing to the expense of the battery power and the slow rate at which the copper was deposited in the reguline state, such attempts have not hitherto been commercially successful.

IMPROVED FOLDING GRATING FOR WINDOWS.

Calvin T. Steckel, Brooklyn, N. Y.—This invention is intended as a substitute for the fixed iron gratings or bars in basement, store, and other windows, so as to provide a shutter that may be folded and turned, making the room more cheerful, and facilitating the cleaning of the windows, etc., while combining, when locked, the same degree of safety as the bars, and is a combination of a folding lary-tong shutter with a fixed and slotted hinge of the window casing, to fold and turn the shutter. The folding shutter is burglar-proof, furnishing the same protection as the fixed grating, but giving, in addition thereto, the great convenience of opening them during the day, and presenting a neater appearance without the objectionable features of the rigid bars.

IMPROVED CANAL LOCOMOTIVE.

Gabrielle De Nottbeck, New York city.—This invention has for its object the construction of a locomotive which will practically run in a canal, the rails or track being laid upon the bed of the canal, and the body of the locomotive raised above the water and mounted upon standards, to which the driving and transporting wheels are applied. Canal boats have been propelled by means of locomotives or traction engines which run on the sides of the canals; but the power in such instances was oblique to the length of the boats, and the resistance was very great; but this locomotive is designed to run in a canal, and in a direct line with the boat which it draws. In practice the body of the locomotive will be entirely out of the water, and it will be provided with a hook at each end for the attachment of a boat.

IMPROVED LEATHER CRIMPING MACHINE.

Jason Smith, Charlestown, Mass.—This invention consists in the arrangement, in a suitable frame, of a tree or form rigidly supported by standards attached to a crossbar of the frame, and in plates that slide in grooves in the standards, one upon either side of the tree, and carry wedge-shaped or beveled pieces having the same curvature as the tree or form. It also consists in a clamping device for clamping the leather, and carrying it down over the tree, and in smoothing plates for pressing the leather smoothly upon the tree, and in levers and screws for operating the various parts.

IMPROVED BALANCED VALVE.

William Hardwick, Erie, Pa.—This invention relates to certain improvements in balanced valves of that class in which the two parts of the valve are made adjustable toward or from each other. Said improvements consist mainly in the arrangement of a stuffing box through which the bolt connecting the parts of the valve passes, and the arrangement of springs in connection with the bolt and the two parts of the valve for the purpose of holding the latter in proper position.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED CURRYCOMB.

Thomas D. Bennett and Horace B. Moody, Harrisonville, Mo.—This invention relates to an improved currycomb for horses, and consists of rotary combs, and an arc-shaped stationary comb, attached to a suitable handle. The crossbar may be plain or provided with teeth on upper side, to serve as a mane and tail comb. The rotary combs raise the hair and admit the stationary comb to enter with great facility, so as to effectually clean the skin.

IMPROVED TOY BUZZ.

James B. Wells, Cincinnati, O.—This invention has relation to a toy known as a "whirligig," and it consists in a thin circular plate or disk surrounded by leaves or semi-circles so shaped and arranged that when rapid rotation is given to the disk a whistling sound is produced. This toy will be struck out of very thin sheet metal, and scraps of tin may be utilized for the purpose.

IMPROVED BRUSH.

Randall Bisbee, New York city.—The object of this invention is to improve the construction of metallic brushes, so as to enable them to be made lighter and nester, and adapt them to receive any desired kind of a back. Wires take the place of ordinary bristles, and are placed through a rubber plate, with their heads resting against the inner side of the plate. A leather plate is placed over the heads of the wires, and between them

and the back, which is a metal plate, through which, around its edge, is formed a row of holes, punched from the outer side in such a way that the burrs of the holes may be passed into or through the rubber plate, so as when the edge of the back is turned down upon the rubber plate they may hold it securely.

IMPROVED ARTIST'S APPLIANCE.

William H. Brownell, Brooklyn, N. Y.—This invention relates to a novel and useful improvement on cases or boxes which are designed for containing artists' brushes, paints, etc., and especially designed for outdoor sketching. The nature of this invention and improvement consists in combining with a portable paint box or artist's case an easel adjustment, which will firmly clamp and safely hold the tablet or material to be painted on in a convenient position for the painter.

IMPROVED MEMORANDUM BOOK.

William A. Cooke, New York city.—This improved memorandum book is so constructed that the inside book or the stubs of the inside book may be removed and replaced with a new book, which may be made of any desired size and thickness, and will open flat and close flat. The invention consists in a metal plate, provided with the loops and fastening wire, in combination with a cover and the inside book, and in the inside book, formed of an odd number of sections, to furnish a positive center to receive the fastening. The inside book is made of three, five, seven, or any other desired uneven number of sections, and each section may have any desired number of leaves, so as to make a book of any desired thickness. The sections are sewed together, and may be still further secured by a paper pasted upon their rear edges. The object of always having a section in the center is to have a firm hold for the fastening that connects the inside book to the cover.

IMPROVED OPEN-FRONT HEATING STOVE.

Francis E. Thompson and Daniel Knappenberger, Belknap, Pa.—This invention provides an improved heating stove that combines the cheerfulness and advantages of the open grate with the economical features of the common heating stoves, and which provides, also, a continuous and conveniently regulated supply of pure heated air, acting as a ventilator and dust escape in all the seasons. The stove rests on the floor and against the wall with or without feet, the outer shell never becoming heated to such an extent as to be dangerous. If feet are used, they may be made of cylindrical form, and wide enough to correspond with the bottom apertures, so as to conduct the air. The stove economizes heat and fuel, ventilates without introducing cold air, draws off the dust, so as to provide a purer air in the room, and admits a quick fire at any time, without blowers, by the folding shield. The stove can be made ornamental in appearance by attaching a fender and hinged side brackets, the whole forming a heating stove of superior qualities.

IMPROVED BALLOON.

Washington Beckley, Louisville, Ky., assignor to himself, David W. Garrod, and Millard F. Garrod.—The object of this invention is to furnish balloons which shall be so constructed that they may be made to ascend and descend an indefinite number of times without varying the amount of gas in said balloons, and without the use of sand or other ballast, adapting them for use in aerial navigation, in raising stone and brick in erecting high buildings, and for various other purposes. The invention consists in the mode of controlling the descent and ascent of balloons and other vessels floating in the air by the buoyancy of gas, by the compression and expansion of the gas contained within balloons or vessels, and in the combination of the cylinders, one or more, provided with the valves opening inward, and the valves opening outward, and the condenser provided with the valve opening inward, with each other, to adapt them to be applied to a balloon for regulating the volume of gas contained in said balloon to control its buoyancy. With this construction the balloon is filled with sufficient gas to raise and carry the desired weight. When the balloonist wishes to descend he operates the mechanism and compresses the gas into the condenser until the specific gravity of the balloon is greater than that of the air in which it floats, and it descends. Should the balloonist wish to check or stop his descent he opens a valve and allows enough gas to escape from the condenser into the balloon to effect his purpose, so that he can ascend or descend any desired number of times without losing any gas, and without throwing out any ballast.

IMPROVED PEN AND PENCIL CASE.

James B. Smith, New York city.—This invention relates to cases designed either for pencils or toothpicks; and the nature of this invention consists in an arrangement of tubes within the stock or outside barrel, whereby the exposed part of the pencil holder will be perfectly rigid, and strongly supported by an interior immovably fixed tube, and this is made without slotting or perforating the exposed parts of the case. Great strength and rigidity is afforded to the pencil nib when it is projected. At the same time it is a solid pencil case—that is to say, its outer shells are not slotted nor perforated. It is obvious that a toothpick may be fixed to the pencil tube or stem, and rendered rigid and strong by this improvement.

IMPROVED SAW-SET AND FILE GUIDE.

Henry C. Root, Virginia City, Nev.—This invention furnishes a simple and reliable device by which the teeth of a saw may be set and filed in convenient manner, the device being readily adjusted on a bench or other support for either operation, and used for either purpose, as required. The invention consists in adjustable clamping jaws pivoted to and secured by a clamp piece to the bench or table, and the combination of parts necessary to the adaptation of the device to the purpose of setting a saw or filing it.

IMPROVED OVERALL.

Jacob Wallach, New York city.—The object of this invention is to furnish for the use of working men overalls of strong and durable construction, made with a view to sustain the strongest wear without ripping of seams and tearing of pockets; and the invention consists of a pair of overalls having flat seams, and exterior strengthening stays running over the seams, and stitched at both sides of the same. The exterior seam covering stays may be made of leather, canvas, or other material suitable for the purpose, they imparting a high degree of strength at the seams, and preventing the ripping or tearing open of the overalls along the seams so covered. A better and more durable make of overalls is thereby produced, which resists in superior manner the wear and strain to which overalls are exposed, and which strengthens them at the points most liable to wear.

IMPROVED REED FOR MUSICAL INSTRUMENTS.

William Spethmann, New York city, assignor to himself and Elias Durlach.—The object of this invention is to furnish an improved reed for toy trumpets and other reed musical instruments; and the invention consists in a musical reed, in which the reed or reeds are cut out of the body of the plate, so as to be in one piece therewith, and having corrugation in the plate.

IMPROVED CLOTHESPIN.

Edwin F. Clearwater, Carmel, N. Y.—In this clothespin the jaws that are connected together near their centers by staples, which are driven into them at each side, and form pivots upon which the jaws move. The jaws are concave from their rounded ends to the staples, making them sufficiently elastic to clasp clothes of any thickness without breaking. The manner of using this improved clothespin is as follows: The pin is placed over the clothes upon the line, and the cam lever is turned upon its pivot, bringing the cam into contact with the opposite jaw of the pin. The motion is continued until the end of the cam lever is above the line of its pivot, when the jaws are securely locked. By this improvement springs are dispensed with, and a clothespin is furnished which is inexpensive, durable, and efficient.

IMPROVED COMBINED OVERALLS AND JUMPER.

Samuel H. Emanuel, Gloucester, Mass.—This invention relates to an improvement in combined overalls and jumper, and has for its object to increase the strength and durability, improve the fit and appearance, and lessen the cost of such garments. The great advantage secured by this improvement is that the seams most liable to rip in garments of ordinary manufacture are avoided, and a stronger and better fitting garment is produced. In this combined overalls and jumper the sections are united by seams at the back, and have the leg portions united by seams on the inner side of the leg, the whole being made without seams at the sides or around the waist, and provided with pockets and pocket openings.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HOE HANDLE.

William R. Littleton, Valley Mills, Texas.—This invention is designed to furnish a device for tightening handles in the eyes of hoes, axes, etc. The handle has a hole, groove, and a longitudinal slot in combination with a collared bolt having thereon two screws of different diameter, and with threads running in different directions. For the various uses to which it may be applied it is simple in construction, easily and quickly operated, effective and reliable in operation.

IMPROVED MACHINE FOR PRESSING HAY, ETC., FOR FUEL.

John E. Hackett, Caledonia, Minn.—The object of this invention is designed to furnish an improved machine for pressing hay, straw, etc., for fuel. In the construction of the machine by bearing down upon the outer end of a lever, a roller will be raised against a shaft, so as to compress the hay as it is being rolled upon this shaft sufficiently to adapt it to be used for fuel. The shaft is so formed that it may be drawn longitudinally from its bearings, to withdraw it from the roll of hay.

IMPROVED MILK COOLER.

Edward F. Prescott, Charlotte, Mich.—This invention relates to an improved milk cooler and aerator, by which the milk is conducted over a series of cooling channels, so as to be thoroughly cooled and aired; and it consists of a tank with a pan having at one end a milk receiver, from which the milk is conducted through an exit opening and gate over a series of inclined channels, divided by raised longitudinal partitions, or ridges extending alternately from one end to a short distance from the other end of the pan. The hollow partitions admit the cooling water to act on both sides of the channels and increase the size of the cooling surface, while the fall in the channels imparts a revolving motion to the milk from the sides and bottom of the cooling channels to the center and surface of the milk, thus bringing the globules of milk to the air in rapid succession, and the warm milk to the bottom, so as to air and cool the milk thereby in quick and effective manner during the passage over the channels, which are all in contact with the water in the tank, that is filled up to the level of the highest channel.

IMPROVED MOWER.

Isaac N. Hall, Garden Grove, Iowa.—The object of this invention is to improve the construction of the mechanism for driving the sickle bars of mowers and reapers, so as to simplify its construction and lessen the jar and strain which accompanies the use of the crank wheel and pitman, and thus enable the machines to be made lighter, and to be run with less power than is necessary with the ordinary constructions. The invention consists in the combination of a large gear wheel, a small gear wheel, a shaft, and a diagonally flanged cylinder with the inner ends of two sickle bars, cutter bar, and drive wheel. The sickle bars are placed the one above the other in seats in the cutter bar, and in the guards attached to said cutter bar. The inner ends of the sickle bars may be directly opposite each other upon the opposite sides of the cylinder, so as to come to a rest and change their motion at the same time, or one may be a little higher than the other, so that one may come to a rest and change its motion a little in advance of the other.

IMPROVED COTTON CLEANER.

Charles O. Thomas and Thomas Robertson, Murfreesborough, Tenn.—The object of this invention is to furnish an improved machine for removing dust, sand, and dirt from seed cotton before it is ginned, and which shall be simple in construction, convenient in use, and effective in operation, producing a much better sample of lint cotton than when ginned without being cleaned. It consists in the combination of a cylinder, provided with an inner circle of longitudinal rods and a central rotary shaft, having spirally arranged pins, the latter beating the cotton against the rods and carrying it round and round the cylinder until the discharge is reached.

IMPROVED GATE.

Daniel Barrett and James F. Quinn, Wilmington, Ill., assignors to said Quinn.—This invention belongs to that class of gates that are operated from the vehicle or from horseback without dismounting; and it consists of a gate guided by rollers and moved by a windlass having long shafts, which are provided with cranks that may be operated from a carriage or from horseback.

NEW TEXTILE INVENTIONS.

IMPROVEMENT IN DYEING YARNS AND FABRICS IN ANILINE BLACK.

William J. S. Grawitz, Paris, France.—The novel chemical reactions of this invention consist in the concurrent action on aniline oil or on its salts, of certain metallic salts and soluble chromates or bichromates of chlorates, without the necessity of exposure to air. The action of the metallic salts may either precede or follow that of chromates or bichromates, and both may be performed with or without the aid of heat.

IMPROVED CLOTH FINISHING MACHINE.

Herman Springborn and Christian H. Baush, Holyoke, Mass.—This invention relates to machines for finishing woven cloth; and it consists in the combination of a perforated steam pipe for directing jets of steam against the surface of the cloth as it enters the machine; a rotating brush and a plush roller for brushing and finishing the surface of the cloth; a heated stationary bed and a roller fitted to the same, for hot-pressing the cloth; a hollow roller, through which passes a current of cold air or water for cold pressing; a device for rolling, and also a device for folding, the cloth. The object of this invention is to provide a machine that will at one operation dampen, brush, hot and cold press, and roll or fold the cloth, or perform a part only of these operations, as may be required.

NEW HOUSEHOLD INVENTIONS.

IMPROVED HOUSEHOLD PRESS.

Henry W. Cam, Greenpoint, N. Y.—This invention relates to portable presses for expressing juices from fruits and for other similar purposes; and it consists of a standard or base piece, which is provided with a clamp for attaching it to the table, and upon the upper end of which a disk is formed, that is surrounded by a trough or channel that terminates in a spout. A yoke is joined to ears at the sides of the said disk, and is provided with a screw, by which the power is applied. The advantages claimed for this improvement are that the press is compact, simple, and easily manipulated. The base piece elevates it so that a receptacle may be placed under the spout for receiving the liquid flowing from the press. The perforated bottom, supported by the internal rib in the hoop, affords means for the escape of liquid from the mass under pressure, and at the same time keeps the hoop down to its place.

IMPROVED DOOR CHECK.

John Francis, Waco, Texas.—This invention relates to a device for holding the door in open position, is readily applied to the door and worked without noise or jamming. The invention consists of a holder or knob, with recessed front end, attached to the base board, and of a countersunk door plate or case provided with a rubber block, that binds on the recessed parts of the holder to retain the door in open position. When the door is opened the block passes readily over the knob, and is retained by the recess of the same, so as to hold thereby the door in position. In closing the door the elastic block clears readily the recess of the knob by taking hold of the door, without requiring a special effort, forming thus a neat, simple, and reliable door-holding device.

IMPROVED STOVE.

Charles Lyman, Clarinda, Iowa.—The sheet iron body of this stove, together with the end pieces, form an elliptical drum, in which, between the end pieces, is placed a sheet of iron that is bent into a semi-elliptical form, between which and the body there is a flue. A firepot is arranged in the semi-elliptical part upon a plate that extends from one end piece of the stove to the other. The gate is provided with a number of tubular projections, which stir the fire and break up the clinker as the grate is moved. The stove may be filled either at the side or top, and the fire may be adjusted by poking it above the grate, between the fingers at the lower side of the pieces at the end of the firepot.

IMPROVED LAMP.

Nicholas F. Rigby, Winfield, Kan.—This invention consists in an open oil cup or chamber, attached underneath the font, being connected thereto by a descending tube with valve opened from the top of the font, the valve being so arranged as to close the exit tube when the font is filled, and open the same when the font is closed. The invention is based on the same general principles of the vacuum font as the German student's lamp, but is capable of being used as a bracket or stand lamp, chandelier, etc., supplying as many burners as desired with oil in regular and reliable manner.

IMPROVED ADJUSTABLE ROCKING CHAIR.

James R. Brumby, Marietta, Ga.—The object of this invention is to produce a chair which is strong and durable, and which may be readily adjusted to different positions, and folded together for storage or shipment. The chair is put into position for use by holding down the back end of the rockers and taking hold of the top of the back and raising it into the desired position. To place it in a reclining position the bottom is raised, which, by means of a cord, also raises a ratchet bar, and the back pressed down until it is in position.

IMPROVED IRONING APPARATUS.

Henry Monk, Troy, N. Y.—This invention relates to an improvement in the class of machines in which the article to be ironed is attached to a table that is adapted to slide beneath a heated roll or rolls. It also consists in a novel method of fastening the shirts to be ironed, and in an arrangement of gearing for driving the rolls and tables. The shirt is arranged at the opposite end of the machine, so that when the first one is discharged from the rolls, the second one is ready to be operated upon, and is introduced under the rolls while the machine is running in the reverse direction. Shirts are thus introduced into the machine first at one end and then at the other, in alternation.

IMPROVED ROTARY CHURN.

Lars Budahl, Spring Grove (Riceford P. O.), Minn.—This invention consists in the combination of a rod, a bar or plate, a lever, and a slotted catch with the churn body and the cover; in the combination of a hook with the detachable dasher, and with the dasher shaft, and in the frame made in two parts to adapt it to receive and hold the pivots and dasher shaft of the churn. The object of this invention is to furnish an improved apparatus, which shall be so constructed as to enable the churning to be done easily and quickly, and which shall be convenient in use.

IMPROVED FAN ATTACHMENT FOR ROCKING CHAIRS, ETC.

Charles Krauss, Chicago, Ill.—The object of this invention is to furnish an improved fan attachment for chairs, rocking-chairs, cradles, and tables, which shall be so constructed as to be operated by the movement of the said chair or cradle while being rocked. A step and clamp, adjustable with each other, adapt the apparatus to be attached to a chair or cradle; and a combination of parts with a supporting bar enables the apparatus to be attached adjustably to a chair, rocking-chair, cradle, or table.

IMPROVED CLOTHES LINE HOLDER.

Richard Raby, Jr., Loudonville, O.—The object of this invention is to provide a clothes line holder which is capable of supporting a great length of line, which may be folded compactly together, and which is strong and durable. The advantages claimed for this holder are that it is simple and inexpensive, and is capable of spreading a great length of line.

IMPROVED LOCK FOR DOORS.

Elam Wilke, Dayton, O.—This invention has reference to an improved burglar-proof door lock which locks the latch on throwing the key bolt, and the latch key and key bolt on throwing the night bolt, forming thus a superior safety door lock that cannot be tampered with from the outside, as the key cannot be pushed in, or a skeleton key inserted, or any one of the bolts opened. The night bolt cannot be thrown except when the key bolt is thrown, which forms a useful feature, as it prevents children from using the night bolt and locking the door when the same is not required to be locked. Thus a safety lock of simple construction is furnished, which is capable of producing a number of checks or safeguards by only two motions, namely, by the throwing of the key and of the night bolt.

IMPROVED FIRE ESCAPE.

Isaac H. Allen, Black Creek, Ontario, Canada.—This invention has relation to ladders which are especially designed for enabling persons to escape from the upper stories of burning buildings; and the nature of the invention consists in a flexible or folding ladder in which the rounds or foot rests are secured to strips of webbing woven in such manner that it affords proper strength and durability at points where the rounds pass through it. Stairs or arms are fixed into the ends of the rounds for the purpose of enabling them to stand off from the wall far enough to afford a good foothold to a person ascending or descending.

IMPROVED KNOB FASTENER.

Oscar Mayo, Evanston, Ill.—This invention consists in a latch that is pivoted to the door, and is provided with a perforated ear that engages a screw that projects from the socket of the knob and prevents the knob from being turned. The device is quickly and easily applied, it being only necessary to remove the screw that ordinarily holds the knob in the spindle and replace it by a screw having an elongated head, and to screw the latch to the door in the proper position.

IMPROVED STEAM DISH CLEANER.

Gen. Don C. Buell, Paradise, Ky.—This apparatus is designed for use in hotels and large restaurants, etc., and consists of a large zinc-lined case or box provided with revolving and removable racks for receiving or holding various kinds of articles of table ware, such as plates, soup-tureens, cups, saucers, spoons, knives, forks, etc. Pipes connect with the case and with perforated tubes arranged within the case in such manner that steam, hot water, or air may be impelled with great force, in the form of jets, upon the articles to be cleaned, while the latter are being revolved. The steam and hot water quickly remove the grease and other adhering foreign matter, and the blast of hot air subsequently admitted as quickly dries the articles. The racks holding the latter are then detached and the articles removed to make room for others requiring to be cleansed.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

The Complete Practical Machinist, by Joshua Rose, price \$2.50. Address Joshua Rose, P. O. Box 5348, N. Y. For sale cheap.—Carrie Ice Machine, 1½ ton capacity; used this season only. Address Enterprise Ice Company, Selma, Alabama.

Wanted—Agent to sell State Rights. S. R. Pay, Peoria, Ill.

Will take the Agency of or Manufacture on royalty for an old established trade, some patented kitchen furnishing or hardware article. W. C. Seavey & Co., Chicago, Ill.

Inventors—Send 25 cts. for "Journal of Invention," one year. Burke & Fraser, publishers, 37 Park Row, N. Y.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Skinner Portable Engine Improved, 2-1/2 to 10 H. P. Skinner & Wood, Erie, Pa.

Emery Grinders, Emery Wheels, Best and Cheapest, Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use prove them stronger and more durable than wrought iron. See advertisement, page 142.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Wanted—A small Tramway Locomotive. Address E. B. Seeley, Bowling Green, Ky.

For Sale—Engines, etc. One 10 x 16 portable, two 11 x 14 stationary (one adjustable cut-off), one 7 x 12 farm engine; one 30 inch portable grist mill and bolt; three sets saw mill head blocks. All new, first-class, and cheap. Address T. L. Clark, Mt. Vernon, Ohio.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsyth & Co., Machine Dealers, Manchester, N. H.

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

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

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

Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand.

Lathes and Machinery for Polishing and Buffing metals.

E. Lyon & Co., 400 Grand St., N. Y.

Solid Emery Volcanite 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.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Reliable Information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M. E., Providence, R. I.

Notes & Queries.

(1) E. A. G. asks: What is the number of strings used in common pianos, also the size and material from which the wire is made? A. There are generally three strings for each note, some of the lower notes having two or one. The strings are made of steel wire, and some of them are wound with fine copper or iron wire.

(2) T. & D. say: We have built a steam yacht, and are greatly disappointed in her speed. We want her to go at least 10 or 12 miles an hour. The hull of boat is 31' in length, 6½' beam, depth in center 3½'. We have a horizontal returned flue boiler 5' long, 30" in diameter. Number of flues 44, 2 inches diameter, firebox width 29", height 18", length of grate 19". We have an upright engine 5 x 5. We have an eagle wing propeller 29" 3/4 pitch, and with a steam pressure of 120 lbs., 210 revolutions per minute, we gained 5 miles an hour. We can gain a greater speed by using a different propeller. A. We judge from your account that the machinery is not sufficiently powerful to obtain the speed you desire—as the propellers you have used seem to have worked with a very moderate slip, if, as we understand you, the speed was estimated when running against the current.

(3) D. E. S. asks how to make nitro-glycerin? A. To a mixture of nitric and sulphuric acids, successively add small quantities of glycerin. The nitro-glycerin falls to the bottom of the vessel. Acids of the purest quality should be used, and the introduction of foreign matters carefully avoided, otherwise slow decomposition may occur, which will result in spontaneous explosion.

(4) P. E. D. asks how to bleach Panama hats? Also how to dye felt hats black? A. To bleach Panama hats, wash the goods clean, and while slightly damp, expose to the fumes of burning sulphur in a closed vessel. To color one dozen hats, take 1 lb. logwood, 1 lb. sulphate of iron, and ¼ lb. verdigris. Digest the logwood for some time. Add the sulphate of iron and the verdigris. Dip the hats in the bath several times and hang in the open air. By the peroxidation

of the iron with the atmospheric oxygen the hats will be more completely blackened. When fully dried wash thoroughly in running water.

(5) E. C. P. asks for a recipe for dyeing woolen pants black? A. To dye black, allow 1 lb. of logwood to each lb. of goods to be dyed. Soak the logwood over night in soft water, then boil it an hour, and strain the water in which it is boiled. For each lb. of logwood, dissolve 1 ounce of blue vitriol in warm water sufficient to wet the goods. Saturate the goods in this and then immerse in the logwood dye. Drain the goods and dry in the shade. When dry set the color by putting them into hot water in which has been dissolved a teaspoonful of salt to three gallons of water. Let the goods remain in until cold, then dry, without wringing out.

(6) C. W. W. says: I have been using plaster of Paris moulds for casting small objects in fusible metal. I find that the upper part of moulds does not fill as perfectly as the lower part, and that the metal becomes agitated even when the moisture is thoroughly excluded from the mould. A. See article on casting in fusible metal on p. 272, No. 17 of the SCIENTIFIC AMERICAN SUPPLEMENT. If the alloy is of low fusibility the mould should be sufficiently heated at the time of pouring in the metal to prevent too rapid cooling. If the mould is double, care should be taken to provide a sufficient number of air vents. The agitation is due to the escape of steam from the mould.

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

R. F. G.—It is mostly iron pyrites with a little copper, but may contain more valuable metals.—S. M. S.—Answered August 11, p. 92.—C. A. C.—The shining scales are mica—a mineral consisting of silica, alumina, and potash. The other fragment appears to be a variety of serpentine—composed of silica, magnesia, and water.—Dr. M. P.—We could not well give an opinion as to the proper proportions of assay flux for the ore without having seen it. By following the rules you can best determine this for yourself by experiment.—W. T. J.—No. 1 is mica schist. No. 2 contains mica, feldspar, quartz, and epidote (red)—a silicate of iron and manganese.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Man of War of the Future. By G. V.
On a Prehistoric Stone Wall. By J. C. W.
On the Axial Motion of the Earth. By J. P.
On the Postage Cancellation Problem. By H. P. S.
On the Adiabatic Curve. By R. A.
On a Curious Appearance of Aniline Red. By W. J. W.
On the Medicinal Uses of Chalk. By T. C. T.
On a Problem of Circles and Lines. By J. M. R.
On Geometrical Problems. By K. N. H.
On Bees and Hives. By Mrs. L. E. C.
On Leaks in Gas Pipes. By M. A. J.
On Curving a Base Ball. By T. E. H.
Also inquiries and answers from the following:
A. H. P.—E. B. E.—A. L. R.—F. B. S.—J. L. S.—W. D. S.—J. O. G.

HINTS TO CORRESPONDENTS.

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

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

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

Hundreds of inquiries analogous to the following are sent: "Who makes machines for cutting veneers? Who publishes books on torpedoes and explosives? Who makes or sells lubricants for heavy machinery?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

July 24, 1877.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adding machine, M. M. Smith..... 193,425
Alkali, process, etc., Hall & Hine..... 193,339
Animal trap, C. M. Orton..... 193,419
Auger, D. E. Henderson..... 193,406
Bag holder, J. G. Shurtz..... 193,351
Baggage check, H. A. Doralmses..... 193,411
Dale tie, E. Wilson..... 193,361
Bed bottom, J. I. Spencer..... 193,367
Bee hive, R. McIntire..... 193,377
Beer preserver, A. Redman..... 193,330
Binder for books, H. H. Edwards (r)..... 7,815
Binder, temporary, P. England..... 193,442
Boat, canal, W. P. Frost..... 193,402
Boats, propelling, J. H. Hetzler..... 193,511
Boiler feeder, R. Garstang..... 193,502
Book and cover, J. R. & H. H. Edwards..... 193,494

Book and shoe machine, H. G. Thompson..... 193,406
Book and shoe machine, J. W. Hatch..... 193,446
Book and shoe mechanism, Hatch & Thompson..... 193,445
Book and shoe machine, J. Keats..... 193,381
Bottle for blacking, S. S. Newton..... 193,399
Box and book shelf, D. Lathrop..... 193,487
Braid rolls, clasp for, J. Cokeroff..... 193,584
Bridle, C. H. Williams..... 193,393
Broiler and toaster, A. C. Bolton..... 193,519
Brush, J. Kistler..... 193,497
Buggy, J. H. Farrell..... 193,572
Building blocks, J. Thompson..... 193,390
Burglar alarm, I. B. Woodruff..... 193,549
Butter firkin, A. Pope..... 193,537
Buttons, L. Millaux..... 193,321
Can and carrier, I. S. Coffin..... 193,408
Can for paints, H. H. Hull..... 193,387
Cans for petroleum, E. Waters..... 193,372
Candle stamp, L. Lavenson..... 193,501
Cap, M. Marks (r)..... 7,807, 7,808
Car brake, A. Winston..... 193,435
Car coupling, T. D. Baldwin..... 193,471
Car coupling, E. B. McCarty..... 193,531
Car starter, C. H. Thompson..... 193,366
Carbureting gas, C. A. Sirie..... 193,561
Carding engine, G. E. Taft..... 193,571
Carriage, S. Gibson..... 193,444
Cartridge, blasting, P. Castellanos..... 193,483
Cartridges, J. D. Wilkinson..... 193,494
Cartridges, J. Lee..... 193,524
Caster, S. E. Bauder..... 193,472
Chain link, E. Nortemann..... 193,543
Chair, J. White..... 193,433
Chuck, A. B. Smith..... 193,424
Churn, Brown and Roberts..... 193,500
Churn, J. Harris..... 193,332
Churn, H. G. Fougeu..... 193,403
Churn, W. Knaggs..... 193,450
Cigar machine, C. H. Schneider..... 193,463
Clasp, G. H. Leonard..... 193,337
Clock, I. B. Woodruff..... 193,391
Clothes pounder, R. R. Kenyon..... 193,515
Clothes pounder, G. L. Fisher..... 192,499
Coal box, C. Hyman..... 193,536
Cock, C. H. Scofield..... 193,506
Coffee cleaner, P. McAuliffe..... 193,416
Collar box and toy bank, H. N. Parker..... 193,420
Compasses, E. S. Ritchie..... 193,552
Cooking utensil, Clark & Wells..... 193,486
Copying press, E. Gill..... 193,404
Copying press, J. A. Powlett..... 193,346
Corn stalk cutting implement, J. Wahner..... 193,579
Corset, G. L. Du Laney..... 193,491
Cotton gins, W. O. Watson..... 193,580
Cultivator, C. McGee..... 193,522
Dental drill, E. Osmond..... 193,456
Dental engines, E. Telle..... 193,429
Desk, school, J. R. Payne..... 193,450
Draft equalizer, R. Hoadley..... 193,513
Draw pull, W. A. Wright..... 193,387
Drum and stove, L. R. Houchens..... 193,335
Egg beater, L. Eberhart..... 193,498
Electro-magnetic motor, A. Shedlock..... 193,385
Engravers' routing machine, V. & J. Royle, Jr..... 193,555
Evaporating pan, J. W. Miller..... 193,539
Exercising machine, J. P. Marsh..... 193,528
Exploding mining powder, P. Castellanos..... 193,485
Fan, J. Miller..... 193,379
Faucet, W. B. Tweedle..... 193,433
Fence barb, wire, H. B. Seut..... 193,557
Fence, barbed, G. G. Hunt..... 193,370
Filtering and cooling apparatus, J. W. Webb..... 193,432
Fire and burglar alarm, Corning & Reid..... 193,588
Firearm, F. W. Tiesing..... 193,574
Firearm, Forehand & Wadsworth..... 193,367
Fire escape, I. D. Cross..... 193,489
Fire escape, J. F. Green..... 193,506
Fire escape ladder, H. B. Walbridge..... 193,431
Fire place, O. F. & O. C. Mehurin..... 193,341
Fire place grates, F. S. Bissell..... 193,473
Fish plates, railroad, Weed & Messinger..... 193,388
Flood gate and fence, A. Watson..... 193,358
Furniture, J. A. Whitaker..... 193,359
Fuse, percussion, E. H. Plumacher..... 193,345
Game apparatus, J. F. Spence..... 193,427
Gas apparatus, W. S. Hill..... 193,407
Gas torch, E. L. Megill..... 193,335
Gas apparatus, W. M. Cosh..... 193,397
Gate, A. T. & A. D. McComb..... 193,530
Gate fastening, C. P. Snow..... 193,365
Gate hanger, N. H. Sherrill..... 193,559
Glassware, G. W. Blair..... 193,314
Glassware, W. Buttler..... 193,317
Governor for steam engines, P. Carriere..... 193,481
Governor, gas, C. W. Isbell..... 193,515
Governor, gas, F. Mass & McManus..... 193,548
Grain tally, etc., A. C. Lintz..... 193,414
Grate back, W. A. Holbrook..... 193,314
Grinding machine, J. M. Poole (r)..... 7,809
Grinding paper knives, Worcester & Prentice..... 193,437
Guide board, J. T. Hart..... 193,403
Gymnastic instrument, C. Klemm..... 193,449
Hair crimper, J. Leeming..... 193,413
Hame, M. Turley..... 193,575
Hame terret, B. C. Smith..... 193,364
Harvester, G. & L. Sweet..... 193,553
Hay elevator, J. L. Malcolm..... 193,415
Hides, tanning, F. Knapp..... 193,415
Hides and skins, B. F. Larrabee..... 193,421
Hog trap, T. C. & H. V. Weaver..... 193,468
Hoisting apparatus, W. Hawkins..... 193,333
Hook for chandeliers, G. W. Woodward..... 193,585
Horse hay rake, H. C. Velle..... 193,578
Hose nozzle, Koegler & Nicol..... 193,522
Hot air furnace, A. J. Robinson..... 193,353
Hydraulic elevator, G. Ball..... 193,392
Ice creeper, F. Leuthy..... 193,432
Ice instrument, E. Burgin..... 193,479
Incubator, T. M. Davis..... 193,490
Injector for boilers, W. Sellers (r)..... 193,516
Insect destroyer, F. J. McDonald..... 193,417
Iron and steel manufacture, J. Reese..... 193,501
Iron scrap, converting, A. J. Moxham..... 193,540
Ironware, enameling, Quinby & Whiting..... 193,422
Key, W. H. Taylor..... 193,569
Lamp rest, Clark & Kintz..... 193,438
Lamps, D. G. Mark..... 193,376
Lamps, Lowers & Klaitz..... 193,525
Last, J. T. Poole..... 193,421
Leather-punching apparatus, W. P. Willoughby..... 193,393
Leg, artificial, C. Collins..... 193,366
Life buoy, etc., G. Drevar..... 193,365
Lightning rod, L. Adams..... 193,469
Lock, T. Fox..... 193,500
Lock, Overmyer & Huston..... 193,544
Locomotive engines, fire box, H. E. Woods..... 193,566
Lubricator, E. McHugh..... 193,533
Mash rake, A. I. Guthrie..... 193,507
Mattress box, J. H. Gallagher..... 193,501
Medicinal compound, Fixmer & Janssen..... 193,396
Millstone dressing, S. Ross..... 193,554
Mining shaft indicator, C. O. Richardson..... 193,462
Molding match plate, T. F. Hammer..... 193,508

DESIGNS PATENTED.

10,102 to 10,107.—CARPETS.—J. Fisher, New York city.
10,108.—CIGAR BOX.—B. Lowenthal, Cincinnati, Ohio.
10,109 to 10,110.—CARPETS.—E. J. Ney, Lowell, Mass.
10,121.—PICTURE FRAME.—L. Pattberg, Jersey city, N. J.
10,122.—BUTTER COOLERS.—B. T. Steinhardt, New York city.
10,123 to 10,128.—CARPETS.—C. W. Swapp, Lowell, Mass.
10,129.—HEATING STOVE.—J. A. Lawson, Troy, N. Y.
10,130.—CARD BASKET.—P. Rosenbach, Brooklyn, N. Y.

[A copy of any one of the above patents may be had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]

Advertisements.

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

PATENTS AT
AUCTION.

Regular Monthly Sales the first week of each month.
For terms, etc., address GEO. W. KEELER, Auctioneer,
55 and 57 Liberty Street, New York.

YALE VERTICAL MILL.
Iron Frame, French Burr, Self-oiling;
Self-feeding; Adjustable-balance; Long
Bearings. Cheapest,
best arranged, best
finished, and for quality
and quantity ground
no superior. Send for
Circular.

FOR SALE.
3 Light 20 in. Homon
Vertical Mills, \$110.00
each. 1 Heavy 20 in. Homon Vertical Mill, \$160.00.

YALE IRON WORKS, New Haven, Conn.

SECOND-HAND SCROLL SAWS.
1 Barnes \$30 Saw, good as new.....\$23.00
1 Fleetwood \$15 Saw, good as new.....19.00
1 Fleetwood \$15 Saw, new.....14.00
New illustrated catalogue, elegant design.
L. H. RUSSELL, Stratford, Conn.

SWARTHMORE COLLEGE.
SCIENTIFIC DEPARTMENT.
Full courses in Civil and Mechanical Engineering,
Chemistry, Physics, etc. For catalogue, address EDWD.
H. MAGILL, President, Swarthmore, Del. Co., Pa.

LADIES can make \$5 a day in their own city or town.
Address Ellis Man'g Co., Waltham, Mass.

MADE TO ORDER.
Special Machinery, Tools, Models, & Pat' Articles. A. A.
Fool & Co., 55 R. R. Ave., Market St. Sta., Newark, N. J.

Baker Rotary Pressure Blower.
(FORCED BLAST)
Warranted superior to any
other.

WILBRAHAM BROS.
2315 Frankford Ave.
PHILADELPHIA.

CIVIL AND MECHANICAL ENGINEERING AT THE
Reussel Polytechnic Institute, Troy, N. Y.
Instruction very practical. Advantages unsurpassed in
this country. Graduates obtain excellent positions. Re-
opens Sept. 13th. For the Annual Register, containing
improved Course of Study, and full particulars, address
PROF. WM. L. ADAMS, Director.

AGENTS WANTED.
For particulars address
WILSON SEWING MACHINE CO.,
829 Broadway, New York City,
New Orleans, La., Chicago, Ill.,
Or San Francisco, Cal.

PIONEER IRON WORKS,
Nos. 149 to 163 Wil-
liam St., BROOK-
LYN, N. Y.
Manufacturers of
the A. LINDELOF
Patent Steam
ROAD ROLLER
and TRACTION EN-
GINE. All kinds of
Paving Machinery.
Machinery for
Sugar Houses and
Plantations a Spe-
cialty.

Alexander Bass's Patent Portable Iron Railroad.

ENGINES, BOILERS AND MACHINERY,
new and second-hand. Send for circular.
GEO. M. CLAPP, 26 Broadway, N. Y.

HOME-MADE TELESCOPE STANDS.
By T. D. Simonton.—A valuable paper, descriptive of a
simple, effective and economical method of constructing
an equatorial telescope stand. With 3 illustrations to
scale. SUPPLEMENT No. 78. Price 10 cents.

MEN WANTED to sell goods to Merchants. NO
PEDDLING from house to house.
\$85 a month.
QUEEN CITY GLASS & LAMP WORKS, Cincinnati, Ohio.

**WROUGHT
IRON
BEAMS & GIRDERS**

THE UNION IRON MILLS, Pittsburgh, Pa., Manu-
facturers of improved wrought iron Beams and
Girders (patented).
The great fall which has taken place in the prices of
iron and especially in Beams used in the construction
of FIRE PROOF BUILDINGS, induces us to call the spe-
cial attention of Engineers, Architects, and Builders to
the undoubted advantages of now erecting Fire Proof
structures; and by reference to pages 52 & 54 of our Book
of Sections—which will be sent on application to those
contemplating the erection of fire proof buildings.—THE
COST CAN BE ACCURATELY CALCULATED, the
cost of insurance avoided, and the serious losses and in-
terruption to business caused by fire; these and like con-
siderations fully justify any additional first cost. It is
believed, that were owners fully aware of the small
difference which now exists between the use of Wood
and Iron, that in many cases the latter would be adopted.
We shall be pleased to furnish estimates for all the Beams
complete, for any specific structure, so that the difference
in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

THE NEW GERMAN PATENT LAW.
Being the Full Text of the New Law for Patents, passed
July 1st, 1877, covering all the States of the German
Empire. Contained in SCIENTIFIC AMERICAN SUPPLE-
MENT No. 80. Price 10 cents. To be had at this office
and of all newsdealers.

GLASS OILERS. Best in use. Send for circular.
CODY & RUTHVEN, Cincinnati.

BRADFORD MILL CO.
Successors to Jas. Bradford & Co.
MANUFACTURERS OF
French Burr Millstones,
Portable Corn & Flour Mills,
Smut Machines, etc.
Also, dealers in Bolting Cloths and
General Mill Fitting.
Office & Factory, 168 W. 24 St.
CINCINNATI, O.
J. B. Stewart, Pres. W. R. Dunlap, Sec.
C. PRICE-LISTS SENT ON APPLICATION.

WATER SUPPLY ENGINEERING.
By J. T. FANNING, C. E. Complete Practical Treatise;
650 pages; 125 Tables; 150 Illustrations. Price \$6.00.
D. VAN NOSTRAND, Publisher, 23 Murray St., N. Y.
*Copies sent free by mail on receipt of price.

DUK'S SPHERICAL ELEVATOR BUCKET.
OVER 20,000 ALREADY SOLD.
Endorsed by the leading millers and manufacturers in the country. No corners to
CATCH; requires less power to run; will throw clean every time; made of the best char-
coal stamping iron, and positively indestructible; cost about the same as tin or sheet iron
square buckets. Ask your nearest Mill Furnishing House or Millwright for them.
Samples furnished. Address
T. F. ROWLAND, Sole Manufacturer,
Brooklyn, E. D., New York.

**N. F. BURNHAM'S
1874
WATER WHEEL**
Is declared the "standard turbine,"
by over 600 persons who bought and use
them with part and full gate open.
Circular Free.

Pond's Tools
Engine Lathes, Planers, Drills, &c.
Send for Catalogue. DAVID W. POND, Successor to
LUCIUS W. POND, Worcester, Mass.

OTIS' Machinery.
SAFETY HOISTING
OTIS BROS. & CO., No. 38 Broadway, New York.
\$55 & \$77 a week to Agents. \$10 Outfit Free.
P. O. VICKERY, Augusta, Maine.

Blake's Patent Stone & Ore Crusher.
NEW PATTERNS, with important im-
provements, and abundant
strength. This is the only machine used
by the principal MUNICIPAL RAILROAD
and MINING CORPORATIONS and CON-
TRACTORS in the United States and
foreign countries, for breaking hard and
brittle substances to ANY SIZE. Send
for circular. Address,
BLAKE CRUSHER CO., New Haven, Ct.

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.,
NEW YORK

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

L. SMITH HOBART, PRESIDENT.

NEW METHOD OF ENGRAVING
Moss' Process.
Photo Engraving Co.
67 Park Place, New York.
RELIEF PLATES

For Newspaper, Book, and Catalogue Illustrations, Engraved in hard Type-metal, by a new Photographic and
Chemical method, from all kinds of Prints, Pen Drawings, Original Designs, Photographs, etc., much cheaper
than Wood-cuts. These plates have a perfectly smooth printing surface, and the lines are as deep, as even,
and as sharp as they could possibly be cut by hand. We guarantee that they will print satisfactorily on wet
or dry paper, and on any press where type or wood-cuts can be so printed. Electrotypes may be made from them
in the usual way.

Our Plates are now used by the principal publishers and manufacturers in every state in the Union.

SEND STAMP FOR ILLUSTRATED CIRCULAR. Please say where you saw this.

LOCOMOTIVE ENGINEERING.—THE
most recent and best examples of Locomotive Construc-
tion, with scale drawings, tables of all principal di-
mensions, general description, etc., are given in the SCIENTI-
FIC AMERICAN SUPPLEMENT. The following
may be had at this office, or ordered through any News-
dealer. Sent by mail prepaid. Please order by the
numbers here given.
Express Locomotives of the London, Chatham and
Dover R. R. Tank Locomotives. With Specifications,
Dimensions, Particulars and three Engravings. Supple-
ment No. 23. 10 cents.
Locomotives at the Centennial. A series of Eighteen
Outline Illustrations, showing the Principal Locomotives
exhibited at the Centennial, with their measures, and a
table of principal dimensions of each locomotive. Supple-
ment No. 35. 10 cents.
Baldwin Locomotive.—Large engraving in sectional
elevation, with measures, scale, and table of dimensions.
Supplement No. 38. 10 cents.
Narrow Gauge Swedish Locomotive, with one page of
engravings. Supplement No. 41. 10 cents.
Locomotives of the Eighteen Inch Railway at Crewe, Eng.
Two engravings. Supplement No. 44. 10 cents.
Locomotive Passenger Engines of Midland Railway, with
table of dimensions. Three engravings. Supplement
No. 27. 10 cents. The same number contains report
of valuable information given before the Master
Mechanics' Association, concerning Locomotives and
Locomotive Improvements.
Narrow Gauge Locomotives, Indian State Railways, en-
graving and dimensions. Supplement No. 53. 10 cents.
New Railway Locomotive Crane, by Black, Hawthorne &
Co. Four engravings to scale, dimensions, etc. Supple-
ment No. 54. 10 cents.
New Road Locomotive, by Marshall Sons & Co. General
description and one engraving. Supplement No. 56.
10 cents.
Express Passenger Locomotives, Great Western Railway.
With five engravings, and tables of all the principal di-
mensions. Supplement No. 58. 10 cents.
Locomotive for Burning Petroleum.—Used on Russian
Railways. With description and five illustrations. Supple-
ment No. 63. 10 cents.
Steam Trolley or Chair.—Used on Oude Railway. Two
engravings. Supplement No. 63. 10 cents.

**PATENT
COLD ROLLED
SHAFTING.**
The fact that this shafting has 75 per cent. greater
strength, a finer finish, and is truer to gauge, than any
other in use, renders it undoubtedly the most economical.
We are also the sole manufacturers of the CELEBRATED
COLLINS' PAT. COUPLING, and turnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed on
application to
JONES & LAUGHLIN,
Try Street, 2d and 3d Avenues, Pittsburgh, Pa.
100 S. Canal Street, Chicago, Ill., and Milwaukee, Wis.
227 Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers St., N. Y.

AIR COMPRESSORS
FOR ALL PURPOSES.
A SPECIALTY OF HEAVY PRESSURES.
THE NORWALK IRON WORKS CO.,
SOUTH NORWALK, CONN.

\$1200
WANTED. Salesmen to sell our
Sole Goods to Dealers. No peddling.
Expenses paid. Permanent employ-
ment. Address S. A. GRANT & CO.,
2, 4 & 6 S. Home St., Cincinnati, O.

DANBURY DRILL CHUCKS.
Perfect and Price reduced.
Manufactured by the HULL & BELDEN CO., Danbury, Ct.

PATENT SCROLL AND BAND SAW MACHINES A
specialty. CORDESMAN, EGAN & CO., Cincinnati, O.

\$3
GOLD PLATED WATCHES. Cheapest
in the known world. Sample Watch Free to
Agents. Address, A. COULTER & CO., Chicago.

SEALED PROPOSALS
Will be received at the office of the City Clerk of Hamil-
ton, Ohio, until 12 o'clock noon of Thursday, September
6th, 1877, for the lighting the streets and public build-
ings of the city of Hamilton with gas for a period of 10
years from the 3d day of June, 1878, according to plans
and specifications on file at the city clerk's office, which
will be furnished on application.
The city reserves the right to reject any or all bids.
Bids will be marked "Proposals for Gas," and ad-
dressed to
R. B. MILLIKIN,
City Clerk,
Hamilton, Ohio.

\$66 a Week in your own town. Terms and \$5 outfit
free. **H. HALLETT & CO., Portland, Maine.**

WE ENAMEL
in FINE JET BLACK every variety of turned wood work
parts of machinery, castings, lin ware and other metal
work ENAMELED JET BLACK, in wood or metal, made to order.
AMERICAN ENAMEL CO., 17 WARREN ST. PROVIDENCE, R. I.

Lathes, Planers, Shapers, Drills,
Gear & Bolt Cutters, &c. E. GOULD, Newark, N. J.

JOHN C. MOSS, SUP'T.

WESTON DYNAMO-ELECTRIC MACHINE CO
Machines for Electro-plating, Electrotyping, 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 M'F'G CO.;
REED & BARTON; HALL, ELTON & CO.; RICHARDSON,
HOYTOS & CO.; W. H. JACKSON & CO.; STANLEY
WORKS; ROGERS CUTLER CO.; CHAS. ROGERS BROS.;
EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NOB-
WALK LOCK CO.; HAYDEN, GERE & CO.; DOMESTIC
SEWING MACHINE CO.; EBERHARD FABER; JOS. DIXON
CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON,
and over 20 others. Outfits for NICKEL, SILVER,
BRONZE, Plating, etc. The two highest CENTENNIAL
AWARDS, and the CENTENNIAL GOLD MEDAL of Ameri-
can Institute. Prices from \$125 to \$500.
"THE MERIDEN BRITANNIA CO., W. Meriden, Conn.,
March 25, 1877."
"Messrs. Condit, Hanson & Van Winkle, Newark, N. J."
"GENTLEMEN: You may send the two machines as
proposed. I will say in regard to them, they are
splendid machines, and will say to any party you may
refer to us that I shall advise them to take no other at
any price, as yours is the best, in my judgment, as we
tried one, kept it, and took out all our old machines and
replaced them with two of yours (making three in all in
all). Just say to your customers we refer you to the
largest plating works in the World. Yours truly,
"H. C. WILCOX, Pres. Meriden Britannia Co."

CONDIT, HANSON & VAN WINKLE
Sole Agents **NEWARK, N. J.**
FOR COMPOUND STEAM PUMPS AND HEAVY
Machine Tools, address
E. & A. BETTS, Wilmington, Del.

WESSELL METAL, A PERFECT IMITA-
tion of gold in color, surface, etc., for manufacturers of
imitation jewelry, and other workers in fine yellow
metal. Wessell Man'g Co., No. 24 East 23d St., N. Y.

U. S. PLANO CO., 810 Broadway, N. Y.
YOU ask WHY we can sell First
Class 1 1/2 Horse Power Planes
for \$250. Our answer is, that we
cost less than \$200 to make any \$500 Plane
sold through Agents, all of whom
make 100 per cent. profit. We have a
Agent, but sell direct to Family
at Factory price, and warrant first class.
We send our Planes everywhere for trial
and require no payment unless they are
found satisfactory. Send for our Illustrated Circular, which gives
full particulars, and contains the names of over 1500 Bankers, Mer-
chants and Families that are using our Planes in every State of the
Union. Please show this notice. Address,
U. S. PLANO CO., 810 Broadway, N. Y.

\$12 a day at home. Agents wanted. Outfit and
terms free. **TRUB & CO., Augusta, Maine.**

EXTRAORDINARY
With engravings, price, \$1.
Contains, also, fifty original
prescriptions for prevailing
diseases, each worth ten
times the price of the book.
Gold Medal has been awarded
the author. Descriptive
circulars sent free. Address
DR. W. H. PARKER, No.
4 Bulfinch Street, Boston.

\$50.00 SCREW-CUTTING FOOT LATHES
Foot Drill Presses. Send for Circular to
H. L. SHEPARD, Cincinnati, O.

BIBB'S
Great Original Baltimore-Made
Fire Place Heaters
Mantels and Registers.
B. C. BIBB & SON,
Baltimore, Md.
Best workmanship. Lowest prices
guaranteed. Send for circular.

CUTTING OUT KEYWAYS. By JOSHUA
ROSE. An excellent practical description of the several
methods employed, with 11 illustrations. The qualities
of the various drills; square files and safe-edges, rough-
ing out, etc. The best tools described and illustrated.
Contained in SCIENTIFIC AMERICAN SUPPLEMENT No.
79. Price 10 cents. To be had at this office and of all
newsdealers.

IMPORTANT FOR ALL CORPORATIONS AND
MAN'G CONCERNS.—Buerk's Watch-
man's Time Detector. capable of accurately con-
trolling the motion of a watchman or patrolman at the
different stations of his beat. Send for circular.
J. E. BUERK, P. O. Box 975, Boston, Mass.
N. B.—The suit against Imhaeuser & Co., of New York,
was decided in my favor, June 10, 1874. A fine was
assessed against them Nov. 11, 1876, for selling contrary
to the order of the court. Persons buying or using
clocks infringing on my patent will be dealt with ac-
cording to law.

\$5 to \$20 per day at home. Samples worth \$5
free. **STINSON & CO., Portland, Me.**

Small Tools of all kinds; also GEAR WHEELS, parts
of MODELS, and materials of all kinds. Castings of
Small Lathes, Engines, Slide Rests, etc. Catalogues free.
GOODNOW & WIGHTMAN, 25 Cornhill, Boston, Mass.

BENTEL, MARCEDANT & CO
MANUFACTURERS OF
SUPERIOR
(UNIVERSAL WOOD WORKERS)
BAND SAWS, SCROLL SAWS
PLANING & MATCHING MACHINES
A UNIVERSAL HAND JOINERS
MOLDING, DOVETAILING, BORING, FRIZING, SHAPING &
AND PAPERING MACHINES, PLANER KNIVES & MILLING BITS
HAMILTON, OHIO.

65 MIXED CARDS, with name, 10c. and stamp.
Agent's Outfit, 10c. **L. C. COE & CO., Bristol, Ct.**

Wood-Working Machinery,
Such as Woodworth Planing, Tongueing, and Grooving
Machines, Daniel's Planers, Richardson's Patent Im-
proved Tenon Machines, Mortising, Moulding, and
Re-Saw Machines, and Wood-Working Machinery gene-
rally. Manufactured by
WITHERBY, RUGG & RICHARDSON,
36 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood
Water. **WM. D. ANDREWS & BRO., 44 Water St., N. Y.**
who control the patent for Green's American Driven Well

WATER SUPPLY FOR TOWNS AND
VILLAGES. By CLARENCE DELAFIELD, C. E. A Con-
cise and valuable Report, showing the Cost and Merits
of the Various Systems.—Discussion of the Holly System,
its Merits and Defects.—The Reservoir System, with
Pumps, Cost, and advantages.—Results obtained and
Economy of Use of Various Systems in Different Towns,
with names and Duty realized. Facts and Figures to
enable Town Committees to Judge for themselves as to
the system best suited for their wants.—The Best Sources
of Water Supply.—Water-Bearing Rocks.—Artesian Wells,
their feasibility, excellence, and Cost of boring.—Im-
portance of Pure Water.—How Surface Water is Ren-
dered Impure.—Cost of Water Pipes, from 2 to 12 inches
diameter, for towns, including laying all labor, materi-
als, gates, joints, etc. Estimates of Income and Water
Rates for supply of 1000 Buildings. Price, 10 cents. Con-
tained in SCIENTIFIC AMERICAN SUPPLEMENT No. 77,
to be had at this office, and of all Newsdealers.

Boul's Patent Reverse Motion
Paneling, Vary-
ety Moulding
& Dovetailing
Machine. Cuts
Panels of any
design or style
of mould in the
solid wood with
neatness and
dispatch.
Is a first-class
Shaper, Edge,
& Scroll Moulder.
Does general
Dovetailing
with thick or
thin stuffs. Simple, Durable and
Efficient. Send for Pamphlet
and Sample of work. Improved
Solid Steel Cutters for all kinds of
Variety Moulders made to order, and warranted by the
B. C. MACHINERY CO.,
Battle Creek, Mich.

FOR THE LATEST IMPROVED STAVE
Heading and Shingle Machinery, also the celebrated
Halley Gauge Lath, Second-hand Boilers and Engines,
or Special Machinery, address **T. R. BAILEY, Agt.,**
Lockport, N. Y.

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
Drawings may be had at the same rate
per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Friday morning to appear in next issue.

FOR SALE—ENTIRE INTEREST IN SELF-MEASURING Fluid Tank. Small capital required. Good profit. Takes well. Address Box 143, Geddes, N. Y.

MECHANICAL DRAWING.—BY PROF. C. W. MACCORT. A series of practical lessons in Mechanical Drawing, accompanied by carefully prepared examples for practice, with directions, all of simple and plain character, intended to enable any person, young or old, skilled or unskilled, to acquire the art of drawing. No expensive instruments are involved. The series consists of three parts, each containing all descriptions of drawing, and forming the most valuable treatise upon the subject ever published, as well as the cheapest. These instructions are contained in SUPPLEMENTS Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48. Price 10 cts. each, or \$2 for the entire series of thirty-three numbers. To be had at this office and of all newsdealers.

P. BLAISDELL & CO.,

Worcester, Mass.,

Manufacturers of the Blaisdell Patent Upright Drills and other first-class Machinists' Tools.

**THE SUCCESS.**

Why is the Success ahead? Because its great merits were attested by the managers of the late Centennial in causing the first award on Turbines to be given it, and in selecting it as the Standard Wheel for estimating the leakage of the wheels of the world there represented. Because it gives over 80 per cent. of power under PAWT as well as FULL GATE. Send for descriptive Pamphlet and Price List to S. M. SMITH, York, Pa.

THE BEST

AND MOST ECONOMICAL

Boiler Feeder**FRIEDMANN'S INJECTOR,**

MANUFACTURED BY

NATHAN & DREYFUS, New York.

108 Liberty St.

Send for Circular.

**CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.**

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 YEARS' EXPERIENCE, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Registrations, 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 Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign Patent 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 patents—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 steam 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, \$130; Belgian, \$100; Canadian, \$50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1877, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1877, 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 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 patentee 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, N. Y.

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

TWO YEARS OF DELIGHTFUL TRAVEL.
THE WOODRUFF SCIENTIFIC EXPEDITION AROUND THE WORLD.
A FLOATING COLLEGE under the direction of Professors WILDER, of Cornell; RUSSELL, of Columbia; HERDMAN and JENNEY, of University of Michigan; MERHAM, of Yale; TAYLOR, of Phillips Academy, and others, with a Large Class of Students, will sail from New York, October next, on a Voyage of Scientific Discovery and Research, Visiting the Most Interesting Parts of the Globe.
Most interesting parts of the globe, has been secured, and is being fitted with special reference to the voyage, which will occupy two years. She will be commanded by Commander JOHN W. PHILLIPS, United States Navy. The entire cost of travel to a student will be \$2,500. Students will be entitled to a choice of staterooms in order of application. This expedition offers great advantages to young men. For pamphlet, containing full particulars, address or call upon
DANIEL MACAULEY, Secretary, St. Nicholas Hotel, New York.

GUARDIOLA'S COFFEE & SUGAR MACHINERY

Coffee, Malt, Corn, Cocoa, and Grain-Drying Machine. Coffee-Hulling and Polishing Machines. Coffee-Washing Machine. Helix Sugar Evaporator.
Messrs. C. ADOLPHE LOW & CO., 42 Cedar Street, Messrs. MUNOZ & ESPRIELLA, 32 Pine Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.

FOOT POWER TENONING MACHINES FOR SALE
By S. C. HILLS, 78 Chambers St., New York.

IRON AND STEEL. BY DR. C. W. SIEMENS.

A most interesting and valuable paper, containing accounts of the most recent practical improvements in the Production, Working, and Application of Iron and Steel; embracing the question of Labor in its relation to Capital; the Character, Value, Cost and Production of the various kinds of Fuel, including Bituminous Coals, Coke, American Fuels, Peat, Natural Gas Fuel, Liquid Fuel, Solar Fuel, Motive Powers and their Transmission over long distances. Water Power; its Transmission by Steel Pipes; its Transmission by Electricity. Wind Power, Bessemer Steel History. The Open Hearth System. The Use of Ferro-Manganese. Use of Chromium. Production of Mild Steel. Piping of Steel. The Applications of Steel. Iron and Steel Nomenclature. Wrought Iron. Mechanical Pudding. Bell's New Process. Wrought Iron Direct from the Ore. Methods of Protecting Iron and Steel from Rust. Ainslie's Method. Bar's Method. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS Nos. 70 and 71. Price 10 cts. each. To be had at this office, and of all newsdealers.

The HOADLEY PORTABLE STEAM ENGINE, WITH AUTOMATIC CUT-OFF REGULATOR AND BALANCED VALVE. THE BEST & MOST ECONOMICAL ENGINE MADE SEND FOR CIRCULAR.
The J. C. HOADLEY CO. LAWRENCE, MASS.
STATE WHERE YOU SAW THIS.

**Niagara Steam Pump Works.**

ESTABLISHED 1836.

CHARLES B. HARDICK,

No. 23 Adams Street, BROOKLYN, N. Y.

NEW AIR COMPRESSOR OF M. DUBOIS.
With description, dimensions. Illustrated by engravings. SCIENTIFIC AMERICAN SUPPLEMENT, No. 22. Price, 10 cents. Sold by all News Dealers.

THE BIGELOW Steam Engine.

BOTH PORTABLE AND STATIONARY.

The CHEAPEST AND BEST in the market. Send for descriptive circular and price list.

H. B. BIGELOW & CO.,

New Haven, Conn.

METALLIC MINERALS—THEIR PRODUCTION AND USES. A lecture by J. G. Watson, F. R. S. A most interesting and useful paper, containing much information on the principal metals; their ancient and modern uses; metallic veins; what they are, their courses in the earth; mineral leases and royalties; the famous Tystock Mines; history of the Anglesa Mines; metals dissolved in water; how mineral veins are worked; iron and its uses; lead ores and uses of lead; tin ores and uses of tin; uses of copper. SUPPLEMENT No. 54. Price, 10 cents.

PUNCHING PRESSES. Drop Hammers and Dies, for working Metals, &c. THE STILES & PARKER PRESS CO., Middletown, Conn.

1872, 1873, 1874, 1875,

SCIENCE RECORD.

A few copies of these splendid books, copiously illustrated, are offered at the following very low prices. Persons desiring a condensed history of the most interesting Facts and Discoveries in the Arts, Sciences, and Inventions, for the years from 1872 to 1875, will find them recorded in the four volumes of the SCIENCE RECORD, now offered at half the original price.

Every Department of Science is treated in these volumes, and the important discoveries of the several years are not only faithfully described, but many of the subjects are illustrated with finely executed engravings, prepared expressly for these Annuals.

Among the subjects, the following are the most noteworthy, exhibiting in a condensed form a general account of the Progress of the World:

CHEMISTRY AND METALLURGY, MECHANICS AND ENGINEERING, ELECTRICITY, LIGHT, HEAT, SOUND, TECHNOLOGY, THE USEFUL ARTS, BOTANY AND HORTICULTURE, AGRICULTURE, RURAL AND HOUSEHOLD ECONOMY, MATERIA MEDICA, THERAPEUTICS, HYGIENE, NATURAL HISTORY AND ZOOLOGY, METEOROLOGY, TERRESTRIAL PHYSICS, GEOGRAPHY, GEOLOGY AND MINERALOGY, ASTRONOMY, BIOGRAPHY AND NECROLOGY.

Each yearly volume contains about 600 octavo pages, including a large number of handsome engravings. They are bound in substantial and handsome bindings, and will be mailed on receipt of \$1.25 each, or \$4 for the set of four volumes.

They were published and heretofore sold at \$2.50 each, or \$10 for the set.

In remitting for a single volume, which year, from 1872 to 1875, is desired, remembering that the date of the volume covers the events and discoveries of the previous year. Sent by mail on receipt of price. Address

MUNN & CO. PUBLISHERS.

37 Park Row, New York city.

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 and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 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.

STEAM PUMPS

Wright's Pat. Bucket Plungers are the best. VALLEY MACHINE CO. Easthampton, Mass.
GREAT BLOWING ENGINE: HIGH
Speed and Novel Construction. Built by Wiemar Machine Works. An accurate description, giving performance, dimensions, new devices, and five elevations. This engine easily reaches 100 revolutions per minute, with a discharge of 5,000 cubic feet of air at 10 lbs. pressure. SUPPLEMENT No. 51. Price, 10 cents. Also, in same number, Root's Force-Blow Blowers, Gas Exhausters and Blacksmith's Tuckers. 12 figures.

ESTABLISHED 1844.

JOSEPH C. TODD,

(Formerly of Todd & Hafferty), ENGINEER and MACHINIST. Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, steam Engines, Boilers, etc. Also Agent for the celebrated and improved Rawson & Rittinger Hoisting Engine, I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address

J. C. TODD,

10 Barclay St., New York, or Paterson, N. J.

COMPRESSED AIR MOTIVE POWER—

With drawings and particulars of the most recent practice. The locomotives worked by compressed air, in use in St. Gothard Tunnel Works, with dimensions, etc. Five engravings. SUPPLEMENTS 1 and 2. Price, 10 cents each.

EAGLE FOOT LATHES,

Improvement in style. Reduction in prices April 20th. Small Engine Lathes, Slide Rests, Tools, etc. Also Scroll and Circular Saw Attachments, Hand Planers, etc. Send for Catalogue of outfits for Amateurs or Artisans.

WM. L. CHASE & CO.,
95 & 97 Liberty St., New York.

STEEL—ITS MANUFACTURE AND
Working Constitution, Qualities, Tempering, etc. With 14 illustrations. By D. Chernoff. A most interesting and valuable treatise, full of important information, embracing the latest contributions to the general knowledge of the subject. SUPPLEMENTS Nos. 36 and 37. Price, 10 cents each.

Steel Castings,

From 1/4 to 10,000 lbs. weight, true to pattern. An invaluable substitute for forgings, or for malleable iron castings requiring great strength. Send for circular and price list to CHESTER STEEL CASTING COMPANY, EVELINA STREET, PHILADELPHIA, PA.

COMPRESSED AIR PNEUMATIC DIS-
patch System used in Paris. With description and 12 illustrative figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 24. Price, 10 cents.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS. Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.

NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

ROCK DRILLS WORKED BY COM-
pressed Air.—By H. W. Pendred, C. E. Description of the most recent and best practice. SUPPLEMENT No. 20. Price, 10 cents.

HARTFORD STEAM BOILER Inspection & Insurance COMPANY.

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

ROCK DRILLING MACHINES AND AIR COMPRESSORS.
MANUFACTURED BY BURLEIGH ROCK DRILL CO. FITCHBURG MASS.
SEND FOR PAMPHLET.

Can I Obtain a Patent?

This is the first inquiry that naturally occurs to every author or discoverer of a new idea or improvement. The quickest and best way to obtain a satisfactory answer, without expense, is to write to us (Munn & Co.), describing the invention, with a small sketch. All we need is to get the idea. Do not use imitative. Be brief. Send stamps for postage. We will immediately answer and inform you whether or not your improvement is probably patentable; and if so, give you the necessary instructions for further procedure. Our long experience enables us to decide quickly. For this advice we make no charge. All persons who desire to consult us in regard to obtaining patents are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us a careful consideration of their plans, an honest opinion, and a prompt reply.

What Security Have I that my communication to Munn & Co. will be faithfully guarded and remain confidential?

Answer.—You have none except our well-known integrity in this respect, based upon a most extensive practice of thirty years' standing. Our clients are numbered by hundreds of thousands. They are to be found in every town and city in the Union. Please to make inquiry about us. Such a thing as the betrayal of a client's interests, when committed to our professional care, never has occurred, and is not likely to occur. All business and communications intrusted to us are kept secret and confidential.

Address **MUNN & CO.,**

Publishers of the SCIENTIFIC AMERICAN,

37 Park Row, New York.

THE TANITE CO.,

STROUDSBURG, PA.

EMERY WHEELS AND GRINDERS.

GEO. PLACE, 121 Chambers St., New York Agent.

**\$3 PRINTING PRESS!**

Prints cards, envelopes, etc., equal to any press. Larger sizes for large work. Do your own printing and advertising and save money. Excellent spare hour amusement for old or young. Or it can be made money-making business anywhere. Send 3c. stamps for large catalogue to
KELSEY & CO., Manufacturers,
Meriden, Conn.

H. W. JOHNS' PATENT**ASBESTOS MATERIALS.**

Paints, Roofing, Steam Pipe and Boiler Coverings, Steam Packing, Sheathings, Fire, Acid, and Waterproof Coatings, Cements, etc. Send for Samples, Illustrated Catalogues, Price Lists, etc.

87 MAIDEN LANE, NEW YORK.**THE FLOW OF SOLIDS.—BY LEWIS S.**

Ware, C. E. Novel and curious experiments. Cold metal caused to flow through orifices, and the laws governing such flow, with mathematical calculations, and 13 illustrations. SCIENTIFIC AMERICAN SUPPLEMENT No. 82. Price, 10 cents.

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 & SON, Buffalo, N. Y.**WOOD & LIGHT Machine Co.**

WORCESTER, MASS.

Manufacture all kinds of

Iron-Working Machinery,

including many novelties.

Chaffing, Pulleys, &c.

Send for Circulars.

THE Scientific American.

The Most Popular Scientific Paper in the World.
THIRTY-SECOND YEAR.

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

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

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

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

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.

NOTICE TO FOREIGN SUBSCRIBERS.

The new Postal Union now offers special facilities for the regular and speedy transmission of the SCIENTIFIC AMERICAN direct from the office of publication in New York to subscribers in foreign countries. The subjoined table exhibits the yearly subscription prices of the SCIENTIFIC AMERICAN and SUPPLEMENT in the principal foreign currencies, payable in advance:

The prices are for one year's subscription, including the postage.	FOR SCIENTIFIC AMERICAN.	FOR SUPPLEMENT.	SCIENTIFIC AMERICAN AND SUPPLEMENT.
Austria.....	S. Fl..... 9	 13	 20
Belgium.....	Francs..... 20	 30	 45
Denmark.....	Kro..... 15	 23	 35
France.....	Francs..... 20	 30	 45
German Empire.....	R. M..... 16	 25	 37
Great Britain.....	Shillings..... 24	 36	 54
Holland.....	H. F..... 9	 14	 21
Italy.....	Franchi..... 20	 30	 45
Norway.....	Kro..... 15	 23	 35
Russia.....	Roub..... 5	 8	 11
Sweden.....	Kro..... 15	 23	 35
Switzerland.....	Francs..... 20	 30	 45

The best way to remit is by Postal Order. Make the order payable to MUNN & CO., New York, United States, and forward the order to us with the name of the sender and the address to which the paper is to be mailed.

MUNN & CO.,

Publishers SCIENTIFIC AMERICAN,

New York.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.